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ZILA ROADS MAINTENANCE AND IMPROVEMENT (ZRMI) PROJECT

USAID PROJECT NUMBER 388-0056

PROJECT INTERIM REPORT

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WILBUR SMITH AND ASSOCIATES
BANGLADESH CONSULTANTS, LTD.
PUBLIC ADMINISTRATION SERVICE

MARCH 1987

ZILA ROADS MAINTENANCE AND IMPROVEMENT (ZRMI) PROJECT

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GLOSSARY

AE	- Assistant Engineer
AIT	- Asian Institute of Technology
ARE	- Assistant Resident Engineer
BDG	- Government of Bangladesh
BCL	- Bangladesh Consultants, Ltd.
BKK	- Bangkok
COP	- Chief of Party
DAC	- Dhaka
DE	- District Engineer
ft	- Foot
HBB	- Herringbone Bond
km	- Kilometer
LGEB	- Local Government Engineering Bureau
m	- Meter
MLGRD&C	- Ministry of Local Government, Rural Development, and Cooperatives
PAS	- Public Administration Service
PE	- Project Engineer
PM	- Project Manager
RE	- Resident Engineer
SAE	- Sub-Assistant Engineer
SMS	- Subject Matter Specialist
sq ft	- Square Foot
sq m	- Square Meter
TA	- Training Advisor
UE	- Upazila Engineer
USA	- United States of America
USAID	- United Agency for International Development
WPW	- Works Program Wing
WSA	- Wilbur Smith and Associates, Inc.
XEN	- Executive Engineer

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I - INTRODUCTION

A. GENERAL

It is axiomatic that a country whose domestic economy is basically agriculturally oriented must maintain a well planned and integrated internal transportation system if that economy is to flourish and expand to meet the nation's ever growing requirements for agricultural production. In Bangladesh, the fluvial transportation system is adequately utilized, as is the rail network, but both systems are limited in their ability to expand to fully serve the growing transportation needs of the rural sector. It is estimated that there are some 8,000 km of navigable river channels in the entire country during the rainy season, but this is reduced by 50 percent in the dry season to a total of some 4,000 km. Furthermore, many of the smaller channels are gradually being reduced in capacity by siltation and aquatic growth, so that available navigable channels become fewer each year. The railroads are limited by the fact that the eastern portion of the country is served by meter-gage rolling stock, while the western portion is served by broadgage rolling stock. This situation increases the handling charges of any cargo moving across the country and, by the very fact of its existence, would greatly increase the cost of any proposed expansions to the system.

On the other hand, the existing feeder road system is quite inadequate and, therefore, serves as a major constraint to meaningful rural development. For example, a survey conducted by the Consultant in 1983 found that total paved and unpaved feeder roads in the three ZRMI Project Districts (old) of Sylhet, Rangpur, and Faridpur totaled 545 km, 2,385 km, and 360 km, respectively. Regardless of the obvious inadequacy in extent of the feeder road system,

the root problem is the lack of proper maintenance and/or reconstruction of those roads and appurtenant structures that now exist.

Proper maintenance and reconstruction cannot be achieved on a hit-or-miss basis. To be economically and technically sound and to maximize the use of scarce resources, such activities must be planned and managed; which implies improvement of existing institutions, or the creation of new ones, to promote the development of an effective program of feeder road maintenance and improvement.

The Bangladesh Government (BDG), cognizant of the need for an improved feeder road system, has been promoting the development of farm-to-market roads through diversified programs such as the Rural Works Program, the Food for Work Program, and others. In the late 1970's, the United States Agency for International Development (USAID) indicated its interest in cooperating with BDG in furthering this activity.

A concrete manifestation of this interest was the commissioning of Louis Berger, International, Inc., to investigate rural road feasibility and to undertake the design of a significant road construction project. The pertinent conclusions of the Rural Roads Study were as follows:

"1. Roads are a critically needed facility in the rural areas of Bangladesh for increased agricultural production, marketing, commerce and improvement in rural dwellers' access to government services.

2. The capability of Bangladeshi rural road construction contractors at present is very limited. Therefore, any sizable road construction project must utilize an expatriate construction firm and certain capital intensive techniques in order to achieve effective project construction within an appropriate construction time frame. The study estimated the cost of this effort in the Faridpur District, including bridges, at $262,000 per mile with a U.S. construction firm and $179,950 per mile utilizing a code 941 construction firm.

3. At present there is no program whatsoever of regular annual/seasonal rural road maintenance which would ensure the durability of a costly investment in new rural road construction."[1]

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1. Project Paper, Bangladesh, Zila Roads Maintenance and Improvement, 388-0056, USAID, Washington, DC, June 1981 (Unclassified).

The extremely high construction costs estimated for the Faridpur District (old) alone precluded the possibility that USAID could finance such a program. However, the complete absence of annual/seasonal maintenance procedures suggested a highly viable alternative -- the development of institutional/ management capability to effectively undertake a program of appropriate annual/seasonal maintenance and improvement on existing feeder roads. Thus, following in-depth studies of existing feeder road institutions and political subdivisions, in August 1981, the Zila Roads Maintenance and Improvement (ZRMI) Project came into being. As shown on Exhibit I, the three districts (old) included in this project were Sylhet, Rangpur, and Faridpur.

B. BACKGROUND

1. ZRMI Project Goals and Purpose

a. Project Goals

"The goal of the Zila Road Maintenance and Reconstruction Project is increased agricultural production - particularly foodgrains. The project seeks this objective by providing better and more reliable year round roads for farmer access to market centers. Needed improvements and regular maintenance of the farm-to-market road network will permit a greater use of low cost transport modes such as oxcarts, pushcarts and bicycle rickshaws, thereby reducing the overall cost of agricultural inputs and increasing the profitability of marketing surplus agricultural production. In addition, improved rural roads will permit a greater level of rural mobility so that modern farm practices and market information can be disseminated more rapidly by extension agents and through traditional rural communication systems."[1]

"An improved and maintained farm-to-market road network will have the additional goal related effects of enhancing the conditions required for expanding rural industries which have an important symbiotic relationship with on-farm activities.

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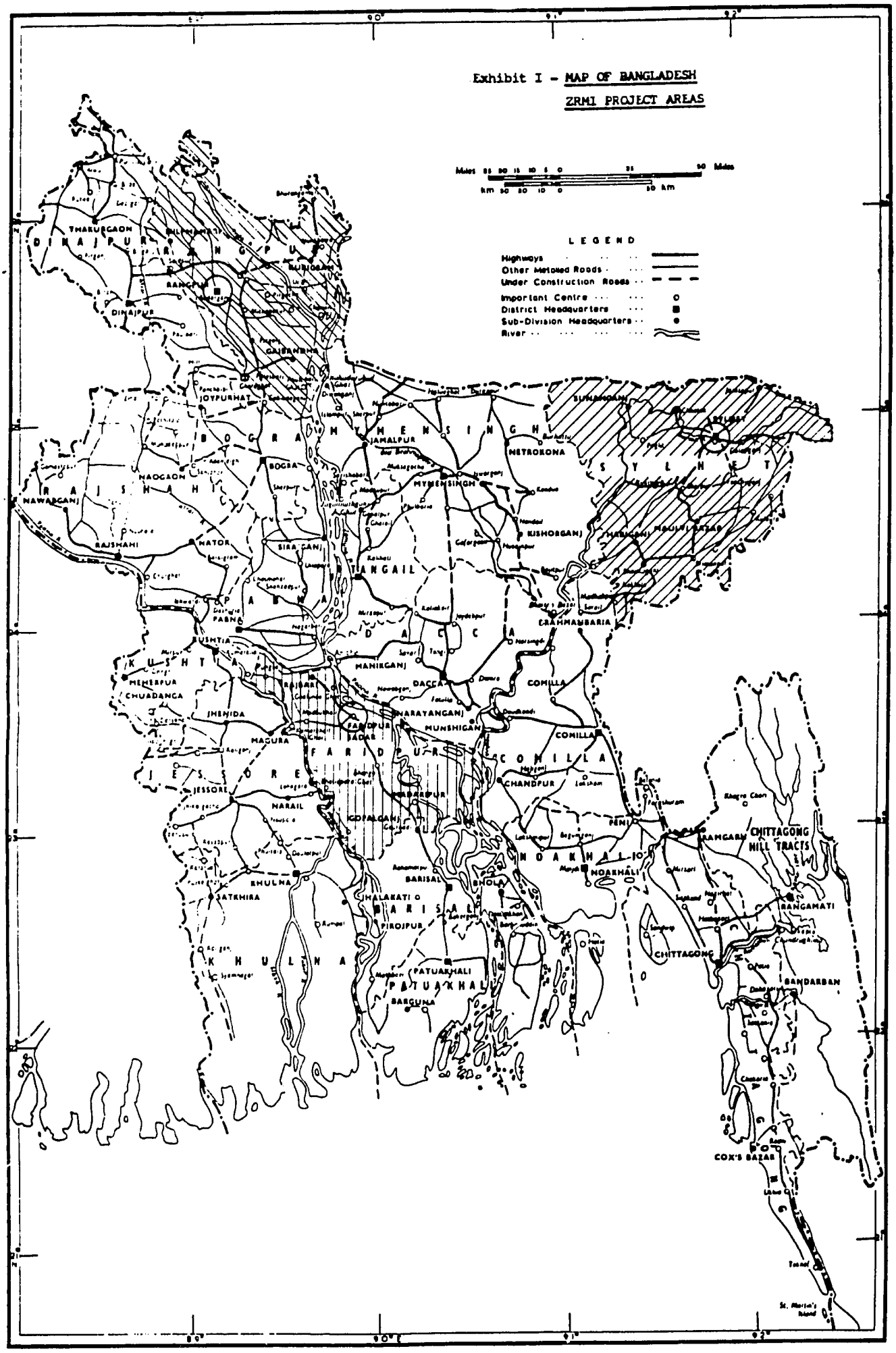
[1] op. cit.

Exhibit I - MAP OF BANGLADESH

ZRMI PROJECT AREAS



The Project will have a wider rural impact by improving the access of rural people in general to public and commercial services. Perhaps the most important of these wider impacts is the greater acceptance of modern contraception practices."[1]

b. Project Purpose

As stated in the Project Paper, the purpose of this Project is to improve rural access (farm-to-market roads) by institutionalizing an effective program of routine annual/seasonal maintenance and increasing the pace of development of roads under the jurisdiction of Zila Parishads (subsequently, the revised rural administrative system has changed the emphasis to the Upazila concept). The purpose follows directly from the Project's goal since proper maintenance is most urgently needed for the preservation of the currently deteriorating existing farm-to-market roads and considerable development of the feeder road networks is required.

2. Project Features

a. Technical Assistance

"The technical assistance concerned with institutional development provided under this Project is considered the critical AID input in order to achieve the objective of establishing the organizational structure, management capability and technical knowledge in the BDG and the project districts required for an effective annual/seasonal maintenance program to be carried out conscientiously. Consequently, personnel selected as members of the technical assistance team must have an operational background of management and technical experience which demonstrates a thorough familiarity with the maintenance and improvement of rural roads."[1] This feature, included as a part of a contract awarded to Wilbur Smith and Associates, Inc. (WSA), will be discussed in the Personnel Section of Part II - Contract Features.

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[1]op. cit.

b. Equipment Procurement

"The Project will provide equipment required for maintenance and road improvement. In addition, logistic support will be provided to the districts' engineering staff."[1] The type and quantity of equipment as finally ordered was somewhat different from that originally specified. Since the WSA contract included the obligation that the Consultant would act as the procurement agent for acquiring the heavy equipment, details of procurement activities will be found in the Equipment Procurement Section of Part II.

c. Training

"While on-the-job training will be carried out continually by the technical assistance firm, the project provides separate resources to finance special problem solving training sessions. The project will provide logistic costs, per diem and subsistence costs to the participants who are brought from each of the project districts to the sites of the training sessions. A limited number of key engineering staff from non-project districts also will be invited to these sessions. It is estimated that the approximately 100 members of the three Zila Parishad engineering staffs will attend training sessions each project year.

The special training sessions will be organized as an exercise to solve specific management and technical maintenance and road improvement problems. Sessions will contain a group of 15 to 20 participants and last from one to two weeks. They will be conducted in the project districts on the sites of the maintenance and road improvement problems so that the training experience is as practical and relevant as possible.

In addition, the project will provide the following short term training in the US or in a third country.

Public Works Administration	6 persons	3 months each
Road Maintenance Procedures	12 persons	3 months each
Equipment Maintenance	6 persons	6 months each"1

[1] op. cit.

d. Local Government Finance Analyses

"The project will provide a team of experts who will analyze the current Zila Parishad finance structure and problems in order to identify new and/or more efficient means for increasing local government revenues. In addition, the team will examine the expenditure patterns of the Zila Parishads to identify factors which constrain the allocation of resources to road maintenance. Particular attention will be given to the Zila Parishads' budget development process, disbursement and accounting procedures. The team will be financed by the project but will be provided through the existing DS/RD cooperative research agreement with Syracuse University. A more comprehensive description of the technical and analytical services to be provided by Syracuse University can be found in the DS/RD Project Paper entitled Local Revenue Administration."[1]

e. Road Development Fund

"A total of $4,000,000 divided among the three project districts will be provided to finance selected corrective maintenance and road improvements. The annual amounts of USAID funds placed with the respective Zila Parishads will be in addition to their own resources and those provided by the Rural Works Program. AID provided funds will be limited to the following work:

1) Installation of box culverts, ring culverts and storm drainage structures with discharge pipe.

2) Earthwork/paving at bridge approaches (less than 200 yards on each side of the bridge).

3) Installation of brick liner, herringbone or crushed bricks on existing earth embankments that are at proper crown, grade, and fully appropriate for paving.

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[1]op. cit.

4) Seal coat or bituminous concrete paving on appropriate existing herringbone, crushed brick or dirt road surface.

5) Construction of small bridges (maximum width 15 feet, and less than 75 feet in length).

6) Embankment protection such as sodding, tree planting and retaining walls.

The $4,000,000 Road Development Fund will be allocated to the three districts over the three year life of the project according to an allocation formula based on the existing degree of road access in each district and the estimated relative wealth of each district. The formula provides a greater level of annual project funding to those districts with a relatively poorer degree of road access and wealth.

The levels of the Road Development Fund available to each district will be increased annually by 15 percent to counter inflation and by 20 percent as an increment in the level of construction to be undertaken by each Zila Parishad. USAID will not finance any embankment rehabilitation with the exception of the bridge approaches noted under item 2) above.

As an incentive for increased effort the full annual allocation of the second and third year's funding level will be provided only to those Zila Parishads which have committed all of the prior year's funds. If a Zila Parishad does not commit all of its annual allocation, the uncommitted amount will not be carried over and therefore (will not be) additive to the following year's allocation. Rather, undercommitments will be reallocated to the other project Zila Parishads which have committed their full allocation in the previous year."[1]

During the course of the three-year Project life, the parameters and financial provisions of the Road Development Fund, while remaining basically

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[1]op. cit.

the same as outlined, did undergo several modifications in actual practice, if not in principle. The details of this feature, the monitoring of which was one of the contractual responsibilities of the Consultant, will be discussed in the Construction Systems and Supervision section of Part II.

f. Socio-Economic Impact Assessment

"The project will provide the services of a qualified long term social scientist who will conduct an in-depth study of the social and economic impact of the maintenance and improvement of the Zila Parishad road system.

The scope of work of the social scientist is as follows:

1) Design and execute studies of the socio-economic aspects of improved Zila roads in the three project districts with particular attention to income levels, distribution, employment and the changing status of tenant farmers. Results of these studies should provide clear indicators of project performance and guidelines when appropriate for project improvement.

2) Develop baseline data for social and economic aspects of the project areas, against which long term changes in productivity, employment and quality of life resulting from implementation of the Zila road project may be measured in the future.

3) Monitor ongoing local responses to project activities and examine important socio-economic processes taking place as a result of improvement in district and road networks."[1]

3. Authority For and Purpose of this Report

a. Authority For This Report

The authority for this report is vested in the following basic documents:

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[1] op. cit.

- Project Grant Agreement (USAID Project Number 388-0056), dated 20 August 1981, and Amendments 1, 2 and 3, between the People's Republic of Bangladesh and the United States of America.

- The Contract, dated 07 October 1982, between the People's Republic of Bangladesh and Wilbur Smith and Associates, Inc., and its amendments:

  + Amendment 1, dated 08 August 1984,
  + Amendment 2, dated 28 July 1985,
  + Amendment 3, dated 13 February 1986,
  + Amendment 4, dated 29 July 1986, and
  + Amendment 5, dated 23 November 1986.

b. Purpose of This Report

The purpose of this report is to review and evaluate the several features of the ZRMI Project for which the Consultant was responsible, to try to formulate, as much as possible, an unbiased and clear picture of accomplishments relative to the goals of the individual features, to present the costs of these accomplishments, and to recommend further courses of action to maintain the momentum of this critical development effort. Data relevant to the progress achieved will be presented in both tabular and graphic form, as well as in the narrative. Photographs will be used to illustrate "before" and "after" situations and to demonstrate the application of techniques learned in both the daily on-the-job training and the more formal training sessions.

Of particular interest will be the discussions concerning the changes in concept of the Project and the administrative reorganization of the Project Implementing Agency from Works Program Wing (WPW) to Local Government Engineering Bureau (LGEB). These changes are reflected in the level of accomplishments achieved during the first phase of the Project, and will also significantly influence the orientation of Project operations in successive phases.

II - CONTRACT FEATURES

A. GENERAL

On 07 October 1982, The Government of the People's Republic of Bangladesh, represented by the Ministry of Local Government (Local Government Division) entered into a contract with the Consultants (Wilbur Smith and Associates, Inc., in association with Public Administration Service and Bangladesh Consultants, Ltd.) for the supply of technical assistance in the ZRMI Project.

On 08 April 1984, the same two parties to the original Contract signed Amendment No. 1 to the Contract. This Amendment increased the Bangladesh staff man-months from 1,427 to 1,841 and reduced the expatriate man-months from 183 to 182. The total Contract budget was increased from US $3,890,436 to US $3,973,665. The Amendment also added the Training segment as a part of the Consultant's contractual responsibilities.

On 28 July 1985, the same two parties to the original Contract signed Amendment No. 2 to the Contract. This Amendment decreased the Bangladesh staff man-months from 1,841 to 1,809 and increased the expatriate man-months from 182 to 202. This NO-COST AMENDMENT extended the Contract completion date from August 1985 to 30 November 1985.

On 13 February 1986, the same two parties to the original Contract signed Amendment No. 3 to the Contract. This Amendment increased the Bangladesh staff man-months from 1,809 to 2,137 and the expatriate man-months from 202 to 228.9. The total Contract budget was increased from US $3,973,665 to US $4,469,438 and the Contract completion date was extended from 30 November 1985 to 30 April 1986.

On 29 July 1986, the same two parties to the original Contract signed Amendment No. 4 to the Contract. This NO-COST AMENDMENT increased the

Bangladesh staff man-months from 2,137 to 2,309.5 and the expatriate man-months from 228.9 to 231.2 and extended the Contract completion date to 31 August 1986.

On 23 November 1986, the same two parties to the original Contract signed Amendment No. 5 to the Contract. This NO-COST AMENDMENT increased the Bangladesh staff man-months from 2,309.5 to 2,406.7 and the expatriate staff man-months from 231.2 to 233.3 and extended the Contract validity date to 31 October 1986. The term "validity" is used here because Amendment 3 of the Program Grant Agreement, dated 31 August 1986, extending the Project Assistance Completion Data to 30 June 1990, and introduced the concept of Phase II of the Project (to be known as the Feeder Road Maintenance and Improvement Project). Thus, the concept of this report was also changed from "completion" to "interim."

USAID Letter of Commitment No. 388-005601 was issued on 14 October 1982. Amendment No. 1, issued 18 July 1984, increased the value of the commitment for the Technical Assistance segment from US $3,890,436 to US $3,973,665. Amendment No. 2, issued 06 March 1986, increased the Technical Assistance funds to a total of US $4,469,438.

B. TERMS OF REFERENCE

As previously mentioned, the ZRMI Project was composed of six principal segments, of which the responsibility for four was assigned to the Consultant under the Terms of Reference of the technical assistance contract and its amendments. These four segments included the following:

- Technical Assistance
- Equipment Procurement
- Training
- Road Development Fund

Each of the principal segments was further subdivided into two or more elements, which taken jointly describe the duties and responsibilities of the Consultant under the terms of the technical assistance contract. These are described in more detail in the following sections.

1. Technical Assistance

a. Organization and Management

"The consultant will thoroughly analyze the existing statutes, regulations, directives, administrative structures, operating procedures, and staff related to the maintenance of rural roads under the jurisdiction of the Zila Parishads in the project districts. Following this analysis, the consultant will make recommendations, formulate and implement training, etc. necessary to establish the organizational structure and management practices required to implement maintenance plans and related construction. Included will be the organizational arrangements which routinely field skilled work gangs to repair asphalt and brick surfaced roads, drainage structures, bridges and other structures of permanent construction. Complementing this will be an organization and management structure appropriate to each district which employs contractors or villagers who reside along the right-of-way to maintain non-paved surfaces, embankments, clean culverts and drainage ditches and alert the district engineer to the more serious maintenance problems as they arise."[2]

b. Establishment of a Road Maintenance and Construction System

"The consultant will develop an effective annual road maintenance program for the establishment of a road maintenance and construction system which categorizes existing roads according to their physical condition, and provides the basis for organizational arrangements and annual budget requirements (supported by a written manual). The following four categories have been suggested in earlier studies and should be reviewed by the Consultant. Explanation of these four is presented in Section II of this RFP.

1) Preventive Maintenance
2) Corrective Maintenance
3) Road Improvement
4) Reconstruction

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2 Contract for Technical Services in Connection with Zila Road Maintenance and Improvement Project, (USAID Project No. 388-0056), 07 October 1982.

It is recognized that a clear line of demarcation cannot always be drawn between the above classification of works; judgement must be exercised in differentiating between these categories. However, recognition must be given to the absence of an effective annual maintenance program at the Zila level, necessitating corrective actions related to the above classifications before knowledgeable maintenance procedures can be developed. The above classifications should be reviewed by the consultant based upon their completion of a comprehensive field survey."[2]

"Following a thorough review of existing conditions the Consultant will develop an appropriate annual/seasonal road maintenance program in each of the three project districts which utilizes to the maximum local resources. Major emphasis will be put on the organizational management requirements, qualifications of technical personnel and the development of effective seasonal maintenance and construction operating procedures. The plans will categorize all of the Zila roads in the respective districts and specify the specific types and scheduling of maintenance and reconstruction procedures to be applied to each category of road. The plan will distinguish between maintenance and reconstruction activities and thus prevent confusion as to the proper allocation of designated funds. The plans will also specify the human and material resources required for each procedure.[2]

c. Preparation of Technical Specifications

"The consultant will prepare road construction technical specifications for rural roads. The institutional development of maintenance procedures requires their introduction and acceptance. The preparation of these specifications must consider such factors as the unique physical characteristics of Bangladesh, the annual flooding, and the lack of natural materials suitable for road construction as compared with what is found readily available in other countries. Further, design for year round road construction will vary with different project districts, e.g., in Faridpur in order to be

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[2]op. cit.

above annual flooding levels road crowns may have to be some eight feet above abutting land, whereas in Rangpur some three feet above abutting land may be sufficient. On the matter of materials, Sylhet has natural aggregate whereas Faridpur does not and huts must use chipped brick.

As a practical matter rehabilitation work will be done on existing embankments. This requires that the improvements be integrated into what exists within the limits of feasible design and funds available. For example, the issue of one lane vs. two lane roads will have to be carefully reviewed by the consultant.

The preparation of these specifications by the consultant for use throughout Bangladesh must allow for certain flexibility without endangering quality control of construction. Aspects of road construction that will require particular attention in the preparation of specifications are the following:

1) Drainage

The absence of adequate drainage is a serious problem. Many of the Zila roads follow the meandering pattern of the original footpaths where little consideration had been given to natural drainage patterns. The absence of lateral storm drainage systems can be observed. Consequently, additional drainage is urgently needed.[2]

"Another aspect of drainage that has been largely ignored is the absence of a granular material extending to the side slopes. This material could provide for the lateral movement of water which seeps through the surface and thus minimize penetrations in the subgrade which is predominantly plastic clays and whose water content must be vigorously controlled.

A USAID-financed document entitled "Design Manual for the Construction of Culverts, Small Bridges and Sluiceways," published in 1979,

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[2]op. cit.

contains practical and economic solutions to certain types of drainage problems encountered in rural roads. The consultants should review this and related design manuals for increased field use and to advise on their contents. The contractor should help the local engineering staff in doing proper hydrological studies.[2]

"2) Earth Compaction

The consultant will advise as to how compaction can be most effectively accomplished and how it will vary with road location, soil conditions, surface levels of existing roads, flood control levels, embankment slopes, etc. Natural subgrade (existing embankments) should be compacted to improve its CBR value so that costly pavement works can be reduced. As this project addressed to some extent the rehabilitation of existing road embankments located in three districts, with different control characteristics, the quantity of earth work that requires compaction will vary considerably; and as previously noted, in the Rangpur District year round roads will be above annual flood levels at a height of approximately three feet above abutting ground whereas in Faridpur this height is approximately eight feet.

The use of labor intensive procedures should be maximized during compaction of lower layers; it is recognized that mechanical compaction of the top layer usually must be done by tandem rollers.

The consultant will provide guidance on construction procedures governing the compaction and on related tests. It is the responsibility of the consultant to ensure that compaction is properly done in accordance with appropriate technical standards on those construction areas financed by USAID under this project. There may be some experiments on soil stabilization using lime or chemical hardeners to find appropriate solutions.

One area of particular concern is that the compaction of approach ramps for new bridges would result in a smooth compacted embankment which would provide a better road surface, more resistant to deterioration

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[2]op. cit.

and hence require less maintenance. In addition, such compaction technique would provide a surface with could serve as a subgrade for any future all weather surfacing improvement. The surface would also be more receptive to any prime or seal coats."[2]

NOTE: One of the important findings concerned with compaction in Bangladesh relates to the structure of the tenders used for road construction bids. The contractor's laborers are paid on a piece work basis by the amount of earth they move. This provides no financial incentive to the laborers if they are requested to compact the earth. Further, most contractors are paid by the volume of finished earth work -- again no financial incentive for compaction. This problem could be minimized if the tender conditions required compaction and stated that the contractor have two separate crews - one for earthwork and one for compaction. This would require the payment of a comparatively small increase above final volume figure to compensate the contractors for less due to compaction. This basic contract change would remove one of the major obstacles preventing effective compaction."[2]

"3) All Weather Surfacing

Available construction materials and construction techniques are discussed and cross sections are shown in Section IV of the RFP. It is clear that there are many areas for improvement. Because the subgrade is almost universally of plastic material, it is imperative that every attempt should be made to prevent water seepage into it. Consequently, it is essential that the consultant put high priority on the methods of waterproofing the surface.

Recently the first asphalt plant constructed in Bangladesh became operational. As supplies of asphalt become readily available, BDG engineers will be able to consider their use on a more regular basis for sealing as well as new pavement. The consultant will review the relative merits of asphalt, cut back asphalts, and emulsified asphalts and their application of

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[2]op. cit.

prime, slurry and single pass seal coats. The existence of this plant in Bangladesh opens up new potential for utilizing different applications for asphalt and offers considerable cost savings on road paving materials. Studies will be initiated by the consultant to find the best application for various district site conditions.

Also, in recent years, with the advent of the increase in oil prices, much research has been going on in industrialized countries concerning recycling and material additives with bituminous materials. An example of the latter would be the use of cellulose materials (which are in abundance in Bangladesh). Such innovations would be welcomed in a country lacking in basic resources and provided another area for appraisal by the consultant."[2]

"4) Concrete Bridge Construction

There are many small bridges in rural Bangladesh. The Bangladeshis have the capability to design and construct these structures. The consultant will review this technology and select those components to be included in the project training sessions, which would emphasize foundation exploration, economic design and quality control of construction in conjunction with effective bridge maintenance procedures. The consultant will also have to look into economics and suitability of small precast concrete slabs and prestrengthened units for bridge and culvert construction. Other available construction materials such as bricks should also be thoroughly investigated."[2]

"5) Access Aprons

It has been observed that many dirt access aprons have deteriorated due to pedestrian/vehicle traffic which adversely affects the connecting road surface, paved or not paved. The related road damage can be considerable and soon becomes worse under monsoon conditions. The probability of this condition occurring may be reduced, particularly in the case of paved

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[2]op. cit.

roads, by continuing the paving from the road surface along the access ramp for an appropriate distance. The consultant should study and provide appropriate guidance."[2]

"6) Quality Control

Quality control in the maintenance, improvement, and reconstruction activities of Zila Parishad roads is essential in order to realize benefits from the resources expended. At present, a variety of problems such as fragmented construction contracts, the absence of uniform standards/technical specifications, and the lack of materials testing impinge on quality control efforts and result in substandard roads which require more than normal maintenance.

Quality construction at all levels with the consequent reduction in maintenance will be achieved when appropriate construction testing and inspection become standard procedures. Quality control, therefore, is an extremely important subject for the consultant to incorporate into their training program. It is the foundation upon which the philosophy of modern maintenance is built. Training of staff in materials testing, quality control, tests for construction materials, undergoing sub-soil foundation explorations for bridges and culverts and establishing a small testing unit in each project district will be key tasks to be undertaken by the consultant."[2]

2. Road Development Fund/Construction Supervision

"It is planned that US $4 million will be divided among the three project districts to finance selected corrective maintenance and road improvements. The annual amounts of USAID funds placed with the respective Zila Parishads will be in addition to their own resources and those provided by the Rural Works Program. AID provided project funds will be limited to the following work:

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[2]op. cit.

a. Installation of box culverts, ring culverts, and storm drainage structures with discharge pipe.

b. Earthwork/paving of bridge approaches (less than 200 yards on each side of the bridge).

c. Installation of brick liner, herringbone or crushed bricks on existing earth embankments that are at proper crown, grade and fully appropriate for paving as per standards set by BDG Planning Commission.

d. Seal coat or bituminous carpet paving on appropriate existing water bound macadam surface on the feeder roads specified by the Planning Commission.

e. Construction of small bridges (as per width standards and loading prescribed by the Planning Commission, and less than 75 ft. in length).

f. Embankment protection such as sodding, tree planting, jute netting and retaining walls.

The US $4,000,000 Road Development Fund will be allocated to the three districts over the three-year life of the project according to an allocation formula based on the existing degree of road access in each district and the estimated relative wealth of each district. The formula provides a greater level of annual project funding to those districts with a relatively poorer degree of road access and wealth. USAID will not finance any embankment rehabilitation with the exception of bridge approaches as noted under item b. above.

During and prior to construction the consultant will be responsible for the following:

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[2] op. cit.

- The consultant will advise and assist the District Engineer and Executive Engineer (Works Program) in instituting appropriate construction management practices related to the management and programming of road works contracted for maintenance and construction to private firms. The consultant will assist in preparing a work program for the projects and its timely completion. It is desired to initiate construction/maintenance activities as soon as possible, preferably in the dry season."[2]

- The consultant will continually review the construction improvement works and progress of implementation of the maintenance organization and procedures and report achievements and short falls on a monthly basis to the respective Zila Parishads, the MLGRD&C and USAID. These reports shall contain appropriate recommendations for action and help in establishing an effective monitoring and management information system for the project at the local and central level.

- The consultant will check all design, specifications, estimates and tenders for the works prepared by the local technical staff and endorse a copy to the Government's Project Manager and USAID.

- The consultant will provide daily observation and monitor all construction work financed by USAID and certify that it conforms with related plans and specifications. The consultant will also prepare payment documents and make any additional measurements necessary to approve payments."[2]

3. Equipment Procurement

"The consultant will evaluate the existing equipment and repair shops in each of the project districts. Earlier studies have indicated that the following equipment may be required to support a basically labor intensive operation.

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[2]op. cit.

EQUIPMENT - ESTIMATED TYPE AND QUANTITY

Description	Quantities
Road Rollers (8-10 ton steel drum or pneumatic tires)	6
Concrete Mixers (10 cft.) with pneumatic tires	6
Survey Equipment	6 sets
Drawing and Cartographic Equipment	6 sets
Office Equipment	3 sets
Motorcycles (75 - 150 cc)	60
Trucks (5 ton)	6
Tractor with Trailer	3
Pickup Vans	7
Concrete Vibrators	18
Plate Vibrators	18
Spare Parts for All of the Above	——"[2]

"The above equipment list is an estimate prepared during the design of this project. During the first four months of the contract, the consultant will carefully review the equipment needs (spare parts, tool shops, etc.) of each of the Project's Zila Parishads and prepare a final commodity list including all appropriate specifications for approval by the Ministry of Local Government, Rural Development and Cooperatives (MLGRD&C) and USAID. After notification of the approvals by the Ministry and USAID, the consultant will procure and arrange for delivery of the equipment to the Project Zila Parishads in consultation with the MLGRD&C Project Manager. All equipment should be on the project site one year following the effective date of the contract. All procurement must be in accordance with AID procurement regulations described in AID Handbook 11, Chapter 3.

The consultant will assist MLGRD&C in receipt of the above in Bangladesh and in port and customs clearance, inspection and transport to sites to work under the project and assist MLGRD&C in the processing of any claims in connection therewith. MLGRD&C shall obtain from Chief Controller of Imports and Exports prior permission to import the items. All items procured shall be retained and used exclusively by the Consultant in the performance of the work until the completion of the project. The consultant

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[2] op. cit.

shall be reimbursed for all allowable costs incurred for the procurement, arrangement and assistance. Upon completion of the project, all non-expendable equipment shall be turned over to MLGRD&C in good working order, less normal wear and tear, for use in future AID funded projects."[2]

4. Training

"The immediate purpose of the training sessions would be the introduction of the specific technical specifications and solutions to common types of maintenance and construction problems encountered in Bangladesh. In addition, particular emphasis would be placed on the philosophy of preventive maintenance and the long range monetary advantages of making repairs promptly. As the maintenance crews develop an understanding and appreciation for road design and construction, they will simultaneously cultivate the desired philosophy. The ultimate goal is to develop a cadre of permanent personnel who can take positions as managers, engineers and field supervisors and provide continuity to the overall maintenance program.

To accomplish this the consultant will organize and conduct technical training exercises which include practical on-the-job experience for the staff of the District Engineer and, as appropriate, the Executive Engineer Rural Works Program. This training will emphasize problem areas and provide technical solutions for all aspects of road maintenance, improvement and reconstruction. In addition, the firm will arrange for all U.S. and third country training.

The end result of this training is that appropriate maintenance and construction techniques will have been introduced to the engineering staff of the Zila Parishads through an intensive program of technical assistance with the emphasis on on-the-job training supported by organized training sessions and technical manuals. Training sessions will have concentrated on specific problem areas and remedial solutions, e.g., the value of surface and lateral

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[2]op. cit.

drainage with respect to the preservation of existing roads, repair/resurfacing of existing paved roads, methods for seasonal/annual maintenance of existing brick herringbone and earthern surface roads, rehabilitation of road embankments, specific maintenance requirements of bridges and construction equipment, quality control and the testing of materials, etc. All district engineering personnel will have participated in at least one training session during each project year. The project further anticipates key engineering personnel from non-project districts will have had the opportunity to visit project areas and attend certain training sessions.

The consultant should plan on conducting on-the-job training continually throughout the project. The consultant will organize and conduct special training sessions as an exercise to solve specific management and technical maintenance and road improvement problems. Sessions may contain a group of 15 to 20 participants and last from one to two weeks. They will be conducted in the project districts on the sites of the maintenance and road improvement problems so that the training experience is as practical and relevant as possible. The training program and materials should be prepared in consultation with the BDG Project Manager.

The Project will provide separate resources to finance the logistic costs, per diem and subsistence costs of the government participants who will attend the special problem solving training sessions. A limited number of key engineering staff from non-project districts will be invited to these sessions. It is estimated that the approximately 100 members of the three Zila Parishads engineering staffs will attend training sessions each project year.

In addition, the project will finance the following short-term training in the U.S. or in a third country:

- Public Works Administration - 9 persons, 3 months each

- Road Construction and Maintenance Procedures - 15 persons, 3 months each
- Soil Testing and Foundation Exploration - 9 persons, 6 months each

It would be preferable if all training could be conducted by "Bangla" speaking local experts under supervision of the consultant.

In order to make the organizational and technical information available on a continuing basis to the project districts and to non-project districts, a technical manual in Bengali and engineering design plans will be prepared by the consultant in consultation with the BDG and USAID. The manual will describe suitable administrative structures, staffing needs, operating procedures, equipment requirements and procedures for equipment maintenance."[2]

"Specific engineering information related to the use of local materials to the maximum will be provided. In addition, the manual will contain model engineering design plans and techniques for road construction, drainage and problem areas. This technical manual related to specific maintenance problems will complement and improve the recent AID financed Design Manual for the Construction of Culverts, Small Bridges, and Sluices which has been widely distributed to technical personnel at the local government level. The project will establish an effective monitoring and management information system for the project districts and at the central level and train the concerned staff in this respect."[2]

5. Reports

a. Inception Report

"This report will fully update the Consultant's proposed program of work and schedule as was originally contained in the technical proposal. It

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[2]op. cit.

should state the methodology proposed for completing the work and the date on which the work will be complete. It will also present an outline of the proposed training program which is to begin (120) calendar days after the effective date of the contract. Ten copies of the Inception Report shall be submitted to the MLGRD&C and six copies to USAID within sixty (60) calendar days after the effective date of the contract.

b. Monthly Reports

The consultant shall prepare a monthly progress report containing a brief history and description of the project, contract mile-stones reached during the reporting period, actual or anticipated problems, with recommended solutions, the financial status of the project, staffing levels, and other items that may have an effect on the contract. The monthly report shall not be used as an instrument to obtain answers to specific questions or problems; this should be obtained by other direct communications. Fifteen (15) copies of the Monthly Report shall be submitted to the MLGRD&C and six (6) copies to USAID. The report shall be submitted within ten (10) days after the end of the reporting period.

c. Final Report

Four months prior to the contract expiration the consultant will submit a draft Final Report. This report will evaluate the project in terms of accomplishment of key objectives as stated in the contract terms of reference. The report will also summarize staff assignments completed by all professional staff, and a financial status summary.

Following review and discussion by the Ministry and USAID, the Consultant will submit twenty (20) copies of the Final Report to the MLGRD&C and eight (8) copies to USAID."[2]

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[2]op. cit.

6. Progress Review Meetings

"The designated representatives of the Consultant and the officials of MLGRD&C shall meet as often as is reasonably required to evaluate progress of the services as per the detailed work schedule. The Consultant immediately after the commencement of services shall submit a detailed work schedule showing starting and completion dates of the specific parts and stages of the consultancy services."[2]

During the life of the Contract, there were many adjustments in concept with regard to the Terms of Reference. Those elements and segments which were particularly affected by subsequent revisions and changes included the following:

- Organization and Management
- Equipment Procurement
- Training

The details of these changes and their respective impact on the Project will be discussed in the relevant sections of Part III - Chronology and Accomplishments.

C. PERSONNEL

1. Basic Contract

The level of manpower effort for this Contract was originally estimated to be a total of 1,610 person-months of direct labor, and the composition of that direct labor was as follows:

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[2]op. cit.

Personnel Category	Person-Months
Expatriate Staff Professionals	183
Bangladesh Staff Professionals	183
Bangladesh Technical Staff	310
Bangladesh Administrative/Clerical	944
TOTAL PERSON-MONTHS	1,610

A listing of all personnel, by position, and a bar-chart schedule showing proposed individual work schedules are shown in Exhibit II - Original Personnel Schedules.

2. Amendments 1, 2, 3 and 4

As stated previously, Amendment 1 increased the total person-months of the Contract, Amendment 2 decreased the person-months, while Amendments 3 and 4 again increased the person-months of the Contract. However, for purposes of comparing personnel rosters and schedules, only the initial and the current rosters and schedules need to be examined.

3. Amendment 5

The final revised level of manpower effort currently in effect for this Contract is 2,640.0 person-months of direct labor, and the composition of that direct labor is as follows:

Personnel Category	Person-Months
Expatriate Staff Professionals	233.3
Bangladesh Staff Professionals	345.8
Bangladesh Technical Staff	735.5
Bangladesh Administrative/Clerical	1,325.4
TOTAL PERSON-MONTHS	2,640.0

EXHIBIT 11 - ORIGINAL PERSONNEL SCHEDULES (PER BASIC CONTRACT) - EXPATRIATE PERSONNEL

Position	Year 1												Year 2												Year 3												Year 4				Total Person Months
	1982			1983												1984												1985										1986			
	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	
Chief Of Party																																												32
Resident Engineer, Sylhet																																												31
Resident Engineer, Rangpur (PAS)																																												28
Resident Engineer, Faridpur																																												28
Soils/Materials Specialist																																												6
Quality Control Specialist																																												6
Maintenance Specialist																																												—
Accounting Specialist (PAS)																																												4
Management O.& M. Spec. (PAS)																																												5
Training Specialist (PAS)																																												16
Design Engineer, Pavement																																												3
Equipment Maintenance Spec.																																												4
Hydrologist/Design Engineer																																												9
Land Surveyor																																												2
Home Office Support																																												6
Home Office Support (PAS)																																												3
Total																																												183

LEGEND

Full time for the time periods shown

Available on demand (to the total person-months indicated)

No activity

EXHIBIT II - ORIGINAL PERSONNEL SCHEDULES (PER BASIC CONTRACT) - BANGLADESH PERSONNEL

Position	Year 1												Year 2												Year 3												Year 4				Total Person Months
	1982			1983												1984												1985												1986				
	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	
PROJECT STAFF PROFESSIONAL																																												
Associate Chief Of Party																																												8
Proj. Engr./Training Coord.																																												32
Office Engineer																																												32
Asst. Resident Engineers (3)																																												57
Hydrologist																																												3
Structural Engineer																																												4
Assistant Design Engineer																																												4
Assistant Design Engineer																																												—
Assistant Engineers (3)																																												—
Soils/Mat.Lab./Trng. Spec.																																												8
Pavement Design/H.O. Support																																												3
Chief Surveyor																																												3
Management Specialist																																												2
Management Specialist																																												3
Training Specialist																																												8
Head Office Support																																												3
Sub-Total																																												173
PROJECT STAFF TECHNICAL																																												
Dhaka Office																																												
Draftsmen (2)																																												44
Laboratory Technician																																												32
District Offices (3)																																												
Surveyor/Land Inventory (6)																																												
Laboratory Technicians (6)																																												
Draftsmen (3)																																												—
Sub-Assistant Engineers (9)																																												—
Mechanics (3)																																												54
Sub-Total																																												310

Cont. on Sheet 3 of 3

EXHIBIT 11 - ORIGINAL PERSONNEL SCHEDULES (PER BASIC CONTRACT) - BANGLADESH PERSONNEL

Position	Year 1												Year 2												Year 3												Year 4				Total Person Months
	1982			1983												1984												1985												1986				
	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	
PROJECT STAFF NON-TECHNICAL																																												
Dhaka Office																																												
Administrative Assistant																																												32
Accountant																																												32
Secretary																																												32
Typist																																												32
Messenger/Printer																																												32
Drivers (2)																																												54
Guards (2)																																												32
Caretaker/Cleaner/Gardener																																												32
District Offices (3)																																												
Office Manager/Accountant (3)																																												87
Secretary/Typist (3)																																												87
Messengers (3)																																												87
Drivers (6)																																												144
Guards (6)																																												174
Caretaker/Cleaner/Gardener (3)																																												87
Sub-Total																																												944
Total																																												1,427

LEGEND

Full time for the time periods shown

Available on demand (to the total person-months indicated)

A listing of all personnel, by position, and a bar-chart schedule showing final individual work schedules are shown in Exhibit III - Final Revised Personnel Schedules (per Amendment No. 5).

It can be observed that the net increase in person months was about 63 percent, with the expatriate portion posting an increase of about 27 percent and the Bengali segment an increase of 68 percent. These increases were due principally to the desire for more training cycles and the need for more project monitoring and quality control, both during the original three-year life of the Project as well as in the extended fourth year.

4. Project Personnel Scheduling Performance

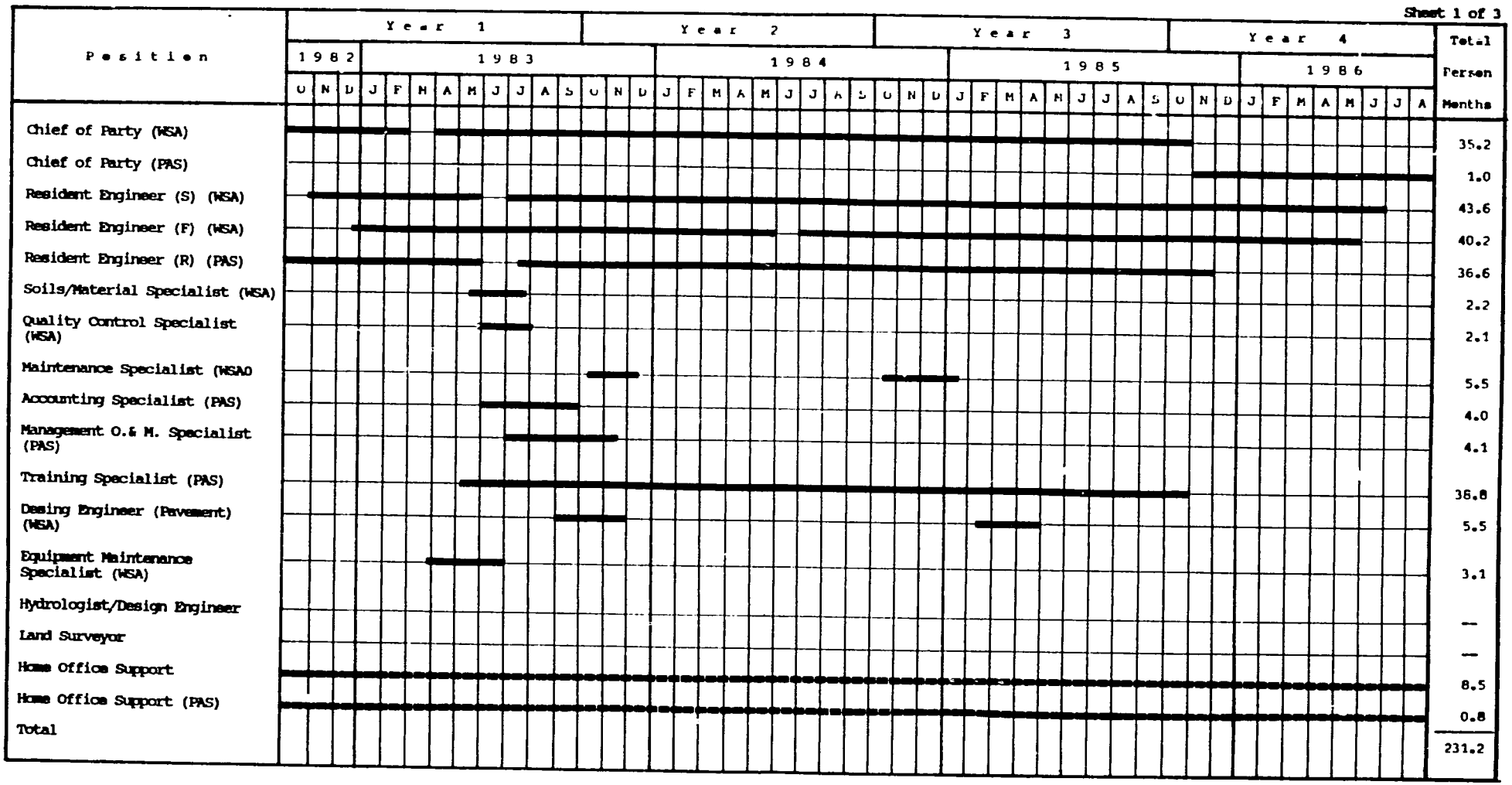
Exhibit IV depicts graphically both the proposed and the actual scheduling of technical personnel by months. The circles represent total personnel per month as proposed, while the triangles represent actual technical personnel present each month. Thus, the circles reflect the manpower planning of the original contract and each of the five amendments, while the triangles are a measure of the accuracy and the viability of that planning. The line connecting the circles represents 1,314.6 person-months, as taken from Amendment 5. The line connecting the triangles represents about 1,231 person-months, as taken from the monthly progress reports. The shortfall in person-months over a period of 49 months was about 83 person-months, or about 6 percent. Considering the several adjustments in manpower during the life of the Contract, this is almost negligible.

D. BUDGET

1. General

The entire contract budget story, from the original Contract through Amendment No. 5 and including total estimated expenditures through 31/10/86, is shown in tabular form in Exhibit V. From an examination of Exhibit V, it can be seen that practically all funds required for logistic support were provided in the original Contract. The principal adjustment in all amendments

EXHIBIT III - FINAL REVISED PERSONNEL SCHEDULES (PER AMENDMENT No. 4)
EXPATRIATE PERSONNEL



LEGEND

Full time for the time periods shown

Available on demand (to the total person-months indicated)

No activity

Note: The Training Specialist (PAS actually served as Chief of Party from 01/11/85 through 31/08/86, even though his salary continued to be charged as Training Advisor.

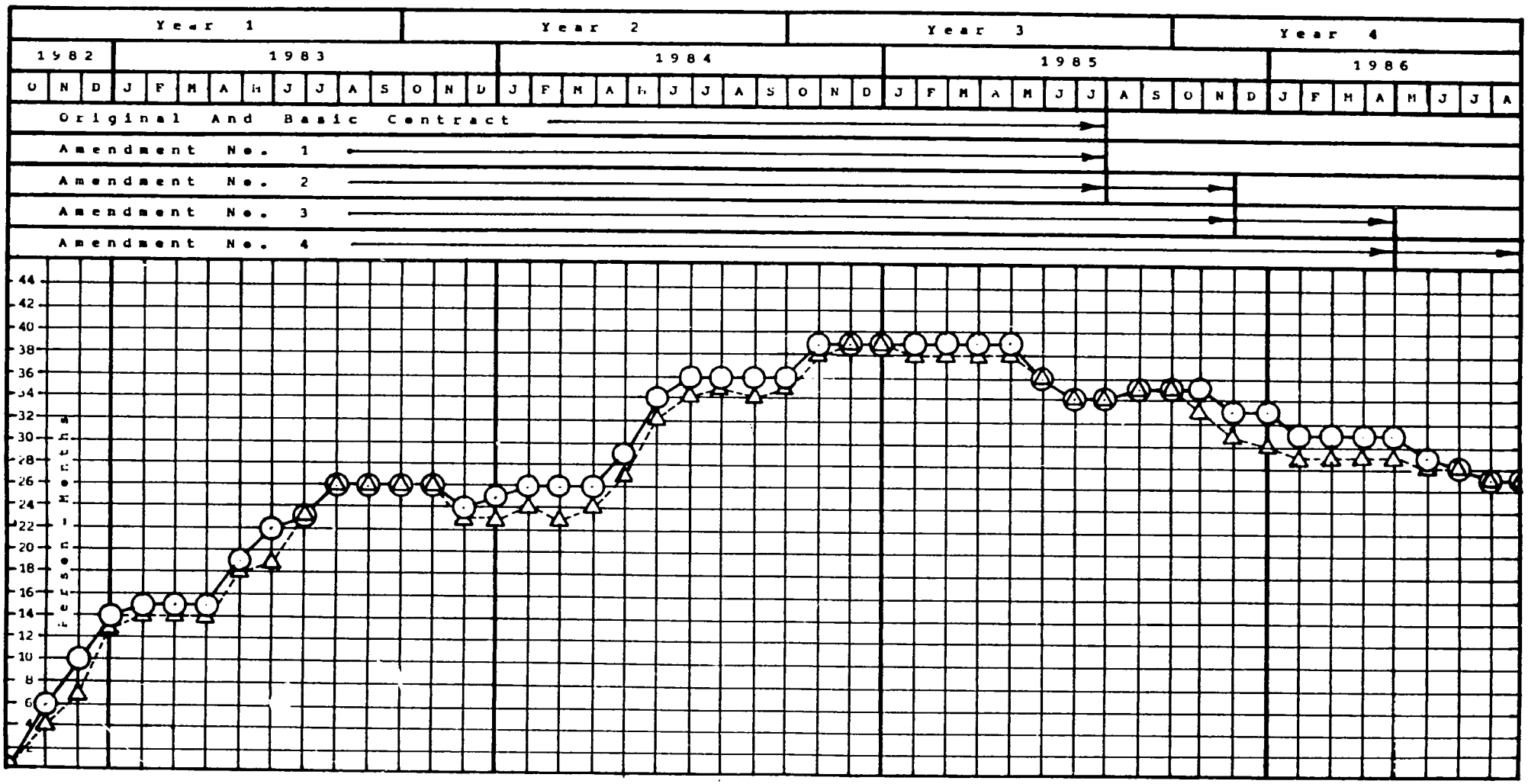
EXHIBIT III - FINAL REVISED PERSONNEL SCHEDULES (PER AMENDMENT No. 4) - BANGLADESH PERSONNEL

Position	Year 1												Year 2												Year 3												Year 4												Total Person Months
	1982			1983												1984												1985												1986								
	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A		
PROJECT STAFF PROFESSIONAL																																																	
Associate Chief of Party																																																	8.3
Proj. Engr./Training Coord.																																																	45.5
Office Engineer																																																	45.5
Asst. Resident Engineers (3)																																																	125.0
Hydrologist																																																	3.0
Structural Engineer																																																	7.8
Assistant Design Engineer																																																	8.0
Assistant Design Engineer																																																	6.0
Assistant Engineers (3)																																																	55.0
Soils/Mat.Lab./Trng. Spec.																																																	7.3
Pavement Design/H.O. Support																																																	3.6
Chief Surveyor																																																	3.8
Management Specialist																																																	1.0
Management Specialist																																																	2.0
Training Specialist																																																	6.0
Head Office Support																																																	5.7
Sub-Total																																																	333.3
PROJECT STAFF TECHNICAL																																																	
Dhaka Office																																																	
Draftsman (2)																																																	62.8
Laboratory Technician (3)																																																	32.7
District Offices (3)																																																	
Surveyor/Land Inventory (6)																																																	212.0
Laboratory Technical (3)																																																	149.0
Draftsman (3)																																																	53.0
Sub-Assistant Engineers (9)																																																	205.0
Mechanics (3)																																																	—
Sub-Total																																																	714.5

EXHIBIT III - FINAL REVISED PERSONNEL SCHEDULES (PER AMENDMENT No. 4) - BANGLADESH PERSONNEL

Position	Year 1												Year 2												Year 3												Year 4								Total Person Months
	1982			1983												1984												1985												1986						
	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	
PROJECT STAFF NON-TECHNICAL																																															
Dhaka Office																																															
Administrative Assistant																																															46.4
Accountant																																															45.4
Secretary																																															46.4
Typist																																															44.5
Messenger/Printer																																															46.0
Drivers (2)																																															71.0
Guards (2)																																															55.0
Caretaker/Cleaner/Gardner																																															45.0
District Offices (3)																																															
Office Manager/Accountant (3)																																															128.0
Secretary/Typist (3)																																															100.0
Messenger (3)																																															110.0
Driver (4)																																															163.0
Guards (6)																																															254.0
Caretaker/Cleaner/Gardner (3)																																															107.0
Sub-Total																																															1,261.7
Total																																															2,309.5

Exhibit IV - PROFESSIONAL/TECHNICAL PERSON-MONTHS (SCHEDULED/ACTUAL)



LEGEND

Scheduled Professional/Technical Personnel Level, Per Basic Contract And Amendments 1, 2, 3, And 4 -

Actual Professional/Technical Personnel Level, Per Monthly Progress Reports -

Exhibit V - SUMMARY OF ORIGINAL AND AMENDED CONTRACT BUDGETS AND ESTIMATED TOTAL EXPENDITURES TO 31/10/86

Budget Table Number	Budget Line Item	Total Amount Budgeted												Total Expenditures (Estimated) To 31/10/86	
		Original Contract		Amendment No. 1		Amendment No. 2		Amendment No. 3		Amendment No. 4		Amendment No. 5			
		(US$)	(Tk)	(US$)	(Tk)	(US$)	(Tk)	(US$)	(Tk)	(US$)	(Tk)	(US$)	(Tk)	(US$)	(Tk)
1 - 2	Salary, Expatriate And Bangladesh Personnel	628,712	4,487,420	628,712	5,602,916	723,838	5,494,911	806,138	6,982,122	821,594	7,588,521	832,074	7,795,541	831,903	7,745,806
3	Fringe Benefits	198,069	1,480,850	198,069	1,849,963	259,736	1,813,320	293,452	2,313,333) 90,767*)	299,755	1,768,125) 622,259*)	290,663	2,026,061 (*)	290,560	2,013,135
4	Overhead	595,621	2,351,400	595,621	2,935,928	705,859	2,879,333	861.515	3.435,204) 223,428*)	836,536	2,117,197) 1,297,637*)	853,308	3,001,283 (*)	853,245	2,982,135
5	Travel/Transportation	282,740	433,700	282,740	1,109,135	154,012	1,460,341	182,729	1,844,443	175,837	1,633,912	165,184	1,550,915	159,061	1,543,521
6	Allowances	462,738	1,079,800	462,738	1,337,900	470,980	1,400,256	507,480	2,487,439	501,687	2,652,439	515,954	2,696,775	512,830	2,695,775
7	Other Direct Costs	32,690	3,636,560	32,690	3,636,560	35,884	3,632,233	59,183	4,553,311	51,760	5,013,851	53,156	5,106,849	52,413	5,098,964
8	Equipment, Materials, Supplies, Vehicles	93,420	4,761,200	93,420	4,815,200	84,119	3,499,180	83,084	3,864,635	83,084	3,969,174	83,095	4,018,690	83,107	4,027,766
	Sub-Total, Consultant	2,293,990	18,230,930	2,293,990	21,286,602	2,434,428	20,100,17.	2,793,581	25,694,682	2,770,253	26,663,115	2,793,434	26,196,114	2,783,119	26,107,102
9	Special Equipment	145,040	—	145,040	—	119,720	—	117,643	—	117,740	48,989	117,740	48,989	117,740	48,989
10	Training	300,000	—	300,000	1,110,850	284,000	1,704,800	185,188	1,043,856	177,579	1,036,429	164,082	1,036,429	164,340	1,036,429
	Sub-Total	2,739,030	18,230,930	2,739,030	22,397,452	2,838,148	21,884,974	3,096,412	26,787,527	3,065,572	27,748,533	3,075,256	27,281,532	3,065,199	27,192,520
11	Fixed Fee	270,000	1,160,000	270,000	1,429,032	270,000	1,429,032	305,229	1,761,080	305,229	1,761,080	305,229	1,761,080	305,229	1,761,080
	Totals	3,009,030	19,390,930	3,009,030	23,826,484	3,108,148	23,314,006	3,401,641	28,548,607	3,370,801	29,509,513	3,380,485	29,042,612	3,370,428	28,953,600
	Exchange Rate Used		US$=Tk22		US$=Tk24.70		US$=Tk26.94		US$=Tk26.74		US$=Tk26.86		US$=Tk26.67		US$=Tk26.67
	Equivalent US Dollars	881,406		964,635		865,517		1,067,797		1.098,637		1,088,953		1,085,616	
	Total US Dollars	1,890,436		3,973,665		3,973,665		4,469,438		4,469,438		4,469,438		4,456,044	

Caused by certain audit objections. To be paid if objections removed by subsequent audit. Carried over from Amendment No. 4 to future Amendment No. 6.

were for the purpose of revising personnel requirements to meet the changing requirements of the Project.

2. Amendment No. 1

Early in the Project, it became apparent that more technical personnel would be required at the field level if adequate quality control was to be maintained on both the construction and the maintenance projects. It was logical that BCL should meet these personnel requirements, as Amendment No. 1 was formulated to provide additional local funding to allow BCL to do so. In addition, local funds for training purposes were also transferred to the Consultant's Contract budget.

3. Amendment No. 2

Amendment No. 2 was a "No Cost" amendment. Its main purpose was to make internal Contract budget adjustments to provide for a four-month extension in Contract Termination time.

4. Amendment No. 3

The main purpose of Amendment No. 3 was to extend the Contract termination date another five months. In this case, however, additional funds were required to accomplish this purpose. These funds came from adjustments in the budgets of other segments of the Project.

5. Amendment No. 4

Amendment No. 4 was also a "No Cost" amendment. Again, the main purpose of this amendment was to make internal budget adjustments to provide for a four-month extension in Contract termination time.

6. Amendment No. 5

Amendment No. 5 was also a "No Cost" Amendment whose primary purpose was to make internal budget adjustments to provide funds for a two-month extension. Because Amendment 3 of the Program Grant Agreement was signed on 31 August 1986 and the intention is to extend the Consultant's technical assistance contract to 30 June 1990, it was deemed desirable to provide interim funding for the completion of Project Phase I activities while details of Phase II were being negotiated. As noted previously, it was also decided to change the concept of this report from that of a completion report to that of an interim report.

7. Total Expenditures to 31/10/86

It is obviously impractical to attempt to include an exact total of all Project expenditures in this report, since many final billings will be submitted after 31/10/86, which is the closing date of this report. However, it is felt that the total estimated expenditures shown in Exhibit V are reasonably accurate, since they are based on accurate figures for all but the last two months of the Contract's life. From the figures presented, it would appear that there would be savings of some $13,000.

Under Amendments 3 and 4, for line items "Fringe Benefits" and "Overhead," there are Taka entries marked with an asterisk, the total of the two line items in Amendment 4 being Tk 1,919,896. As explained in the footnote, these funds represented the total of certain audit objections, and were included in the budget to be available for disbursement should the audit objections subsequently be removed. However, this "contingency" fund of Tk 1,919,896, which converts to US$ 58,178, was not included in Amendment 5. As noted, it will be carried over to Amendment 6.

III - CHRONOLOGY AND ACCOMPLISHMENTS

A. INCEPTION REPORT

1. General

The Inception Report for the ZRMI Project was presented in revised and final form in May 1983. There was a delay of more than four months past the scheduled submittal date of 60 days following initiation of the Project. This was due primarily to delays in mobilizing resources vital to an integrated operation of the Project. Since an inception report traditionally reflects the consultant's evaluation of project goals and objectives and proposed ways and means to achieve those goals within the constraints of time and resources imposed by the Terms of Reference of the contract, it was deemed preferable to present a somewhat tardy document that was based on reliable data, rather than a less reliable document that had been summarily prepared simply to meet an arbitrary deadline.

The objective of the Inception Report was to indicate the plan and detailed methodology to be followed in attaining the stated objectives of the ZRMI Project. While the plans and methodology as outlined were based on careful considerations of the most viable uses of the available resources within the imposed time limitations, it was never intended to be a document subject to revisions as the Project progressed, and improved ways and means of attaining Project goals could be identified.

The proposed plan and methodology for activating the plan included time schedules for the various elements included in the plan. The time frame, composed of individual time schedules, served a double purpose; that is, the interrelationship of the elements was more clearly shown, and a tool was provided as well for keeping the Project and the individual elements on schedule.

During the life of the Project, there were several adjustments made in the scope of work, time schedules, and methodology. However, these adjustments were never formalized in an addendum to the Inception Report. Instead, major changes involving scope of work and/or availability of resources were formalized by the negotiation of amendments to the Contract. Minor changes were initiated by signed approval on the part of LGEB and concurrence by USAID of programs within the individual elements of the Contract.

Of course, the change in BDG rural administrative patterns from the old District concept to the Upazila concept introduced changes in planning and methodology, to varying degrees, in all elements of the Contract. These changes are discussed in more detail in subsequent relevant sections.

2. Scope of the Report

In more specific terms, the ZRMI Project Inception Report outlined how the Consultant proposed to carry out the contractual responsibilities that had been assumed. As previously explained, the Project was composed of six segments, of which responsibility for four was implicit in the terms of the Contract. Other than routine mobilization, housekeeping, and administrative responsibilities, the Inception Report covered the following general categories of activities and how the Consultant proposed to handle them.

- Technical Assistance
  - + Organization and Management
  - + Establishment of Road Maintenance and Construction Systems
  - + Preparation of Technical Specifications
  - + Expatriate/Local Staffing Schedule
- Training
- Construction Supervision
- Procurement of Equipment

Contract Amendment No. 1, dated 08 April 1984, subsequently transferred the Training segment from the Project budget to the Technical Assistance budget. In the sections that follow, each category of activity will be discussed in detail, attention will be directed to adherence to and/or deviation from the Inception Report plan and methodology, and results obtained (positive or negative) will be presented.

B. ORGANIZATION AND MANAGEMENT

1. General

The program for this element as outlined in the Inception Report provided for three separate functions, as follows:

- An organization and management study of the operational aspects of rural road construction and maintenance in the three (old) Project districts,
- An organization and management study of the fiscal and logistical aspects of feeder road construction and maintenance in three (old) Project districts, and
- A study of equipment and shop facilities for road improvement in each (old) Project district.

In actual practice, the first two studies constituted the activities under this category, while the third was performed as a part of the Equipment Procurement segment (Section G) of this chapter.

For both the first two studies, the work, as originally planned and scheduled, was based on the then-existing rural administration concept of district/subdivision/thana. Under this concept, there were 21 districts. The three Project districts of Sylhet, Rangpur and Faridpur were further subdivided as shown in Exhibit VI and Exhibit VII. One of the biggest problems encountered here was the apparent duplication of responsibilities between two governmental organizations; one of very long standing and one of recent vintage. This duplication of effort and responsibility is shown very clearly on Exhibit VIII.

Exhibit VI - ORIGINAL PROJECT DISTRICTS/SUBDIVISIONS/THANAS

DISTRICT	SUBDIVISIONS	THANAS	DISTRICT	SUBDIVISIONS	THANAS	DISTRICT	SUBDIVISIONS	THANAS
Faridpur	Gopalganj	Maksudpur	Rangpur	Nilpharmi	Domar	Sylhet	Sunamganj	Dharmapasha
		Kasiana			Nilphamari			Tahirpur
		Gopalganj			Saidpur			Jamalganj
		Kotwalipara			Kishoreganj			Derai
		Tungipara			Jaldhaka			Sulla
					Dimla			Jagannathpur
	Madaripur	Sibchar						Sunamganj
		Rajaoir		Sadar	Patgram			Chhatak
		Madaripur			Hatibandha			
		Kalkini			Kaliganj		Sadar	Gowainghat
		Palong			Gangachara			Kotwali
		Janijira			Badarganj			Biswanath
		Naria			Kotwali			Balaganj
		Bhedarganj			Kaunia			Fenchuganj
		Goshairhat			Pirgacha			Golapganj
					Mithapukur			Beanibazar
	Sadar	Kotwali			Pirganj			Zakiganj
		Boalmari						Kanaighat
		Alfadanga		Kurigram	Bhurungamari			Jaintaipur
		Nagarkanda			Nageswari			
		Bhanga			Fulbari		Moulvi Bazar	Moulvi Bazar
		Sadarpur			Lalmonirhat			Screemangal
		Char Bhadrasan			Kurigram			Kamalganj
					Ulipur			Rajnagar
	Goalunda	Panasa			Chilmari			Kulaura
		Baliakandi			Rahumari			Bariekha
		Rajbari						
		Goalundaghat		Gaibandha	Sundarganj		Habiganj	Azmiriganj
					Sadullapur			Baniachang
					Palashbari			Lakhai
					Gobindaganj			Madhabpur
					Saghatta			Chunarughar
					Fulchari			Habiganj
					Gaibandha			Bahubal
								Nabiganj

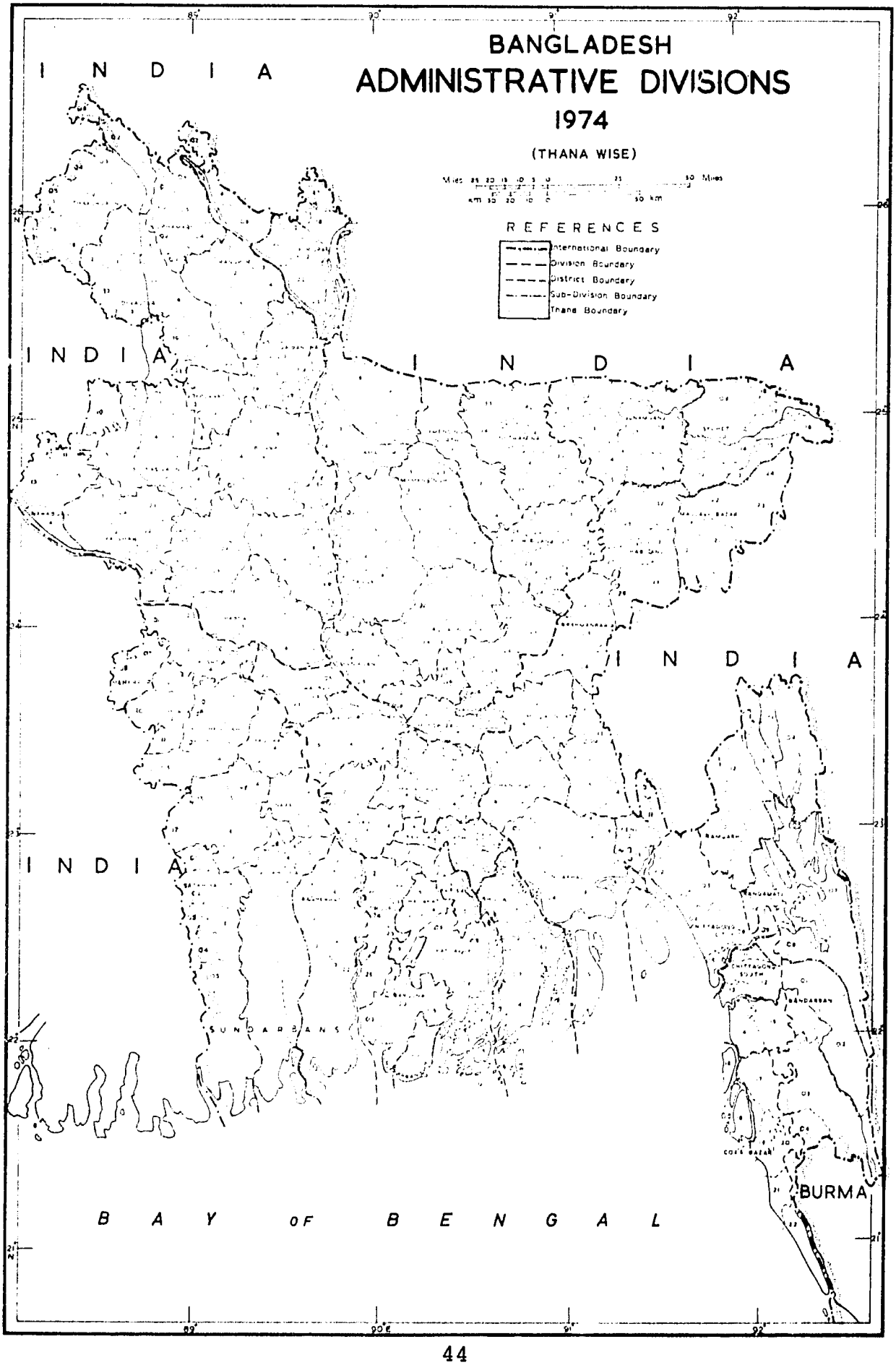
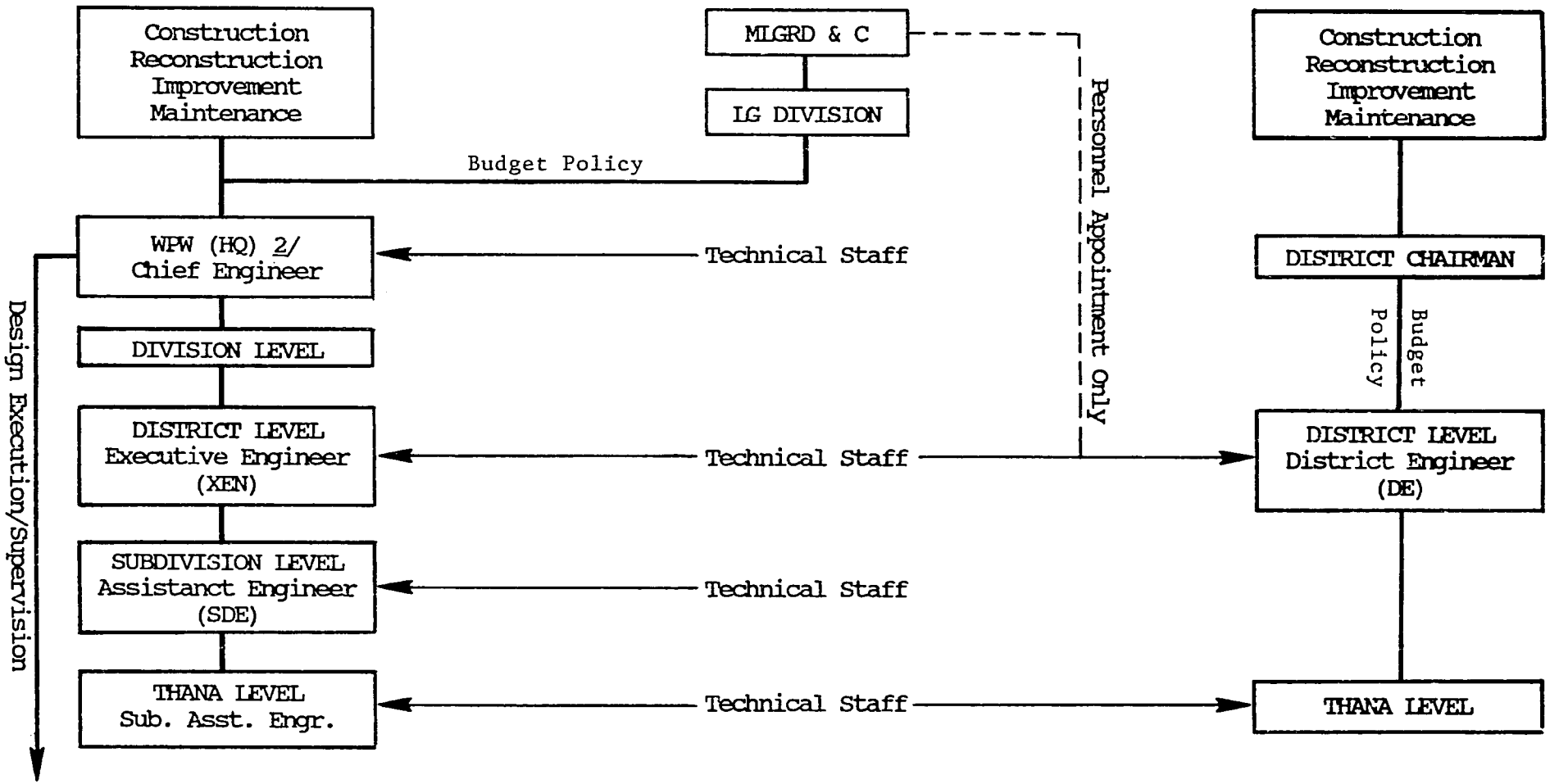

BANGLADESH
ADMINISTRATIVE DIVISIONS
1974
(THANA WISE)
REFERENCES
International Boundary
Division Boundary
District Boundary
Sub-Division Boundary
Thana Boundary
INDIA
INDIA
INDIA
INDIA
INDIA
SUNDARBANS
BURMA
BAY OF BENGAL

Exhibit VIII

COMPARISON OF DISTRICT-LEVEL ORGANIZATIONS 1/



1/ Conceptual construction by the TA, ZRMI Project.

2/ Works Program Wing (WPW) and its powers and responsibilities created and defined by the Administrative Order Number Admin3E-64382(Pt)32557, dated 25 October 1982.

The concept of the District Engineer within the rural administration organization has been in existence for over 100 years.

Of course, this duplication of responsibility was a very untenable arrangement and ultimately had to be replaced. In October 1984, the BDG replaced the existing rural administration concept with one oriented around the concept of greater decentralization of rural administrative functions. As shown on Exhibit IX and Exhibit X, the old districts were subdivided into new and smaller districts, with the next subordinate administrative unit being the Upazila. The District Engineer's office and functions were eliminated completely and the Executive Engineer's staff and functions were greatly reduced.

Needless to say, this dramatic change in rural administrative concept, while not necessarily invalidating any parts of the first two studies, did introduce the possibility that further evaluations might be desirable to ensure compatibility of proposed organizational arrangements with such factors as revised definition of feeder roads, assessed capability of new administrative units to handle feeder road construction and maintenance, and short- and long-term equipment management capabilities of the new units.

There is no contradiction in thinking involved in the previous statement for most of the suggestions and recommendations presented in the two organization and management studies would be relevant no matter what physical form the rural administrative setup might take. Recommendations for further study and evaluation as the rural administrative organization in Bangladesh stabilizes and becomes fully functional will be indicated.

2. An Organizational and Management Study of the Operational Aspects of Feeder Road Construction and Maintenance

a. The Report

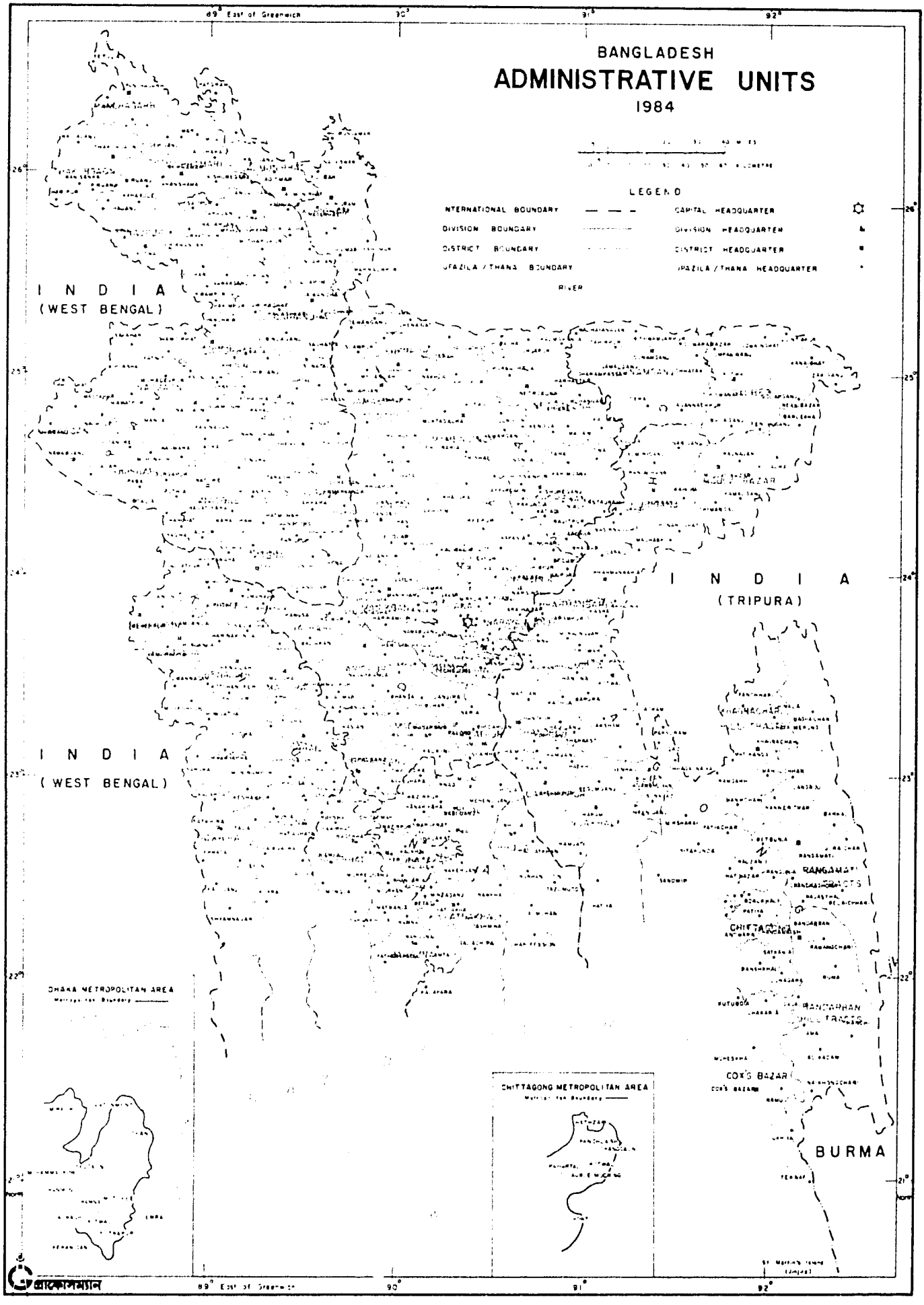
The report covering this activity titled, "An Organization and Management Study of Road Maintenance and Construction in Faridpur, Rangpur and Sylhet Districts" was issued in October 1983. The report was the result of four months of intensive research by M. Kimbrough, Maintenance Management Specialist, PAS.

Exhibit IX

REVISED PROJECT DISTRICTS AND CORRESPONDING UPAZILAS

Old District	New Districts	No. of Upazilas	Total Upazilas
Faridpur	Faridpur	8	27
	Rajbari	4	
	Madaripur	4	
	Gopalganj	5	
	Shariatpur	6	
Rangpur	Rangpur	8	35
	Lalmonirhat	5	
	Gaibandha	7	
	Kurigram	9	
	Nilphamari	6	
Sylher	Sylhet	11	35
	Sunamganj	10	
	Moulavibazar	6	
	Habiganj	8	

Exhibit X


BANGLADESH
ADMINISTRATIVE UNITS
1984
LEGEND
INTERNATIONAL BOUNDARY
DIVISION BOUNDARY
DISTRICT BOUNDARY
UPAZILA / THANA BOUNDARY
RIVER
CAPITAL HEADQUARTER
DIVISION HEADQUARTER
DISTRICT HEADQUARTER
UPAZILA / THANA HEADQUARTER
INDIA
(WEST BENGAL)
INDIA
(TRIPURA)
INDIA
(WEST BENGAL)
BURMA
DHAKA METROPOLITAN AREA
CHITTAGONG METROPOLITAN AREA
COX'S BAZAR
RANGAMATI
BANDARBAN
89° East of Greenwich
90°
91°
92°

b. District Organization for Construction and Maintenance

This section compared the advantages and disadvantages of construction and maintenance by Normal Works (District Engineer) and by Rural Works (Executive Engineer). While the upazila concept has since completely eliminated the District Engineer's office and has considerably reduced the scope of the XEN's office, thereby accomplishing a decentralization of political control in the rural areas, many of the operational problems associated with the district concept have been eliminated to be merely replaced by new ones. The terms of reference for consulting services for Phase II (Feeder Roads Maintenance and Improvement) of this Project contain three provisions for finding solutions to alleviate the new operational problems. They include:

- During the period September to December 1986, an independent study will be conducted to determine the capabilities of Upazilas to be involved in feeder roads improvement. Depending on the results of the study, the Consultant will be responsible for the development of pilot road improvement projects compatible with the Upazila capabilities.

- During Phase II, the Consultant will develop a five-year maintenance program which will define the organizational structure required to conduct the program at the district level, as well as the equipment and financial requirements of same.

- During Phase II, three new districts (one in each old district) will be selected and the included Upazilas (total of 14) will be organized to handle the maintenance of the included feeder roads.

Thus is can be seen that there will be no additional need to update or revise this section of the report.

c. Planning, Conducting and Financing the District Road Program

1) General

Here the report quite clearly established that the policy of BDG gives top priority to road maintenance and specified that a significant part of the district budget is to be allocated to rural road maintenance. However,

there is little to indicate that district-level maintenance operations are influenced to any degree by the allocations of 25 percent and 10 percent of district funds. It will now have to be determined if the decrees establishing the Upazila system contain provisions to supersede all previous decrees concerning rural road maintenance practice and funding.

2) Planning the Construction and Maintenance Program

The old report emphasizes that long-range planning was not practiced by either of the two (old) district-level organizations. Rather, each prepared its own program on an annual basis, with coordination between the two offices. Under any administrative arrangement, this is not a recommended practice. As will be discussed in a subsequent section, long-range planning for maintenance operations is one of the goals of the maintenance system that the Consultant has been striving to establish.

The two offices also collaborated annually in the preparation of a schedule of rates for estimating purposes for the ensuing year. The consultant has determined that this is often not practical for the rates as determined have been found to be unrealistic and not compatible with the level of work required by the specifications. The end result is either a lowering of specification level, a complete disregard of specifications, or the contractor using the schedule of rates is forced to resort to unacceptable practices in order to stay within the limits of contract funds and still make even a modest profit.

3) Conducting the Construction and Maintenance Program

Each (old) district was found to maintain a register of prequalified contractors who are usually divided into three or four groups according to upper cost limits of projects for which they are permitted to tender. Tenders for a full construction season program are often all submitted on one day. The tenders are evaluated by the appropriate tendering office and then submitted to the (old) district tendering committee for action on the respective recommendations.

Quality control was found to be virtually nonexistent. Until the Project established the (old) district soil and material testing laboratories, there was little, or no, material testing. Concrete quality, if tested at all, was usually tested by the "Swiss Hammer" non-destructive, in-place method. At best, this method is considered to be only a rough approximation. Bricks were seldom tested for compression or water absorption, and never for abrasion. Concrete culvert pipe was neither tested, not inspected during the manufacturing process.

Record keeping was limited to two systems maintained for each contract. One was a field book for inspecting officials to write comments or directions related to work quality or progress. The second was a measurement book maintained by the project supervisor with measurements of work items entered so that quantities could be computed for payment purposes.

4) Financing the Construction and Maintenance Program

The report noted that (old) district funds available for feeder road maintenance seemed to be on the decline, while foreign assistance funds appeared to be on the increase. This is a trend which must be confirmed, or rejected, by further study. If it is found to be true, then it is an important indicator that recommended maintenance systems are not becoming institutionalized as a part of normal feeder roads management and administration.

d. Maintenance Definition, Need and Organization Concepts

1) Definition of Maintenance and Construction

This section agrees that worldwide there are some slight differences of opinion regarding whether some specific activities should be defined as construction, or as maintenance. The main point is that an activity be defined as construction or maintenance by the nature of work accomplished irrespective of what organizational unit accomplishes the work, who pays for the work, or whether it is accomplished by contract or by force account. The definitions presented for maintenance (routine and preventive)

and construction/reconstruction are illustrated by a page of tabulated examples.

2) Need for Maintenance

Here it was noted that an interim study by Syracuse University, dated November 1982, stated that within the three (old) Project districts there were a total of 3,290 miles of district roads. Of this total, 265 miles were classed as being paved, while 3,025 miles were classed as being unpaved. With 92 percent of the rural roads being unpaved, the magnitude of the maintenance problem can be appreciated. The heavy rainfall and surface flooding throughout Bangladesh, along with the presence of poor soils for construction purposes, further aggravates the problem.

It was found that little or no maintenance work was being done in the three (old) Project districts except by contract, and that most of this work was so extensive that it should properly be defined as reconstruction. The important point was that almost all maintenance work being done was on the 8 percent of the rural roads that were then paved.

The reason usually given by district engineers for lack of maintenance on (old) district roads was that resources were very scarce and the need for new construction was very great; hence, no funds were available for maintenance work. The Consultant has demonstrated the economic fallacy in ignoring annual maintenance requirements until the road has deteriorated to the point that complete reconstruction is the only remedial measure left. However, success in this effort has been limited.

3) Organizing for Road Maintenance and Construction

Organizational arrangements for construction and maintenance of feeder roads may vary throughout the world, or even from one area to another within a country, but the basic tenets associated with effective public administration remain fixed and are applicable at any time and at any stage of a country's development. These basic tenets include:

- Individual responsibilities must be clearly defined and understood,
- The chain of command and reporting relationships must be firmly established with no one responsible to two superiors,
- The span of control or number of people within a hierarchy that one person is expected to supervise should not exceed reasonable limits, and
- Responsibilities for like activities should be assigned to one group within an organization with duties defined to assure no overlap, duplication, or gaps.

To the extent that these tenets of public administration are violated, an organization is less effective.

The report further discussed some basic organizational concepts which, while specifically directed toward the BDG rural administrative organization as it then existed, are viable and adaptable to any administrative system which may be in effect. These concepts can be characterized as follows:

- Source of financing concept,
- Contract versus in-house staff concept, and
- Construction versus maintenance concept.

a) Source of Financing

The practice of assigning responsibilities based purely on the basis of funding source was being followed under the old district organization. This concept simplified the process of fund allocations, but it has resulted in duplicative organizations and was wasteful of scarce human and financial resources. This the concept is in basic contradiction to the proposed definitions for maintenance and construction which were previously discussed.

b) Contract Versus In-House Staff Concept

The Upazila administrative organization has eliminated many of the problems of duplication of effort and responsibility, but there still

remain many other problems to be solved. With regard to construction/ reconstruction, there is little doubt of the superiority of the contractual system over the force account system. However, in maintenance operations, a great deal of flexibility in thinking is required. For instance, for the maintenance of feeder roads, local laborers could be hired to take care of routine maintenance problems (say 2 or 3 laborers for every 2 or 3 km of road). Depending upon the terms of the working arrangements, these laborers could be considered as either "in-house" employees, or contract employees. Such organizational problems will be resolved during the development of the maintenance program during Phase II of this Project.

c) Construction Versus Maintenance Concept

In the report, it was envisaged that at the (old) district level there would be one agency responsible for construction operations, while the maintenance operations would be the responsibility of another. Under the current Upazila arrangement, such a division of responsibility is still within the realm of possibility. When the results of the two studies previously mentioned are available, it will be possible to evaluate all alternatives. Since construction required much more equipment than normal maintenance operations, it may be more logical to assign construction/ reconstruction responsibilities to the (new) district level, while leaving the major share of the maintenance responsibilities at the Upazila level.

e. Recommended Assignment of Responsibilities for Maintenance and Construction

In this section, the report again noted the anomalies and contradictions that existed between USAID's Project Paper, the BDG's Project Proforma, and the Consultant's Inception Report concerning organizational responsibility for feeder road maintenance. Because of these differences of opinion that existed at that time, and still do for that matter, the report felt that it was desirable to again emphasize that any organizational arrangements for managing construction and maintenance of feeder roads must be preceded by firm agreements concerning the definition of construction and maintenance and

the constituent activities to be assigned to each classification and/or subclassification.

1) Fundamental Assumptions Related to Organizational Assignment of Responsibilities

In establishing recommendations for organizational assignment of feeder road construction and maintenance responsibility, the report made three basic assumptions as follows:

- That the Works Program Wing of the Ministry would gain permanent status,
- That the Ministry will take appropriate and necessary actions to ensure that responsibilities assigned to district engineers are, in fact, carried out, and
- That feeder road maintenance and construction, as defined in the report, will each be budgeted and accounted for separately in Zila Parishad budgets irrespective of whether they are accomplished by contract or in-house staff.

Although the fundamental reasoning behind these assumptions is still valid, they have been altered considerably in substance, to wit:

- The Works Program Wing has become the Local Government Engineering Bureau (LGEB), but it is not yet an operational branch of BDG; it is still functioning at the (old) district level, but with greatly reduced scope of activity;
- The office of district engineer has been completely abolished and division of its previous functions among new district and subordinate administrative divisions has not yet been fully and clearly defined; and,
- Feeder road construction and maintenance management concepts have not yet been clearly defined for the new rural administrative organization.

The results of the separate construction capability evaluation study and the maintenance capability study scheduled for Phase II of the Project will be of great assistance in more clearly defining organizational and operational responsibilities for feeder road construction and maintenance.

f. Organization and Staffing Adjustments for Maintenance and Construction

Certain observations basic to any rural organizational arrangement were presented in the report, and they merit repetition here. Certainly the need for staffing an organization in a manner appropriate for assigned work is universally recognized as good management policy. A decision basic to the development of an organization for feeder road maintenance is the proportion of maintenance work to be done by contract, by force account by permanent staff, and by force account by temporary or seasonal staff. The report found that routine feeder road maintenance organizations developed for Bangladesh must consider certain local factors which influence how routine road maintenance can best be accomplished. These factors include:

- Feeder road maintenance in Bangladesh is a labor-, rather than an equipment-intensive activity,
- The geographic dispersal of work throughout the (old) districts creates service problems related to transportation of employees and materials,
- Specialized skills are required for some maintenance work, and
- Road maintenance can be performed most effectively during the dry season.

Furthermore, the report's recommendations for functions to be performed by any feeder road construction and maintenance organization were timely and to the point. These functions, taken out of context from a list prepared for the now defunct district engineer's office, would include:

- Feeder road maintenance by full-time staff,
- Feeder road maintenance by day laborers or work gangs arranged through local officials (seasonal labor),
- Feeder road maintenance by contract,
- Equipment maintenance, and
- Feeder road construction by contract.

The report could offer no reasonable alternative to the two operating organizations than functioning at the (old) district level. The new rural administrative organization has eliminated this duplication of effort to a certain degree. When the proposed two capability studies have been completed, it should be possible to present a viable feeder roads organization based on the precepts just outlined. In fact, since the construction-capability study is to be completed by the end of 1986, it should be possible to institute some pilot organizational changes during the 1986-1987 construction season, refine them during the following seasons, and make final recommendations during the 1988-1989 construction season. Since the proposed Upazila feeder road maintenance program report is due in mid-1989, pilot programs will have to be established in 1986-1987 and refined in 1987-1988 and 1988-1989.

g. Managing the Construction and Maintenance Processes

1) Managing the Construction Process

The report noted that, while the annual planning process for construction programs was not seriously lacking, it would be improved by considering the program to be a single document developed around identical criteria.

Since road maintenance is strongly influenced by the adequacy of design and degree of control exercised during construction, these two operations need to be critically reviewed. Many design items must be standardized throughout Bangladesh, but allowances must also be made for peculiarities of each individual project. Supervision must be upgraded from occasional visits to daily inspection. Specifications must be practical, but once adopted, strict adherence must be demanded. Project log books with a daily record of all happenings, tests made, progress achieved, and instructions given to the contractor must be maintained and kept as a permanent record.

2) Managing the Maintenance Process

The details of any recommended maintenance management program will have to be developed by the Consultant during the course of the maintenance investigation scheduled for Phase II, but the fundamental elements to be included in any maintenance management program would include the following:

- Inventorying the regional road system,
- Determining required service levels,
- Identifying deficiencies and preventive maintenance needs,
- Selecting maintenance methods,
- Developing the maintenance budget,
- Staffing and supplying regions for road maintenance work,
- Conducting maintenance work, and
- Reporting maintenance activities.

h. Personnel Administration

This section, while emphasizing the requirements of the rural administrative organization that then existed, contained comments on personnel administration that are valid for any rural administrative organization. Items discussed included:

- Institutionalization of the construction and maintenance systems to provide feeder roads staff with a sense of permanency,
- Allocations of similar work assignments to positions with similar titles and job descriptions, and
- Adherence to the basic tenets of public administration as outlined in section B.2.d.3, of this report.

i. Implementing Actions and Schedules

In this report, the implementing actions to be taken and the schedule for implementation were based on the organization that existed at that time. However, the final reports which emerge from the capability studies for both construction and maintenance must include the same types of recommendations for actions and concomitant schedules for implementation of

those actions. These management goals and schedules for accomplishing them must be met if this Project is to achieve its ultimate objectives within the time period allocated.

3. An Organization and Management Study of the Fiscal and Logistical Aspects of Feeder Road Construction and Maintenance

a. The Report

The report covering this activity, titled "A Review of Budgeting, Accounting, and Procurement - Sylhet, Rangpur and Faridpur Districts," was also issued in October 1983. The report was the result of four months of work by L.E. Simpson, Accounting Specialist, PAS.

b. General

Even though this study was done during the time that the (old) district-level rural administrative concept still prevailed, it can be easily shown that the observations of practices then current and recommendations for improving same are valid, no matter what physical form or rural administration is presently installed. Statements made in the introduction of the report perhaps best illustrates this point:

> "Our review of the present budgeting, accounting, and procurement systems revealed that these systems were developed and implemented many years ago and should be rationalized through modernization of forms and procedures, and the introduction of generally accepted principles and practices of financial practices for governmental organizations. Rationalization of the accounting system is of particular importance since this system must support both the budgeting and procurement systems.
>
> The present accounting system is an elementary single-entry, cash basis system designed for the purpose of providing budgetary accounting for revenue and expenditures. Budgetary accounting provides for the assembling and recording of current budget costs as a means of budgetary control through the comparison of estimated and actual budget costs. The system is essentially a record of input, and will not support a cost finding subsystem directed to the measurement of volume through the processes of assigning all costs, direct and indirect, to measurable activities, for the following reasons:

- Accounting records are maintained on a cash basis.

- Depreciation is not taken into consideration except for memorandum purposes to determine unit costs.

- Procurement of fixed assets are treated as a current year expenditure.

- The budgeting and accounting systems consider only direct costs; i.e., expenditures which can be distributed directly to each applicable activity. Indirect costs such as overhead, depreciation and other equipment costs which must be first collected and analyzed, then allocated to each activity on the basis of some factor common to all applicable activities, are not considered."

c. Budgeting

This section of the report presented a review of the budget preparation and execution procedures, with recommendations for improvement, as they applied to road maintenance and improvement in the three (old) districts. It is logical to assume that, even though the details may differ, the same general procedures are still being followed in the Upazila organizational concept. This will be confirmed during the course of the two capability studies scheduled for the Project area as previously discussed. However, the main items considered in this section of the report included the following:

- Organization for Budgeting
- Budget Preparation
- Budget Execution
- Conclusions Related to Budgeting
- Recommendations for Budgeting Improvements

For reasons discussed above, it is not necessary at this time to consider here any of the first four items. However, since the two major recommendations for budget improvements would be equally valid no matter what the physical form of rural administrative organization, it is desirable to present them at this time. It must be emphasized that to rationalize, through updating and modernization of forms and procedures, budgeting procedures that were established more than 25 years ago would require considerable time and manpower for system analysis and design, preparation of forms, procedures, and a

procedures manual, and training and implementation. Meanwhile, the following recommendations could be implemented without completely disrupting present procedures.

- Expenditures should be classified by function and by organizational unit. The level used depends upon the type and detail of information desired. At the lowest level, the activity, unit costs can be obtained. At the highest level, only the total cost of the road maintenance and improvement program can be obtained.

  There are three important points to consider in the use of this classification system for road maintenance and improvement.

  + Budget preparation at the activity level will require that an estimated cost be determined for the personnel time, the materials and supplies required, and the equipment cost for each activity. Obviously, the accounting system must be designed to support the budget system through the process of assembling, analyzing, recording, and reporting actual expenditures for comparison with budget estimates.

  + The classification system can be used to determine whether current costs; i.e., budgeted costs which do not include indirect costs, or total costs which includes all cost elements.

  + The classification system is applicable for the feeder road maintenance and improvement program regardless of the rural organizational unit responsible for carrying out the program.

- Contractors, or any other creditors have a right to expect payment of approved expenditure documents within a reasonable period of time. To expedite this process, it is recommended that the number of approving signatures be reduced to a very minimum. A set period of time should be established between approval by the engineer (the first signature) and payment to the contractor.

d. Accounting

The discussions and recommendations presented for accounting procedures may be viewed with the same light as those presented for budgeting. As with budgeting, during the course of the two capability studies proposed for the ongoing Phase II of the Project, it will be necessary to confirm that the accounting procedures as outlined are indeed still being practiced and to

confirm the recommendations as presented. The main items considered in this section of the Report included the following:

- Organization for Accounting
- Legal Requirements
- Accounting Procedures
- Conclusions Related to Accounting
- Recommendations for Accounting Improvements

Again, no good purpose would be served by discussing the details of the first four items at this time. However, in the absence of a new, overall budgeting and accounting systems design, the following recommendations can be implemented and are compatible with, and necessary for, effective implementation of the recommended budget classification improvement.

- The proposed expenditure ledger for feeder road maintenance and improvement. This ledgee is designed for use with the proposed classification of expenditures. The use of this ledger provides a system for:

  + Maintaining a record of actual expenditures incurred for feeder road maintenance and improvement work done by in-house staff, contract, or both.

  + Controlling budgets through the comparison of estimated and actual expenditures.

  + Determining activity unit cost for management information and as a basis for establishing performance standards.

  + Verifying that the legal requirements of Circular 64, dated June 25, 1964, are complied with.

  + Preparing Monthly Expenditure reports.

- The Proposed Monthly Expenditure Report. The report is designed to provide management information in terms of accumulated expenditure and budgetary status for each activity, the work units completed by each activity, and the cost of each work unit.

- The proposed classification of expenditures. The classification system recommended for budgeting must also be used for accounting and reporting purposes to obtain comparative information. A comprehensive classification would include numerical coding for major and detail objects and an account number for each organizational unit.

e. Procurement

This section discussed the procurement system as it existed under the (old) district concept, and there is no reason to feel that the basic procedures were changed when the rural administrative organizational arrangement was changed to the Upazila concept. The main categories of procurement activities considered in the report included the following:

- Organization for Procurement
- Legal Requirements
- Procurement Procedures
- Storekeeping
- Equipment Distribution
- Conclusions Related to Procurement
- Recommendations Related to Procurement

Procurement procedures in Bangladesh are governed by rules and regulations that prevail throughout the country and all governmental organizations. It is sometimes possible to get certain provisions waived under a given set of conditions. However, to effect any permanent changes would require legal action beyond the scope of this Project. In fact, the report has stated that the limited number of recommendations for improvement is an indication that the present procurement procedures are reasonable and capable of supporting major recommendations relating to budgeting and accounting. If there is a decision to rationalize the budget and accounting systems, then the system analysis and design recommendations would apply to procurement as well to make sure that all systems are compatible.

Although equipment management was not a part of the scope of this report, no report on budgeting, accounting, and procurement would be complete if the importance of this aspect of management was not at least recognized. This report did discuss this activity in terms of the desirability of maintaining an individual equipment ledger as an additional means of management control.

f. Implementation Plan

Of the total recommendations proposed by this report, three were considered to be highly important and interdependent on the extent that all three should be implemented simultaneously. These three included the following:

- Budgeting - Classification of expenditures and budget format.
- Accounting - Proposed expenditure ledger.
- Accounting - Proposed monthly expenditures report.

However, the schedule of implementation as proposed is no longer valid and will have to be revised in the light of experience gained from both the two proposed capability studies, as well as the pilot construction and maintenance projects launched during Phase II of the FRMI Project as a result of the findings of the two studies.

4. Conclusions and Recommendations

a. The fundamentals of organization and management, both operational as well as fiscal and logistical, as presented in the two reports reviewed in this section, are basically valid for any form of rural administration organization. The Upazila feeder road construction capability study planned for later 1986 and the Upazila feeder road maintenance capability study proposed as part of Phase II of the FRMI Project will both serve to indicate any adjustments in detail required to adapt these fundamentals to the Upazila organizational concept.

b. In the early stages of Phase II of the FRMI Project, great emphasis must be placed on the development of feeder road construction and maintenance organization and management capability.

c. A strong organization and management capability (operational, fiscal, and logistical) is a basic prerequisite for institutionalization of sound feeder road construction and maintenance programs.

C. TRAINING

1. Background

In the Project Grant Agreement,[1] training was considered to be one of the six basic elements of the ZRMI Project. The Consultant was responsible for planning and executing the ZRMI Project Training Program, but the funds allocated for this purpose were not included within the Contract budget. However, by Contract Amendment No. 1, dated 08 April 1984, the training funds were incorporated into the Contract budget.

The Project Training Advisor, Gifford E. Rogers, a PAS specialist, arrived for duty in the first week of May 1983. The first order of business was to become acquainted with Project goals and how the Consultant proposed to achieve them (the Inception Report), and then it was necessary to learn about the other rural development programs active, or recently completed, in Bangladesh, and their respective goals and areas of operation. As it developed, there were six other organizations, but feeder roads construction and maintenance was only a part of their overall programs of rural infrastructural development, as compared with the ZRMI Project, whose only immediate objective was the improvement of feeder roads.

However, two of the existing organizations also included training elements as a part of their overall programs, and with each program there was a partial overlap with areas included in the ZRMI Project. Coordination with these two groups was especially important if conflicts in scheduling, use of resource-persons, and use of other resources were to be avoided. As will be discussed later in some detail, the two existing organizations and the ZRMI Project were all being directed by the same executing agency (WPW, later LGEB) and their training efforts would eventually become a part of the LGEB centralized training unit.

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[1] op. cit.

Thus, the planning, development, and implementation of a sound training program for the ZRMI Project had to be oriented around certain fundamental concepts -- some common to all training efforts, some peculiar to the environment which prevails in Bangladesh, and some in response to constraints imposed by the Terms of Reference of the Project Grant Agreement (PGA) between the two participating governments. The organization of such a program had also to be cognizant of the existence of other feeder road development training programs; all concerned with some aspect of feeder road construction/reconstruction/improvement/maintenance at selected, or all, levels of local government. For the ZRMI Project Training Program to be successful, and produce the desired impact, it had to be compatible with all of these imposed constraints, operated on recognized fundamental training principles, and concentrated on course content which reflected both the needs of the participants and their respective organizations, and technically sound engineering and construction techniques.

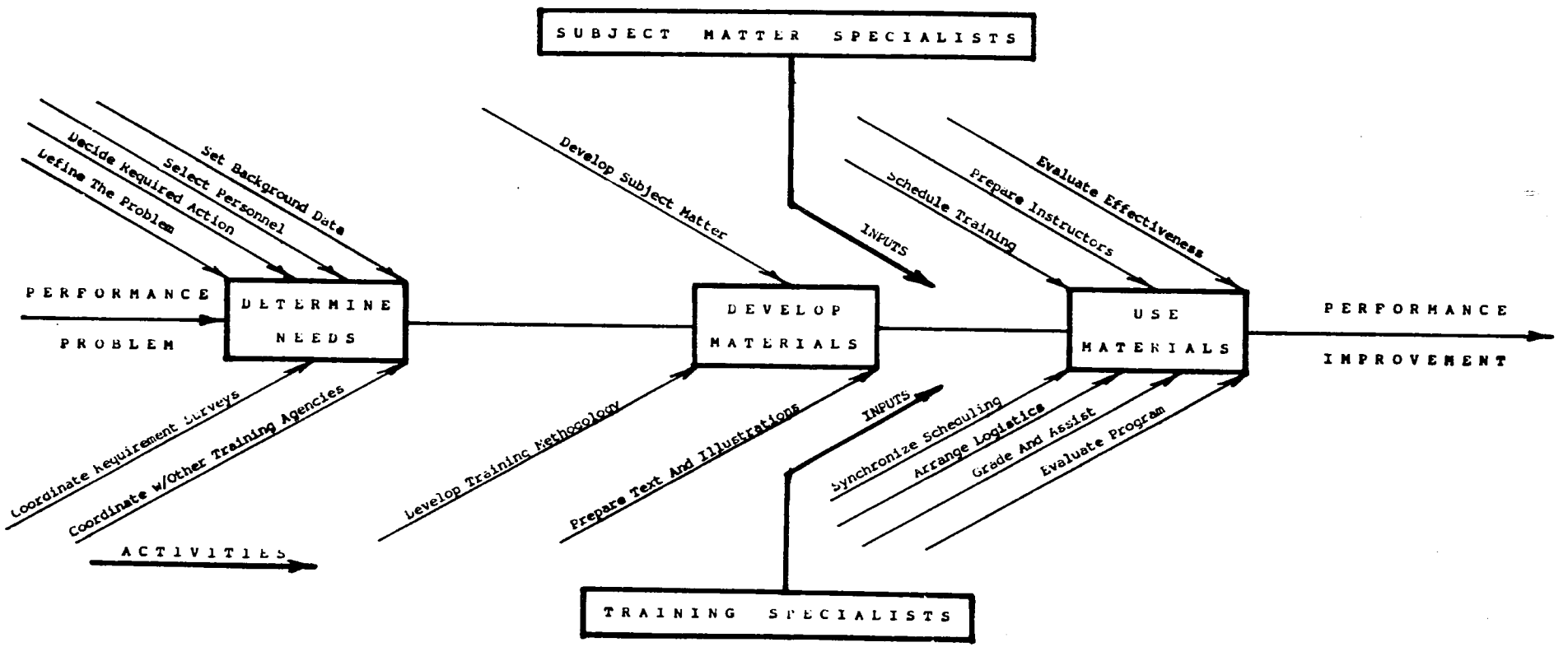
2. Policy

The ZRMI Project Training Program was geared to the physical and social environment prevailing in Bangladesh; programs and subject matter were prepared to meet the requirements of all levels of maintenance and/or rehabilitation employees, and, so far as was practical, courses were taught by nationals in the Bengali language. These policy guidelines are emphasized on Exhibit XI, which also graphically displays the manner in which the Subject-Matter Specialist (SMS) and the Training Advisor (TA) collaborated in the preparation and evaluation of the various training programs and sessions.

In an overall view of the ZRMI Project Training Program, if the goal to institutionalize a road facilities maintenance and improvement program which would be self-sustaining was to be realized within the Project Terms of Reference, certain tasks had to be performed within given constraints of time and budget. These tasks are shown in graphical form in Exhibit XII. They were also prepared in tabular form with narrative to provide more explanation

Exhibit XI - TRAINING PROGRAM ORGANIZATION (SCHEMATIC)

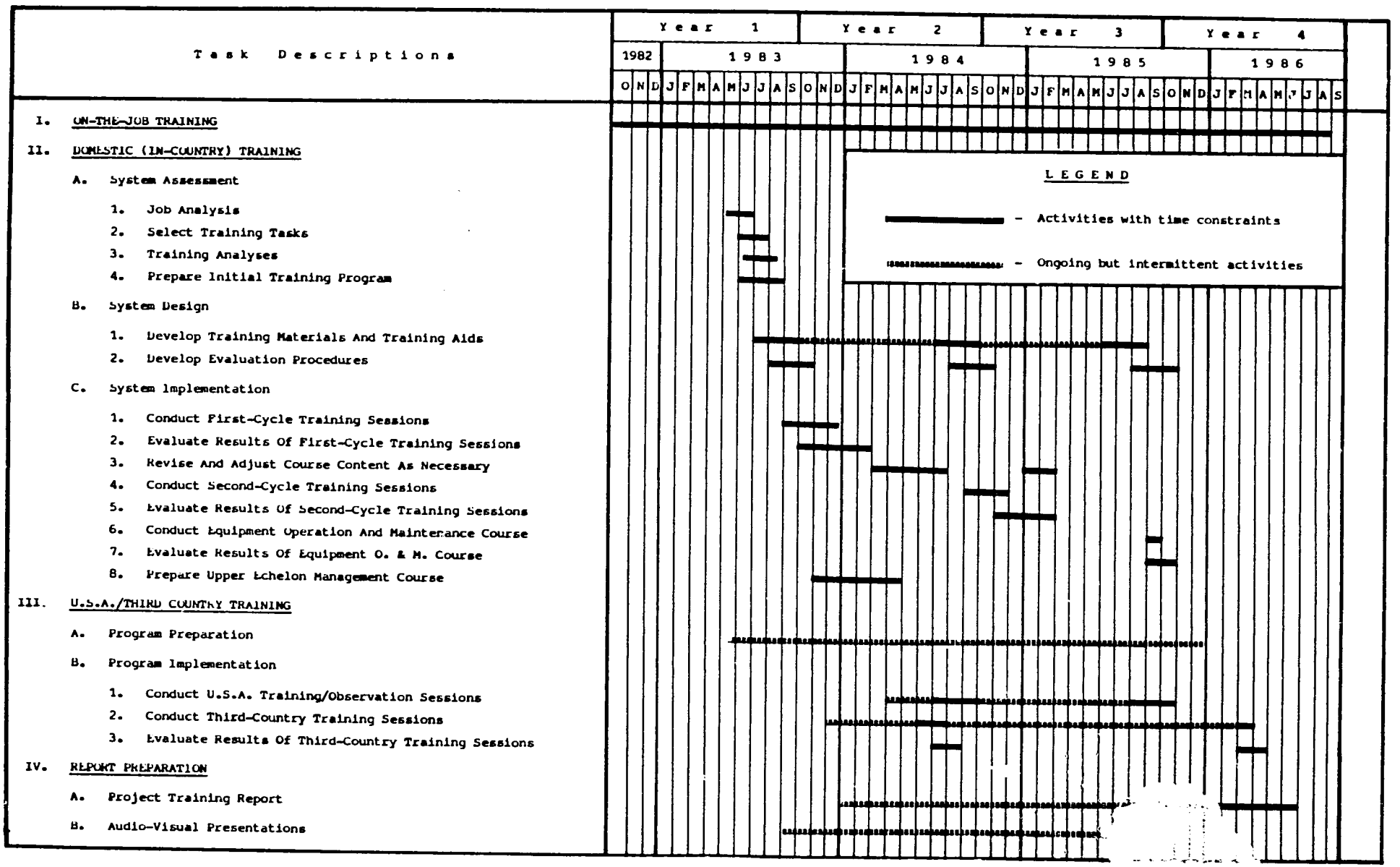
Training is the teaching of work methods, techniques, and skills necessary for the satisfactory performance of specific work assignments. Maintenance and/or rehabilitation training is carried on to improve performance. Therefore, it is not a "one-time" operation, but rather it is on-going in character. The development of training materials, and their subsequent use, requires contributions from technical specialists as well as training specialists.



Note : In the initial phases of the training program, both categories of specialists were composed primarily of consultant personnel, either expatriate, or local. However, with regard to the in-country training element, this was considered to be an evolutionary process whereby LGEB professionals ultimately replace all expatriates. Ideally, the training unit of LGEB would assume all responsibility for the on-going training program.

: Adapted from Transportation Technology Support For Developing Countries, Compendium 14, Training, Transportation Research Board, National Academy of Sciences, Washington, D.C., 1980 (AID/OTR-C-1591, Project 931-1116).

Exhibit XII - ZRMI PROJECT TRAINING PROGRAM SCHEDULE (REVISED MARCH 1986)



for each of the tasks. If should be noted that this program schedule was revised in March 1985 to more accurately reflect schedules and events as they actually occurred over the major part of the life of the program.

Though the ZRMI Project was nominally limited to three districts, it was hoped that institutional benefits realized would ultimately be extended to all districts within the nation. Therefore, at each training session, if available physical plant and training facilities permitted, the XEN's were encouraged to nominate a limited number of selected participants from neighboring districts.

It should be noted that this training program was flexible and must continue to be so. Two significant policy changes within LGEB will have a definite impact on future training policy, and they are:

- The change of rural administrative organization from the district concept to the Upazila concept, and
- The creation of a centralized training organization within LGEB.

3. Program

a. General

Guided by the goal and purpose of the Project and the Project training policy as defined, it was decided that an effective training program must contain the following elements:

- In-Country (Domestic) Training Sessions,
- On-the-Job Training,
- Third-Country Training Programs, and
- USA Observation/Training Programs

In order to create a management tool for scheduling and monitoring program progress, it was necessary to weigh each of the four elements with reference to the program as a whole. This was done on the basis of training effort required and the estimated relative impact of each element on the

program as a whole. From this data, the traditional "S" curve of scheduled progress was plotted as shown on Exhibit XIII, which is the scheduled progress curve superimposed on the bar chart of Exhibit XII. The normal use of this curve is to maintain a monthly record of progress achieved by superimposing the achieved progress curve on the scheduled progress curve. If project management follows the project schedule perfectly, the two curves will coincide. In actual practice, this is seldom achieved, and the progress achieved curve will run a little below, or even a little above, the scheduled progress curve.

In the case of the ZRMI Project Training Program, the achieved progress curve always ran a little below the scheduled progress curve. However, the Program was adjusted three times to reflect extension of the Contract time frame and the addition/deletion of training activities. As a result, when Exhibit XIII was adjusted in March 1986 to reflect the latest schedule adjustments and achievements, the achieved progress curve coincided with the scheduled progress curve. As shown in the March 1986 Progress Report, final achieved progress of the ZRMI Project Training Program was about 95 percent of original scheduled progress. As will be shown later, the basic reason for this lag was the change in the scope of the USA Observation/ Training Program. This was a relatively minor change made in the best interests of the Project, so it is reasonable to show the Training Program as having nominally achieved 100 percent of its scheduled activities and goals.

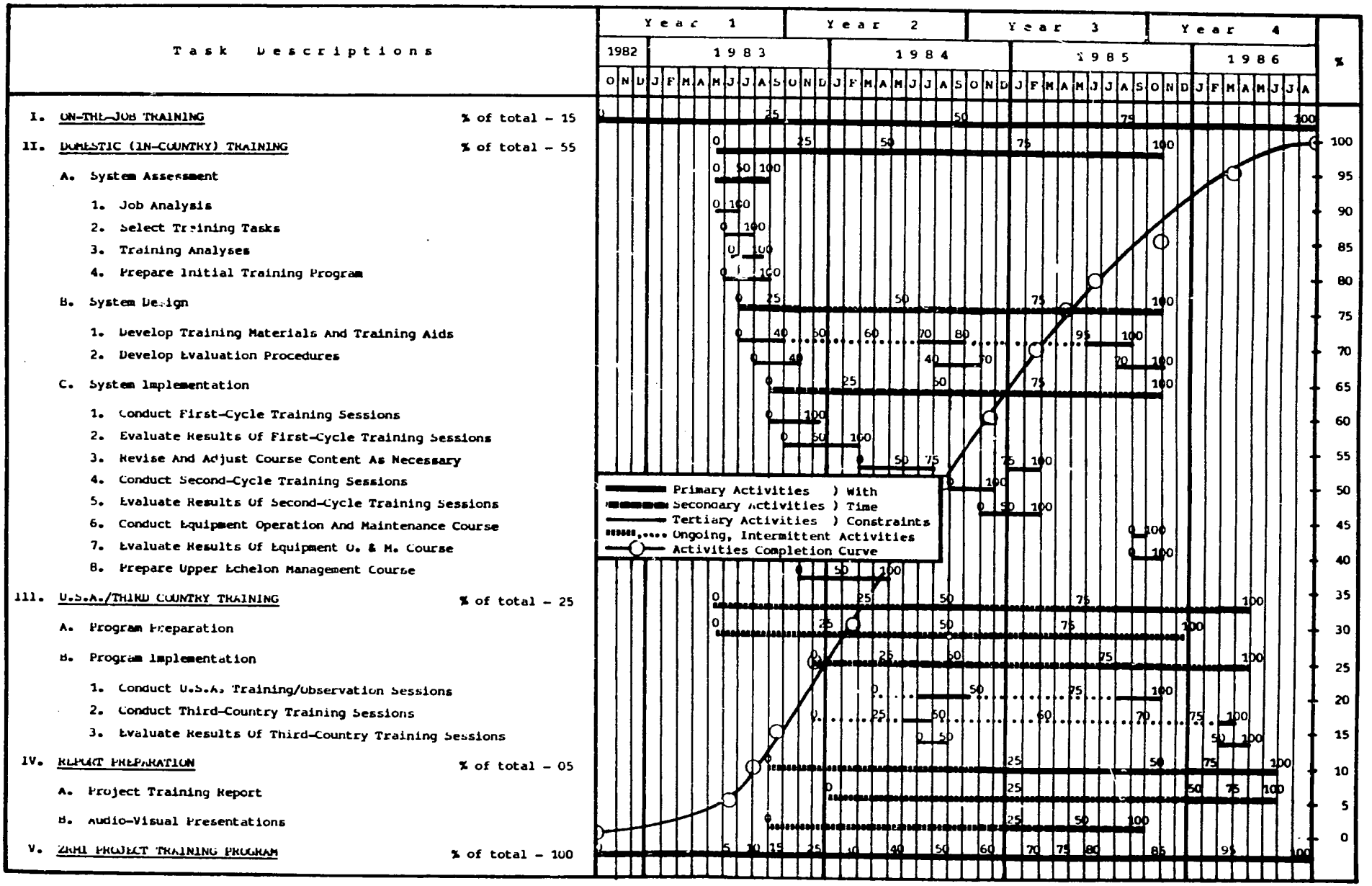
b. In-Country (Domestic) Training Sessions

1) Basic Approach

The modular approach was selected as being the most appropriate for the preparation and presentation of on-site training sessions. From the results of the needs and requirements survey made in the three districts, a total of eight basic modules, all considered to be readily applicable to rural road construction and maintenance, were selected, and they included the following:

Exhibit XIII

ZRMI PROJECT TRAINING PROGRAM SCHEDULE (REVISED, MARCH 1986)



- Plane Surveying
- Soil Sampling and Testing
- Feeder Roads Maintenance Practices
- Basic Hydrology and Design of Hydraulic Structures
- Maintenance Management
- Project Management
- Basic Embankment Design
- Basic Pavement Design

The methodology employed in the in-country training sessions can best be illustrated by the circular percentage graph (or "pie chart") shown in Exhibit XIV. Here it is shown that the use of the Bengali language by national instructors was at the very core of the system. Lectures per se were held to a minimum (25 percent). However, the combination of lecture, demonstration, and review/critique comprised 50 percent of the time. The other 50 percent of the time was devoted to field and/or laboratory practice.

2) Venue

As shown by appropriate symbols on Exhibit XV, all of the on-site training sessions were held in, or near, the towns of Sylhet, Rangpur or Faridpur, which were the respective administrative centers of the old districts of the same name. In all cases, the operational headquarters were the ZRMI Project offices in each district.

3) Schedule

The schedules for the first- and second-cycle training sessions and the equipment operation and maintenance sessions are shown graphically on Exhibit XVI, which consists of three sheets. As shown on Sheet 1, each first-cycle training session was split into two separate sessions of 5 days each. The majority of the participants, as well as the training staff, felt that it would be more efficient to schedule two consecutive five-day sessions, separated by a one-day rest break. As shown on Sheet 2, an attempt was made to schedule the second-cycle sessions in this manner. Only in Rangpur was it possible to achieve the one-day rest break between the two sessions, unusual weather conditions, holidays, and/or political strife

Exhibit XIV

ZRMI PROJECT TRAINING PROGRAM

CIRCULAR PERCENTAGE GRAPH

IN-COUNTRY TRAINING METHODOLOGY

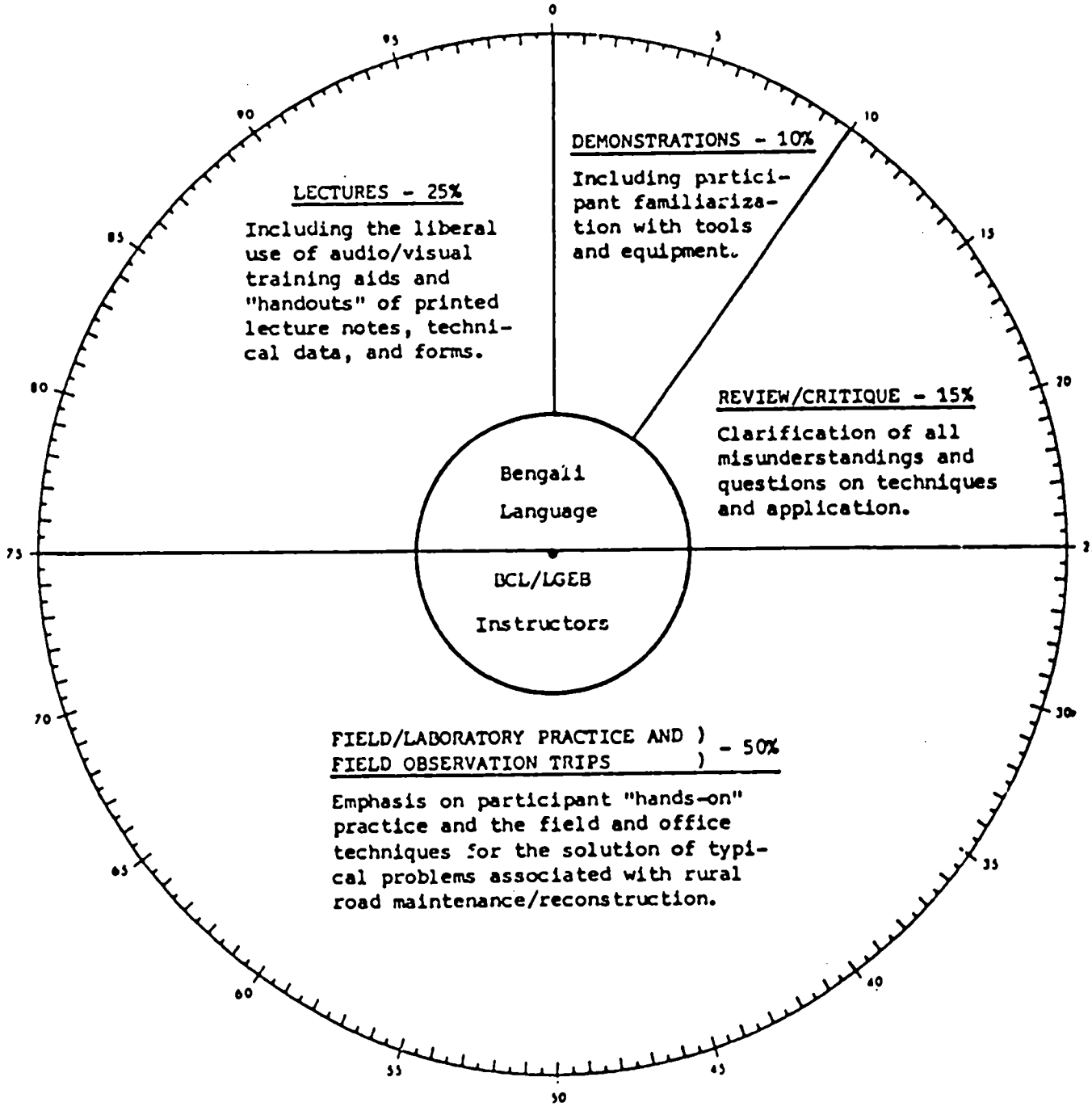


Exhibit XV - VENUE, FIRST- AND SECOND-CYCLE TRAINING SESSIONS

EQUIPMENT O. & M. TRAINING SESSIONS

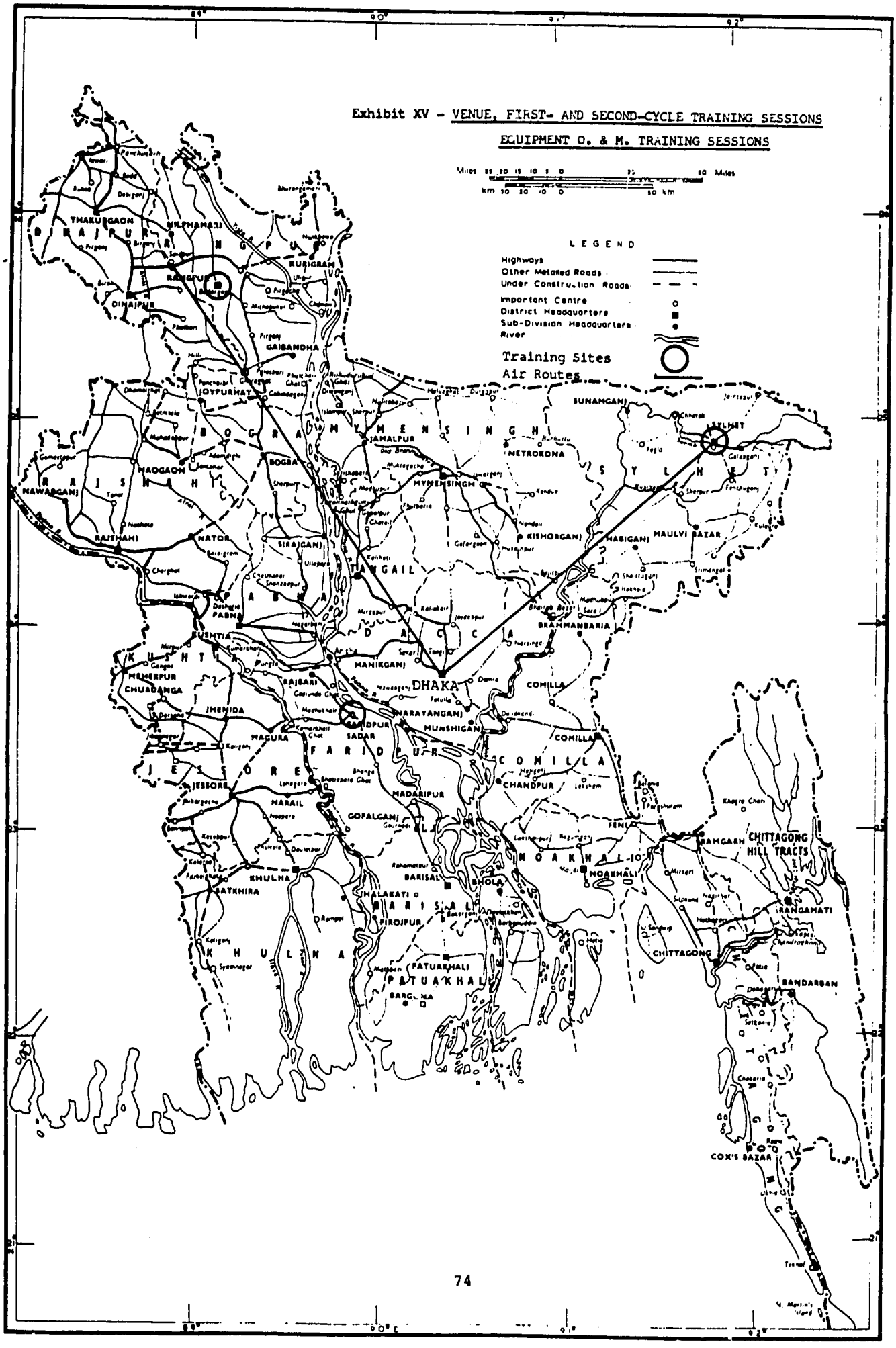


Exhibit XVI - ZRMI IN-COUNTRY TRAINING SESSIONS VENUE, SCHEDULE, PARTICIPANTS

SCHEDULE, FIRST-CYCLE TRAINING SESSIONS, 1983

Venue	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Days TOTAL
Sylhet														SEPTEMBER 1983																		
District				■	■	■	■	■																	■	■	■	■	■			10
													NOVEMBER 1983																			
Rangpur													■	■	■	■	■															05
				DECEMBER 1983																												
District				■	■	■	■	■																								05
																				NOVEMBER 1983												
Faridpur																				■	■	■	■	■								05
											DECEMBER 1983																					
District											■	■	■	■	■	■																05

TRAINING MODULES AND RESPECTIVE TOTAL PARTICIPANTS

Module Description	Total Number Of Participants			
	Sylhet	Rangpur	Faridpur	Total
Plane Surveying	13	21	23	57
Rural Roads Maintenance Practices	31	21	24	76
Material Sampling And Testing (Soils)	11	11	15	37
Total Number Of Participants	55	53	62	170

Exhibit XVI - ZRMI IN-COUNTRY TRAINING SESSIONS
VENUE, SCHEDULE, PARTICIPANTS

SCHEDULE, SECOND-CYCLE TRAINING SESSIONS, 1984

Venue	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	Days TOTAL
Sylhet	October 1984																							September 1984								
District																																11
Rangpur																	October 1984															
District																																11
Faridpur													November 1984																			
District																																11

PARTICIPANT DISTRIBUTION BY TRAINING MODULE AND UNIT

Module Description	Unit Designation	Total Number Of Participants			
		Sylhet	Rangpur	Faridpur	Total
Basic Plane Surveying	I	7	13	9	44
Advanced Plane Surveying	II	6		9	
Rural Roads Maintenance Practice (Basic)	III	12	15	8	48
Rural Roads Maintenance Practice (Advanced)	IV	6		7	
Material Sampling And Testing (Soils) (Basic)	V	10	12	9	40
Material Sampling And Testing (Soils) (Advanced)	VI			9	
Total Number Of Participants		41	40	51	132

prevented it in the other two districts. Of course, the question of separation of sessions did not arise in the case of the operation and maintenance training sessions, for this was a short-term, one-time course covering a span of three days only.

4) Participants

Each of the three sheets of Exhibit XVI also shows the distribution of the participants according to the module attended. Table I shows the distribution according to parent organization. It can be seen that two-thirds of the participants came from the XEN organization, while only about one-third were from the DE's ranks. The first footnote on Table I is important because it emphasized one of the disadvantages of the separate-session operation. Some of the participants attended the first portion of the training sessions, but not the second; while the balance attended both portions. The result is a gross total of 170 participants for calculating costs, but a net number of 125 participants for calculating impact.

Table II shows the distribution of the participants by current posting. It is interesting to note that all levels of assignment, from Laboratory Technician to Acting XEN, are included. By far the majority of the participants were from the junior executive level -- young men, technically qualified, and seeking additional training to improve their career opportunities. Finally, Table III shows participant distribution by current posting. In each district, the majority of the participants were from the host town. Because of the transportation and other mobilization problems, this is to be expected.

The participants in the operation and maintenance training sessions were delegated from the staffs of the XEN's in the three Project districts. Since this was a highly specialized training subject, the participation was limited -- in all, there were a total of 16 participants. The distribution by organizations and occupation is shown on Sheet 3 of Exhibit XVI.

Table I - PARTICIPANTS ACCORDING TO PARENT ORGANIZATION
FIRST-CYCLE, IN-COUNTRY TRAINING SESSIONS, 1981

Location and Session	Distribution of Participants			
	District Engineer	Works Program Wing	Others	Total
Sylhet				
01	04	18	—	22
02	04	29	—	33*
Sub-Total	08	47	—	55
Rangpur				
01	11	12	—	23
02	12	18	—	30*
Sub-Total	23	30	—	53
Faridpur				
01	09	15	—	24
02	18	18	02**	38*
Sub-Total	27	33	02	62
Total	58	110	02	170

* Some participants attended both sessions; therefore, the net total of participants was: Sylhet - 48, Rangpur - 32, and Faridpur - 45, or a total net of 125 participants in the first-cycle training sessions.

** XEN, Khulna and XEN, Kushtia

Table II - PARTICIPANT DISTRIBUTION BY CURRENT ASSIGNMENT
SECOND-CYCLE, IN-COUNTRY TRAINING SESSIONS, 1984

Current Assignment	Distribution by Districts			
	Sylhet	Rangpur	Faridpur	Total
Executive Engineer (XEN) (In-Charge)	—	1	—	1
Assistant Engineer (AE)	2	6	5	13
Upazila Engineer (UE)	2	—	11	13
Sub-Assistant Engineer (SAE)	15	17	9	41
District Physical Planner	—	1	—	1
Sectional Officer (SO)	—	—	5	5
Sectional Officer - I (SO-I)	—	—	1	1
Sectional Officer - II (SO-II)	—	—	1	1
Work Assistant (WA)	9	6	8	23
Overseer (O)	—	3	—	3
Sub-Overseer (SO)	5	—	4	9
Supervisor (S)	1	—	—	1
Deputy Supervisor (DS)	2	—	—	2
Draftsman (D)	—	1	—	1
Estimator (E)	2	1	—	3
Surveyor (S)	3	3	5	11
Laboratory Technician (LT)	—	1	2	3
TOTAL	41	40	51	132

Table III - PARTICIPANT DISTRIBUTION BY CURRENT POSTING
SECOND-CYCLE, IN-COUNTRY TRAINING SESSIONS, 1984

Present Posting	Total Number
Sylhet Sessions	
Sylhet	26
Habiganj	4
Bahubal	1
M. Bazar	3
Fenchuganj	1
Sunamganj	1
Comilla	3
Chittagong	2
Sub-Total, Sylhet Sessions	41
Rangpur Sessions	
Rangpur	20
Gaibandha	5
Kurigram	3
Nildlamari	1
Lalmonirhat	1
Bamandanga	1
Mithapukur	1
Bogra	5
Dinajpur	3
Sub-Total, Rangpur Sessions	40
Faridpur Sessions	
Faridpur	27
Rajbari	6
Shariatpur	2
Khulna	1
Kushtia	4
Madaripur	4
Gopalgonj	1
Bagerhat	1
Bhadarganj	1
Baliakandi	1
Kasinai	1
Naria	1
Charvadrason	1
Sub-Total, Faridpur Sessions	51
TOTAL PARTICIPANTS	132

If the net totals from the first-cycle sessions are used, then the total number of professionals and technicians receiving benefits from the in-country training sessions was 125 for the first-cycle sessions, 132 for the second-cycle sessions, an 16 for the equipment operation and maintenance sessions, or a grand total of 273. The Project goal of 200 participants in the in-country training program during this same period has been more than attained.

5) Training Staff

In the first-cycle sessions, the instructors were all recruited from the Consultant's staff. However, the District RE's and their respective staffs also contributed an important input to these training sessions. Because of the heavy emphasis on the Bengali language as the communication medium, and the need to build a nucleus of on-going training activities, the major part of the training staff was recruited from BCL. Table IV is a list of the Consultant's in-country training staff for both the first- and second-cycle training sessions, as well as the equipment operations and maintenance training sessions.

Since the second-cycle sessions were considered to constitute the transitional phase, LGEB and DE staff personnel were encouraged to participate as trainers to the maximum extent possible. A complete list of the participating lecturers, and their respective subjects, is shown on Table V. It should be noted that two of these lecturers attended the first USA Training Course, seven attended the first AIT Training Course, two were in the Second USA Training Course, and two were in the second AIT Training Course. This is indeed fulfilling one of the objectives of the ZRMI Project Training Program, i.e., the transfer of knowledge.

A great deal of the success of both the first- and second-cycle training sessions was due to the coordination of the training program with the mobilization of the participants, and the logistics of housing and

Table IV - CONSULTANT TRAINING STAFF
IN-COUNTRY TRAINING, 1983/84

Name and Position	1st-Cycle	2nd-Cycle	O. & M.
Gifford E. Rogers, PAS, Course Director/Monitor	x	x	x
Brig. Abdullah, BCL, PE, Rural Roads/Soils/Surveying	x	x	-
M. Majid, BCL, Special Advisor, Rural Roads and Soils	x	x	-
G.S.M. Habibur Rahman, BCL, OE, Rural Roads and Soils	x	x	-
S. Arefin, BCL, Laboratory Engineer, Soils	x	x	-
M.A. Gafur, BCL, Chief Surveyor, Surveying	x	x	-
A. Nielson, WSA, RE, Syl , Coordination, R. Roads	x	x	x
K.M. Hassan, BCL, ARE, Sylhet, R. Roads/Surveying	x	x	x
A. Tavel, PAS, RE, Rangpur, Coordination, R. Roads	x	x	-
S.S. Ahmed, BCL, ARE, Rangpur, Rural Roads	x	x	-
H. Correll, WSA, RE, Faridpur, Coordination	x	-	-
N. Ziegler, WSA, RE, Faridpur, Coordination, R. Roads	-	x	-
A. Habib, BCL, ARE, Faridpur, Rural Roads/Soils	x	x	-
A. Islam, BCL, Soils Technician, Rangpur, Soils	x	x	-
A. Hossain, BCL, Soils Technician, Faridpur, Soils	x	x	-
Kh. I. Uddin, BCL, Inventory Engineer, Faridpur, R.R.	x	-	-
N.M. Siddique, BCL, Lab. Tech., Sylhet, Soils	x	x	-
B. Hossain, BCL, Lab. Tech., Rangpur, Soils	x	x	-
M. Rahman, BCL, Laboratory Tech., Faridpur, Soils	-	x	-
A. Karim, BCL, Surveyor, Sylhet, Surveying	x	x	-
Abu Musa Mia, BCL, Surveyor, Sylhet, Surveying	x	x	-
Z. Abedin, BCL, Surveyor, Rangpur, Surveying	x	x	-
Tajul Islam, BCL, Surveyor, Faridpur, Surveying	x	x	-

Table V - LIST OF LGEB AND DE LECTURERS AND SUBJECTS
SECOND-CYCLE, IN-COUNTRY TRAINING SESSIONS, 1984

Name	Position	Date/Duration	Subject Of Lecture
		Sylhet Sessions	
Mr. R.N. Hasan* ++	PM, ZRMI Project, LGEB	24/09/84 - 2 hours	Contract administration, standard procedures for contract administration
		25/09/84 - 2 hours	Contract supervision, quality control
Mr. Mohiuddin Ahmed	XEN, Sylhet, LGEB	27/09/84 - 2 hours	Planning, site investigation, foundation investigation, soil sampling and testing
		01/10/84 - 2 hours	Financial planning
		02/10/84 - 2 hours	Human relations, people participation
Mr. Bashiruddin Ahmed**	AE, Sylhet, LGEB	28/09/84 - 2 hours	Planning, standard specifications, role of specifications, types of specifications, need for clarity and conciseness
Mr. Matiur Rahman**	DE, Zila Parishad, Sylhet	29/09/84 - 2 hours	Project management
		Rangpur Sessions	
Mr. R.N. Hasan* ++	PM, ZRMI Project, LGEB	14/10/84 - 2 hours	Definition of planning and programming, planning and program priorities, procedures for contract administration
		15/10/84 - 2 hours	Contract supervision, quality control
Mr. Ashraful Haque**	AE, Kurigram, LGEB	17/10/84 - 2 hours	Planning, site investigation, hydrologic investigation, stream gaging, site mapping
Mr. Zahangir Alam*	AE, Rangpur, LGEB	20/10/84 - 2 hours	Contract procedures, standard procedures for advertising, evaluation, and awarding contracts in Bangladesh
Mr. Salauddin ++	AE, Nilphamari, LGEB	21/10/84 - 2 hours	Supervision and quality control, necessity and responsibility
Mr. Yeasin Ali**	DE, Rangpur, Z.P.	22/10/84 - 2 hours	Program control and supervision, use of bar charts, etc.
Mr. A. Karim +	XEN, Rangpur, LGEB	23/10/84 - 2 hours	Principal elements of project supervision, project control techniques
Mr. Dewan Shahidur Rahman	AE, Bogra, LGEB	22/10/84 - 2 hours	Sieve analysis and Atterberg Limits tests (Maintenance Module)
Mr. Nurul Amin	AE, Rangpur, IRWP	25/10/84 - 2 hours	Construction surveys and field demonstration
		Faridpur Sessions	
Mr. R.N. Hasan* ++	PM, ZRMI Project, LGEB	19/11/84 - 2 hours	Contract administration and quality control
		20/11/84 - 3 hours	Road pavement
Mr. S. Hassan +	XEN, Faridpur, LGEB	15/11/84 - 3 hours	Project implementation, contract procedures
		16/11/84 - 1 hour	Project implementation, contract administration
		18/11/84 - 2 hours	Project supervision
		20/11/84 - 1 hour	Project supervision
Mr. A. Gaffar	XEN, Khulna, LGEB	16/11/84 - 1 hour	Project implementation
		18/11/84 - 2 hours	Project supervision
Mr. Giasuddin**	DE, Faridpur, Z.P.	15/11/84 - 3 hours	Proj. Planning, standard spec.
Mr. A. Azam**	UE, Sadar, Faridpur, LGEB	16/11/84 - 1 hour	Proj. supervision, quality con.
		18/11/84 - 2 hours	Proj. supervision, quality con.
Mr. Kamruzzaman**	AE, Rajbari, LGEB	11/11/84 - 3 hours	Program planning, priorities
		18/11/84 - 1 hour	Program supervision and control

* - Participant in First ZRMI Project U.S.A. Training/Observation Course. + - Participant in the Second USA Course

** - Participant in First AIT Training Course, Bangkok, Thailand. ++ - Participant in the Second AIT Course

feeding the participants. Table VI is a list of LGEB and Zila Parishad personnel who directed this coordination effort.

6) Training Schedules and Syllabi

Once the general scenario for in-country training sessions has been set, it was necessary to develop a detailed schedule and syllabus for each training session. Before this could be undertaken, the relationships of course modules and units, expected number of participants, subject matter to be covered, and the optimum use of available qualified trainers had to be defined. Exhibit XVII illustrates how this mutually dependent relationship was defined for the second-cycle sessions.

With this interrelationship well defined, it was possible to proceed to the development of the detailed schedule. This was done in bar-chart form following the data presented in Exhibit XVII. The working day was set from 9830 to 1700 hours, with 1½ hours for lunch and two tea breaks of ½ hour each. Where possible, classroom work was scheduled for the mornings, when the maximum work period was 1½ hours. Most of the field work was scheduled for the afternoon, when two-hour work periods prevailed.

The syllabus for each training session was then prepared to be compatible with the bar-chart schedule. It clearly presented what subjects would be taught, the venue of the class, and the assigned instructor(s). Each participant was given a personal copy of the course schedule and syllabus. Thus, by merely knowing his own unit number, he was able to know exactly where he should be at any time during the working day, and to be prepared for the subject matter being presented.

7) Logistics

For all sessions, each participant was paid a per diem of Tk 100, and tea was provided twice each day. For the second-cycle sessions, two meals per day were added to the amenities. For the participants of the equipment operation and maintenance course, a lunch was added. Also for those

Table VI - SESSION COORDINATORS, FIRST- AND SECOND-CYCLE, IN-COUNTRY TRAINING SESSIONS 1983/84

Name and Position	1st-Cycle	2nd-Cycle
R.N. Hasan, LGEB, Project Manager, ZRMI Project * ++	x	x
Mohiuddin Ahmed, LGEB, XEN, Sylhet District	x	x
Motiur Rahman, Zila Parishad, DE, Sylhet District **	x	x
A. Karim, LGEB, XEN, Rangpur District +	-	x
Jahangir Alam, LGEB, XEN (Acting), Rangpur District *	x	-
Yeasin Ali, Zila Parishad, DE, Rangpur District **	x	x
Shaidul Hassan, LGEB, XEN, Faridpur District +	x	x
Md. Giasuddin, Zila Parishad, DE, Faridpur **	x	x

* - Participant in First ZRMI Project USA Training/Observation Course

** - Participant in F t AIT Training Coursse, Bangkok, Thailand

\+ - Participant in Second ZRMI Project USA Training/Ovservation Course

++ - Participant in Second AIT Training Course, Bangkok, Thailand

Exhibit XVII

ZRMI Project In-Country Training Program -- Second-Cycle Sessions

RELATIONSHIP OF COURSE GROUPS, CONTENTS, TRAINING HOURS, AND STAFF

Training Staff Participation															Training Course Contents (By Group*)	Training Effort Distribution By Groups * And By Hours						
																1	2	3	4	5	6	Total
P			M								E	D			A	OPENING/CLOSING, GENERAL ORIENTATION	13	13	13	13	13	13	78
			M								E			B	A	SURVEYING (I & II)							
							I	H						B		Review Of Fundamentals	2	2	-	-	-	-	4
							I	H								Measurements And Errors	4	2	-	-	-	-	6
							I	H								Differential Levels	7	2	-	-	-	-	9
							I	H								Profiles And Cross Sections	14	4	-	-	-	-	18
							I	H								Hand Level, Compass, Rangefinder	7	3	-	-	-	-	10
							I	H								Planetable And Its Use	2	4	-	-	-	-	6
							I	H								Theodolite And Its Use	2	3	-	-	-	-	5
							I	H								Traverse (Open And Closed)	-	4	-	-	-	-	4
							I	H								Topography	-	3	-	-	-	-	3
							I	H		F	E			B	A	Field Problems/Site Mapping	20	20	-	-	-	-	40
							I	H		F				B		Notes And Note Reduction	7	10	-	-	-	-	17
								H		F				B		Quantity Calculations	3	6	-	-	-	-	9
																Total, Surveying	68	63	-	-	-	-	131
			M								E	D		B	A	MAINTENANCE/RECONSTRUCTION MANAGEMENT (III & IV)							
											E	D		B		Review Of Fundamentals	-	-	2	2	-	-	4
										F	E	D			A	Planning Program Priorities	-	-	5	12	-	-	17
	O	N		L						F	E	D	C	B	A	Site Investigation	-	-	7	7	-	-	14
				L						F	E	D	C			Structure Siting/Sizing	-	-	-	7	-	-	7
	O	N	M							F	E	D	C	B		Standard Specifications	-	-	4	4	-	-	8
	O		M		K					F	E	D		B		Implementation Contract Procedures	-	-	-	4	-	-	4
	O		M		K					F	E	D		B		Contract Administration	-	-	-	4	-	-	4
							I	H		F	E		C	B		Construction Surveys	-	5	5	5	-	-	15
	O	N	M							F	E	D		B		Supervision/Control Program Control	-	-	-	4	-	-	4
			M							F	E	D		B		Project Supervision	-	-	6	6	-	-	12
			M							F	E	D		B		Program/Project Monitoring	-	-	7	4	-	-	11
		N				J			G	F	E		C	B		Quality Control	-	-	10	4	4	4	22
			M						G	F	E			B		Completion Reports	-	-	4	4	-	-	8
																Total, Maint./Recon. Management	-	5	50	67	4	4	130
			M											B	A	SOILS (V & VI)							
													C	B		Review Of Fundamentals	1	1	3	-	3	3	11
						J			G		E		C	B		Field Identification	1	1	4	-	4	4	14
						J			G		E		C	B		Field Sampling	2	2	3	-	3	3	13
						J			G							Sample Preparation	-	-	1	-	2	2	5
						J			G				C	B		Specific Gravity	-	-	2	-	5	5	12
						J			G							Grain-Size Analyses	1	1	4	-	14	7	27
						J			G							Atterberg Limits	2	2	4	-	14	7	29
						J			G		E		C	B		Unified Classification System	-	-	4	4	4	4	16
						J			G				C	B		Proctor Optimums	-	-	-	-	7	7	14
						J			G		E		C	B		California Bearing Ratio (CBR)	-	-	-	-	8	8	16
						J			G		E		C	B		Field Density Testing	-	-	-	-	7	7	14
	O	N				J			G		E		C	B		Field Exploration (Deep Borings)	-	-	-	4	4	-	8
	O	N							G				C	B		Application Of Data To Design	-	-	-	-	-	10	10
																Total, Soils	7	7	25	8	71	71	189
																Total, All Training Groups	88	88	88	88	88	88	528

Composition Of Training Staff	
A - Training Advisor	PAS
B - Training Coordinator	BCL
C - Advisor, Soils/Structures	BCL
D - Management Advisor	WSA
E - RE, Maintenance/Soils (3)	PAS/WSA
F - ARE, Maintenance (3)	BCL
G - Soils Laboratory Engineer	BCL
H - Chief Surveyor	BCL
I - Surveyor (3)	BCL
J - Soils Laboratory Technician (3)	BCL
K - Implementation Advisor	WPW
L - Site Hydrology Advisor	WPW
M - Training Administrator (3)	WPW
N - Other Advisors	WSA/BCL/PAS
O - Other Advisors	WPW
P - Guest Speakers, USAID, Etc.	

* Group Designation	Students
1 - Group I - Basic Surveying	8
2 - Group II - Advanced Surveying	8
3 - Group III - Basic Maintenance Pract.	8
4 - Group IV - Advanced Maint. Management	6
5 - Group V - Basic Soil Mechanics	6
6 - Group VI - Advanced Soil Mechanics	6
Total Participants (Each District)	42

operation and maintenance course participants from Rangpur and Faridpur, an extra payment of Tk 100 was made to cover costs incurred in the round trip. For all sessions, lodging and board for the Dhaka training staff were provided at the home of the RE, at the ZRMI Project Guest House, and/or a local hotels. Each received a per diem of Tk 300 to cover the daily board costs.

Except for the Rangpur and Faridpur participants in the equipment operation and maintenance course, all participants provided their own transportation from their respective duty station to the training site and return. The exceptions noted were given bus transportation from Faridpur or Rangpur to Dhaka and on to Sylhet and return. The Dhaka training staff traveled by Biman Airlines wherever the service was offered; otherwise, travel was by Jeep and/or minibus. All equipment, materials, and supplies went overland by Jeep and/or minibus.

Travel at the training sites was provided by two Jeeps and a Coaster bus. Participants provided their own transport from their place of lodging to the training site. Again, an exception was made for the equipment operation and maintenance course participants -- they were paid a flat sum of Tk 50 for local transport.

As an incentive to encourage LGEB/DE staff personnel to participate in the training chores, a special stipend of Tk 300 was paid for each day of participation as a lecturer. This was paid in place of the regular per diem, not as an additional fee.

For each training session in each district, USAID and Project officials made a special effort to be present for at least the opening or the closing days. The local Deputy Commissioner usually consented to give the opening and the closing speeches. The latter was normally given at the diploma ceremony held at the closing dinner on the evening of the last day.

Training materials supplied to all participants are listed on Table VII. Training materials and equipment available at all training sites are shown on Table VIII.

Table VII - TRAINING MATERIALS SUPPLIED TO THE PARTICIPANTS

I. FIRST-CYCLE SESSIONS

A. All Participants

1. Jute Field Bag (Local Manufacture)
2. Pad of Ruled Paper
3. Pencil and Small Sharpener

B. Participants of Survey Module

1. Flat, Plastic Scale
2. Plastic Protractor
3. One Each Level and Field Notebooks

C. Participants of Rural Roads Maintenance Practice Module

A collection of notes and forms assembled and edited by the ARE's.

D. Participants of Material Sampling and Testing Module

A collection of notes and laboratory forms assembled and edited by the ARE's

II. SECOND-CYCLE SESSIONS

A. All Participants

1. Plastic, Zipper-Closing Portfolio (Local Manufacture)
2. Pad of Ruled Paper
3. Pencil and Small Sharpener

B. Participants in Survey Module

1. Flat, Plastic Scale
2. Plastic Protractor
3. One Each Level and Field Notebook
4. Spiral-Bound Survey Manual

C. Participants of Rural Roads Maintenance Practice Module

Spiral-Bound Maintenance Manual

D. Participants of Material Sampling and Testing Module

Spiral-Bound Soils Manual

III. EQUIPMENT O. & M. SESSIONS

A. Plastic, Zipper-Closing Portfolio (Local Manufacture)
B. Pad of Ruled Paper
C. Pencil and Small Sharpener
D. A Compendium of Equipment Maintenance

Table VIII - TRAINING MATERIALS AVAILABLE AT ALL SITES
FIRST- AND SECOND-SESSIONS

Surveying Module	Material Sampling and Testing Module
Level, Wild NAK-O, w/accessories/tripod	Earth Augers/Shelby Tubes/Plastic Bags
Theodolite, Wild T-1, w/accessories/tpd	Drying Pans and Specimen Cans
Alidade, Wilk RK-1, w/accessories	Hot Plate and Electric Mixer
Plane Table, w/universal head/tripod	Atterberg L.L. Equipment/Glass Plates
Stadia/Leveling Boards, Wild GNLE-2 and Wild GNLF-2	Specific Gravity Flasks
	Temperature-Control Water Bath
Hand Levels and Clinometers	Standard and Modified Proctor Hammers
Compass, Reconnaissance Type, w/tripod	Proctor Molds and CBR Molds
Rangfinder, Wild TMO	CBT Testing Equipment (Hand Operated)
Rangepoles	Spring, Beam, and Chemical Balances
Steel Tapes, Cloth Tapes	Set of Standard Brass Sieves
Chaining Pinss, Plumbbobs	Sieve Shaker (Hand Operated)
Blackboard and Chalk	Hydrometer Cylinders and Hydrometers
Set of Project Area Maps	Penetration Mold and Collar
Pre-Cut Wooden Stakes and Hubs	Straight-Edge and Other Small Tools
Cross-Section Paper (mm)/Tracing Paper	Pick Mattox, Sledge Hammer, Shovel
Brunton Compass	Wooden Planks
String Levels	Blackboard and Chalk

Rural Roads Maintenance and Practice Module	
Standard Road Inventory Forms	Set of Project Area Maps
Steel Tapes/Cloth Tapes	Blackboard and Chalk

Equipment Operation and Maintenance Module
Honda MB80 - MT-80 Motorcycle Maintenance Manual
4-Wheel Drive CJ Jeep Maintenance Manual
3-Wheel, Static Weight, Steel Drum, Roller Maintenance Manual

8) Participants' Course Evaluation

A Participants' Personal Course Evaluation Questionnaire was supplied to each participant in each series of training sessions. The first page was general in nature, with questions for all participants to answer. Page two contained specified questions directed toward the specific training modules. The individual responses to these questionnaires was tabulated and evaluated, first on a district basis, and then on a cycle basis. Exhibit XVIII, consisting of three sheets, is a compilation-evaluation for the second-cycle responses. It is typical of the responses received from other training sessions.

9) Cost of In-Country Training Sessions

Table IX shows the current status of the in-country training budget. It will be noted that the second-cycle expenditures were more than double those for the first-cycle sessions. There are several reasons for this; namely, increase in costs due to inflation, greatly increased amenities for the participants, significant increase in printing costs, and the provision of more training materials and supplies. It will also be noted that the costs for the equipment operation and maintenance course are higher still. This is due to increased transportation costs, higher amenities, and other cost increases due to inflation.

Some of the budget line items were overexpended, while some were underexpended. Overall, the budget was underexpended with the result that there is a surplus of US$ 9,073. However, the main reason for this surplus was the increase in the exchange rate from about Tk 24.00 at the start of the Project to Tk 30.00 for the current rate. To account for this fluctuation, an average exchange rate of Tk 26.82 was used.

For the first-cycle, the average cost/participant-day was Tk 329, which rose to Tk 415 for the second-cycle, and Tk 771 for the equipment operation and maintenance sessions. This gave an average cost for all the training sessions of Tk 336, or US$ 12.70. The budgeted unit cost was US$ 16.35. It may be said here that a unit cost (not including salary costs of

EXHIBIT XVIII - COMPILATION, EVALUATION QUESTIONNAIRE RESPONSES

Evaluation Questionnaire Item	Consolidated Responses Sylhet	Rangpur	Faridpur	Total
Page 1 - General				
1. Training Module Attended				
Surveying	12	13	18	43
Rural Roads Maintenance and Improvement	17	15	15	47
Soil Sampling and Testing	10	12	17	39
No Questionnaire returned	02	--	01	03
Totals	41	40	51	132
2. Attendance, All Modules, All Sessions (%)	98	99	99	
3. Option of Course Duration				
Two Consecutive Weeks is About Right	24	38	25	87
Should be Two Separate One-Week Sessions	15	01	20	36
Even One Week is Too Long	--	01	--	01
No Response	02	--	0[illegible]	08
Totals	41	40	51	132
4. Satisfaction with Module Assignment				
Yes	33	39	45	117
No	06	01	01	08
No Response	02	--	05	07
Totals	41	40	51	132
5. Satisfaction with Per Diem, Board, Lodging				
Yes	35	34	35	104
No	04	06	14	24
No Response	02	--	02	04
Totals	41	40	51	132

Consensus of Comments

In Sylhet, one man from each of the Survey and the Maintenance Modules failed to submit a questionnaire. In Faridpur, the failure to submit a questionnaire was from the Soils Module.

The average attendance for all sessions, all Districts was 99 percent.

About 66 percent of the participants thought the course duration was about right, while 29 percent favored the divided sessions. This is about the same as the opinions expressed during the first cycle training sessions.

About 87 percent were satisfied with their module assignment, while only 6 percent were actually dissatisfied.

About 79 percent were satisfied with the per diem rate and other board and lodging arrangements. Of those that were not satisfied, most felt that the per diem should be increased to cover all expenses. Two indicated a rate of Tk500/day should be standard.

6. Reaction to course Organization, Preparation of Trainers, Etc. A total of 50 respondents were completely satisfied.

A total of 98 reported that the sessions were well organized and that the trainers were well prepared, while 3 stated that trainers are poorly prepared, and one classified the trainers as "mediocre." A total of 14 reported satisfaction with the course, one said the proportion of trainees/trainer is too high, and one said he would like to see better relationship between trainees and trainers. Three felt that the trainees should be better segregated according to their backgrounds. Four noted that there should be more equipment available for training, and one would like better seating arrangements. Seven failed to respond to this question.

It appeared that attendance at the second-cycle sessions was somewhat improved over the attendance at the first-cycle sessions. Perhaps this was due to increased participation on the part of LGEB officials as lecturers. For the most part, the responses to the general questions indicated an overall satisfaction with the present form and substance of the ZRMI Project Training Program. As with the first-cycle analyses, there was a significant variation in responses received in Sylhet, Rangpur, and Faridpur.

Page 2 - Survey Module				
1. Approve of Splitting this Module into Two Sections -- Basic and More Advanced?				
Yes	12	13	17	42
No	--	--	--	--
No Response	--	--	01	01
Totals	12	13	18	43
2. Satisfied with Training Materials Supplied to Each Person?				
Yes	12	12	18	42
No	--	01	--	01
No Response	--	--	--	--
Totals	12	13	18	43

The splitting of the module into two segments was a reaction from criticism expressed during the first cycle sessions. The most unanimous approval for this action in the second cycle would indicate that this type of organization should be considered for all future training sessions as well.

The one negative response to the personal training materials supplied to each participant was that the plastic protractor was of poor quality.

EXHIBIT XVIII - COMPILATION, EVALUATION QUESTIONNAIRE RESPONSES

Evaluation Questionnaire Item	Consolidated Responses Sylhet	Rangpur	Faridpur	Total	Consensus of Comments
Page 2 - Survey Module (Cont.)					
4. Participation in This Module Increased Ability?					Even though opinion was unanimous that participation in the survey module had increased the individual's knowledge of surveying as well as improved the individual techniques, there were some who felt they had sufficient training in surveying and indicated a desire to move on to training in other modules that might be presented in the future.
Yes	12	13	18	43	
No	--	--	--	--	
No Response	--	--	--	--	
Totals	12	13	18	43	
5. Like to Have Additional Training in Surveying?					By far, the majority of the participants indicated an interest in future training in rural roads maintenance and improvement. However, nine indicated interest in future soil sampling and testing courses, and a total of three said they had no interest in any of the alternatives offered.
Yes	10	12	13	35	
No	02	01	04	07	
No Response	--	--	01	01	
Totals	12	13	18	43	
6. Interest in Other Training Modules in Future?					
Maintenance of Rural Roads	06	13	16	35	
Soil Sampling and Testing	03	03	03	09	
Neither of the Two Alternatives	03	--	--	03	
Totals	12	16	19	47	

7. General Comments

A total of 33 responded that the survey training was very beneficial, and 5 said that they would like to see similar courses taught every year. Three reported they would like more emphasis on actual project execution, and two thoughy that the survey sessions should cover an even longer time span than the time allotted.

Page 3 - Rural Roads Maintenance Module					
1. Approve of Splitting this Module into Two Sections -- Basic and More Advanced?					While the great majority of the participants favored splitting the module, there were three who did not favor such an arrangement. This should be considered when planning future sessions for this module.
Yes	16	15	13	44	
No	01	--	02	03	
No Response	--	--	--	--	
Totals	17	15	15	47	
2. Satisfied with Training Materials Supplied to Each Person?					
Yes	13	12	08	33	There was more dissatisfaction with the personal training materials provided to this module. Additional materials desired included: Clipboard - 4, diary - 2, eraser - 3, triangle - 1, calculator - 1, pen - 1, graph paper - 1, cap - 4.
No	04	03	04	11	
No Response	--	--	03	03	
Totals	17	15	15	47	
4. Participation in This Module Increased Ability and Knowledge of Techniques?					
Yes	17	15	15	47	As with the surveying module, there was unanimity of opinion that participation in this module had been of benefit to all. However, four replied that they had no interest in additional training in rural road maintenance.
No	--	--	--	--	
No Response	--	--	--	--	
Totals	17	15	15	47	
5. Like to Have Additional Training in Rural Roads Maintenance?					
Yes	15	14	13	42	For the participants in this module, the greatest preference for future training courses was for the soil sampling and testing module. In Sylhet, significant interest was shown on participating in future survey courses, but the interest was less in Rangpur, and negligible in Faridpur. Again, the total showing no interest in any of the alternatives was three.
No	02	01	01	04	
No Response	--	--	01	01	
Totals	17	15	15	47	
6. Interest in Other Training Modules in the Future.					
Surveying	11	07	01	19	
Soil Sampling and Testing	08	10	12	30	
Neither of the Two Alternatives	--	01	02	03	
Totals	19	18	15	52	

Evaluation Questionnaire Item	Consolidated Responses Sylhet	Rangpur	Faridpur	Total	Consensus of Comments

Page 3 - Rural Roads Maintenance Module (Cont.)

7. General Comments

A total of 31 responded that rural roads maintenance training was very beneficial, two replied that it should be continued, and four felt that a training program should be offered every alternate year. Two replied that the training program should be more demonstration oriented, one suggested more emphasis on preventive maintenance, and one thought that the time span for this module should be more than two weeks. One participant suggested a central library be provided in each District, while one suggested that each participant should be given a set of standard reference books. One participant remarked that at least the course should improve the office work, while one participant offered no comment at all.

Page 4 - Soil Sampling and Testing Module

1. Approve of Splitting this Module into Two Sections -- Basic and More Advanced?

	Sylhet	Rangpur	Faridpur	Total
Yes	09	11	16	36
No	01	01	--	02
No Response	--	--	01	01
Totals	10	12	17	39

As with the other two training modules, the majority of the participants favored the splitting of this module into two segments. While there are a few dissenters, it would appear that this practice should be continued in future training sessions.

2. Satisfied with Training Materials Supplied to Each Person?

	Sylhet	Rangpur	Faridpur	Total
Yes	09	09	15	33
No	01	03	02	06
No Response	--	--	--	--
Totals	10	12	17	39

Suggestions for improving personal training materials included: Diary - 1, calculator - 1, copy of all training manuals to all participants - 1, soils manual should be improved - 1, soils manual should be more basic - 1.

4. Participation in This Module Increased Ability and Knowledge of Techniques?

	Sylhet	Rangpur	Faridpur	Total
Yes	10	12	17	39
No	--	--	--	--
No Response	--	--	--	--
Totals	10	12	17	39

All agreed that participation in this module was of great benefit to them. In fact, 92 percent indicated they would like further training in this module. This continuing interest is the highest of the three, with lowest interest being in surveying. However, physical plant and available equipment are at their limits now. To satisfy the great demand for participation in the soils module training would require more laboratory space and equipment. The lack of interest in the survey module is understandable, especially on the part of those who qualify for the soils module. It should be recognized, though, that surveying is a basic skill that should be dominated by all civil engineers, no matter their rank or grade.

5. Like to have Additional Training in Soil Sampling and Testing?

	Sylhet	Rangpur	Faridpur	Total
Tes	09	10	17	36
No	01	02	--	03
No Response	--	--	--	--
Totals	10	12	17	39

6. Interest in Other Training Modules in the Future.

	Sylhet	Rangpur	Faridpur	Total
Surveying	02	04	03	09
Maintenance of Rural Roads	10	08	13	31
Neither of the Two Alternatives	--	--	--	--
No Response	--	--	01	01
Totals	12	12	17	41

7. General Comments

A total of 26 responded that the soil sampling and testing module training was very beneficial, and two even said that a circular should be issued to compel implementation of the new techniques learned in this course. Two responded that the number of students should be held to a minimum so that all could have a "hands on" experience in the laboratory. Two felt that there should be more scope for advanced study, while one indicated he was not in agreement with the course content.

Table IX - CURRENT STATUS, IN-COUNTRY TRAINING BUDGET

	Budget Item	Total Expenditures (Tk)				Totals (US$)		
		1st Cycle	2nd Cycle	O. & M.	Total	Expended	Budgeted	Remaining
01	PER DIEM							
	A. Participants	85,700	160,000	6,400	252,100	9,400	8,100	
	B. Staff	48,499	58,188	1,475	108,162	4,100	2,400	
02	AMENITIES (LUNCH, TEA, CLOSING DINNER)	33,041	95,444	3,350	131,835	5,000	5,500	
03	TRAINING FACILITIES	—	8,260	4,300	12,560	500	300	
04	TRANSPORTATION							
	A. Training	25,067	50,077	3,700	78,844	3,000	2,400	
	B. Staff	15,500	28,400	1,35[illegible]	45,290	1,700	2,000	
05	PRINTING AND REPRODUCTION (FILMS AND PHOTO PROCESSING)	26,273	157,388	10,800	194,461	7,300	8,000	
06	TRAINING MATERIALS AND SUPPLIES	35,832	60,062	4,000	99,894	3,800	4,000	
07	TRAINING EQUIPMENT	10,000	15,814	1,000	26,814	1,000	1,500	
08	CONTINGENCIES/MISCELLANEOUS	—	—	585	585	100	10,773	
	TOTALS	279,912	633,633	37,000	950,545	35,900	44,973	9,073
	COST/PARTICIPANT-DAY	Tk 329	Tk 415	Tk 771	Tk 336	US$ 12.70	US$ 16.35	

Note: This accounting does not include the US$ expended for training aids, materials, equipment.

This accounting does not include salaries of the training staff.

For conversion from Tk to US$, an average conversion rate of Tk 26.82 was used.

the training staff) of less than US$ 20.00/participant-day is well within the range of other similar type training programs.

10) Conclusions and Recommendations

a) Survey Module

(1) Many of the participants in this module had little or no "hands-on" experience in the use of the equipment provided for this course. The trainers are convinced that plane surveying is such a fundamental engineering operation that demonstrated competence in the basic techniques should be a prerequisite for directing field work and utilizing survey data in design work.

(2) To correct this shortcoming, it is suggested that future survey training modules be split into perhaps three units. Units one and two would be composed of the participants selected for the surveying module, while unit three would be composed of participants from other modules.

(3) To successfully accomplish this limited goal, there must be more surveying equipment available so that all participants will have ample opportunity to handle the equipment in the field. The additional equipment selected should fulfill the requirements of the next recommendation.

(4) It is recommended that each of the subordinate offices within each rural administrative unit be supplied with a set of rudimentary surveying tools to enable the assigned staff or carry our their responsibilities. The set could consist of no more than a hand level, a leveling rod, two or more range poles, a compass, chain/tapes, string levels, plumb bobs, and cord. These sets should first be made available for use in the training sessions, and then turned over to the XEN for distribution to the subordinate offices. The more sophisticated surveying equipment could then be retained in the higher echelon office and sent out on a loan basis to any subordinate office that might indicate a need for this type of equipment.

b) Feeder Roads Maintenance and Improvement Module

(1) This module could profit from standardization. One logical place to start would be the maintenance manual that is distributed to all participants, the organization and management manual, and the maintenance management manual, all three prepared by the Consultant.

(2) The importance of a reliable and current road inventory has not yet been fully appreciated. It is recommended that future training sessions devote even more time to the development and maintenance of such an inventory.

(3) The concept of priority setting and rational scheduling of feeder road maintenance and/or improvement has not received sufficient emphasis. More training time must be devoted to the impact of the road inventory on both the planning and management of rural road maintenance.

(4) This module has received enthusiastic response not only from the participants in the course, but also from other districts and other BDG agencies as well. Therefore, future training sessions for this module might be held in some centralized location whose facilities would permit a greatly expanded number of participants.

c) Material Sampling and Testing Module (Soils)

(1) This was the "glamour" module that everyone wanted to attend, but not everyone had an academic background of a level required to cope with the entire course. However, like surveying, it is one of the basic concepts that everyone involved in feeder road construction/maintenance should have, at the very minimum, a fundamental familiarity.

(2) To overcome these difficulties, it is recommended that future sessions of this module be split into three units, instead of two. The first two units would be for the regular participants of the course and the third would be for the participants from other modules.

(3) This module lends itself to the centralized training site idea. However, more of the elementary sampling and laboratory equipment would have to be procured.

d) Equipment Operation and Maintenance Management

(1) Experience gained from field observations plus the enthusiastic response to the training course as offered are convincing evidence that this type of training must be repeated. With the arrival of additional items of heavy equipment, the need for such a course will become critical.

(2) For future courses of this type, a high-priority work activity would be the translation of the printed "hand-outs" into the Bengali language.

e) General

(1) Two consecutive six-day sessions, broken by one day of rest, seems to be the best way to schedule training sessions of this type.

(2) Training sessions must be scheduled to avoid taking the participants from their normal work at a time when they are most needed. Conflicts in scheduling and the use of resources by other training efforts must be avoided.

(3) Serious consideration should be given to holding most, if not all, future training courses at a centralized site. This would enable more students to be taught by the same number of instructors and would reduce the possibilities of schedule duplication, misuse of resources, and other problems noted to date.

(4) District-level personnel have demonstrated their ability as trainers and should be encouraged to assume more and more of the responsibilities for the training sessions.

(5) The creation of the LGEB Training Unit is a positive development which should mitigate many of the past problems due to duplication of training effort. The ZRMI Project should enthusiastically cooperate with this organization and seek ways and means to interface with it. However, for the ZRMI Project, training is a means to an end (improved feeder road maintenance and reconstruction), and not the end itself.

(6) The bound reference manuals for distribution to the participants of each training module were well received. These manuals should be continuously upgraded and improved for future training sessions.

(7) A Project minibus was approved for use in the training sessions during the first phase, but it was never procured. As a result, a large part of the funds required to acquire the vehicle were spent in the rental of such a vehicle for just two cycles of sessions. Obviously, the minibus should be procured as quickly as possible for use in future training sessions.

(8) A large number of 35 mm slides were taken of all training activities, and these were then used to prepare audio-visual presentations of training activities. Such presentations were well received and the preparation of this type of audio-visual material should be continued.

(9) In view of the complete decentralization of the rural administrative system in Bangladesh, future training sessions should place a great deal of emphasis on construction and maintenance management. Included in this effort should be complete orientation of USAID rules and regulations concerning compliance with specifications and reimbursement procedures.

c. On-the-Job Training

The on-the-job training element was an ongoing activity that did not lend itself to formal programming, but rather was the responsibility of all the RE's and XEN's, and their respective staffs, to encourage transfer of

knowledge at every opportunity. Specific examples of on-the-job training included:

- The use of the soils laboratory in each of the three districts for quality control and for establishing design parameters,
- Information sessions with the contractors to discuss work requirements and how they could best be met,
- Assistance from the RE's and their respective staffs, in pre-construction and construction surveys,
- Regular joint site inspection trips by the RE's and the XEN's,
- Construction-site monitoring by the RE's and their respective staff members, and
- Consultant assistance in the design of bridges and other drainage structures.

The only practical baseline for measuring the impact of on-the-job training is the observed improvement of production performance. True, other facets of the training program will also be reflected in quality of production performance, but it is impractical to attempt to define the relative importance of the impact of each facet. Observed production activities which reflect the beneficial impact of on-the-job training include:

- Monthly progress reports indicate that there has been an improvement in the level of quality control and works supervision, which is reflected in an improvement of overall contractor performance.
- The enthusiastic manner in which participants in overseas training courses assumed responsibility as trainers is an excellent example of transfer of knowledge through on-the-job training.
- The excellent cooperation of the ARE's in the preparation of the handout materials for the in-country training sessions and in the acceptance of the responsibilities of the training duties indicated that they too wished to contribute to the transfer of knowledge process.

d. Third-Country Training Courses

1) General

There are several countries in Southeast Asia and the Sub-Continent that have physical and social environments similar to those that prevail in Bangladesh. Such countries would include India, Sri Lanka, Thailand, Malaysia, Philippines, and Indonesia. However, during most of the ZRMI Project life, many of these countries have been suffering from political turmoil. This would eliminate India, Sri Lanka, and the Philippines, and leave only Thailand, Malaysia and Indonesia for further consideration.

The area of Malaysia whose environment is most similar to that in Bangladesh is Sabah State. This introduces the problems of travel distance and time, which are also negative factors in the consideration of Indonesia. Therefore, Thailand emerges as the third country with more advantages and fewer disadvantages than the others of this region. Of course, the presence of the Asian Institute of Technology in Thailand was an additional plus factor in the selection of that country for third-country training.

2) AIT Feeder Roads Construction and Maintenance Courses

There were two such courses of this type; one held from 20 June to 10 July 1984 for 15 participants, and one held from 02 to 23 March 1986 for 16 participants. In each case, the course consisted of two weeks of classroom and laboratory work on the AIT campus just north of Bangkok, Thailand, and one week of field observations in northeast and northern Thailand.

For both courses, the participants were selected by an Interviewing Board composed of Messrs. Hasan, PM, Gene George, USAID Project Officer, Fred Barnes, CPO, Brig. Abdullah, PE, and Gifford Rogers, TA. In the first case, 15 participants were selected from a list of 20 candidates recommended by WPW, and in the second case, 15 participants were selected from a list of

25 candidates recommended by LGEB. The PM was later added as a participant and group leader to give him experience in supervising courses of this type.

For both of these third-country training courses, the participating organizations were as follows:

- Executing Agency - Asian Institute of Technology, Continuing Education Center, Bangkok, Thailand
- Sponsoring Agency - Local Government Engineering Bureau (LGEB) (formerly WPW), Local Government Division, MLGRD&C, Government of Bangladesh
  - United States Agency for International Development, USAID/ Bangladesh
- Monitoring Organization - WSA/BCL/PAS Consultants

The long-term objective of these courses was to strengthen the human resource element of the ZRMI Project by providing short-term specialized training to a group of selected Bangladeshi engineers and technicians. Following their successful completion of the course, the participants, through on-the-job training techniques and other associations with their fellow professionals, will disseminate their newly acquired knowledge to their colleagues, thereby further extending the benefits of this specialized training. The immediate objective was to strengthen the professional capabilities of the group of engineers and technicians to plan and undertake the maintenance and improvement of feeder roads.

The first week of the two-week academic program covered subjects appropriate to feeder road construction, while the second was devoted to feeder road maintenance. Subjects covered included:

- Feeder Road Construction
  + Feeder Road Construction Materials
  + Design Philosophy and Considerations
  + Programming Rural Road Investments

- Feeder Road Maintenance
  + Road Assessment and Maintenance Techniques
  + Priority Setting and Budget Allocation
  + Maintenance Resources Management
  + Labor-Based Maintenance and Employment Generation
  + Maintenance Information and Management Systems

The third-week study tour/seminar was carried out in cooperation with the Thai Department of Highways and the Accelerated Rural Development Office.

In both courses, a notable feature of the planning that preceded course presentation was the preparation of lecture notes and other printed material. This printed material, given to the participants prior to the course to which is pertained, enabled the students to more easily follow the discussions and demonstrations. They also were able to return to their posts in Bangladesh supplied with a good reference library for use in their future work.

Each participant was given a per diem of US$ 45.00. However, lodging was provided at the AIT Center during the on-campus portion and at selected hotels and motels during the field trip. The cost of this lodging was US$ 25/day for double occupancy, so each participant was charged US$ 12.50 for his lodging. This left each one a net of US$ 32.50/day to cover board and personal expenditures. Transportation to and from the campus and during the extended field trip was provided by AIT. On campus, all facilities were within walking distance of the AIT Center.

At the end of each course, the participants were asked to complete a personal evaluation questionnaire concerning all aspects of the course. The responses were then compiled and evaluated. Exhibit XIX, consisting of seven sheets, is a compilation of the second AIT course responses. A perusal of this compilation reveals that, for the most part, the responses were positive and enthusiastic. It is to be expected that there would be some bias on the part of individuals. In general, it was felt that both courses were highly successful and merit repetition in the future.

EXHIBIT XIX

SECOND AIT RURAL ROAD CONSTRUCTION AND MAINTENANCE COURSE
BANGKOK, THAILAND, 03 - 21 MARCH 1986

PARTICIPANTS' EVALUATION RESPONSES (A COMPILATION)

A. Please mark the appropriate response on the right to indicate your opinion with respect to each of the seven items enumerated below.

	Excel-lent	Good	Fair	No Response
1. Were the subjects dealt with in this course appropriate in satisfying your needs for your own professional practice?	4	11	—	1

Comments:

a. Two offered no comments, but neither was the individual who did not respond to the direct question.

b. Two felt that the material presented in the course would not be very useful in Bangladesh.

c. Twelve offered positive comments varying from just "so-so" to highly enthusiastic.

2. Please rate the source notebook and other printed materials used in the course	5	11	—	—

Comments:

a. Two offered no comments.

b. One felt that all notebook materials should have been supplied the day before they were going to be used.

c. One would have preferred the notebook materials to have dealt with specific problems.

d. One thought that a reference book should have been supplied as a supplement to the notebook materials.

e. One thought that the notes should have been more elaborate.

f. Ten were quite positive that the notebook would prove to be very useful.

PARTICIPANTS' EVALUATION RESPONSES (A COMPILATION) (continued)

	Excellent	Good	Fair	No Response
3. Course organization and execution.	10	6	--	--

Comments:

a. One offered no comments.

b. One felt that there was some confusion at times.

c. Fourteen responses were positive -- varying from "good," through "very good," to "excellent."

4. Please evaluate the likely usefulness of the printed course materials for your reference in future professional practice.	9	5	1	1

Comments:

a. One offered no comments.

b. Two were rather reserved in their judgement as to the usefulness of the printed materials in their future professional practice.

c. Thirteen were positive in their responses -- varying from mildly enthusiastic to very enthusiastic.

5. Please rate the usefulness of the new ideas, techniques, and procedures presented in this course in relation to their applicability to problems in your country.	7	6	2	1

Comments:

a. One offered no comments.

b. Two were discouraged by the lack of available equipment in Bangladesh.

c. Thirteen were positive in their responses - varying from mildly enthusiastic to very enthusiastic.

PARTICIPANTS' EVALUATION RESPONSES (A COMPILATION) (continued)

	Excel-lent	Good	Fair	No Response
6. Overall view and evaluations of the course.	8	8	--	--

Comments:

a. Four offered no comments.

b. One thought that the course should cover a longer time frame.

c. One felt that the course needed still more emphasis on the solution of field problems.

d. Ten responded that the course had been very useful.

7. Please rate the usefulness of the laboratory techniques presented.	10	5	1	--

Comments:

a. Four offered no comments. One of the four was the same participant who gave the "Fair" evaluation.

b. Two thought that the laboratory sessions should have been done more "elaborately."

c. Two thought that the time allowed was too short for the type of laboratory work that was expected.

d. Eight were positive in their evaluation of the benefits to be derived from the laboratory sessions.

B. Which aspects or features of the course did you find the most interesting or useful, and which the least? Please comment on these aspects. In order to assist in formulating future seminars and short courses, please do not hesitate to mention any shortcomings. Your frankness will be appreciated.

PARTICIPANTS' EVALUATION RESPONSES (A COMPILATION) (continued)

MOST INTERESTING		LEASE INTERESTING	
Soil Stabilization	- 10	Equipment Maintenance/Mgmt.	- 5
Use of Geofabrics	- 2	Pavement Design	- 1
Rural Roads Construction and Maintenance Problems	- 6	Labor-Based Construction, II	- 4
Pavement Assessment and Maintenance	- 2	Budget Allocation	- 1
Equipment Maintenance/ Management	- 2	Project Approval Procedures	- 2
Pavement Design	- 2	None found to be least interesting	- 5
Setting Maintenance Priorities	- 1		
Labor-Based Construction	- 2		
Programming Rural Road Investment	- 2		
All were found to be Interesting	- 5		

C. Would you consider participating in a follow-up seminar or short course on any aspect related or associated with the current course?

Yes 14 No -- Perhaps, depending upon subject area 2

If a follow-up seminar or short course were to be held, which of the following should be covered more intensively? Please rank items numerically; i.e., 1 = first choice, 2 = second choice, etc.

	1	2	3	4	5
Construction Materials	4	3	5	2	2
Design Aspects	4	4	4	2	2
Maintenance Management and Techniques	2	7	1	4	2
Labor-Based Construction	1	1	2	5	7
Soil Improvement	5	1	4	3	3
Totals	16	16	16	16	16

Others? No Responses

PARTICIPANTS' EVALUATION RESPONSES (A COMPILATION) (continued)

D. Do you think the subject matter of the current course would be beneficial to other individuals in your agency, ministry, or private-sector engineering firms in your country?

Yes 15 No 1

E. What types of programs (for example, seminars, short courses, short-term or long-term on-the-job training, study tours, etc.) would you consider to be most cost effective in meeting the road engineering training needs of your country? Please indicate according to:

1. Professional background and experience of potential trainees

2. Type and period of training required

3. Methods and content of the training

Only one person understood the question, and he responded "short-term courses similar to the AIT course."

F. Please rate the lecturers according to the value of the subject matter and presentation or delivery.

	Relevance of Subject Matter			Presentation		
	Excellent	Fair	Poor	Excellent	Fair	Poor
1. Dr. Pichai						
Introduction	16	--	--	16	--	--
Granular Road Construction Materials for Low-Volume Roads	16	--	--	16	--	--
Traffic Counting: Method Reliability, Axle Load Distribution, Equivalent Axle Load	15	1	--	14	2	--
Programming Rural Road Investments	15	1	--	15	1	--
Relating Training to Bangladesh Case	14	2	--	15	1	--

PARTICIPANTS' EVALUATION RESPONSES (A COMPILATION) (continued)

	Relevance of Subject Matter			Presentation		
	Excellent	Fair	Poor	Excellent	Fair	Poor
2. Dr. Maitree						
Road Maintenance Management (RMM)	11	5	--	9	7	--
Labor Based Construction I	10	6	--	7	9	--
3. Mr. Surachai						
ARD Rural Road Construction and Maintenance	10	6	--	7	9	--
ARD Rural Employment Creation Program	10	6	--	7	9	--
4. Mr. Weera						
ARD Project Selection Method	6	9	1	5	10	1
5. Mr. Sanga						
Equipment Maintenance and Management	9	7	--	10	5	1
6. Mr. Wisit						
DOH Rural Road Construction and Maintenance Problems	14	2	--	13	3	--
Setting Maintenance Priorities	13	3	--	13	3	--
Allocation of Routine Maintenance Budget	12	4	--	12	4	--
Maintenance Techniques	12	4	--	13	3	--

PARTICIPANTS' EVALUATION RESPONSES (A COMPILATION) (continued)

	Relevance of Subject Matter			Presentation		
	Excellent	Fair	Poor	Excellent	Fair	Poor
7. Dr. Rugs						
DOH Maintenance Manual	4	11	1	5	10	1
8. Dr. Teerachart						
Pavement Design Examples	10	5	1	5	10	1
Construction Methods and Techniques	7	8	1	1	14	1
Rural Road Construction in Problem Soil Areas	7	8	1	3	12	1
9. Dr. Bergado						
Soil Improvement Techniques - I	16	--	--	16	--	--
Soil Improvement Techniques - II	16	--	--	16	--	--
10. Dr. Rantucci						
Pavement Assessment and Maintenance	11	5	--	10	6	--
11. Mr. Nilsson						
Labor-Based Construction - II	8	8	--	6	8	2

3) Conclusions and Recommendations

a) Both courses were well organized and the logistics efficiently handled. For some participants, the tightness of the schedule may have precluded complete understanding and absorption of the material presented in some of the lectures. For any future course of this type, it may be advisable to make more time available either by extending the time span of the course, or by reducing the number of subjects covered, or by some combination of these two possibilities.

b) Practically all of the subjects included in the second course were timely and appropriate for the participants' requirements. This was an improvement over the subject matter offered in the first course.

c) In both courses, there was some difficulty in communication between lecturers and the students, but there was a marked improvement in the second over the first. Probably the presence of a Team Leader of the caliber of the PM inspired the students to make a greater effort to concentrate on the substance of the lecture rather than on the language shortcomings of the lecturer.

d) It is quite impractical to consider on-site, on-the-job opportunities to apply newly acquired knowledge during the course of a training program such as the AIT program. However, consideration could be given to the development of a hypothetical problem to be solved independently by groups of students who would then be expected to defend their solution in a group critique directed by course instructors.

e) With each course, it becomes increasingly apparent that it would be preferable to develop some system for testing and grading the students to determine the relative amount of course material that is being absorbed by each individual student.

f) More attention should be given to pre-course orientation of the participants. The experience gained from two AIT courses should enable the organizers of future courses to thoroughly brief all future participants concerning course content, logistics, the responsibilities of the students, and the responsibilities of the course organizers, team leader, and course monitor.

g) A way must be found to accelerate the approval/clearance process of BDG. The first course required seven months from preliminary overtures to the actual start of the program. For the second course, the candidates were interviewed and a list of the recommended 15 was sent to LGEB in September 1984. LGEB immediately forwarded the list with their own recommendations, and the course was scheduled for November 1984. Because of vacillations at the higher levels of government, the course was rescheduled five times, and finally took place during March 1986! Such actions, or lack of actions, not only causes the ZRMI Project to lose credibility, but also caused the Project to lose US$ 500, which was the amount billed by AIT for expenses in connection with the many cancellations and reschedulings of the second course.

h) There is no doubt that the courses organized and presented by AIT have had a beneficial impact on the course participants. It is also apparent that the staff and physical plant for presenting a course of this type are readily available only to institutions such as AIT, or to organizations specifically created for training purposes. Facilities of this type are available in Bangladesh. It is therefore recommended that steps be taken to organize a combination in-country/third-country training program similar to the AIT program.

i) The recommendations just made should not be viewed as precluding additional training/observation trips to third countries. A third AIT program would continue to yield good benefits to Bangladesh. India has an excellent rural roads training program and should be given serious consideration as a site for a short-term training course. The officials of LGEB have

indicated an interest in a possible training course in the Philippines. Now that the politics of that country appear to be stabilizing, it might be worthwhile to investigate the possibilities there.

e. USA Observation/Training Programs

1) General

This element of the overseas training program proved to be the most difficult to arrange. In the first place, the only area of the USA that has a physical environmental resembling that of Bangladesh is the southeastern portion, particularly the Gulf States area. Secondly, the requirements of participant selection are much more stringent, both on the part of the BGD, as well as the USA. As a result of these more rigid conditions, the lead time from candidate proposal to departure for the course is at least double that required for participants in third-country training courses. Finally, negotiations with the prospective sponsoring agency in the USA require several months for finalization. It is difficult to find an agency whose level of technical operations might be adaptable to Bangladesh. Such an agency, once identified, is often reluctant to delegate the manpower and other resources that might be required to take care of the needs of a relatively short-term training/observation program.

It is very difficult to arrange for any type of "hands-on" training, especially with private industry, principally because of the restrictions imposed by their accident and liability insurance coverage. Some of the universities could offer this type of training, but they were not interested in short-term training courses.

2) The Training Course

There were two training courses, each of about two months duration. The first course was in July/August 1984, and the second course was in September/October 1985. The participants in each course were as follows:

- First USA Training/Observation Course
  + Mr. R.N. Hasan, PM, ZRMI Project
  + Mr. Zahinger Alam, AE, Rangpur District
  + Md. Abu Taher Khan, AE, Faridpur District

- Second USA Training/Observation Course
  + Mr. Q.I. Siddique, Engineering Advisor, LGEB
  + Mr. Shahidul Hasan, XEN, Faridpur District
  + Mr. Ashraful Kabir, XEN, Rangpur District

The itineraries and schedules were practically identical for both courses. In each case, the participants spent about one week in Washington, DC, in orientation sessions in the Washington International Center and the Federal Highway Administration followed by five weeks at the Jefferson County Public Works Department in Birmingham, Alabama. The last stop was Columbia, South Carolina, where four days were spent in visits to the South Carolina State Highway Department and the home office of Wilbur Smith and Associates, Inc.

During their time with the Jefferson County Public Works Department, the participants were exposed to the entire spectrum of road construction and maintenance management and operations. All of the participants returned full of enthusiasm for the things they had seen and learned. They all felt that many of the techniques observed were adaptable to conditions in Bangladesh. The Jefferson County officials were also pleased with the positive responses of the participants -- witness the fact that they were willing to give the course a second time and have indicated that they are ready to give it again.

3) General Conclusions and Recommendation

There is one school of thought that feels that trips of this type are not of great value because the participants witness new methods and procedures being utilized that will not become standard in Bangladesh for many years. The LGEB officials feel that this introduction to advanced technology is a positive experience, rather than a negative one. The Consultant agrees with LGEB and recommends that more high-level LGEB officials be sent to the USA.

f. Cost of Overseas Training

Exhibit XX shows the final status of the overseas training budget; including total expenditures (by years), funds budgeted, and funds remaining. It can be noted that a total of US$ 171,300 were expended, which was only 57 percent of the total budget of US$ 300,000. One of the principal reasons for this large under-expenditure was the drastic reduction in scope of the overseas training program from that originally contemplated.

Exhibit XXI shows the distribution of overseas training funds. The first AIT course cost US$ 50,300. Since 15 participants attended for a total of 22 days each, the unit cost was US$ 152/participant-day. The total cost of the second AIT course was US$ 45,500. There were 16 participants in this course for a total of 22 days each. Therefore, the unit cost was US$ 130/participant-day, which was considerably lower than the first course.

The total cost to send three participants to the USA for two months each was US$ 32,400, or a unit cost of US$ 180/participant-day. For the second USA course, the total cost was US$ 35,100, which gives a unit cost of US$ 195/participant-day. Neither case includes any expenditures made by LGEB out of their own funds.

Exhibit XX - FINAL STATUS, OVERSEAS TRAINING BUDGET

	Budget Item	Total Expenditures (US$)					Total (US$)	
		1983	1984	1985	1986	Total	Budgeted	Remaining
01	TRAINING AIDS, MATERIALS, EQUIPMENT	4,000	5,000	500	500	10,000	13,000	3,000
02	INTERNATIONAL TRAVEL	—	10,500	10,300	7,200	28,000	27,000	(1,000)
03	DOMESTIC TRAVEL	—	7,000	3,000	3,000	13,000	14,000	1,000
04	PER DIEM/DAILY ALLOWANCE	—	28,900	13,200	17,200	59,300	55,000	(4,300)
05	TUITION/FEES	—	16,300	1,700	14,000	32,000	33,000	1,000
06	BOOKS, SUPPLIES, MATERIALS, MISCELLANEOUS	—	9,000	2,000	3,500	14,500	18,000	3,500
07	DIRECT COSTS	2,000	5,000	7,200	300	14,500	15,000	500
08	SUB-TOTALS	6,000	81,700	37,900	45,700	171,300	175,000	3,700
09	UNALLOCATED FUNDS						125,000	125,000
10	TOTAL US$						300,000	128,700

Exhibit XXI - DISTRIBUTION OF OVERSEAS TRAINING FUNDS

	Budget Item	Total Expenditures (US$)					
		Domestic 1/	1st AIT	2nd AIT	1st USA	2nd USA	Total
01	TRAINING AIDS, MATERIALS, EQUIPMENT	8,000	200	300	1,000	500	10,000
02	INTERNATIONAL TRAVEL	--	6,800	7,200	6,500	7,500	28,000
03	DOMESTIC TRAVEL	--	4,000	3,000	3,000	3,000	13,000
04	PER DIEM/DAILY ALLOWANCE	--	16,100	17,200	12,800	13,200	59,300
05	TUITION/FEES	--	15,000	14,000	1,300	1,700	32,000
06	BOOKS, SUPPLIES, MATERIALS, MISCELLANEOUS	--	8,000	3,500	1,000	2,000	14,500
07	DIRECT COSTS	--	200	300	6,800	7,200	14,500
08	TOTALS	8,000	50,300	45,500	32,400	35,100	171,300
09	COST/PARTICIPANT-DAY		US$ 152	US$ 130	US$ 180 2/	US$ 195 2/	

1/ These funds were expended for equipment and supplies used primarily for in-country training purposes.

2/ This does not include any expenditures made by LGEB from their BDG funds.

D. MAINTENANCE SYSTEMS AND SUPERVISION

1. General

It has been previously stated that the purpose of the ZRMI Project was to improve rural access by institutionalizing an effective maintenance program and increasing the pace of development of roads under the jurisdiction of the Zila Parishads. The purpose follows directly from the Project's goals, since proper maintenance is most urgently needed for the preservation of the currently deteriorating existing feeder roads, and considerable development of the feeder road network is required. This section deals with the road maintenance aspects of the Project's goal, the plans generated by the Consultant to solve the problems inherent in any road maintenance program, and the results obtained. Since the activities involved in the institutionalization of a maintenance system are quite distinct from maintenance supervision, the maintenance section has been divided into two segments: maintenance systems and maintenance supervision.

2. Maintenance Systems

a. The Reports

1) An Organization and Management Study of Road Maintenance and Construction in Faridpur, Rangpur and Sylhet, Kimbrough, PAS, October 1983. This report has been discussed in some detail in Section B, Organization and Management. However, parts of the report pertain to maintenance systems, so pertinent discussion has been included in this section.

2) Maintenance Management for Zila Roads, Pentecost, WSA, June 1985. The first draft of this report was submitted in November 1983, but the final version forms the basis for the Consultant's recommendations concerning road maintenance systems.

b. Definition of Maintenance

Simply defined, roadway maintenance is the preserving and keeping of each type of roadway, roadside, structure, and facility as nearly as possible in its original condition as constructed, or as subsequently improved, and the operation of roadway facilities and services to provide satisfactory and safe transportation. In most road and/or highway organizations, roughly one-third of all road funds normally go to maintenance.

There is a close relationship between design and construction practices and maintenance costs. For example, insufficient pavement or base thickness or improper construction of these elements soon result in extensive patching or surface repair. Shoulder care becomes a serious problem where narrow lanes force heavy vehicles to travel with one set of wheels off the pavement. Improperly designed drainage facilities mean erosion of deposition of materials and costly cleaning operations or other corrective measures. In many instances, high maintenance costs resulting from poor design or construction practices offer the most compelling reason for reconstruction.

Maintenance may be further defined according to timing, scale, or purpose. The definitions vary, and the lines between the categories are not sharp, but this separation of the work into classes is useful for management purposes. Table X illustrates the difference between maintenance and construction activities.

c. Organization of Maintenance

An organized force to maintain the existing and future Zila roads will require the standard levels of such operations, and they are:

- General Administration
- Program Management
- Engineering Advice and Control
- Field Supervision by Maintenance Areas
- Work Crews with Participating Foreman

Table X - CATEGORIZATION OF ROAD MAINTENANCE AND CONSTRUCTION ACTIVITIES[3/]

Work Items	Maintenance		Construction
	Routine	Preventive	
Installing permanent bridges and culverts	-	-	x
Cleaning of culverts or deposits at bridges	x	-	-
Reshaping upstream/downstream channels	x	-	-
Minor slope treatment to protect structures	x	-	-
Replacing guard rails	x	-	-
Replacing bridge deck and structural members	-	-	x
Installing new headwall	-	-	x
Adding minor ditches/culverts to existing road	x	-	-
Cleaning/reshaping of ditches	x	-	-
Placing original embankment	-	-	x
Widening existing embankment	-	-	x
Filling in or reshaping earth roadway, shoulders, or side slopes	x	-	-
Installing or widening soling or HBB	-	-	x
Replacing patches of soling or relaying to original cross section	x	-	-
Removing soling and replacing with WBM	-	-	x
Installing original bituminous carpet over base course	-	-	x
Seal coating or bituminous surface	-	x	-
Thin bituminous carpet over existing carpet or other permanent pavement	-	x	-
Installing WBM and bituminous carpeting over HBB or soling	-	-	x
Patching existing pavement	x	-	-
Removing and replacing extensive segments of soling, base course, or wearing surface	-	-	x
Surfacing or replacing bridge deck, but not structural members	-	x	-
Vegetation control	x	-	-

3/ An Organization and Management Study of Road Maintenance and Construction i Faridpur, Rangpur and Sylhet Districts, WSA in association with BCL and PAS Dhaka, Bnagladesh, October 1983.

Road maintenance work consists almost entirely of simple tasks repeated often, and it may be asked why the care of rural roads needs complex arrangements for management. The reply is that all efforts, from the simplest village enterprise to the largest industrial program will benefit from the basic elements or organization; that is,

- planning and scheduling,
- controlled execution, and
- evaluation of results.

It does not matter what structure is chosen for this chain of command, accomplishment, and reporting, or the titles given to the different positions, so long as all of the elements are provided and there are clear lines of authority. The program should be carried on continuously, in the most direct manner possible, and with the minimum number of personnel. There is no need for a large administrative apparatus. What is essential is a group of people with pretty good skills and a clear mandate to maintain the roads.

d. The Development of Maintenance Management

During the last twenty years, there has been a development of more rational methods of quantifying maintenance needs. The goals have been to set up logical systems for fixing needs and budgets, for controlling the work, and for measuring the results. The term which has come into use for describing these efforts is "Maintenance Management."

In its usual form, maintenance management is a process which predicts maintenance requirements by generalizing road characteristics, probable road conditions, and standard maintenance responses; predicting annual maintenance programs which are approximate, but nevertheless closely related to field conditions. The process is direct and easily understood, permits annual updating, and becomes more accurate with time. The generalized programs give a sound basis for funding and staffing, with latitude for adjustments in the actual work procedures to allow for the requirements in the field of the individual roads.

Maintenance management systems, however general in nature, must be tailored for a given set of environmental circumstances, whether they be for highly sophisticated freeways, or for feeder roads. However, all have certain elements in common, and these common elements include those outlined in Table XI.

e. The Network of Roads and Kinds of Work

Early in 1983, lists of Zila roads were prepared for each of the three districts. Subsequently, the lists were changed by additions, deletions, and transfers. It is normal that such adjustments should be made, but the list as it was in October 1984 was adopted so that the formulation of a maintenance program could be completed for the three districts for implementation in FY 1985-1986.

The individual roads of the 1983 lists were grouped by geographic areas within each (old) district, areas which at that time were called "sub-districts." These were of a size generally suitable for the normal distribution of road maintenance crews and were accepted for that purpose. In this report, they were referred to as "Maintenance Areas" instead of sub-districts. Rangpur and Sylhet (old) Districts each had four Maintenance Areas and Faridpur had five. In November 1984, the BDG was in the process of upgrading all sub-districts into full districts, but since staffing and equipping these new districts would take several months, the adopted structure of Maintenance Areas within (old) districts was retained. Resource needs for road maintenance are calculated by maintenance areas in any case, so titles for these geographic subdivisions are of secondary importance.

The 1983 - 1984 inventory of the Zila roads in the three Project districts could be summarized as follows:

District (old)	No. of Active Roads	Total Length (Miles)
Faridpur	38	277.95
Rangpur	60	641.36
Sylhet	39	175.03
TOTALS	137	1,094.35

Table XI - ELEMENTS COMMON TO ANY MAINTENANCE MANAGEMENT SYSTEM 4/

Systems for managing road maintenance may be developed for freeway networks, rural access roads, and any road systems between these two extremes. However, all maintenance systems have certain common elements, and these include:

- Definition of the network of roads to be maintained
- Collection of information on the separate road sections -- road inventory
- Classification of the roads to be maintained
- Identification of the types of maintenance work which will be required for each type of classification
- Decision on the best way of performing each maintenance activity -- a performance standard
- Establishment of maintenance levels to be achieved
- Determination of crew-days required for each activity on each road in an annual cycle
- Calculation of the resources needed, including amounts required for non-routine costs
- Establishment of unit prices and conversion of resource needs to a monetary budget
- Budget approval routine
- Development of work program based on previously determined crew-day caculations
- Development of work sschedule according to priorities and seasons
- Assignemnt of work responsibilities and allocation of resources
- Execution of work with appropriate inspection and control
- Preparation of results-obtained reports in the same terms and units as the performance standards
- Analysis of reports and adjustments, if any, in subsequent phases of the maintenance management program

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4/ Maintenance Management for Zila Roads; WSA in association with BCL and PAS, Dhaka, Bangladesh, June 1985.

A route numbering system was established so that the terminal place names would not have to be called out whenever reference was made to a road. In the identification, the initial letter (R, S, or F) denoted (old) district, and the second and third letters indicate the maintenance area (old sub-district) within the district. This is followed by the original route number of that district's list and, finally, a letter which specified the section of the route. Thus, the Rajbari - Baliakandi Route in Faridpur District, Rajbari Maintenance Area, was designated FRA-6 and divided into five sections (A, B, C, D and E), of which the first is rigid pavement, the second, third and fifth are bituminous, and the fourth is HBB. A complete road list with corresponding numbering, by districts and maintenance areas, is presented in Appendix 3 of the report.

The original road inventories provided the basic data for the first maintenance program (FY 1985-1986). It is obvious that changes are taking place on some routes — rehabilitation, widening, new bridges, etc. The new characteristics were used in all cases where the improvements were funded and would be completed by May 1985. It was emphasized that the road inventories would have to be reviewed annually, and that information on construction requirements must be passed on to the construction forces.

The next step was the classification of the roads of the rural network by features affecting maintenance. In Bangladesh, the climate is sufficiently uniform across the nation so that this element will not cause differences in types of work by areas. Except for some of the rolling areas of Sylhet, topography was also a negligible factor. Consequently, the major factors considered were kind and width of surfacing, age and/or condition of that surfacing, and traffic; all three being interrelated. A summary of the classifications recommended for the three districts is shown on Table XII.

To facilitate the identification of kinds of maintenance work to be done, the elements comprising Zila roads, as they now exist, were summarized as shown in Table XIII. This was followed by a complete listing of maintenance activities that might be required for the elements shown. This list,

TABLE XII - ZILA ROADS CLASSIFICATIONS FOR MAINTENANCE [4]

TYPE	CODE	DESCRIPTION OF SURFACE
		Surface Classification
21	RP	Portland Cement Concrete Pavement
22A	BIT	Bituminous Pavement, Good Condition
22B	BIT	Bituminous Pavement, Poor Condition
25	HBB	Herringbone Brick Pavement
26A	SOL	Single-layer Cobble Pavement
26B	SOL	Single-layer Brick Pavement
41	WBM	Water-bound Macadam
43	GRV	Gravel or Other Selected Material Surface
45A	EA	Earth, All Vehicles, All Seasons
45B	EA	Earth, All Vehicles, 7 Months per Year
45C	EA	Earth, Jeep Only (No Trucks)
45D	EA	Earth, Cart and Pedestrian Only
		Shoulder Classifications
25	HBB	Herringbone Brick
26A	SOL	Soling Only, Brick or Other
30	EA	Earth

[4] op. cit.

Table XIII - ELEMENTS OF ZILA ROADS [4/]

PAVEMENTS

Portland cement concrete
Bituminous (asphalt)
Herringbone brick
Single-layer cobble or brick

SHOULDERS ALONG PAVEMENTS

Herringbone brick
Soling only, brick or other
Earth

UNPAVED ROADWAYS

Waterbound Macadam
Gravel, or other selected material
Earth

DRAINAGE

Primary Ditches (longitudinal)
Secondary ditches
(crown, intercept, bleeder)
Culverts
(ring, box, arch, multiple box)
Culvert channels
Bridge channels

RIGHT-OF-WAY

Travelway
Embankment slopes
Cut slopes
Borrow areas

STRUCTURES

Bridges
Retaining walls and bank protection

TRAFFIC CONTROL AND ASSISTANCE

Signs (controls, warning, information)
Signals (electric or manual)
Railroad crossing protection
Pavement markings
Guard rail (not on bridge)
Edge and curve markers, mileposts

4/ op. cit.

along with corresponding units of measurement, can be found in Appendix I of the report.

f. Quantify Maintenance

Once the maintenance activities have been identified, the performance standards must be developed. Performance standards are written only for basic, repeated activities; that is, the ones which offer the best opportunities for saving money through efficient work organization. Performance standards are meant to be flexible, because they are used as average statistical units in planning maintenance. The Consultant has prepared 22 performance standards, and they appear in the report as Appendix 2. Each performance standard assumes an eight-hour payroll day with about seven hours of effective working time and a reasonable travel distance for working crews. However, they should not be considered as final, bur rather must still be verified and very probably adjusted.

The next step is to establish maintenance levels for each of the maintenance tasks. For the following reasons, it was assumed that very modest maintenance levels should be set for the roads of the ZRMI Project:

- New funds will have to be found by BDG to initiate a program of work not previously performed, and
- The roads are local by definition, and most of them have only modest volumes of traffic.

Exhibit XXII is a tabulation of maintenance levels proposed by the Consultant for the ZRMI Project roads. It shows most of the routine and periodic activities which will be required on the various types of roads. In most of these, the annual amount of activity is expressed as a percentage of the surface area of the road travelway (or shoulder). That is, the estimat d proportion of the whole surface area which will have to be repaired during an annual cycle. This allows the rate to be applied to roads or shoulders of any known width, or to combined amounts within a maintenance area. Three of the activities are shown as repetitions several years apart, and the remainder in other terms.

Exhibit XXII
MAINTENANCE LEVELS, ANNUAL AMOUNTS

Shown as Percent of Road Surface Area,
Amount per Mile, Repetitions per Year or
Cycle of Years Between Repetitions

ACTIVITY	UNIT	21 PCC Pavement	22A Bit. Pavement Good Condition	22B Bit. Pavement Poor Condition	25 HBB Pavement	26A Cobble Single Pavement	26B Soling Single Pavement	41 WB Macadam Surface	43 Gravel Surfacing	45A Earth-All Vehicles, All Seasons	45B Earth-All Vehicles, 7 Months per Year	45C Earth-Jeep Only (No Trucks)	45D Earth Cart and
		QUANTITY											
21.03 Repair PCC with Bit. Mix	% Surface	0.75											
22.02 Patch Bit. Surface	% Surface		0.75	1.50									
22.03 Repair Base and Surface	% Surface	0.25	0.25	0.50									
22.04 Bituminous Overlay	% Surface			0.25									
22.05 Seal Small Areas	% Surface	1.25	1.25	2.50									
22.06 Seal Coat (Periodic)	Cycle Years		5	3									
25.01 Patch Surface HBB	% Surface				0.25								
25.02 Patch Base and Surface HBB	% Surface				0.25								
26.01 Patch Soling or Cobble Pavement	% Surface					0.50							
30.01 Regrade Earth Shoulders	% Surface	75	75	75	75	75	75	75					
41.01 Patch WB Macadam Surface	% Surface						0.50						
41.02 Replace WBM Surface (Periodic)	Cycle Years						8						
43.01 Patch Gravel Surface	% Surface							0.80					
43.02 Replace Gravel Surface (Periodic)	Cycle Years							5					
43.03 Regrade Gravel Surface	% Surface							10					
45.01 Patch Earth Surface	% Surface								1.00	1.00	0.50	0.25	
45.02 Regrade Earth Surface - Sylhet	% Surface								20	20	10	5	
45.02 Regrade Earth Surface - Other Districts	% Surface								50	50	25	10	
50.01 Clean Ditches	rft/mile	40	40	40	40	40	40	40	40	40	40	20	
50.02 Clean Culverts	cft/mile	10	10	10	10	10	10	10	10	10	10	5	
60.01 Trim Weeds or Brush	Repetitions	1	1	1	1	1	1	1	1	1	1	1	

On the general subject of maintenance levels, it should be recognized that an established and operating maintenance agency will be familiar with each of the individual roads in its area of responsibility, and will know through frequent inspections the kind and amount of work which is needed on each road. This sets a specific "maintenance level" for individual roads. The process of maintenance management does this in a more generalized way so that it can deal with systems, or groups of roads, by averaging their characteristics and the relevant conditions affecting their maintenance.

The workload, then, is the combined annual work program for a budgetary unit -- the Maintenance Area for the ZRMI Project. The workload base for each (old) district was first calculated, and this information, in turn, was used to calculate the Maintenance Area workload. The Maintenance Area workload, or number of crew-days of each standard activity, is the base quantity of the element, times the maintenance-level annual rate, divided by the daily production figure of the Performance Standard.

When the annual workload is known, the resources (labor and equipment hours and material quantities) needed for the program can be calculated. For the three resource elements, the Consultant provided an identification code, which was chosen quite arbitrarily. These codes are shown on Table XIV and Table XV. The resource recommendations were then tabulated for each proposed maintenance area. From these resource recommendations, some general conclusions can be drawn:

- Some of the Maintenance Areas, now new Districts, are not really large enough to be independent entities, because of their limited road mileages and workloads. Five of the MA's do not have enough maintenance work to employ one Work Assistant full time. Five of them have very little work for roller drivers or truck drivers, or the associated equipment, and the justification for allocating any type of equipment is doubtful. The quantification of the maintenance requirements for programs other than feeder roads is beyond the scope of this Project.

- The amount of equipment specified in the recommendations exceeds the total number of machines being acquired. The greatest deficit is in flatbed trucks; 17 units were recommended, but only four are to be purchased. This situation will be mitigated somewhat by the procurement of the four pickup trucks, none of

TABLE XIV - CODES FOR PERSONNEL CLASSIFICATION AND EQUIPMENT TYPES [4/]

PERSONNEL CLASSIFICATION

Title	Code
Assistant District Engineer)) Sub-Assistant District Engineer)	ENG
Work Assistant	WKA
Road Roller Driver	RDR
Truck Driver	TDR
Gang Leader	GAL
Laborer	LAB

EQUIPMENT TYPES

Equipment Types	Code
Steel-wheel Roller (8 - 10 ton)	01
Flatbed Truck (15,000 GVW)	02
FWD Pickup Truck (_,000 GVW)	03
Vibrating Plate Tamper	05

4/ op. cit.

TABLE XV - MAINTENANCE MATERIALS, CODE AND UNIT 4/

Item	Specification	Unit	Code
Bitumen, Penetration Grade 80-100	Project 808 1/	lb	BITU
Kerosene		gal	KERO
Liquid Bitumen (Cutback), Grade RC-70	Asphalt Institute 2/	lb	RC07
Grade MC-250	Asphalt Institute	lb	MC25
Emulsified Bitumen, Grade RS-2	Asphalt Institute	lb	RS-2
Grade MS-2	Asphalt Institute	lb	MS-2
Grade SS-1	Asphalt Institute	lb	SS-1
Bitumen/Aggregate Premix for Patching	See Note 3/	cft	PRMX
Granular Base	Project 806	cft	BASE
First Class Brick	Project 801	nos	JHAM
Broken Stone (2" to 1", or 1" to 3/4", or 3/4" down)		cft	BRST
Broken Brick (2" to 1", or 1" to 3/4", or 3/4" down)		cft	BRBR
Screening (for blinding water-bound Macadam)		cft	SCRN
Sand, F.M. Not less than 2.8	Project 807	cft	SND1
F.M. 1.5 - 2.8	Project 807	cft	SND2
F.M. 1.0 - 1.5	Project 807	cft	SND3
F.M. 0.8 - 1.0	Project 807	cft	SND4
F.M. 0.5 - 0.8	Project 807	cft	SND5
Pea Gravel	Project 804	cft	PEAG
Earth or Soil, Selected of Unclassified		cft	SOIL
Portlane Cement	R.& H. Dept. '83	bag	POCM

1/ - Section 801 to 808 of the recommended "Standard Specifications for Road Construction" of this Project, USAID No. 388-0056.

2/ - The Asphalt Institute, Pacific Coast Division, USA.

3/ - For the computation of maintenance quantities and cost, bitumen/aggregate Patching Premis is assumed to consist of a dense-graded, 3/4" down, stone aggregate similar to that described in Section 806 of the recommended specifications of this Project, mixed with Grade 80 - 100 bitumen for hot mixtures, or with MC-250 liquid bitumen for cold (stockpiled) mixtures. See Performance Standard 82.02.

4/ - op. cit.

which are on the recommended lists. However, there still will remain a deficit of nine haul units. A serious deficit in rollers is also projected. A total of 13 were recommended, but only six are being procured. This is a serious problem that must be solved if good maintenance work is to be achieved.

- The equipment needs figures of maintenance equipment studies are often used as a basis for purchasing plans, because they provide justification of capital outlays. In the case of Zila roads, the recommended maintenance methods are highly labor oriented, with equipment use kept to a minimum. Nevertheless, it is the opinion of the Consultant that some power machines are necessary and warranted. Compaction equipment in small and medium sizes is essential for good results in some activities. It is clear that some additional equipment beyond the current procurement should be made available for Zila road maintenance in the three (old) districts of this Project. However, before any new purchases are made, there should be a careful review of the types and sizes of machines best suited for maintenance work, taking into consideration the nature of the activities and the generally low standards of the roads to be maintained.

g. Budgeting

In road maintenance, budgets are mostly the costs of resources which have been quantified as necessary for the program. In the case of the ZRMI Project, a maintenance operations budget was desired for FY 1985 - 1986. The unit prices for the resources were set after consultation with the RE's and local sources. Labor rates were calculated on the basis of prevailing BDG practices. Normally, equipment rental rates include three cost categories; that is, fixed costs, operating costs, and driver and other operating personnel costs. However, for the Zila Parishads, there are no fixed costs because there is no sinking fund to replace machines when they reach the end of their usable life. Also, local practice is to include the driver and other operator salaries in labor costs. Therefore, equipment costs become nothing more than operating costs. Material costs were based on prevailing rates in the three Project (old) districts.

The accepted unit rates for the three elements of cost were then applied to the quantified resource needs of each maintenance area, as modified in the resource recommendations. These calculations are presented as

Appendix 8 of the report. Budgets were then prepared for the proposed 1985 - 1986 Road Maintenance Program for the 13 Maintenance Areas of the Project.

h. Programming

Once a budget has been prepared and authorized, the work program for the year can be developed. The workload prepared previously supplies most of the information needed for this. The purchasing or processing of materials is a first consideration and is normally anticipated by several weeks or months. Work programs have to be set forth in a way which allows them to be understood and communicated at all levels. The method deemed best for the ZRMI Project was the program card system. One card is made for each repetition of each activity specified in the program.

The number of cards issued represents the number of days the work is expected to be done during the year. The cards are made up at the start of the program year, and should be accounted for by serial numbering or logging, to ensure that the work performed will conform to the program and budget. One great advantage of this method is that the same cards are used to record the work at the time it is done, and to report back the information needed for control and evaluation. The same cards can also be used for basic payroll and equipment use data in some accounting systems. Recommended formats of "Program and Report of Work" cards and examples of their use were prepared by the Consultant.

However, maintenance is not suited to close and rigid scheduling. There must be room for flexibility and adjustment, and open time for unexpected work. Any maintenance work to be done by contract has to have a definite timing, and any associated work done by force-account, like preparation before the contract operation or completion afterwards, must be scheduled to fit. Approximate programming of big jobs during the year can be done by making bar charts or other scheduling aids, but the field offices need to have considerable freedom in setting and changing the timing of routine work. It is the field personnel who have the responsibility for knowing the conditions on the roads and responding to them.

Instructions about maintenance operations go down a chain from administrators and engineers to work assistants or crew leaders and finally to individual workers. At all steps in this process, those persons giving the orders have an obligation to do the following:

- Assign responsibility, so it is known who is in charge,
- Give clear instructions concerning what is to be done,
- Provide the resources needed — men, equipment, tools, and materials, and
- Monitor and assist in the progress of the work.

i. Execution

In general, in the execution of maintenance work, each activity should be broken down into subtasks by field supervisors, for individual cases of the work, with the best number of workers assigned to each subtask so that each many will be busy almost all the time and doing productive, efficient work. This flexibility and variation seems to conflict with the performance standards, which appear to show fixed resource needs for each activity. It may be that the performance standard does show the best crew, equipment, and materials for doing that job under normal circumstances, but maintenance does not always consist of dealing with normal circumstances. The roads differ in age, thickness, and other characteristics. Traffic is variable by volume, season and type. Weather changes from month to month and even from one area of a district to another. All of these variables cause differences in the kinds and amounts of maintenance needed, even on a single type of road. A performance standard is not an absolute instruction on how to do an operation, or what to use. A performance standard is intended to be a guide to the best method under the most common conditions, and a sort of average of the various crews and quantifies of materials which might be used. Several years of records, evaluation, and balancing are needed to set satisfactory numbers on a performance standard.

j. Reporting Back

If a "Program and Report of Work" card, such as the one previously discussed, is used, then the reporting of work accomplished is almost automatic. No other forms are needed for recording the work, although some type of summary and analysis forms may be useful. Two kinds of report information are usually compiled: fiscal data to account for expenditures and work data to keep track of program accomplishment.

It is desirable to know where each day's work is done. The road numbering system described previously should be used in filling our the PRW card when work is reported. This will record the route number and the section where the work was performed. It is important that the reporting of "work completed" be reasonably accurate, that the work be measured in the manner indicated on the performance standard for that activity, and in the same units. All Work Assistants should have sets of the performance standards so that they can check often for the recommended crew sizes, methods and materials to be employed, and the units in which materials and work are to be reported.

k. Evaluation

An evaluation of a maintenance management system would include an analysis of the adequacy of a component parts of the system and a review of the efficiency with which it is being executed. In an analysis of the adequacy of the component parts, the following activities might be included:

- The classification of surface types should be reviewed periodically to ensure that all cases are covered, and to see if any types can be dropped or combined to simplify the list.
- The road inventories are revised when there are jurisdictional changes, abandonments, new construction, upgrading (or downgrading) of surfaces, etc. The present inventories should be completed and brought up to date for the 1986 - 1987 program.
- The activities list is changed whenever it is found that another category is needed, or one of the major series should be more detailed.

- Performance standards should be compared with reports of how the work was actually done, and the results obtained. All elements of the standards must be checked -- resources employed, procedures, and production.

- Assumptions on maintenance levels must be reviewed. The first question is whether all the programmed maintenance work was done. The second is whether that amount of work was enough, or perhaps more than was necessary. This evaluation will have to be made through field inspection and personal judgement, asking whether the condition of the different road elements has been preserved, or whether deterioration has taken place. The maintenance levels are adjusted upward or downward according to the requirements of the roads and the resources available.

- It is likely that some improvements can be found from time to time in the mechanics of computing workload, resources, and programs. Unit prices will have to be updated each year, for converting workload to a financial budget.

In the evaluation of efficiency, the "Yield Rate" value is a very useful tool in measuring productivity and searching for better ways to do road maintenance. It is derived by dividing the total labor hours of the crew-day into the daily production, and the result is shown as man-hours per unit of work. Its purpose is to give a quick and simple check of the efficiency of alternative work methods. However, it is not a complete index of efficiency. Higher production rates can often be achieved by using superior tools and materials, without a change in crew size. The industrialized countries get very high yield rates from smaller crews by substituting power machines for some of the workers on maintenance operations. Production rates are higher, but so are the costs, and much of the increased cost in the case of Bangladesh would be in foreign currencies. These factors must be considered in looking for more efficiency. Maintenance management, with its performance standards and its orderly methods for planning, controlling, and comparing, can help in many ways to achieve a good road maintenance at minimum cost.

1. Conclusions

The maintenance management plans proposed for Bangladesh will work for the districts, for the maintenance areas of the Project, or for any

network of jurisdiction which might be established. There are several steps in the process, but they cover everything from the first look at the roads on the ground to completed maintenance, and a way of judging the results. The bulk of the preparation is done only once; after that an annual update is required to note changes which have occurred, corrections and improvements, and new special work. Successful use requires only a recognition of the need for road maintenance, funding at a level which is demonstrated to be rational, and a steady effort in carrying out the program.

3. Maintenance Supervision

Because of the pressure to prepare the construction programs for implementation during the 1983 - 1984 construction season, the districts paid scant attention to the development of an acceptable maintenance program until August 1983. Some maintenance works were reported by the Rangpur District in May 1983, but this seems to be a misnomer and reflects the mistaken concept of maintenance that prevailed at that time, for the work reported was bituminous carpeting on four roads. Such activities, by definition in Table X, are classified as construction. The same type of work was reported as increased to six schemes in June 1983, but it was still construction, and not maintenance.

In August 1983, Rangpur District reported a proposed maintenance program of eight roads totaling 52 miles. In the September 1983 Monthly Report, this program was changed somewhat; i.e., the total was still 8 roads, but the total length was 67 miles. The lengths of the individual roads proposed for maintenance, as shown on Table XVI (consisting of two sheets), would indicate that these projects should also be classified as construction (improvement), rather than maintenance.

In the October 1983 Monthly Report, it was stated that the Sylhet District has three <u>reconstruction</u> works underway, or planned:

- Sherpur - Nabiganj Road - Maulavi Bazar Subdivision
- Chunargat - Balah Road - Maulavi Bazar Subdivision
- Maulavi Bazar - Shamshernagar Road - Maulavi Bazar Subdivision

TABLE XVI - PROPOSED MAINTENANCE PROGRAMS, RANGPUR DISTRICT, 1983

	Name of the Road	Sub-Division	Growth Centers	Length (Miles)
		AUGUST 1983 LIST		
1.	Bhurungamari - Shikuria Road (Bhurungamari Bazar Portion)	Kurigram	Shilkuri Bazar and Bhurungamari	2
2.	Gaibandha - Baradarga Road, via Sadullapur and Madargonj, Zila Parishad Road No. 870	Gaibandha	Madargonj Bazar	10
3.	Gaibandha - Shaghatta Road, Zila Parishad Road No. 49	Gaibandha	Gaibandha Bazar, Nurulgonj Bazar, and Fulsuri Bazar	13
4.	Domar - Dimla Road (Domar Bazar Portion), Zila Parishad Road No. 35	Nilphamari	Domar Bazar and Boragari Bazar	2
5.	Rangpur - Shundarganj via Chowdhurani	Rangpur Sadar	Rangpur Bazar, Foradarga Bazar, and Pirgacha Bazar	4
6.	Nilphamari - Tengonmari Road, Zila Parishad Road No. 94	Nilphamari	Nilphamari Bazar, Ramnagar Bazar, and Ramgonj Bazar	3
7.	Tengonmari Bridge to Pagla Pir	Nilphamari	Tengonmari Bazar and Kishoregonj Bazar	14
8.	Gangachara - Bardibari Road	Rangpur Sadar	Gangachara Bazar and Betgari Bazar	4
	TOTAL			52

TABLE XVI - PROPOSED MAINTENANCE PROGRAMS, RANGPUR DISTRICT, 1983

	Name of the Road	Sub-Division	Growth Centers	Length (Miles)
		SEPTEMBER 1983 LIST		
1.	Gaibandha - Baradarga Road via Sadullapur and Madargonj, Zila Parishad Road No. 870	Gaibandha	Madargonj Bazar	10
2.	Gaibandha - Shaghatta Road via Badiakhali, Zila Parishad Road No. 49	Gaibandha	Gaibandha, Nurulgonj, and Fulsuri Bazar	13
3.	Domar - Dimla Road (Domar Bazar Portion), Zila Parishad Road No. 35	Nilphamari	Domar Bazar and Boragari Bazar	2
4.	Rangpur - Sudarganj Road via Bamandanga	Rangpur Sadar	Rangpur Bazar, Barodarga Bazar, and Pirgacha Bazar	14
5.	Rangpur - Parbatipur Road via Badargonj	Rangpur Sadar	Badargonj and Sympurhat	14
6.	Rangpur - Shahebgonj Road	Rangpur Sadar	Rangpur Bazar, Mahigonj, and Sharihat	4
7.	Nilphamari Domar Road	Nilphamari	Nilphamari Bazar and Domar Bazar	5
8.	Lalmonirhat - Phulbari Road	Lalmonirhat	Lalmonirhat and Phulbari	5
	TOTAL			67

Funds allocated for the reconstruction and maintenance of the Maulavi Bazar - Shemshernagar Road were Tk 2,400,000. Thus, it appeared that the Sylhet District also had a misconception of the term "maintenance."

At this time, the PM of the ZRMI Project issued Memo No. DCE/M-62/82/83(3), dated 30/10/83, which set forth the lists of feeder roads for maintenance and reconstruction works in the three districts under the ZRMI Project. For maintenance work, this memo listed 7 roads totaling 66 miles for Faridpur, 8 roads totaling 52 miles for Rangpur, and 8 roads totaling 42 miles for Sylhet. This memo was a continuation of Memo No. DCE/M-62/82/643(3), dated 24/10/83, which contained the guidelines for preparation of schemes and utilization of development funds under the ZRMI Project for FY 1983 - 1984.

As shown in Table XVII, in November 1983, the Faridpur District presented a program of eight maintenance projects with a total budget of Tk 1,258,000. By December 1983, Rangpur had again revised its proposed program to five projects with a total budget of Tk 2,933,866. In both cases, by the description of the work to be done, it appears that these should have been classified as construction projects, and not as maintenance.

In January 1984, it was reported that the Sylhet DE has prepared 48 schemes for tendering, of which 47 were for road improvement/corrective maintenance. At this date, the Sylhet District was still laboring under a misconception concerning the proper categorization of rural road works. However, further information reported that month indicated some progress towards understanding the difference, at least on the part of the XEN's. It was agreed that:

- The XEN would be responsible for the maintenance of the paved section of the Jaintiapur - Gowainghat Road and half of the earth road between Hatimganj and Dhakadakshin, using force account workers in both cases, and
- The DE would be responsible for the maintenance of the Doorboost - Kanairghat Road pavement and the other half of the Dhakadakshin - Hatimganj Road, utilizing contractors in both cases.

TABLE XVII - PROPOSED MAINTENANCE PROGRAMS FOR F.Y. 1983-1984

Name of the Road	Nature of the Work	Estimated Cost (Tk)
	FARIDPUR (Presented in November 1983)	
Goalundo Bazar Road	Bituminous carpeting work	332,000
Dr. Kazi Motahar Hossain Road	Earthwork and HBB pavement	315,000
Rajbari - Baliakandi Road	Bituminous carpeting work	233,000
Pukuria - Sadarpur Road	Maintenance and repairs to damaged CC pavement	140,000
Talma - Nagarkanda Road*	Maintenance and repairs	139,000
Road from Haishave Junction to Degree College	Maintenance and repairs to damaged CC pavement	59,000
KB Ismail Road	Maintenance and repairs to damaged CC pavement	24,000
Faridpur - Chabhadrasan Road, from Harishave to Mosque	Maintenance and repairs	16,000
Total		1,258,000

* Talma - Nagarkanda Road was selected for the Pilot Maintenance Project.

	RANGPUR (Presented in December 1983)	
Gaibandha - Shaghatta Road (Via Bidiakhali)	Khoa consolidation and carpeting, 1 mile	592,866
Rangpur - Parbatipur Road (Via Badargang) - Rangpur Town Portion	Patching and seal coat, 2900 lin. ft.	308,000
Cantonment Area	Patching and seal coat, 6400 lin. ft.	700,000
Nazirhat Towards Badarganj	Khoa consolidation and carpeting, 1 mile	790,000
Rangpur - Sundarganj Road (Bamondanga - Sundarganj Portion)	Khoa consolidation and carpeting	543,000
Total		2,933,866

In February 1984, the Sylhet District continued to report works being tendered for contract as maintenance when they were more in the realm of construction works. The Rangpur District reported that tenders for 48 maintenance schemes had been received and 34 work orders issued, yet the December 1983 list, shown on Table XVII, contained only five projects, all construction rather than maintenance.

In March 1984, the Consultant reported that no routine or preventive maintenance, as defined in the O&M Report, had been observed in any of the three districts. The RE's of the three districts were preparing detailed operational estimates for use in the proposed Pilot Maintenance Projects scheduled to be undertaken in each district in May 1984. In support of this proposed project, during the month of April 1984, the PM issued Memo No. S-IV/28-8/83/109(3), dated 02/04/84, which set forth a new set of guidelines, based on the Consultant's O&M report, to be followed for routine and preventive maintenance on the ZRMI Project roads. It also specified that, for the Pilot Maintenance Scheme, there should be two projects in each district, 70 percent of the required funds would come from Project funds and the balance from BDG, and established a revolving fund of Tk 25,000 for each district to get the programs operational.

The Pilot Maintenance Project did indeed get underway in the three districts in May 1984, with work being reported on the following roads:

- Sylhet District - Hatimganj - Dhakadakshin Road - Earth
- Rangpur District - Rangpur - Mahiganj Road - Bituminous Pavement
  Rangpur - Badarganj Road - Bituminous Pavement
- Faridpur District - Rajbaro - Baliakandi Road - Bituminous Pavement
  Talma - Magarkandi Road - Bituminous Pavement

By June 1984, each district had two maintenance projects underway, but progress was being reported in various shades of optimism:

- Sylhet District
  - Hatimganj - Dhakadakshin Road - Satisfactory progress until mid-June, when depletion of the revolving fund brought all activities to a halt.
  - Badarghat - Bariberbazar Road - Work was slow from the start, and stopped completely when the revolving fund was depleted in June.
- Rangpur District
  - Rangpur - Mahiganj Road - Shoulder repair complete and pothole patching underway. Latter work done during rainy weather and quality of work was poor.
  - Rangpur - Badarganj Road - About 75 percent of shoulder repairs were complete when all work was suspended.
- Faridpur District
  - Rajbari - Baliakandi Road - Work was limited to dressing, compacting, reshaping, and cambering shoulders and crown.
  - Talma - Nagarkanda Road - Heavy rains limited this work to dressing and reshaping the existing embankment.

July 1984 saw the development of a strange anomally -- Sylhet reported all maintenance activity had stopped for lack of funds, Rangpur reported slow progress and poor quality control, while Faridpur reported that work crews had been increased on their two projects and that progress was being achieved in an acceptable manner. 1983 - 1984 Pilot Maintenance Projects as of this date are shown in Table XVIII. Meanwhile, in the same month, the Rangpur XEN reported that his office would take over the maintenance responsibilities of some 52 miles of road (probably the same 52 miles reported by the DE as shown on Table XVI and announced in August 1983).

In August 1984, Sylhet announced that the problem of shortage of funds had been alleviated somewhat and work had resumed on the Pilot Maintenance Projects. Rangpur reported little or no additional progress, mainly due to lack of supervision. Faridpur reported some work on both projects.

All three districts reported that the heavy rains of September 1984 had effectively halted any meaningful maintenance work during that period. Sylhet was still reporting in an optimistic tone, but Rangpur reported that

TABLE XVIII - 1983-1984 PILOT MAINTENANCE PROJECTS*

Name of Road	Type of Road	Length (Km)
Badarghat - Shiber Bazar Road	Earth Road	2.61
Badarghat - Shiber Bazar Road	Bituminous Pavement	4.70
Hatimganj - Dhakadakshin Roadd	Earth Road	9.65
TOTAL, SYLHET DISTRICT		16.96
Rangpur - Badarganj Road	Bituminous Pavement	2.95
Rangpur - Mahiganj Road	Bituminous Pavement	1.88
TOTAL, RANGPUR DISTRICT		4.83
Rajbari - Baliakandi Road	Bituminous Pavement	19.32
Talma - Nagarkanda Road	Bituminous Pavement	10.50
TOTAL, FARIDPUR DISTRICT		29.82

* Projects as of July 1984

there were signs that work on the Rangpur - Badarganj Road has been suspended. Faridpur reported that a lack of bituminous material had delayed most maintenance work in that district. At the same time, this district reported approval to add the following projects to their maintenance operations:

- Talma - Nagarkanda Road - Repair wingwall and roadway of bridge at Km 2.7.
  - Repair 100-m embankment failure at Nagarkanda.
- Pukuria - Sadarpur Road - Repair five embankment failures.
- Madukhali - Baliakandi Road - Repair bridge deck.

On 13/09/84, USAID issued PIL No. 11, which authorized the use of Road Development Funds for the following Pilot Maintenance Projects for the 1983 - 1984 Program:

District and Road		Allocation (Tk)
Sylhet District	- Sylhet - Badarghat Road	726,900
	Dewan Sarak Etimganj - Dhakadakshin Road	59,296
Rangpur District	- Rangpur - Badarganj Road	131,460
	Rangpur - Mahiganj Road	269,729
Faridpur District	- Rajbari - Baliakandi Road	1,105,274
	Talma - Nagarkanda Road	403,500
Total (which was 70 percent of total estimated cost)		2,696,159

Sylhet again reported in October 1984 that maintenance work had been halted, this time for lack of a roller or plate compactor. Rangpur was still reporting no progress due to lack of supervision. The Faridpur District reported that enough bituminous material had been found to allow work to resume on both of the Pilot Projects. Faridpur also reported that the bridge wingwall failure mentioned previously was repaired by the DE by contract, and that work on the 100-m embankment failure was in progress.

By the end of CY 1984, Sylhet District had reported that the maintenance problems on their two Pilot Projects had been solved and that satisfactory progress was being achieved. Rangpur District was still reporting no significant progress on their two projects. Faridpur was reporting progress, even though a shortage of bituminous material was still plaguing the work.

None of the Pilot Maintenance Projects undertaken in 1983 - 1984 has been satisfactorily completed by January 1985, but that did not restrain Sylhet and Rangpur Districts from embarking on 8 to 10 additional projects for the 1984 - 1985 program. By this time, the Sylhet RE was complaining that the maintenance program was not working as well as might be expected. He specifically mentioned lack of planning, failure to submit reimbursement claims in a timely manner, and a lack of understanding of the function of maintenance. There were still complaints of lack of funds in spite of the fact that the revolving fund had been increased from Tk 25,000 to Tk 50,000, and then to Tk 100,000. The maintenance activities reported by the three districts at this time were as follows:

- Sylhet District
  1983 - 1984 Projects
  Badarghat - Shiberbazar Road - 4.7 km Bituminous Pavement 35 percent complete

  1984 - 1985 Projects
  Hatimganj - Dhakadakshin Road- 9.6 km earth road (by the previously mentioned agreement, the ZRMI Project is responsible for 4.8 km from Hatimganj), originally a 1983 - 1984 project.

  Bajubal - Putijuri - Bijnaghat Road - Earth Road
  Munshi Bazar - Kurmacher Road - Earth Road
  Tajpur - Syedpur Road - Earth Road
  Sunamganj - Chahatak Road - Earth Road

- Rangpur District
  1983 - 1984 Projects
  Rangpur - Mahiganj Road - 1.9 km Bituminous Pavement, 50 percent complete
  Rangpur - Badarganj Road - 3.9 km Bituminous Pavement, 30 percent complete

1984 - 1985 Projects

Rangpur - Sundarganj Road)	
Gaibandha - Sadullahpur Road)	
Gaibandha - Kamarjani Road)	
Rangpur - Kamdia Road)	Not one of these projects was yet
Nilphamari - Jaldhaka Road)	under active maintenance work.
Mirganj - Jaldhaka Road)	
Barodarga - Bhendabari Road)	
Rangpur - Badarganj Road)	

- Faridpur District

  1983 - 1984 Projects

  Rajbari - Baliakandi Road - 19.3 km Bituminous Pavement
  Talma - Nagarkanda Road - 10.5 km Bituminous Pavement

  1984 - 1985 Projects
  Projects not yet officially approved.

On 04/02/85, USAID issued PIL No. 15, which authorized the use of Road Development Funds for Pilot Maintenance Projects for the three districts for FY 1984 - 1985. The same amount of US Dollars was allocated as before, but the Taka equivalent was slightly more because of the increased exchange rate. The main difference between PIL 11 and PIL 15 was that the latter allowed MLG to distribute the funds among the three districts as it saw fit, whereas the former budgeted the funds to the six roads in the program. However, the same rules for reimbursement as set forth in PIL 11 were continued in PIL 15.

Following this action, it is interesting to note how the list of projects under maintenance had undergone a significant change by the end of February 1985:

- Sylhet District

  Hatimganj - Dhakadakshin Road - Earth Road
  Badarghat - Shiberbazar Road - Bituminous Pavement
  Shahbondar - Shamsherganj Road - Bituminous Pavement
  Munshi Bazar - Kamalganj - Kurma Char Road - Earth Road
  Bahubal - Putijuri - Bijnaghat Road - Earth and Bituminous Pavement
  Dulaikal - Mirpur Road - Earth Road
  Nabiganj - Baniachung Road - Earth Road
  Sunamganj - Chhatak Road - Earth Road
  Shahbag - Kanaighat Road - Bituminous Pavement
  Fenchuganj - Maijgaon Road - Bituminous Pavement
  Dhakadakshin - Beanibazar Road - Bituminous Pavement
  Tajpur - Syedpur - Nayabondar Road - Earth Road

- Rangpur District
  Rangpur - Mahiganj Road - Bituminous Pavement
  Rangpur - Badarganj Road - Bituminous Pavement
  Mahiganj - Damdama Road -

  However, Table XIX shows that Rangpur has proposed eight maintenance projects for 1984 - 1985, and the list was quite different from those projects shown as being under active maintenance.

- Faridpur District
  Rajbari - Baliakandi Road - Bituminous Pavement
  Talma - Nagarkada Road - Bituminous Pavement

Once more the shortage of funds for road maintenance work began to take its toll, and by May 1985, the active projects had been reduced in number and scope:

- Sylhet District

Hatimganj - Dhakadakshin Road) Badarghat - Shiberbazar Road) Munshi Bazar - Kamalganj Road)	Preventive maintenance work complete, routine maintenance being practiced on a very reduced scale
Bahubal-Putijuri-Bijnaghat Rd)	Bituminous pavement section requires considerable preventive maintenance, earth section under routine maintenance
Nabiganj - Baniyachung Road)	Preventive maintenance for 5.5 km of earth section complete, little further work observed
Sunamganj - Chhatak Road)	Preventive maintenance on earth road started at Sunamganj, and then attention was transferred to Chhatak end, where work continued at a slow pace
Shahbag - Kanaighat Road)	Maintenance work was undertaken on the bituminous pavement section, and then was stopped because the materials in use were below specifications. This was corrected and work was again held up for lack of funds
Tajpur-Syedpur-Nayabondar Rd)	The last maintenance work observed was March 1985

TABLE XIX - PROPOSED MAINTENANCE PROJECTS, RANGPUR, 1984 - 1985

Name of Road	Length (ft)	Estimated Cost (Tk)
Rangpur - Sundarganj Road	5,000	838,000
Gaibandha - Barodarga via Sadullahpur	13,500	872,000
Gaibandha - Kamarjani Road	2,200	243,000
Rangpur - Kamdia Road	2,500	542,000
Nilphamari - Jaldhaka Road	6,300	366,000
Mirganj - Jaldhaka Road	3,800	172,000
Barodarga - Bhendabari Road	2,860	127,000
Rangpur - Badarganj Road*	3,600	595,000
TOTAL ESTIMATED COST		3,755,000

* Part of 1983-1984 Rangpur Maintenance Pilot Project

Maintenance projects cancelled for lack of funds included:

Shahbondar - Shamsherganj Road - Bituminous Pavement
Dulaikal Mirpur Road - Earth Road
Fenchuganj - Maijgoan Road - Bituminous Pavement
Dhakadakshin - Beanibazar Road - Bituminous Pavement

- Rangpur District

Rangpur - Mahiganj Road Rangpur - Badarganj Road	No further maintenance on the bituminous pavement
Mahiganj - Damdama Road	The maintenance cost of this road was estimated to be Tk 317,000, which was about 30 percent of the total maintenance budget
Mirganj - Jaldhaka Road	Preventive maintenance of the bituminous pavement was underway
Rangpur - Kaliganj Road	Small amount of maintenance of bituminous pavement reported
Barodarga - Bhendabari Road	Patching of bituminous pavement complete, shoulder work 90 percent complete
Rangpur - Sundarganj Road Nilphamari - Jaldhaka Road	No maintenance work on bituminous pavement reported
Gaibandha - Kamarjani Road Gaibandha - Sadullahpur Road	No maintenance work reported for either road

- Faridpur District

Rajbari - Baliakandi Road Talma - Nagarkanda Road	Preventive maintenance complete and routine maintenance underway
Pukuria - Sadarpur Road	No maintenance work on the bituminous pavement reported
Khalipur - Sibrampur - Lakhidasher Road	No maintenance work on this HBB pavement reported
Madhukhali - Baliakandi Road	Remedial work required of contractor, but no work reported

The work on the Pilot Maintenance Projects in all three districts was still hampered by a shortage of funds during the period June - August 1985.

However, the Sylhet District reported that, with the exception of one project, all projects in the 1983 - 1984 and 1984 - 1985 FY were complete. Rangpur reported that all 1983 - 1984 projects were complete, and that the 1984 - 1985 projects were about 60 percent complete. Faridpur also reported just one road short of completing both the 1983 - 1984 and the 1984 - 1985 programs.

At this point, in July 1985, the Consultant wrote the following comment:

> "From the very outset, the ZRMI Project was known as a 'maintenance and improvement' project. However, major emphasis has increasingly been on the improvement aspects of the project, and maintenance has been relegated to a secondary position. Maintenance Pilot Programs have been organized in each district, but there has been little effort devoted to the creation of a system of maintenance in an organized and managed program. Full benefit from improved roads will not be realized unless there is a maintenance system to keep the condition of the roads at the improved level. For the balance of this project, there should be greater emphasis on maintenance. The report, 'Maintenance Management for Zila Roads', issued by the Consultant in June 1985, should be followed closely."

Up to the end of CY 1985, all three districts were still reporting that the scope of the maintenance operations was greatly restricted by the lack of funds. Rangpur District was in a particularly bad shape from the budget point of view, for they had undertaken maintenance work totaling some Tk 4,070,000, whereas the approved budget for this district was Tk 1,540,000. During the last one-third of 1985, the maintenance work in Sylhet was confined to maintenance of the bituminous pavement on the Shahbag - Kanairghat Road. Rangpur District did no work at all, and work in Faridpur was restricted to minor repairs on the Pukuria - Sadarpur Road and the Talma - Nagarkanda Road.

For the first half of 1986, there was no maintenance work in either Sylhet District, or Rangpur District, and very little in Faridpur District. The only conclusion to be drawn here is that the maintenance system never was institutionalized to the extend that it could perpetuate itself. Once it began to appear that international financial assistance might not be

available, the entire concept of maintenance was pushed aside. This is a self defeating attitude, for if the rehabilitation projects (to be discussed in Section "E") are not accorded the benefits of maintenance from the day that each project is completed, then all the money spend to rehabilitate the roads will soon be lost.

Exhibit XXIII is a compilation of the Pilot Maintenance Project activities, month-by-month, for all projects. Here the erratic pattern of maintenance activities becomes readily apparent. Without meaning to rate one district's accomplishments over another, it would appear that, on the basis of systemization of maintenance operations, Faridpur had the best program. Obviously, they did not attempt to schedule more work than they could realistically handle. As a result, maintenance efforts could be concentrated on a few roads and the work could be performed in a satisfactory manner.

a. Cost of Maintenance Program

The cost of the Pilot Maintenance Projects for both 1983 - 1984 and 1984 - 1985 is shown on Table XX. It is difficult to equate total cost to total milage under maintenance because some of the roads were earth roads, while others were bituminous pavement surfaces. The amounts shown as "Final Cost" are the billed costs, not the reimbursed costs. It is interesting to note that, for the 1983 - 1984 projects, the total amount spent is about 65 percent of that budgeted. Since final cost versus estimated cost is 70 percent, 63 percent, and 62 percent for Sylhet, Faridpur, and Rangpur, respectively, it is reasonable to assume that this difference represents failure to achieve the program goal, rather than work accomplished under the cost estimate.

For the 1984 - 1085 projects, the overall picture improved somewhat. The total final cost was 83 percent of the total estimated cost, but the spread from district to district was much more -- a low of 67 percent in Faridpur District, through 78 percent in Rangpur, to a high of 100 percent in Sylhet District. However, an examination of Exhibit XXIII shows that comparison of work accomplished based on funds expended can be misleading. On the

TABLE XX - PILOT MAINTENANCE PROJECT COSTS

Name of Road	Est. Cost (Tk)	Final Cost (Tk)
SYLHET DISTRICT		
1983-1984 Program		
Sylhet - Badaghat - Earth)	229,090)	753,734
Sylhet - Badaghat - Bituminous Pavement)	809,339)	
Hatimganj - Dhakadakshin - Earth	84,709	38,451
Total - 1983-1984 Program	1,123,138	792,185
1984-1985 Program		
Munshi Bazar - Kurmachar	200,000	146,098
Bahubal - Putijuri	125,000	125,160
Nabiganj - Baniyachong	80,000	102,805
Sunamganj - Chhatak	88,000	77,004
Shahbag - Kanairghat	558,217	640,252
Tajpur - Khadimpur	80,000	87,391
Hatimganj - Dhakadakshin	60,000	55,941
Stockpile of RCC Pipe, 25 nos.	45,768	12,170
Total - 1984-1985 Program	1,236,985	1,246,821
FARIDPUR DISTRICT		
1983-1984 Program		
Talma - Nagarkanda	576,430	556,101
Rajbari - Baliakandi	1,578,962	803,628
Total - 1983-1984 Program	2,155,392	1,359,729
1984-1985 Program		
Modhukhali - Baliakandi	101,000	29,108
Pukuria - Sadarpur	413,900	345,502
Shibrampur - Khalilpur	57,200	---
Talma - Piajkhali	---	10,678
Total - 1984-1985 Program	572,100	385,288

TABLE XX - PILOT MAINTENANCE PROJECT COSTS

Name of Road	Est. Cost (Tk)	Final Cost (Tk)
RANGPUR DISTRICT		
1983-1984 Program		
Rangpur - Mahiganj Preventive Maintenance	475,000	230,289
Rangpur - Badarganj Routine Maintenance	191,810	184,060
Total - 1983-1984 Program	666,810	414,349
1984-1985 Program		
Rangpur - Sundarganj	150,000	43,278
Nilphamari - Jaldhaka	366,000	198,553
Gaibandha - Sadullahpur	30,000	41,293
Gaibandha - Kamarjani	165,000	---
Rangpur - Kakina	425,000	416,142
Mirganj - Jaldhaka	150,000	146,214
Mahiganj - Damdama	317,000	295,117
Barodarga - Bhendabari	127,000	123,803
Rangpur - Badarganj	370,000	374,373
Total - 1984-1985 Program	2,100,000	1,638,773

Exhibit XXIII - COMPILATION OF PILOT MAINTENANCE PROJECT ACTIVITIES

Name And Description Of Maintenance Project	Maintenance Status																																				Remarks
	C.Y. 1983						C.Y. 1984												C.Y. 1985												C.Y. 1986						
	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	J	A	S	O	N	D	J	F	M	A	M	J	
Sylhet District																																					
Hatimganj - Dhakadakshin, Earth	-	-	-	-	-	-	-	-	-	-	O	-	X	X	O	O	X	O	O	O	△	-	△	△	△	△	X	X	X	X	X	X	X	X	X	X	Divided responsibility.
Badarghat - Shiber Bazar, Earth/B.P.	-	-	-	-	-	-	-	-	-	-	-	-	X	X	O	/	O	O	O	O	O	-	△	△	△	△	X	X	X	X	X	X	X	X	X	X	Good work on B.P. sect.
Shahbondar - Shamsherganj, B.P.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Never undertaken.
Munshi Bazar - Kurma Char, Earth	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	O	O	△	△	△	△	△	△	X	X	X	X	X	X	X	X	X	X	Prev. Maint. incomplete
Bahubal - Putijuri, Earth/B.P.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	O	O	O	△	-	△	△	△	X	X	X	X	X	X	X	X	X	X	Good preventive maint.
Dulaikal - Mirpur, Earth	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Never undertaken.
Nabiganj - Baniyachung, Earth	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	O	O	-	-	O	O	△	X	X	X	X	X	X	X	X	X	X	Exemplary routine maint.
Sunamganj - Chhatak, Earth	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	O	-	O	O	O	X	X	X	X	X	X	X	X	X	X	X	X	X	Poor preventive maint.
Shahbag - Kanairghat, B.P.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	O	-	O	O	O	O	O	O	X	X	X	X	X	X	X	Low quality material
Senchuganj - Maigaon, B.P.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Never undertaken.
Tajpur - Nayabondar, Earth	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	O	O	O	-	-	O	△	△	X	X	X	X	X	X	X	X	X	X	Acceptable work.
Dhakadakshin - Beanibazar, B.P.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	Never undertaken.
Sherpur - Nabiganj	-	-	-	O	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	(Reported as mainte
Chunarghat - Balah	-	-	-	O	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	(nance projects, but
Maulavi Bazar - Shamshernagar	-	-	-	O	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	(were const. projects.
Rangpur District																																					
Rangpur - Mahiganj, B.P.	-	-	-	-	-	-	-	-	-	-	O	-	O	-	O	O	/	-	O	O	-	-	-	O	△	△	X	X	X	X	X	X	X	X	X	X	(Work reported as of
Rangpur - Badarganj, B.P.	-	-	-	-	-	-	-	-	-	-	O	-	O	-	O	O	/	-	O	O	-	-	O	O	△	△	X	X	X	X	△	△	X	X	X	X	(acceptable quality,
Rangpur - Sunderganj, B.P.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	O	O	O	O	-	X	X	X	X	X	X	X	X	X	X	(but not an example of
Nilphamari - Jaldhaka,	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	O	O	O	-	X	X	X	X	X	X	X	X	X	X	(good maintenance
Gaibandha - Saadullahpur,	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	O	O	O	X	X	X	X	X	X	X	X	X	X	(work.
Gaibandha - Kamarjani,	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	X	X	X	X	X	X	X	X	X	Never undertaken.
Rangpur - Kakina,	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	O	O	O	-	X	X	X	X	X	X	X	X	X	X	(Work reported as of
Mirganj - Jaldhaka,	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	O	O	O	O	△	X	X	X	X	X	X	X	X	X	X	(acceptable quality,
Mahiganj - Damdama,	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	O	O	-	O	O	O	-	X	X	X	X	X	X	X	X	X	X	(but not an example of
Barodarga - Bhendabari,	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	O	O	△	△	X	X	X	X	X	X	X	X	X	X	(good maintenance work.
Bhurungamari - Shikuria,	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	(Reported as proposed
Gaibanda - Shaghatta, B.P.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	(maintenance projects,
Domar - Dimla,	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	(but were construction
Gangachara - Bardibari,	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	(projects.
Rangpur - Kaliganj	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	Never undertaken.
Faridpur District																																					
Rajbari - Baliakandi, B.P.	-	-	-	-	-	-	-	-	-	-	O	-	O	O	/	O	/	O	O	O	O	△	△	△	△	△	X	X	△	X	X	△	X	X	X	X	) Work reported as per-
Talma - Nagarkanda, B. P.	-	-	-	-	-	-	-	-	-	-	O	-	O	O	/	O	/	O	O	O	O	O	△	△	△	△	△	X	△	X	X	X	X	X	X	X	) formed in a very
Pukuria - Sadarpur, Embankment Failures	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	O	-	-	O	O	O	X	O	X	X	X	X	X	X	X	) satisfactory manner.
Madukhali - Baliakandi, Bridge Repairs	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	O	X	X	X	-	X	X	X	X	X	X	X	)
Khalipur - Sibrampur - Lakhidasher, HBB	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	X	X	X	X	-	X	X	X	X	X	X	X	)
Sadarpur - Piajkhali, B.P.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	X	-	X	X	X	-	X	X	X	X	X	X	X	Never fully undertaken.

Note : The maintenance work reported in this chart does not include any other maintenance work that might have been performed; it is limited to work performed under the ZRMI Project.

LEGEND

O - Preventive Maintenance Activities

△ - Routine Maintenance Activities

/ - Stopped For Lack Of Materials, Equipment, Supervision

X - Activity Stopped For Lack Of Funds

- - No Maintenance Activity Reported

basis of total expenditures versus estimated expenditures for maintenance, it would appear that Sylhet enjoyed the most successful program. However, as explained previously, this may be an erroneous assumption.

b. Conclusions and Recommendations

1) At the start of the ZRMI Project, the concept of rural road maintenance, at the district level in Bangladesh, was quite different from the planned and managed road maintenance programs of many other countries. However, when the PM issued his maintenance guidelines circular in May 1984, based on the practices recommended by the Consultant in the maintenance manual, the picture began to improve. Therefore, it is recommended that even greater emphasis be placed on maintenance management in the next phase of the Project.

2) One of the principal reasons for the erratic activity of the maintenance program was the constant shortage of operating funds. True, the size of the revolving fund was increased from Tk 25,000 to Tk 100,000, but increasing the size of the fund alone will not necessarily solve the problem. The entire cycle of expenditure and reimbursement must be streamlined so that revolving funds are not tied up in unprocessed invoices for reimbursement. This is another aspect of maintenance management.

3) Planning maintenance programs on a year-to-year basis is not acceptable in good maintenance practice. It is recommended that a road maintenance priority system be developed based on a numerical index of the road's condition at the time of the most current inventory.

E. CONSTRUCTION SYSTEMS AND SUPERVISION

1. General

For ease in evaluation and reporting, the two elements, construction systems and construction supervision, will be discussed separately, as was done for the road maintenance section. It is logical to use this approach for, while the two are closely related, each has its own distinct function. It was this failure to distinguish between construction and maintenance that prevailed in the three districts that caused many misunderstandings at the start of the ZRMI Project.

2. Construction Systems

As stated in the Inception Report, the Terms of Reference of the Contract did not clearly define the degree of attention to be accorded to the development of construction systems. It was further stated that it was the Consultant's position that present procedures for planning, allocation, and utilization of construction-funds should be thoroughly reviewed, followed by the development of appropriate recommendations for improvements where indicated. The result of this effort was the report, "An Organization and Management Study of Road Maintenance and Construction in Faridpur, Rangpur and Sylhet Districts." As was discussed previously in this report, the management study was prepared to meet the requirements of a rural administrative concept based on the old district arrangement. Therefore, to better reflect the requirements of an administrative set-up based on the Upazila concept, it is now proposed to update the management study through two additional studies -- one to determine the Upazila capabilities to handle construction management and one to determine the Upazila capabilities to handle maintenance management.

In the early stages of the Project, there was considerable misunderstanding concerning the role of the Consultant in the ZRMI Project. A great deal of this was due to differing definitions of such terms as "design," "approve," "supervise," etc., as well as failure to set out guidelines as to

just what was subject to design, approval, or supervision. As a result of this confusion, not a great deal of progress was achieved in the construction systems element until about the third quarter of CY 1983. At about this time, WPW appointed a full-time Project Manager for the ZRMI Project. One of the first acts of this official was to issue Memo No. DCE/M-62/82/643(3), dated 24/10/83, which provided guidelines for preparation of schemes and utilization of development fund under the ZRMI Project for FY 1983-1984. By means of this memo, the confusion which had prevailed was greatly alleviated. However, as far as construction systems are concerned, the memo did little to encourage the acceptance of modifications in the prevailing system other than those required by the Project Agreement. It did clarify the lack of understanding that existed concerning the responsibilities of the Consultant.

In the overview of the ZRMI Project, it must be concluded that a great deal remains to be done before it can be said that construction systems have been successfully institutionalized. This does not mean to say that radical changes must be wrought in the current procedures used in Bangladesh, but standardization within the three Project districts would be a good start. An updating of the organization and management study would no doubt result in many viable recommendations for the systemization of efficient construction management procedures that would be compatible with existing political institutions and organizations.

3. Construction Supervision

The term "construction" as defined in the various documents forming the authority and background of the ZRMI Project, as far as financing by USAID funds was concerned, limited the projects to the following types of works:

- Box culverts, ring culverts, and storm drain structures with discharge pipe,
- Earthwork and paving of bridge approaches -- less than 200 yards each side of the bridge,

- Paving over existing earth embankment,
- Resurfacing the existing paved roads,
- Construction of small bridges, 15 foot maximum width, and less than 75 feet in length, and
- Embankment protection.

It was also understood that all of the work in all three districts would be performed to the standards acceptable to USAID.

Further, with regard to construction supervision, the Inception Report defined the Consultant's responsibilities as follows:

- Manage and program selected maintenance and road improvements, and the supervision and approval of works specified under the Project Road Development Fund.
- Continually review the construction improvements under contract, and progress of maintenance organization and procedures, and to report achievements and shortfalls on a monthly basis to the respective Zila Parishads, the MLG(LGD) and USAID.
- Review and/or jointly develop all designs, specifications, estimates and tenders for the works prepared by the local technical staff, and make appropriate recommendations to the Chief Engineer MLG(LGD). Only documentation for projects recommended for AID participation would be forwarded to USAID.
- Make regular, frequent observations and monitor all construction works financed by USAID for conformance with related plans and specifications. If construction procedures and/or materials were not considered acceptable, immediate notice would be given to the XEN, or his designated representative, so that appropriate corrective actions could be taken. If appropriate changes were not made, a second notice would be given to the XEN and a copy provided to the Chief Engineer MLG(LGD). If this did not provide necessary action, USAID would be so advised and the Consultant would recommended disapproval of the construction and/or materials for USAID reimbursement.

As mentioned earlier, this description of the Consultant's responsibilities raised quite a furor. By mid-1983, it was apparent that this issue had to be resolved if the Project was to be able to function in a harmonious manner. Accordingly, a meeting of all concerned parties was convened and some

workable guidelines were developed. At a meeting called by the Consultant's COP on 02/08/83 the Consultant's RE's were briefed concerning these guidelines and admonished to follow them closely.

Soon after the meeting, the WPW appointed a permanent PM, and this official clarified the situation even more when he issued the Instructions and Guidelines for 1983-1984 Projects. This was of great assistance in clarifying the Consultant's supervisory role, not only in regard to improvement projects, but also with regard to maintenance projects.

a. The Projects

It was mentioned previously that maintenance was relegated to a minor role by the emphasis placed on road construction (improvement) projects, and this observation bears repeating at this time. It is interesting to note the following communications by WPW:

- By Memo No. DCE/M-62/82/480, dated 28/11/82, WPW submits to the Consultants a list of feeder roads connecting growth centers in the three Project districts.
- By Memo No. DCE/M-23/82/53/1, dated 27/01/83, WPW submitted a revised list of feeder roads connecting growth centers in the three Project districts.
- By Memo No. DCE/M-3/83/68(20), dated 06/02/83, WPW submitted the national road classification to the Consultants.

At about this point in time, USAID, by letter dated 02/03/83, issued PIL No. 7 for funding USAID's portion of the first-year projects (FY 1982-1983). The total value of the PIL No. 7 was Tk 16,800,000. The details of the funding arrangements will be discussed in the following section. However, PIL No. 7 also stated that BDG forces must first disburse their own funds and then seek reimbursement according to the rules stated in PIL No. 7. These rules continued to be basic throughout the life of the first phase of this Project.

From the time that PIL No. 7 was issued until the Guidelines for 1983-1984 Projects were issued in October 1983, the pace of construction in all three districts was hampered by the problems of supervision which have been previously discussed. As a result of this controversy, reimbursement by USAID was delayed for several months, witness the fact that by Memo No. S-VII/2R-1/82/623, dated 19/12/83, MLG requested release of grant funds to cover the 1982-1983 Program requirements of Tk 11,400,000.

The reimbursement trouble continued, and on 22/05/84, by AID Letter No. 759, USAID reminded WPW that the rules established by PIL No. 7 must be followed, particularly with regard to documents accompanying the request for reimbursement. USAID also expressed concern about the Consultant's statement vis-a-vis compliance with plans and specifications, and stated that the issue must be resolved before reimbursement could be approved. Soon thereafter, by AID Letter No. 771, dated 20/05/84, USAID complained to WPW of the lack of progress and warns that a PIL for the 1984-1985 projects would not be issued until there was more progress achieved on both the 1982-1983 and 1983-1984 projects. Because of the difficulties mentioned, PIL No. 12, allocating Tk 32,000,000 for USAID's portion of the 1983-1984 projects, was not issued by USAID until 13/09/84.

Meanwhile, by Memo No. S-IV/IS-I/84/158(3), dated 20/06/84, the Instructions and Guidelines for Preparation and Implementation of Schemes Under ZRMI Project for the Year 1984-1985 were issued to the Consultant. However, by AID Letter 1321, dated 17/09/84, USAID was again complaining to WPW that contracting procedures outlined in PIL 7 were not being followed. A specific complaint was the practice of negotiation after the selection of the lowest bidder.

In spite of USAID's letter concerning lack of progress in the 1983-1984 projects, WPW submitted their proposals for the 1984-1985 projects. USAID responded by AID Letter No. 1226, dated 20/08/84, and advised that a proposed increase in budget to a total of Tk 65,600,000 was not justified by past performance in any of the three districts. Instead, USAID proposed that

the total budget for 1984-1985 be limited to Tk 52,500,000, of which USAID's portion would be a total of Tk 38,600,000 and BDG's portion would be Tk 13,900,000. This would bring the proportion nearer to 70 percent for USAID and 30 percent for BDG when combined with the two previous annual allocations.

From the very outset, it had been understood that USAID's annual budget allocations would be used as an incentive to encourage both quantity as well as quality production. In other words, the budget for FY 1982-1983 would be established on estimates of the individual district's ability in both road rehabilitation and maintenance work; while each succeeding annual budget would be based on the following factors:

- An evaluation of each district's performance in completing the previous year's program and its allocation, and
- An evaluation of each district's ability to complete the program proposed for the coming fiscal year.

On the basis of these parameters, an agreement for the FY 1984-1985 program was attained, and USAID, by AID Letter dated 04/02/85 issued PIL No. 14 for an allocation of Tk 35,900,000 to cover their portion of the costs of the FY 1984-1985 projects. However, this allocation, late as it was, did not become available immediately, for USAID, by AID Letter 777, dated 14/05/85, requested BDG to please signify approval of PIL No. 14 so that the money would be available to reimburse expenditures incurred with BDG funds.

It would seem that the seemingly unending succession of delays, misconceptions, and misunderstandings would be reflected in a lack of progress in all districts. In the early stages of the ZRMI Project, this was true, but as the Project moved into the second, third, and fourth years of its existence, the performance improved progressively. It can be said that the lessons learned by all concerned during the first two years resulted in improved performances during the third and fourth years of the Project.

Exhibit XXIV is a tabular presentation of the final status of all ZRMIP road improvement projects by district and by fiscal year. For each project, there are abbreviated, but appropriate, comments. The three project districts are presented in chronological order (Sylhet, Rangpur and Faridpur), and under each district the respective projects are presented chronologically in the fiscal year in which they were undertaken. Because of this large amount of detail, Exhibit XXIV consists of 12 sheets. Exhibit XXV is a set of three maps, one for each district, indicating the roads involved in the improvement program over the life of the Project. Exhibit XXVI is a one-sheet summary of the general technical information contained in Exhibit XXIV. Because of the variety of projects, costs have not been summarized. However, a total cost summary is presented in a subsequent section on project costs. In the following paragraphs, observations on the performance in each district will be presented in some detail.

1) Sylhet District

Sylhet has the highest average annual rainfall of the entire country, which partially accounts for the fact that there were more drainage structure projects in that district than in either of the other two districts -- a total of 104 compared with 9 for Rangpur and 15 for Faridpur. The Sylhet topography also has more rolling terrain than either of the other two districts, which further accents the need for adequate drainage structures. The high rainfall in the Sylhet area also works to the disadvantage of construction works, for high rainfall and accompanying flooding often resulted in delays in the progress of road improvement projects in that district.

During the three fiscal years of the ZRMI Project, there were a total of 50 projects undertaken by the Sylhet District, of which 17 were road improvement projects and 34 were drainage structure projects (one project was a combined road improvement and drainage structure project). Of the drainage structure projects, one bridge project was subsequently dropped, principally because high water impeded any significant progress. A second drainage structure project consisting of five box culverts was of such poor workmanship

Exhibit XXIV - FINAL STATUS OF ZRMIP ROAD IMPROVEMENT PROJECTS, BY DISTRICT AND BY FISCAL YEAR

Contract Identification		Starting Date (Scheduled)	Completion Date		Contract Cost (Tk)			Claim As Received (Tk)	Recommended Reimbursement* (Tk)	Remarks
Number	Description		Scheduled	Actual	Original	Revised	Actual			
Sylhet District (1982 - 1983 Projects)										
SHAHBONDAR - SHAMSHERGANJ ROAD										
01 ZRMI/17/82-83	Bituminous Pavement, 1.2 km Contractor: Mr. A. Mumith Khan	07/07/83	30/11/83	20/10/84	1,132,032	1,185,190	1,185,190	1,185,190	605,395	Completion delayed 1 year for shortage of roller
BAHUBAL - PUTIJURI - BIJNAGHAT ROAD										
02 ZRMI/11/82-83	Bituminous Pavement, 1.0 km Contractor: Mr. Habibur Rahman	07/07/83	31/10/83	15/02/84	914,450	-	930,562	930,562	487,009	All contracts delayed by heavy rains, but completion dates were reasonable and the quality of the work was considered to be very satisfactory
03 ZRMI/12/82-83	Box Culvert, 4.6 m Contractor: Mr. Kazi Moniruddin	07/07/83	31/12/83	31/12/83	164,834	-	160,672	160,672	82,071	
04 ZRMI/13/82-83	Box Culvert, 9.1 m Contractor: Mr. Habibur Rahman	07/07/83	15/10/83	07/03/84	187,966	-	232,214	232,214	118,615	
05 ZRMI/14/82-83	Box Culvert, 2 nos., 3.6 m Contractor: Mr. Helauddin Akanjee	07/07/83	30/09/83	30/12/83	200,792	-	205,842	205,842	105,144	
06 ZRMI/15/82-83	Box Culvert, 3.0 m Contractor: Mr. Hiralal Das	07/07/83	30/09/83	30/10/83	115,191	-	115,053	115,053	58,769	
07 ZRMI/16/82-83	Box Culvert, 4.6 m Contractor: Mr. Hiralal Das	07/07/83	30/12/83	20/11/83	172,667	227,872	223,314	223,314	114,068	
ATGRAM - ZAKIGANJ ROAD										
08 ZRMI/18/82-83	Bituminous Pavement, 2.0 km Contractor: Mr. Am[illegible]uzzaman Chowdhury	07/07/83	30/12/83	31/06/84	1,424,432	1,433,834	1,433,824	1,433,824	796,729	Execution time was double due to heavy rains
SYLHET - KAMAL BAZAR ROAD										
09 ZRMI/19/82-83	Bituminous Pavement, 1,84 km and Pipe Culvert, 0.91 m Diameter Contractor: Mr. Kona Miah	07/07/83	30/11/83	20/09/84	1,360,010	-	1,292,098	1,292,098	704,557	Best work of all, even though road work delayed by lack of roller
TAJPUR - GOALABAZAR - SYEDPUR - KHADIMPUR ROAD										
10 ZRMI/20/82-83	RCC Pipe Culverts, 10 nos. (Revised) Contractor: Mr. Saaduddin	13/03/84	07/07/84	30/12/84	139,650	149,940	144,007	144,007	73,559	Starting time of both contracts delayed 4 mos. by heavy rain and flooding
11 ZRMI/21/82-83	Box Culvert, 3.0 m Contractor: M/S Khaza Trading Corp.	07/07/83	30/12/83	30/12/83	92,150	-	82,719	82,718	42,252	
FENCHUGANJ - MAIJGAON - CHILACHARA ROAD										
12 ZRMI/22/82-83	Bituminous Pavement, 800 m, Maijgaon Contractor: Mr. Ziaul Islam	07/07/83	30/10/83	15/12/84	747,545	-	654,952	654,952	334,550	Execution was hampered by lack of road roller
13 ZRMI/23/82-83	RCC Pipe Culvert, 6 nos. Contractor: M/S Ayra and Co.	29/12/84	20/03/85	15/05/85	96,602	-	88,934	88,934	45,428	Completed satisfactorily

* From Project Assistance Funds

Exhibit XXIV - FINAL STATUS OF ZRMIP ROAD IMPROVEMENT PROJECTS, BY DISTRICT AND BY FISCAL YEAR

Contract Identification		Starting Date (Scheduled)	Completion Date		Contract Cost (Tk)			Claim As Received (Tk)	Recommended Reimbursement* (Tk)	Remarks
Number	Description		Scheduled	Actual	Original	Revised	Actual			
DHAKADAKSHIN - BLANIBAZAR ROAD										
14 ZRMI/24/82-83	Earthwork and Bituminous Pavement, 1.2 km (Revised) Contractor: Mr. Khalilur Rahman	30/06/83	30/11/83	15/04/85	1,105,408	-	1,348,200	1,348,201	688,661	Both projects delayed by heavy rains; culvert completion was hampered by site flooding
15 ZRMI/25/82-83	RCC Pipe Culvert, 6 nos. (Revised) Contractor: Mr. Habibur Rahman	30/06/83	30/09/83	15/07/85	65,732	146,045	106,924	106,924	54,617	
Sylhet District (1983 - 1984 Projects)										
BAHUBAL - PUTIJURI - BIJNAGHAT ROAD										
02A ZRMI/01/83-84	Bituminous Pavement, 250 m Contractor: Mr. A. Haque	28/03/84	20/08/84	31/12/84	294,314	-	279,688	279,688	198,397	Completion delayed by many factors, mainly heavy rainfall
02B ZRMI/02/83-84	Box Culvert, 13.3 m, Putijuri Contractor: Mr. Bablu Das	28/03/84	20/07/84	14/12/84	350,598	474,462	454,180	454,180	364,603	All projects completed in a satisfactory manner, but each suffered a time over-run, due mainly to heavy rainfall and prolonged flooding of the culvert sites
02C ZRMI/03/83-84	Box Culvert, 2 nos., 3.6 m, Resurat and Burigaon Contractor: Mr. Helaluddin Akanjee	28/03/84	20/07/84	26/10/84	265,850	320,296	310,957	310,957	266,281	
02D ZRMI/04/83-84	Box Culvert, 3 nos., 1.5 m (Revised) Fultoli and Kandigaon Contractor: Mr. Bablu Das	28/08/84	20/07/84	16/11/84	265,850	-	220,561	220,561	177,065	
02E ZRMI/05/83-84	Box Culvert, 5.2 m, Kargaon Contractor: Mr. Arju Miah	28/03/84	20/06/84	28/10/84	199,710	234,528	233,412	233,412	199,722	
02F ZRMI/06/83-84	Box Culvert, 4 nos., 1.5 m Gaznipur, Aingaon, and Deapur Contractor: Mr. Bablu Das	28/03/84	20/06/84	30/11/84	185,010	-	141,071	141,071	113,280	Inaccessability of work site delayed completion
02G ZRMI/07/83-84	RCC Pipe Culvert, 14 nos., 0.75 m Diameter Contractor: Mr. Abdus Soahan	13/03/84	06/07/84	30/12/84	218,400	-	211,642	211,642	169,906	Completion delayed by rain and site flooding
ATGRAM - ZAKIGANJ ROAD										
03C ZRMI/09/83-84	Box Culvert, 23 m Contractor: Mr. A. Mumith Khan	10/12/84	03/04/85	03/04/85	546,150	570,925	548,428	548,427	440,277	Contract awarded 3 times before satisfactory completion
03A ZRMI/10/83-84	Bituminous Pavement, 1.78 km Contractor: Mr. Habibur Rahman	28/03/84	20/09/84	15/12/84	1,594,469	-	1,644,023	1,644,023	1,380,306	Good quality work
03B ZRMI/11/83-84	Leveling Course, 4.78 km Contractor: Mr. Amiruzzaman Chowdhury	22/03/84	15/07/84	16/03/85	1,278,722	-	1,169,824	1,169,823	939,134	Good quality work, but delayed by lack of roller
TAJPUR - GOALABAZAR - SYLDPUR - KHADIMPUR ROAD										
05A ZRMI/12/83-84	Bituminous Pavement, 350 m (Revised) Contractor: Mr. Habibur Rahman	28/03/84	20/07/84	15/11/84	675,675	-	290,780	290,754	233,404	Good quality pavement, earthwork did not qualify
05B ZRMI/13/83-84	Box Culvert, 10.1 m, (Revised Contractor: Mr. Shahid Chowdhury	01/04/84	25/07/84	15/03/85	427,665	746,486	718,739	718,738	576,984	Site flooding/lack of good borrow

Exhibit XXIV - FINAL STATUS OF ZRMIP ROAD IMPROVEMENT PROJECTS, BY DISTRICT AND BY FISCAL YEAR

Contract Identification		Starting Date (Scheduled)	Completion Date		Contract Cost (Tk)			Claim As Received (Tk)	Recommended Reimbursement* (Tk)	Remarks
Number	Description		Scheduled	Actual	Original	Revised	Actual			
FENCHUGANJ - MAIJGAON - CHILACHARA ROAD										
06 ZRMI/14/83-84	Earthwork and Leveling Course, 2.8 km Contractor: Mr. Shahid Chowdhury	05/04/84	29/09/84	28/02/85	1,640,415	-	627,188	627,187	503,440	Completion delayed for lack of a road roller
DHAKADAKSHIN - BEANIBAZAR ROAD										
07B ZRMI/15/83-84	Box Culvert, 5 nos., 1.5 m (Revised) Noakhali Contractor: Mr. Babul Ahmed	15/03/84	20/06/84	25/11/84	221,025	343,945	343,946	-	-	No payment certified for 4 structures for failure to meet specs.
07A ZRMI/16/83-84	Earthwork and Bituminous Pavement, 2.45 km Contractor: Mr. Khalilur Rahman	22/03/84	16/09/84	20/04/85	1,981,042	-	2,184,602	2,184,601	1,753,798	Claim for acceptable structure not yet received
NABIGANJ - BANIYACHUNG ROAD										
08 ZRMI/17/83-84	Box Culvert, 14.8 m, Nabiganj Contractor: Mr. A. Matin for M/S Janwar And Co.	28/03/84	20/07/84	31/12/84	623,175	-	793,829	756,027	606,867	Completed satisfactorily Completion delayed for shortage of borrow
Sylhet District (1984 - 1985 Projects)										
SHAHBONDAR - SHAMSHERGANJ ROAD										
01A ZRMI/9A/84-85	Leveling Course, 2.825 km Contractor: Mr. Abdul Hoque	07/01/85	07/05/85	15/08/85	617,179	-	594,565	594,564	368,928	Jurisdictional dispute with WDB, along with heavy rainfall, accounted for most delays on both of these projects
01B ZRMI/9B/84-85	Leveling Course, 2.28 km Contractor: Mr. Syed Faisal Islam	08/12/84	30/06/85	30/11/85	618,304	-	505,883	505,883	313,900	
BAHUBAL - PUTIJURI - BIJNAGHAT ROAD										
02A ZRMI/10/84-85	Bituminous Pavement, 1.5 km, Putijuri Contractor: Mr. Abdul Khaleque	03/01/85	27/06/85	27/07/85	1,825,174	2,009,250	1,923,276	1,923,276	1,193,392	Work completed in a satisfactory manner for both of these projects
02C ZRMI/11/84-85	Box Culvert, 2 nos. Contractor: Mr. Bablu Das	27/11/84	21/03/85	03/05/85	693,092	-	653,366	653,365	405,413	
02B ZRMI/12/84-85	Reconstruct Existing Bridge Slabs, 8 nos. Contractor: Mr. Salen Ahmed	22/11/84	23/03/85	22/05/85	631,219	-	607,138	607,138	376,729	Improper demoli- of old structure delayed this work
ATGRAM - ZAKIGANJ ROAD										
03A ZRMI/13/84-85	Bridge, 31 m (Revised to Box Culvert) Contractor: Mr. Rezaul Karim	26/11/84	20/06/85	29/12/85	963,930	-	855,180	855,178	530,638	Completion delayed by flood in borrow area
03D ZRMI/14/84-85	RCC Pipe Culverts, 15 nos. Contractor: J.C. & Co.	25/11/84	19/03/85	30/11/85	258,978	-	217,915	217,915	135,217	Cancellation of contract was threatened
03B ZRMI/15A & C/ 84-85	Box Culvert, 2 nos. Contractor: Mr. Mumith Khan	21/01/85	25/04/85	13/04/85	557,782	-	562,307	562,307	348,912	Work completed satisfactorily

* From Project Assistance Funds

Exhibit XXIV - FINAL STATUS OF ZRMIP ROAD IMPROVEMENT PROJECTS, BY DISTRICT AND BY FISCAL YEAR

Contract Identification		Starting Date (Scheduled)	Completion Date		Contract Cost (Tk)			Claim As Received (Tk)	Recommended Reimbursement* (Tk)	Remarks
Number	Description		Scheduled	Actual	Original	Revised	Actual			
ATGRAM - ZAKIGANJ ROAD										
03B ZRM1/15B/84-85	Box Culvert, 24.4 m Contractor: M/S Mukhakim Corp.	21/01/85	05/06/85	20/04/86	1,021,653	-	932,121	932,121	578,399	Site flooding delayed inception of this project until November 1985
TAJPUR - GOALABAZAR - SYEDPUR - KHADIMPUR ROAD										
04A ZRM1/16/84-85	Bridge, 31 m (Revised to 24.4 m Box Culvert) Contractor: M/S Sarowar & Co.	20/11/84	21/05/85	30/03/86	982,905	-	1,085,946	1,050,524	651,850	Site flooding delayed completion of this project
FENCHUGANJ - MAIJGAON - CHILACHARA ROAD										
05D ZRM1/17/84-85	Bituminous Pavement, 0.925 km Contractor: Mr. Kazi Moniruddin Ahmed	12/05/85	20/06/85	27/10/85	801,020	-	928,113	928,113	575,894	Work completed in a satisfactory manner for both of these two road projects
05A ZRM1/18/84-85	Leveling Course & Earthwork, 2.8 km Contractor: Mr. Mosleh Uddin Chowdhury	29/11/84	19/04/85	19/04/85	455,730	-	397,931	508,625	315,602	
05C ZRM1/19/84-85	Box Culvert, 2 nos., 6.8 & 3.6 m Contractor: Mr. Kazi Moniruddin Ahmed	24/11/84	18/03/85	15/04/85	518,873	-	508,959	508,959	315,809	Both culvert projects completed in a satisfactory manner
05B ZRM1/20/84-85	Box Culvert, 6 nos., 1.5 m Contractor: Mr. Abdul Quaiyum	24/11/84	21/03/85	30/06/85	362,460	-	355,793	355,793	220,769	
DHAKADAKSHIN - BEANIBAZAR ROAD										
06A ZRM1/21/84-85	Box Culvert, 5.2 m, and Retaining Wall, Dhakadakshin Contractor: Mr. Nowab Meah	22/11/84	30/02/85	27/04/85	591,596	-	571,080	571,080	354,354	Work completed in a satisfactory manner
06B ZRM1/22/84-85	Box Culvert, 26.5 m, Lula River Contractor: Mr. Nowab Meah	17/02/85	20/06/85	15/04/86	940,561	-	1,053,439	1,106,567	364,951	Contract retendered.
-- ZRM1/23/84-85	Bridge, 86 m, Radhajuri Contractor: Mr. Mona Meah	--	--	--	-	-	-	-	-	Progress on both drainage projects delayed by high water
NABIGANJ - BANIYACHUNG ROAD										
07A ZRM1/24/84-85	Box Culvert, 10.1 m, Barrakhal Contractor: M/S Sanowar and Co.	27/11/84	21/03/85	15/05/85	429,128	520,560	519,503	519,503	322,350	Final completion delayed for proper site clean-up by the contractor
07B ZRM1/25/84-85	Box Culvert, 4 nos., 3.6 & 6.85 m Contractor: M/S Sanwar and Co.	27/11/84	11/04/85	10/08/85	822,546	1,072,731	1,081,897	1,081,897	671,317	Work delayed by a borrow shortage

* From Project Assistance Funds

Exhibit XXIV - FINAL STATUS OF ZRMIP ROAD IMPROVEMENT PROJECTS, BY DISTRICT AND BY FISCAL YEAR

Contract Identification		Starting Date (Scheduled)	Completion Date		Contract Cost (Tk)			Claim As Received (Tk)	Recommended Reimbursement* (Tk)	Remarks
Number	Description		Scheduled	Actual	Original	Revised	Actual			
Rangpur District (1982 - 1983 Projects)										
GAIBANDHA - KAMARJANI ROAD										
Group 1A	HBB, 0.96 km Contractor: Mr. Abul Kashem Sarker	07/06/83	07/09/83	05/04/84	465,958	-	463,726	463,726	227,782	All projects suffered delays from excessive rainfall, but all were finally completed in a satisfactory manner. Patching of rain erosion cuts on shoulders and side slopes was a was a problem on all of these HBB projects
Group 1B	HBB, 0.96 km Contractor: Mr. Anup Kumar Sarker	31/05/83	30/08/83	05/04/84	475,875	-	470,391	470,391	231,056	
Group 1C	HBB, 0.96 km Contractor: Mr. AKM Showkat Ali	07/06/83	07/09/83	05/04/84	464,967	-	457,792	457,792	224,867	
Group 1D	HBB, 0.96 km Contractor: Mr. SBH Saleque	07/06/83	07/09/83	05/04/84	470,899	-	463,759	463,759	227,798	
Group 1E	Tree Afforestation Contractor: Mrs. Hashida Begum	25/06/83	25/07/83	09/11/83	22,165	-	22,165	22,165	10,887	Work completed in a satisfactory manner
MIRGANJ - JALDHAKA ROAD										
Group 2A	Bituminous Pavement, 465 m Contractor: Mr. Abul Hossain	15/06/83	15/09/83	15/05/84	287,738	-	297,784	297,784	146,271	All projects delayed by heavy rainfall, although there was also poor organization at the start. All projects were finally completed in a satisfactory manner.
Group 2B	Bituminous Pavement, 465 m Contractor: M/S Eastern Builders	07/06/83	07/09/83	29/03/84	298,836	313,688	317,848	317,848	156,127	
Group 2C	Bituminous Pavement, 465 m Contractors: Mr. Abul Hossain	30/05/83	30/08/83	15/04/84	285,536	-	296,350	296,350	145,567	
Group 2D	Bituminous Pavement, 465 m Contractor: Mr. Ismail Hossain	07/06/83	07/09/83	15/04/84	292,168	-	290,836	290,836	142,859	
Group 2E	Tree Afforestation Contractor: Mr. Enamul Hoque	25/06/83	25/07/83	30/09/83	9,200	-	9,200	9,200	4,519	Work completed in a satisfactory manner
Group 2F	HBB, 1.83 km Contractor: Mr. Yakub Ali	30/01/85	07/05/85	15/06/85	1,094,000	-	999,547	999,547	408,883	Work completed in a satisfactory manner
Group 2G	Bituminous Pavement, 884 m Contractor: M/S Nipa & Co.	20/12/84	31/01/85	30/05/85	803,000	991,954	992,160	992,160	388,579	Work delayed by heavy rains
BARODARGA - BHENDABARI ROAD										
Group 3A	Bituminous Pavement, 440 m Contractor: Mr. Lutfor Rahman	20/06/83	20/09/83	17/05/85	280,107	-	279,555	279,554	117,317	All projects delayed by heavy rainfall, although there was also poor organization and management. All eventually completed in a satisfactory manner
Group 3B	Bituminous Pavement, 440 m Contractor: Mr. Lutfor Rahman	20/06/83	20/09/83	17/05/85	277,878	-	285,127	285,128	140,055	
Group 3C - 1	Bituminous Pavement, 220 m Contractor: Mr. Shahjahan Khan Abu	30/06/83	30/09/83	15/09/84	141,657	148,220	144,346	144,346	70,904	
Group 3C - 2	Bituminous Pavement, 220 m Contractor: M/S Momin Brothers	07/07/83	07/10/83	15/12/84	141,657	147,150	147,259	147,259	72,335	

* From Project Assistance Funds

Exhibit XXIV - FINAL STATUS OF ZRMIP ROAD IMPROVEMENT PROJECTS, BY DISTRICT AND BY FISCAL YEAR

Contract Identification		Starting Date (Scheduled)	Completion Date		Contract Cost (Tk)			Clain As Received (Tk)	Recommended Reimbursement* (Tk)	Remarks
Number	Description		Scheduled	Actual	Original	Revised	Actual			
Group 3D - 1	Bituminous Pavement, 220 m Contractor: Mr. Abdul Momen Talukdar	07/07/83	07/10/83	15/12/84	144,803	149,803	148,341	148,341	72,865	See remarks on the previous page
Group 3D - 2	Bituminous Pavement, 220 m Contractor: Mr. Ranjit Bakshi	30/06/83	30/09/83	15/09/84	144,803	149,803	144,737	144,737	71,095	Both projects were completed in a satisfactory manner
Group 3E	Tree Afforestation Contractor: Mr. Anwarul Azim	25/06/83	25/07/83	25/10/83	8,968	-	8,968	8,968	4,405	
KANDIA - GHORAGHAT ROAD										
Group 4A	HBB, 780 m Contractor: Mr. Entaj Ali	25/05/83	25/09/83	28/02/84	360,169	-	360,029	360,029	176,846	Except for Group 4B, these projects were completed in an acceptable and fairly timely manner. The over-run of Group 4B was about 400 percent, due to various factors
Group 4B	HBB, 780 m Contractor: Mr. Motlebur Rahman	07/01/84	31/03/84	10/03/85	376,191	-	388,205	388,205	190,686	
Group 4C	HBB, 780 m Contractor: Mr. Ataullah Khan	25/06/83	25/09/83	28/02/84	361,523	-	360,198	360,198	176,929	
Group 4D	HBB, 780 m Contractor: Mr. Motlebur Rahman	20/06/83	20/09/83	28/02/84	360,511	-	359,034	359,034	176,358	
Group 4E	Tree Afforestation Contractor: Mr. Solaiman Ahmed	—	—	—	-	-	-	-	-	Project dropped
RAJARHAT - ULLAGHATA ROAD										
Group 5A	HBB, 740 m Contractor: M/S Pavel Construction	25,06/83	25/09/83	15/10/84	394,154	-	391,872	391,872	192,488	Completion delayed for heavy rains and other reasons (poor management)
Group 5D	HBB, 740 m Contractor: M/S Pavel Construction	07/07/83	07/10/83	30/12/84	388,143	-	432,905	432,905	187,816	
Group 5B	HBB	—	—	—	-	-	-	-	-	Project dropped
Group 5C	HBB	—	—	—	-	-	-	-	-	Project dropped
LALMONIRHAT - MUGHALHAT ROAD										
Group 6	RCC Pipe Culvert, 1.78 m Diameter Contractor: Force Account	—	28/03/85	28/03/85	29,936	-	29,936	29,936	14,705	Work completed in a satisfactory manner
Rangpur District (1983 - 1984 Projects)										
GAIBANDHA - KAMARJANI ROAD										
1A Group A	Bituminous Pavement, 933 m Contractor: Mr. Shamsul Aziz	05/03/84	05/06/84	30/11/85	585,856	-	585,866	417,215	335,358	For lack of funds, final payment has not yet been made. Over-runs due to heavy rains and poor management
1B Group B	Bituminous Pavement, 933 m Contractor: Mr. Shamsul Aziz	05/03/84	05/06/84	31/03/86	585,866	-	585,866	193,593	155,610	
1C Group C	Bituminous Pavement, 922 m Contractor: Mr. Shajahan Khan Abu	05/03/84	05/06/84	30/11/85	585,867	-	609,898	570,090	458,238	

Exhibit XXIV - FINAL STATUS OF ZRMIP ROAD IMPROVEMENT PROJECTS, BY DISTRICT AND BY FISCAL YEAR

Contract Identification		Starting Date	Completion Date		Contract Cost (Tk)			Claim As Received	Recommended Reimbursement*	Remarks
Number	Description	(Scheduled)	Scheduled	Actual	Original	Revised	Actual	(Tk)	(Tk)	
MIRGANJ - JALIHAKA ROAD										
3A Group A	Bituminous Pavement, 553 m Contractor: M/S Shahed and Co.	12/12/84	15/01/85	30/03/85	759,730	844,664	846,084	846,083	610,671	Work on this project completed in a satisfactory manner
3B Group B	Bituminous Pavement, 850 m Contractor: M/S Shahed and Co.	07/04/84	20/06/84	10/02/85	629,970	752,166	754,340	754,339	604,591	Work on all projects was completed in a satisfactory manner. Some delays due to retendering part of the work
3C-1 Group C-1	Bituminous Pavement, 440 m Contractor: Mr. Atiar Rahman	25/11/84	31/12/84	31/12/84	368,916	395,942	392,768	392,768	315,706	
3C-2 Group C-2	Bituminous Pavement, 420 m Contractor: Mr. Azizul Huq Basumla	05/03/84	05/06/84	05/03/85	305,395	330,744	332,475	332,475	245,477	
BARGUARGA - BHENDABARI ROAD										
2A Group A	Bituminous Pavement, 950 m Contractor: Mr. Kazi Md. Ish	05/03/84	05/06/84	30/04/85	732,253	942,383	942,584	942,580	757,647	Work on all projects was completed in a satisfactory manner. Progress pace very slow due to heavy rains and other factors
2B Group B	Bituminous Pavement, 970 m Contractor: M/S Eastern Boring Construction	05/03/84	05/06/84	12/02/85	728,636	947,659	945,076	945,075	759,651	
2C Group C	Bituminous Pavement Contractor: Mr. Muckleshur Rahman	05/03/84	05/06/84	07/03/85	670,673	844,840	795,722	795,722	530,087	
2D Group D	Bituminous Pavement, 391 m Contractor: Messrs. Zahirul/Exramul Haque	05/03/84 15/02/85	05/06/84 15/03/85	— 15/03/85	676,548 183,331	234,794 -	234,794 179,698	234,794 179,898	188,727 144,602	Contract canceled for unreasonable delay. New contractor to complete work. Completion delayed for poor performance
2E Group E	Bituminous Pavement, 738 m Contractor: M/S Raihan Construction	05/03/84	05/06/84	29/05/85	666,308	-	703,339	703,339	535,578	
2F Group F	Bituminous Pavement, 822 m Contractor: M/S Zakaria Khan	05/03/84	05/06/84	12/07/85	727,772	-	810,138	810,138	584,983	Completion delayed by frequent work interruptions
KAMDIA - GHORAGHAT ROAD										
4A Group A	HBB, 910 m Contractor: Mr. Amjad Ali	25/11/84	31/12/84	25/03/85	533,500	-	528,364	528,364	424,699	Work on all projects finally completed in an acceptable manner, but work progress rate was very slow due mainly to lack of planning and unseasonable rains
4B Group B	HBB, 760 m Contractor: Mr. Motlebur Rahman	05/03/84	05/06/84	05/03/85	337,048	-	335,438	335,438	269,625	
4C Group C	HBB, 760 m Contractor: Mr. Amjad Ali	05/03/84	05/06/84	20/02/85	333,830	-	333,365	333,365	267,959	
4D Group D	HBB, 910 m Contractor: Mr. Kazemuddin Ahmed	18/12/84	31/01/85	30/05/85	550,000	599,500	599,502	599,502	442,096	
Rangpur District (1984 - 1985 Projects)										
GAIBANDHA - NALDANGA ROAD										
B - 1	RCC Bridge, 6.1 m Contractor: Mr. Shamsul Huq	10/12/84	10/02/85	10/08/85	281,300	-	248,884	248,884	131,660	Work on this project completed in a satisfactory manner

Exhibit XXIV - FINAL STATUS OF ZRMIP ROAD IMPROVEMENT PROJECTS, BY DISTRICT AND BY FISCAL YEAR

Contract Identification		Starting Date (Scheduled)	Completion Date		Contract Cost (Tk)			Claim As Received (Tk)	Recommended Reimbursement* (Tk)	Remarks
Number	Description		Scheduled	Actual	Original	Revised	Actual			
B - 3	RCC Bridge, 6.1 m Contractor: Mr. Anwarul Azim	07/01/85	07/04/85	09/07/85	371,724	-	278,340	278,340	147,242	Work on this project completed in a satisfactory manner
GAIBANDHA - SAGHATA ROAD										
B - 2	RCC Bridge, 4.55 m Contractor: Mr. Ranjit Bakshi	07/01/85	07/04/85	31/05/85	202,686	-	186,620	173,615	91,842	Payment of final bill has not yet been made for lack of funds
CHAPERHAT - KALIGANJ ROAD										
C - 5	RCC Bridge, 3.03 m Contractor: Mr. Mofazzel Hossain	07/01/85	07/03/85	11/07/85	140,000	-	115,037	115,037	60,854	Completed in a satisfactory manner, but completion delayed
BAMANDANGA - SUNDARGANJ ROAD										
C - 6	RCC Box Culvert, 3.03 m, Saitentola Contractor: Mr. AKM Kashem	07/01/85	07/03/85	31/05/85	146,090	-	148,095	148,095	77,282	Project completed completed satisfactorily
KAMDIA - GHORAGHAT ROAD										
Group 4(b)A	Bituminous Pavement, 780 m Contractor: Mr. Mahbub Elahi	07/01/85	07/04/85	—	750,375	-	-	335,506	177,482	Finalized at 77 percent completion. R.A. bill payment not made because of a lack of funds
Group 4(b)B	Bituminous Pavement, 780 m Contractor: M/S Padma Enterprises	07/01/85	07/04/85	—	750,375	-	-	171,546	90,748	
Group 4(b)C	Bituminous Pavement, 780 m Contractor: M/S United Enterprise	07/01/85	07/04/85	13/10/85	748,418	-	659,436**	641,647	339,431	Final bill being processed. **Tentative cost according to advice from the XEN
Group 4(b)D	Bituminous Pavement, 780 m Contractor: Mr. Abdullah Al Mahmud	07/01/85	07/04/85	—/12/85	750,375	-	750,375**	639,672	338,387	
Group 4(a)A	Bituminous Pavement, 538 m Contractor: Mr. Kazimuddin Sarker	07/01/85	07/04/85	15/10/85	663,165	-	663,105	663,105	350,782	Work delayed by poor weather and other factors, but both both projects completed satisfactorily
Group 4(a)B	Bituminous Pavement, 538 m Contractor: Mr. AKM Showkat Ali	07/01/85	07/04/85	16/10/85	663,167	-	659,171	659,171	348,701	
Group 4(a)C	Bituminous Pavement, 538 m Contractor: Mr. Amjad Ali	07/01/85	07/04/85	27/07/85	663,167	-	661,198	661,198	349,773	Work completed in a satisfactory manner
RAJARHAT - ULLAGHATA ROAD										
B - 5	RCC Bridge, 24.4 m, Deulia Beel	—	—	—	-	-	-	-	-	Project dropped
B - 6	RCC Bridge, 14.2 m, Baddayar Bazar	—	—	—	-	-	-	-	-	Project dropped
B - 7	RCC Bridge, 14.2 m, Panghat	—	—	—	-	-	-	-	-	Project dropped
BARODARGA - BHENDABARI ROAD										
Group 2(a)A	Bituminous Pavement, 500 m Contractor: M/S National Construction	07/01/85	07/04/85	25/04/85	610,196	-	603,775	603,774	319,397	Both projects completed in a timely and satisfactory manner
Group 2(a)B	Bituminous Pavement, 500 m Contractor: Mr. Ekramul Haque	07/01/85	07/04/85	27/05/85	621,262	-	610,782	610,782	323,104	

Exhibit XXIV - FINAL STATUS OF ZRMIP ROAD IMPROVEMENT PROJECTS, BY DISTRICT AND BY FISCAL YEAR

Contract Identification		Starting Date	Completion Date		Contract Cost (Tk)			Claim As Received	Recommended Reimbursement*	Remarks
Number	Description	(Scheduled)	Scheduled	Actual	Original	Revised	Actual	(Tk)	(Tk)	
Group 2(a)C	Bituminous Pavement, 500 m Contractor: Mr. Mucklesur Rahman	07/01/85	07/04/85	20/10/85	594,170	-	593,353	593,353	290,571	All projects completed in a satifactory way, but only one project was completed in a timely manner. The other three suffered over-runs due mainly to adverse weather, poor scheduling, and bad planning
Group 2(b)A	Bituminous Pavement, 474 m Contractor: Mr. Shamsul Haque	07/01/85	07/04/85	30/10/85	627,535	-	628,373	628,373	331,966	
Group 2(b)B	Bituminous Pavement, 474 m Contractor: M/S Eastern Builders	07/01/85	07/04/85	22/05/85	612,063	-	596,872	596,872	315,744	
Group 2(b)C	Bituminous Pavement, 474 m Contractor: Mr. Ataullah Khan	28/01/85	20/04/85	15/10/85	623,709	-	609,285	609,284	322,312	
C - 1	RCC Box Culvert, 2.4 m Contractor: Mr. A. Hamid	10/12/84	10/02/85	25/06/85	110,952	-	85,527	85,527	45,243	All projects completed in a satisfactory way, but only the bridge slab in a timely manner. All culverts had poor progress rates because of site flooding and other delaying factors
C - 2	RCC Slab, 3.96 m, Gurjipara Contractor: Mr. A. Hamid	10/12/84	10/02/85	20/03/85	66,750	-	59,713	59,713	31,588	
C - 3	Pipe Culvert, 1.2 m Dia., Mile 2 Contractor: Mr. Rezaul Hasan	10/12/84	10/02/85	30/06/85	36,902	-	25,482	25,482	12,605	
C - 7	RCC Box Culvert, 3.04 m, Mile 1 Contractor: Mr. A. Salam/Force Account	07/01/85	07/03/85	31/07/85	126,140	-	125,202	125,202	66,232	
B - 4	RCC Bridge, 10.2 m, Sharifpur	—	—	—	-	-	-	-	-	Project dropped
A & B	Lifting HBB Contractor: Mr. Atiar Rahman	30/10/84 30/10/84	30/11/84 30/11/84	30/11/84 30/11/84	31,310 31,310	- -	31,309 21,608	31,310 21,608	16,563 11,431	Contracts completed satisfactorily
GAIBANDHA - KAMARJANI ROAD										
Group 1A	Bituminous Pavement, 526 m Contractor: Mr. MN Nabi Lalu	07/01/85	07/04/85	—	460,000	-	132,270	132,269	69,970	Work Order canceled for lack of progress
Group 1B	Bituminous Pavement, 576 m Contractor: Mr. Tapash Kumar Sarker	28/01/85	20/04/85	15/07/85	459,840	-	440,517	440,517	233,033	Work completed in a satisfactory manner
C - 4	RCC Bridge, 3.04 m, Dariapur Contractor: Mr. Jalal Uddin	10/12/84	10/02/85	—	161,500	-	93,172	93,172	49,288	Work Order canceled for lack of progress
B - 8	RCC Bridge, 20.4 m, Kumarpara	—	—	—	-	-	-	-	-	Project dropped
MIRGANJ - JALDHAKA ROAD										
Group 3A	Bituminous Pavement, 670 m Contractor: Mr. Yakub Ali	07/01/85	07/04/85	15/05/85	566,426	-	562,131	562,130	297,366	All projects completed in a satisfactory manner and within a reasonable time limit
Group 3B	Bituminous Pavement, 670 m Contractor: Mr. Shamsul Haque	07/01/85	07/04/85	15/05/85	633,600	-	650,530	650,530	344,130	
Group 3C	Bituminous Pavement, 670 m Contractor: Mr. Atiar Rahman	07/01/85	07/04/85	07/04/85	615,472	-	636,448	636,448	325,585	

* From Project Assistance Funds

Exhibit XXIV - FINAL STATUS OF ZRMIP ROAD IMPROVEMENT PROJECTS, BY DISTRICT AND BY FISCAL YEAR

Contract Identification		Starting Date (Scheduled)	Completion Date		Contract Cost (Tk)			Claim As Received (Tk)	Recommended Reimbursement* (Tk)	Remarks
Number	Description		Scheduled	Actual	Original	Revised	Actual			
Faridpur District (1982 - 1983 Projects)										
MADHUKHALI - BALIAKANDI ROAD										
1 Group A	Bituminous Pavement, 1.98 km Contractor: Mr. Kh. Nazmul Hossain & Co.	30/05/83	31/08/83	20/07/84	1,506,600	-	1,639,717	1,639,717	1,203,716	Work was completed in a satisfactory manner on all projects, but the time over-runs were almost 400 percent for all projects, due principally to delays caused by bad weather
2 Group B	Bituminous Pavement, 900 m (Revised) Contractor: Mr. Kh. Nazmul Hossain & Co.	30/05/83	31/08/83	10/08/84	1,590,300	824,213	823,861	823,861	604,796	
3 Group C	Bituminous Pavement, 1.61 km Contractor: Mr. Rashid & Sons	30/05/83	31/08/83	06/08/84	1,615,242	-	1,665,357	1,665,357	1,222,539	
4 Group D	Bituminous Pavement, 1.61 km Contractor: Mr. Al Masud Maqsudul Haque	30/05/83	31/08/83	14/08/84	1,648,450	-	1,687,263	1,687,263	1,238,620	
TAKERHAT - SIBCHAR ROAD										
5 Group C	RCC Pipe Culvert, 0.91 m Diameter Contractor: Mr. AKM Zafrul Islam	10/05/83	25/06/83	23/06/83	28,761	-	27,655	27,655	20,302	All projects were completed in a satisfactory and timely manner
6 Group D	RCC Pipe Culvert, 0.91 m Diameter Contractor: Mr. Mejbaur Rahman	15/05/83	30/06/83	23/06/83	28,671	-	27,630	27,630	20,283	
7 Group B	RCC Pipe Culvert, 0.91 m Diameter Contractor: Mr. AKM Zafrul Islam	10/05/83	25/06/83	23/06/83	28,800	-	27,664	27,664	20,308	
8 Group A	RCC Pipe Culvert, 0.91 m Diameter Contractor: Mr. AKM Zafrul Islam	10/05/83	25/06/83	23/06/83	28,800	-	27,774	27,774	20,389	
9 Group E	RCC Pipe Culvert, 0.91 m Diameter Contractor: Mr. Majbaur Rahman	10/05/83	25/06/83	23/06/83	28,800	-	27,689	27,689	20,326	
10 Group G	RCC Pipe Culvert, 0.91 m Diameter Contractor: Mr. AKM Zafrul Islam	10/05/83	25/06/83	23/06/83	28,800	-	27,757	27,757	20,376	
11 Group F	RCC Pipe Culvert, 0.91 m Diameter Contractor: Mr. AKM Zafrul Islam	10/05/83	25/06/83	23/06/83	28,800	-	27,759	27,759	20,378	
MATKRISHNAPUR - SADARPUR - PIAJKHALI ROAD										
12	RCC Pipe Culvert, 0.91 m Diameter, 2 nos. Contractor: Mr. AKM Zafrul Islam	10/05/83	25/06/83	23/06/83	54,000	-	53,721	53,721	39,437	All projects were completed in a satisfactory and timely manner
13	RCC Pipe Culvert, 0.91 m Diameter 2 nos. Contractor: Mr. AKM Zafrul Islam	10/05/83	25/06/83	20/06/83	54,000	-	52,646	52,646	38,647	
14	RCC Pipe Culvert, 0.91 m Diameter 2 nos. Contractor: Mr. AKM Zafrul Islam	10/05/83	25/05/83	26/06/83	54,000	-	53,081	53,081	38,967	
BADARPUR - SALTHA ROAD										
15 Group A	Bituminous Pavement, 2.2 km	31/07/83	31/10/83	24/06/84	1,826,282	-	1,935,027	1,935,027	1,420,503	Work completed in a satisfactory manner

* From Project Assistance Funds

Exhibit XXIV - FINAL STATUS OF ZRMIP ROAD IMPROVEMENT PROJECTS, BY DISTRICT AND BY FISCAL YEAR

Contract Identification		Starting Date (Scheduled)	Completion Date		Contract Cost (Tk)			Claim As Received (Tk)	Recommended Reimbursement* (Tk)	Remarks
Number	Description		Scheduled	Actual	Original	Revised	Actual			
Faridpur District (1983 - 1984 Projects)										
MAIMUKHALI - BALIAKANDI ROAD										
1A Group E	Bituminous Pavement, 1.61 km Contractor: M/S Jahangir and Co.	26/01/84	26/05/84	10/09/84	1,684,825	-	1,703,533	1,703,533	1,581,901	All projects were finally completed in a satisfactory manner. Early lack of quality control and later a shortage of bituminous material both contributed to delays and consequent time over-runs
1B Group F	Bituminous Pavement, 1.61 km Contractor: Mr. Atiar Rahman	26/01/84	26/05/84	10/10/84	1,684,825	-	1,734,607	1,734,607	1,610,756	
1C Group G	Bituminous Pavement, 1.61 km Contractor: Mr. Kazi Eradat Ali	22/01/84	22/05/84	20/12/84	1,684,825	-	1,725,059	1,730,564	1,605,427	
1D Group H	Bituminous Pavement, 1.61 km Contractor: M/S Mir Akhter Hossain & Co.	27/01/84	27/05/84	27/10/84	1,662,124	1,701,295	1,701,295	1,702,779	1,579,651	
1E Group I	Bituminous Pavement, 1.61 km Contractor: M/S MN Co.	10/01/84	19/05/84	14/11/84	1,684,825	1,712,775	1,712,775	1,714,279	1,590,310	
1F Group J	Bituminous Pavement, 1.05 km Contractor: Mr. Shaidul Haque	01/02/84	01/06/84	30/12/84	1,215,715	-	1,137,583	1,137,583	1,056,246	
BADARPUR - SALTHA ROAD										
2A Group B	Bituminous Pavement, 1.04 km Contractor: M/S Ghose Brothers	12/02/84	20/06/84	31/07/84	1,379,590	-	1,099,891	1,099,891	1,021,359	Both projects completed in a satisfactory manner and within reasonable time limits
2B Group C	Bituminous Pavement, 1.04 km Contractor: Mr. A. Karim Mish	18/02/84	26/06/84	15/08/84	1,218,106	-	1,008,838	1,008,838	936,807	
HATKRISHNAPUR - SADARPUR - PIAJKHALI ROAD										
3A ZRMIP/01/83-84 Group A	HBB, 2.3 km Contractor: M/S AF Construction	06/06/84	04/09/84	30/12/84	1,135,200	398,365	367,693	399,191	370,638	Contract canceled and earnest money forfeited. New contract let for the balance
	Mr. Mir Akhter Hossain & Co.				1,114,729	-	1,090,830	1,092,312	1,012,727	
3B ZRMIP/10/83-84 Group D	HBB, 1.1 km Contractor: Mr. Firoj Mish	06/04/84	05/07/84	15/06/84	545,700	-	548,595	548,595	509,371	Both projects were completed in a satisfactory and timely manner
3C ZRMIP/13/83-84 Group E	HBB, 2.8 km Contractor: Mr. Enayet Hossain	06/04/84	05/07/84	25/06/84	1,501,500	-	1,343,725	1,343,725	1,247,514	
Faridpur District (1984 - 1985 Projects)										
TALMA - HATKRISHNAPUR ROAD										
01 ZRMIP/05/84-85 Group A	Bituminous Pavement, 1.6 km Contractor: Mr. A. Rahim Mia	14/12/84	12/06/85	20/07/85	1,818,114	-	1,847,131	1,850,032	1,569,323	All projects completed in a satisfactory manner and within reasonable time limits
02 ZRMIP/06/84-85 Group B	Bituminous Pavement, 1.6 km Contractor: M/S Mir Akhter Hossain & Co.	13/12/84	11/06/85	29/06/85	1,633,024	-	1,817,045	1,817,045	1,543,761	
03 ZRMIP/07/84-85 Group C	Bituminous Pavement, 1.6 km Contractor: Mr. Kh Enayet Hossain	13/12/84	11/06/85	01/07/85	1,645,590	1,711,811	1,711,811	1,713,307	1,454,355	
04 ZRMIP/08/84-85 Group D	Bituminous Pavement, 1.24 km Contractor: M/S Mir Akhter Hossain & Co.	21/12/84	19/06/85	11/07/85	1,298,460	-	1,341,454	1,341,454	1,139,699	

* From Project Assistance Funds

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Contract Identification		Starting Date (Scheduled)	Completion Date		Contract Cost (Tk)			Claim As Received (Tk)	Recommended Reimbursement* (Tk)	Remarks
Number	Description		Scheduled	Actual	Original	Revised	Actual			
HATKRISHNAPUR - SADARPUR ROAD										
05 ZRMIP/10/84-85	HBB, 3.6 km Contractor: Mr. A. Karim Mia	01/02/85	14/06/85	20/05/85	2,755,614		2,576,145	2,580,316	2,188,693	Both projects completed in a satisfactory manner and within reasonable time limits
06 ZRMIP/11/84-85	HBB, 3.6 km (Revised) Contractor: M/S Mir Akhtar Hossain Ltd.	02/02/85	14/06/85	03/06/85	1,400,394	2,800,788	2,617,464	2,617,464	2,223,800	
07 ZRMIP/26/84-85	RCC Bridge, 9.1 m, Taltola	—	—	—	-	-	-	-	-	Project dropped
08 ZRMIP/50/84-85	RCC Bridge, 9.1 m, Matakchar Contractor: M/S Mir Akhter Hossain & Co.	30/03/85	31/07/85	31/03/86	864,880	1,032,000	963,127	963,127	818,272	Project delayed by high water
09 ZRMIP/25/84-85	RCC Bridge, 12.1 m, Majumdar Contractor: Mr. Atias Rahman	—	25/03/85	31/07/86	-	1,179,140	1,156,033	1,156,033	-	Project revived, claim received 09/86
10 ZRMIP/50/84-85	RCC Bridge, 9.1 m, Khaigo Contractor: M/S SS Construction	15/12/84	30/06/85	31/12/85	564,604	609,000	585,004	585,004	497,020	Project completed in a satisfactory manner
MADHUKHALI - BALIAKANDI ROAD										
11 ZRMIP/01/84-85	Bituminous Pavement, 1.6 km Contractor: Mr. Atiar Rehman	13/12/84	11/06/85	24/02/85	1,400,398	-	1,329,523	1,340,469	1,129,563	Both projects completed in a satisfactory manner and within the given time limits
12 ZRMIP/02/84-85	Bituminous Pavement, 1.4 km Contractor: M/S MN and Co.	13/12/84	11/06/85	04/06/85	1,169,735	1,474,487	1,384,040	1,400,966	1,175,880	
BALIAKANDI - RAJBARI ROAD										
13 ZRMIP/14/84-85 Group 1	Bituminous Pavement, 1.6 km Contractor: M/S Kh Hazmul Hossain & Co.	14/12/84	12/06/85	30/06/85	2,035,185	2,059,517	2,059,517	2,061,068	1,749,766	All projects were completed in a satisfactory manner and within reasonable time limits. There were some delays due to a lack of a road roller
14 ZRMIP/15/84-85 Group 2	Bituminous Pavement, 1.6 km Contractor: Mr. Taser Ali Bepari	15/12/84	13/06/85	08/06/85	1,741,350	1,722,735	1,722,735	1,724,225	1,463,635	
15 ZRMIP/16/84-85 Group 3	Bituminous Pavement, 1.6 km Contractor: M/S Ghose Brothers	15/12/84	13/06/85	28/05/85	1,613,765	1,617,144	1,617,144	1,618,615	1,373,926	
16 ZRMIP/17/84-85 Group 4	Bituminous Pavement, 1.6 km Contractor: Mr. Kazi Eradat Ali	13/12/84	11/06/85	20/08/85	1,826,280	1,835,000	1,829,155	1,830,408	1,551,608	
17 ZRMIP/18/84-85 Group 5	Bituminous Pavement, 1.6 km Contractor: Mr. Kazi Eradat Ali	14/12/84	12/06/85	03/11/85	2,035,185	-	2,026,307	2,027,620	1,722,666	
18 ZRMIP/19/84-85 Group 6	Bituminous Pavement, 1.6 km Contractor: Md. Akbar Ali	14/12/84	12/06/85	26/04/85	1,699,550	1,875,997	1,875,997	1,877,429	1,593,847	
19 ZRMIP/20/84-85 Group 7	Bituminous Pavement, 540 m Contractor: Mr. NK Mukharjee	15/12/84	13/06/85	16/06/85	557,802	580,922	580,922	582,594	493,552	
20 ZRMIP/21/84-85 Group 8	Bituminous Pavement, 1.4 Contractor: Mr. NK Mukharjee	14/12/84	12/06/85	07/06/85	705,878	-	704,014	705,294	598,130	
21 ZRMIP/22/84-85	Bridge Approach, Horai Bridge Contractor: Mr. SM Endadul Hoque	14/12/84	14/03/85	30/04/85	669,940	-	543,305	543,305	461,592	All work completed in a satisfactory and two within reasonable time limits. Third suffered delays due to lack of suitable borrow material
22 ZRMIP/23/84-85	Bridge Approach, Matiapara Bridge Contractor: Mr. SM Endadul Hoque	14/12/84	14/03/85	30/04/85	290,130	-	220,983	220,983	187,748	
23 ZRMIP/24/84-85	Approach Spans, Bangram Bridge (Revised) Contractor: Mr. A. Bari Miah	23/12/84	22/04/85	31/12/85	885,000	1,332,400	1,378,145	1,378,145	1,170,872	

* From Project Assistance Funds

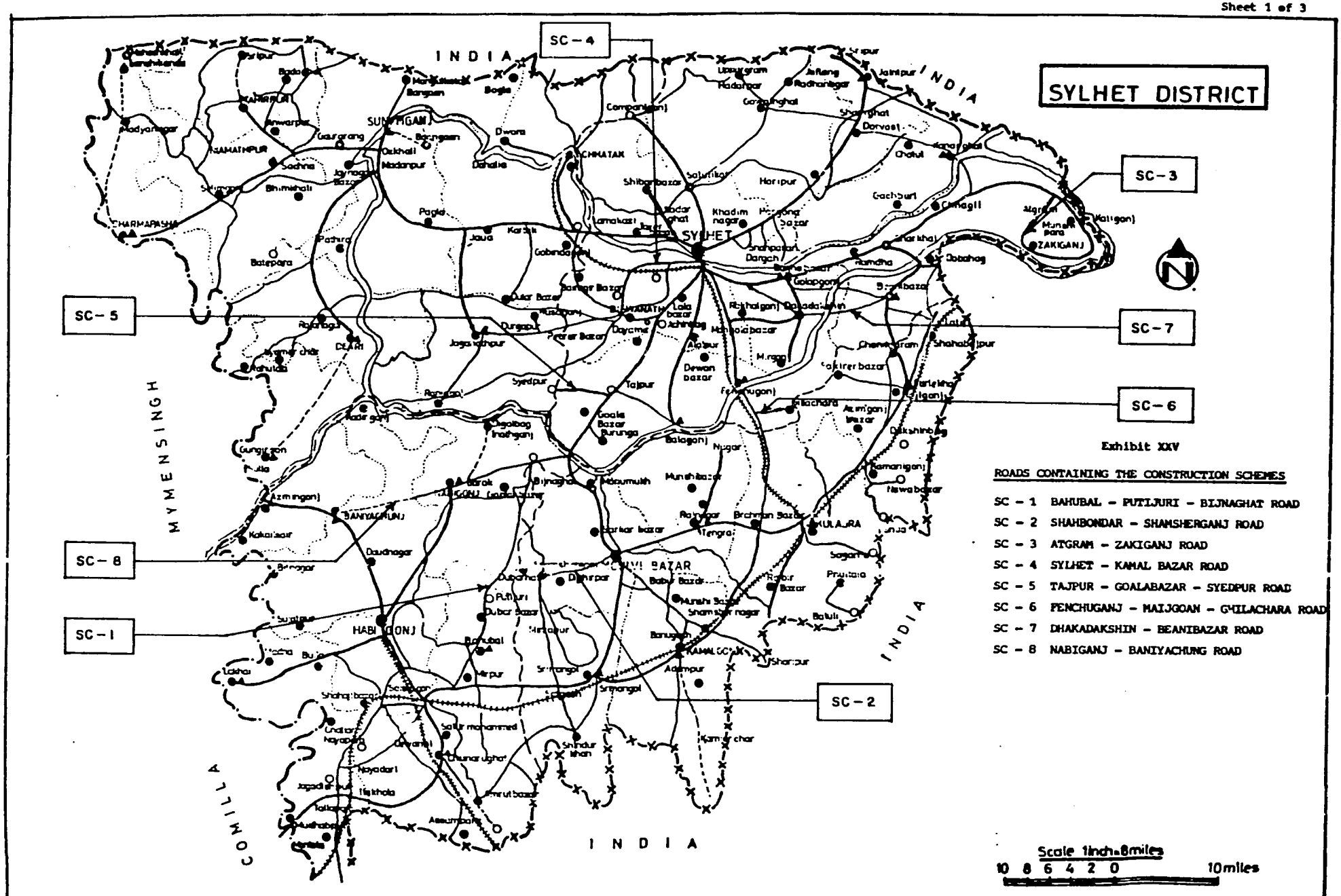

Exhibit XXV

ROADS CONTAINING THE CONSTRUCTION SCHEMES

SC - 1 BAHUBAL - PUTIJURI - BIJNAGHAT ROAD
SC - 2 SHAHBONDAR - SHAMSHERGANJ ROAD
SC - 3 ATGRAM - ZAKIGANJ ROAD
SC - 4 SYLHET - KAMAL BAZAR ROAD
SC - 5 TAJPUR - GOALABAZAR - SYEDPUR ROAD
SC - 6 PENCHUGANJ - MAIJGOAN - GHILACHARA ROAD
SC - 7 DHAKADAKSHIN - BEANIBAZAR ROAD
SC - 8 NABIGANJ - BANIYACHUNG ROAD

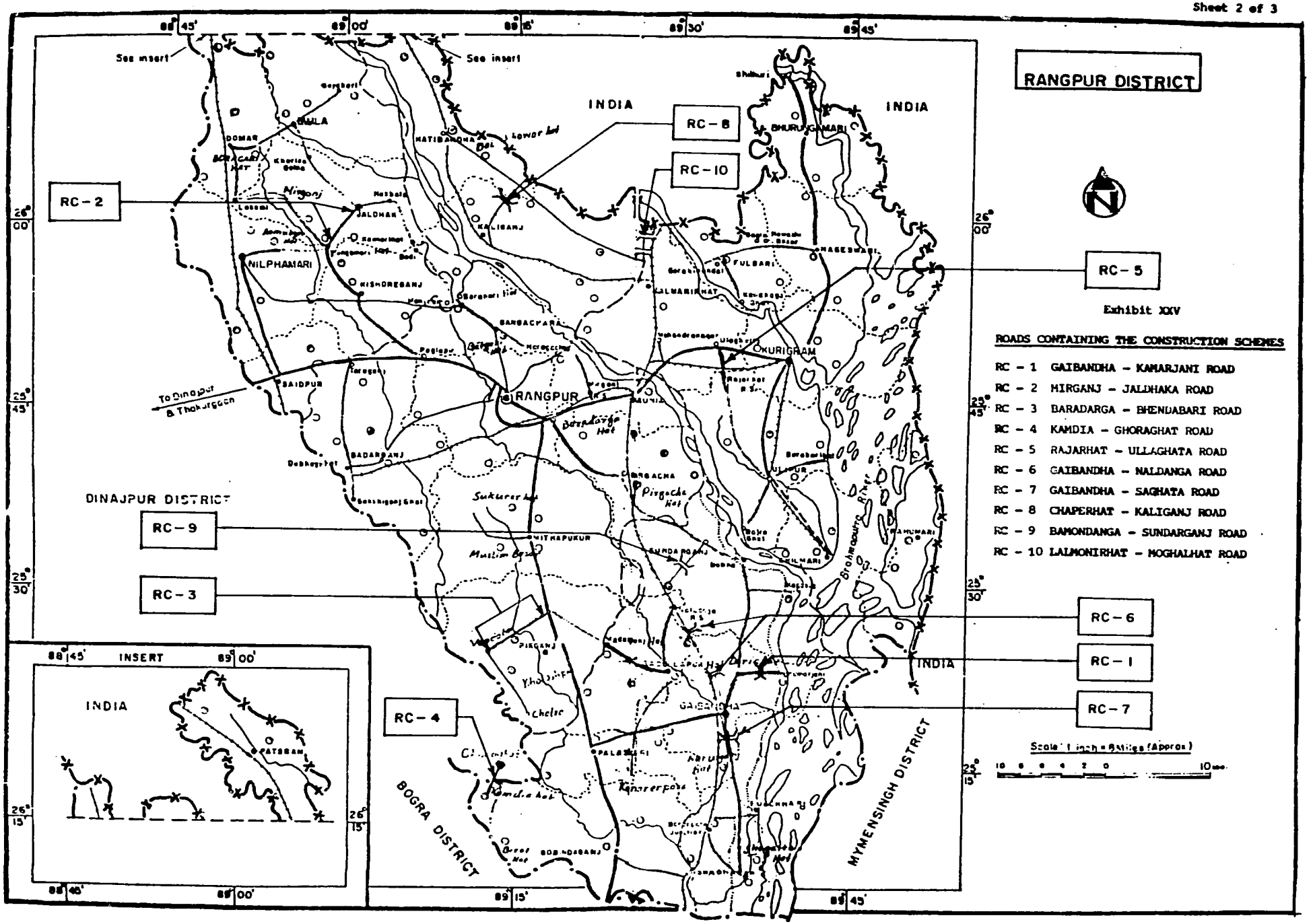

Exhibit XXV

ROADS CONTAINING THE CONSTRUCTION SCHEMES

RC - 1 GAIBANDHA - KAMARJANI ROAD
RC - 2 MIRGANJ - JALDHAKA ROAD
RC - 3 BARADARGA - BHENDABARI ROAD
RC - 4 KAMDIA - GHORAGHAT ROAD
RC - 5 RAJARHAT - ULLAGHATA ROAD
RC - 6 GAIBANDHA - NALDANGA ROAD
RC - 7 GAIBANDHA - SAGHATA ROAD
RC - 8 CHAPERHAT - KALIGANJ ROAD
RC - 9 BAMONDANGA - SUNDARGANJ ROAD
RC - 10 LALMONIRHAT - MOGHALHAT ROAD

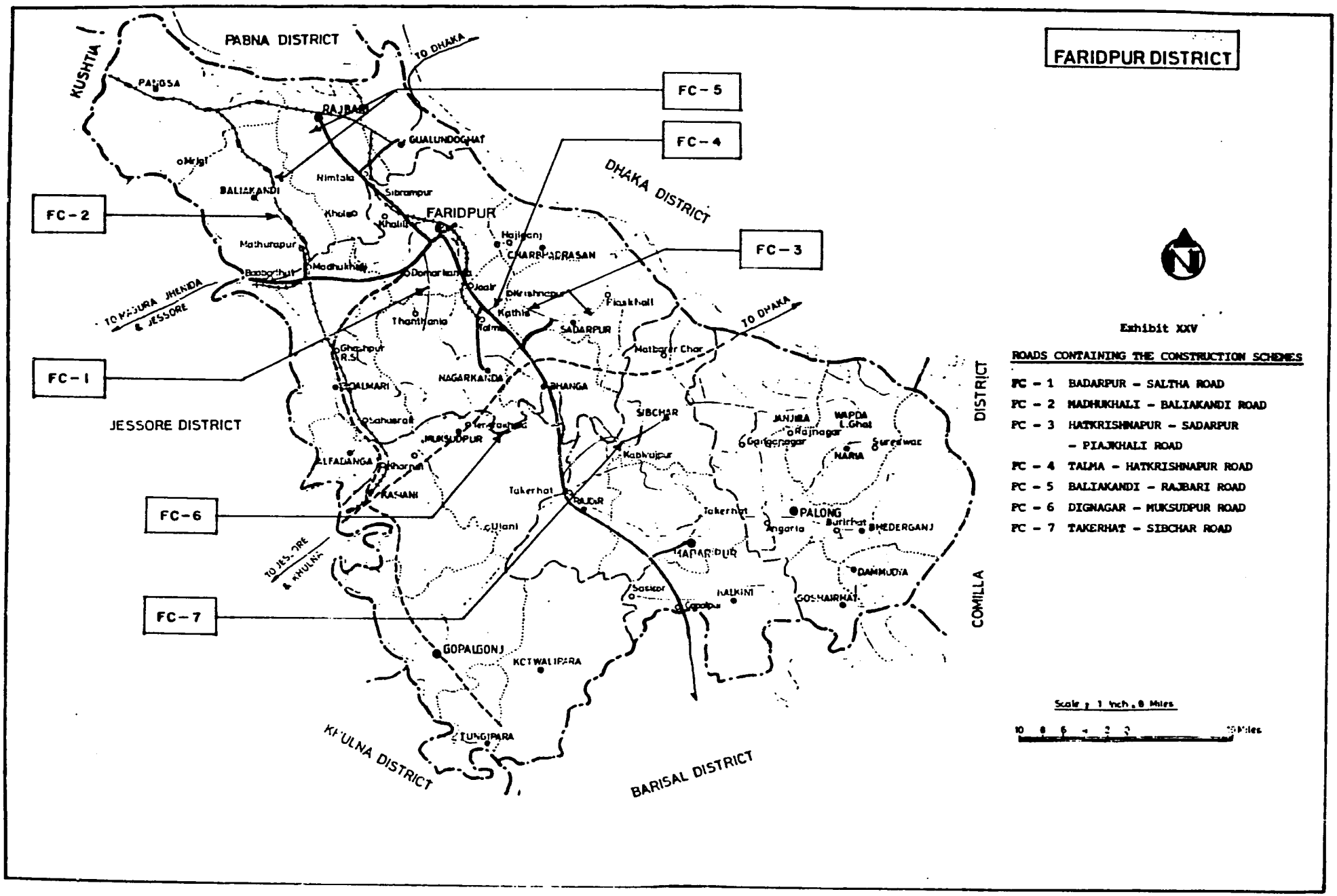

Exhibit XXV

ROADS CONTAINING THE CONSTRUCTION SCHEMES

FC - 1 BADARPUR - SALTHA ROAD
FC - 2 MADHUKHALI - BALIAKANDI ROAD
FC - 3 HATKRISHNAPUR - SADARPUR - PIAJKHALI ROAD
FC - 4 TALMA - HATKRISHNAPUR ROAD
FC - 5 BALIAKANDI - RAJBARI ROAD
FC - 6 DIGNAGAR - MUKSUDPUR ROAD
FC - 7 TAKERHAT - SIBCHAR ROAD

Exhibit XXVI - COMPILATION OF WORK PERFORMED BY DISTRICT, FISCAL YEAR, AND CATEGORY

District Fiscal Year Work Activity	Bituminous Pavement Projects	Total Length (km)	H.B.B. Surfacing Projects	Total Length (km)	Leveling Course Projects	Total Length (km)	Earth Work Projects	Total Length (km)	Box Culverts (No)	Pipe Culverts (No)	R.C.C. Bridges (No)	Bridge Decks (No)	Bridge Approaches (No)	Bridge Approach Spans (No)	Retaining Walls (No)
SYLHET DISTRICT															
F.Y. 1982 - 1983															
Road Improvement	6	8.04	-	-	-	-	1	1.20	-	-	-	-	-	-	-
Drainage Structures	-	-	-	-	-	-	-	-	6	23	-	-	-	-	-
F.Y. 1983 - 1984															
Road Improvement	4	4.85	-	-	2	7.58	2	5.25	-	-	-	-	-	-	-
Drainage Structures	-	-	-	-	-	-	-	-	19	10	-	-	-	-	-
F.Y. 1984 - 1985															
Road Improvement	2	2.42	-	-	3	7.90	1	2.80	-	-	-	-	-	-	-
Drainage Structures	-	-	-	-	-	-	-	-	22	15	1	8	-	-	1
Sub-Total, Sylhet	12	15.31	-	-	5	15.48	4	9.25	47	48	1	8	-	-	1
RANGPUR DISTRICT															
F.Y. 1982 - 1983	Note : There were also two (2) afforestation projects this fiscal year.														
Road Improvement	11	4.50	11	10.27	-	-	-	-	-	-	-	-	-	-	-
Drainage Structures	-	-	-	-		-	-	-	-	1	-	-	-	-	-
F.Y. 1983 - 1984															
Road Improvement	13	9.82	4	3.34	-	-	-	-	-	-	-	-	-	-	-
Drainage Structures	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F.Y. 1984 - 1985															
Road Improvement	18	10.76	1	77	-	-	-	-	-	-	-	-	-	-	-
Drainage Structures	-	-	-	-	-	-	-	-	3	1	4	1	-	-	-
Sub-Total, Rangpur	42	25.08	16	13.61	-	-	-	-	3	1	4	1	-	-	-
FARIDPUR DISTRICT															
F.Y. 1982 - 1983															
Road Improvement	5	8.30	-	-	-	-	-	-	-	-	-	-	-	-	-
Drainage Structures	-	-	-	-	-	-	-	-	-	10	-	-	-	-	-
F.Y. 1983 - 1984															
Road Improvement	8	11.18	3	6.20	-	-	-	-	-	-	-	-	-	-	-
Drainage Structures	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
F.Y. 1984 - 1985															
Road Improvement	16	20.58	2	7.20	-	-	-	-	-	-	-	-	-	-	-
Drainage Structures	-	-	-	-	-	-	-	-	-	-	2	-	2	1	-
Sub-Total, Faridpur	29	40.06	5	13.40	-	-	-	-	-	10	2	-	2	1	-
Total, All Districts	83	80.45	21	27.01	5	15.48	4	9.25	50	59	7	9	2	1	1

that only one structure of the five could be certified for reimbursement. However, the balance of the 48 projects were all completed in a satisfactory manner, although somewhat behind schedule.

As can be seen from the remarks on Exhibit XXIV, there were many reasons for the delays in completion of the projects -- heavy rainfall and flooding (especially in 1983), poor planning (both on the part of WPW and the contractor), shortage of road roller equipment, and poor contractor performance. Unseasonal rainfall and subsequent flooding are happenings over which there is no control, and little can be done about them except to acknowledge that such possibilities do exist and make plans for alternate actions to minimize their adverse effects should such happenings actually occur. Failure to do this is part of the poor planning on the part of both parties. Perhaps the greatest reflection of poor planning on the part of WPW was the unrealistic time limits placed in the contracts. Failure of the contractor to stockpile acceptable materials in anticipation of his requirements was one of the indicators of poor planning on the part of the contractor. Failure to properly clean up job sites at the completion of the work (thereby delaying approval for the final payment) was another instance of poor contractor planning. The shortage of road roller equipment was alleviated by WPW by shifting such equipment from other rural road projects to the ZRMI Projects. With the arrival of the rollers procured under this project, the shortage of equipment will be relieved for either the road improvement projects, or the road maintenance projects, but there was not enough ordered to completely alleviate the problem for both elements.

However, it should be noted that delays in completion of the projects showed a significant improvement from 1982-1983 through 1984-1985. In FY 1982-1983, the average overrun for 15 projects was 6.3 months. For FY 1983-1984, the average time overrun for 16 projects had dropped to 4.5 months, and by FY 1984-1985, the average overrun for 18 projects had dropped to 3.7 months. It is reasonable to state that this increase in performance level was due principally to the positive influence of the ZRMI Project.

2) Rangpur District

Rangpur also has a high rainfall, and its feeder road problems are further complicated by the annual flooding of the Tista River and the Jamuna River. In fact, from the point of view of the three project districts, the percentage possibility of flooding is higher in Rangpur than in Sylhet, but lower than in Faridpur. Rangpur has more of a pronounced wet and dry season than the other two districts, and the high winds experienced during the dry season will actually cause wind erosion damage to newly completed earthwork composed of the cohesionless silty soils found in many places in this district.

During the three fiscal years of this project, there were a total of 80 projects undertaken by the Rangpur District, of which 60 were road improvement projects, 3 were afforestation projects, and 17 were drainage structure projects. Subsequently, 4 drainage, 2 road improvement and 1 afforestation project were dropped for a variety of reasons, leaving a total of 73 completed projects. All were completed in a satisfactory manner, although greatly behind schedule, especially in the first two years.

A perusal of Exhibit XXIV reveals that there were again several reasons for delays in the completion of the projects -- heavy rainfall and flooding, poor planning on the part of both the WPW and the contractor, and poor contractor performance. Unrealistic time limits and unit costs imposed by WPW in Rangpur were particular examples of poor planning. On the contractors' side, failure to provide acceptable materials at the job site on a timely schedule was again an indication of poor planning on the part of the contractors. One development worthy of note in the Rangpur saga was that district's inclination to undertake more work than it could accomplish with its available resources, which is another indication of poor planning. Of course, the rather negative relationship that existed between the XEN and the RE for the first two years did not help to improve the situation. As will be seen, once the RE was replaced, the situation began to show some improvement.

A brief analysis of the data presented in Exhibit XXIV shows that Rangpur also enjoyed an improvement in the performance level, but it was not a steady improvement as displayed by both Sylhet and Faridpur Districts. In FY 1982-1983, the average overrun for 26 projects was 8.3 months. For FY 1983-1984, the average time overrun actually increased to 8.9 months for 16 projects. It is felt that this drop in performance level reflects the negative relationship that existed between the XEN and the RE. During FY 1984-1985, a new RE was assigned to Rangpur, and the performance level improved to an average time overrun of 3.1 months for 25 projects. As with Sylhet, a great deal of the credit for this demonstrated improvement in performance must go to the efforts of all connected with the ZRMI Project.

3) Faridpur District

The Faridpur District is also located in a high rainfall area, and its feeder road problems are also complicated by annual flooding, perhaps more so than either of the two other project districts. Flooding and its effects on roads and drainage structures is more complex in Faridpur because it involves not only over-bank flooding from the Ganges/Padma complex that forms the district's eastern boundary, but also flooding from the backwater effect of the many tributaries and braids in this deltaic river system. In addition to the drainage problems inherent in the physical environment of Faridpur, there are many problems in this district in connection with the use of available soil as an engineering material. Since Faridpur is located in a river delta system, the soils are principally unconsolidated recent alluvium composed of fine silty clays and clays, both of which present problems in stability and consolidation when used as road construction materials.

During the three fiscal years of this project, the Faridpur District undertook a total of 49 projects, of which 31 were road improvement projects and 18 were drainage structure projects. Of the drainage structure projects, 2 were subsequently dropped. The balance of the projects were completed in a satisfactory manner and, in the last two years, within reasonable time limits. In this district, there was more evidence of punitive

action being taken, or threatened, against the contractors for non-performance of contract. This was probably one of the factors that accounted for a better performance level by the contractors than in either of the other two districts.

Again with reference to Exhibit XXIV, it can be seen that there were also delays in project completion, some foreseeable and some not. For instance, the same elements of delays due to heavy rainfall and flooding, poor planning, and poor workmanship are still present. However, a new cause for delay appeared in this district, and that was a shortage of bituminous material. This was a very real shortage responsible for cumulative delays of as much as two months. Perhaps it could be said that good planning would have prevented such a shortage, but great volumes of material can not be stockpiled in advance if there are no funds to pay for them, nor adequate areas to store them once the materials have been procured. Again there were some delays due to lack of road rollers. The same comments made for this problem in Sylhet apply to Faridpur as well. An observation of the Faridpur experience, that is worthy of mention here, is the fact that the Faridpur program was notable for the following policies, all of which contributed to their comparably better performance:

- The number of projects undertaken annually by Faridpur was compatible with that district's available resources for managing and supervising such projects,
- Individual projects were sized larger with fewer participating contractors, thereby giving each contractor a larger contract. This greater concentration of contractors resulted in fewer problems in supervision and quality control, and
- Following the change of RE's at the end of the first year, there was excellent rapport between the RE and XEN.

A scrutiny of the data in Exhibit XXIV shows that Faridpur also improved its performance level over the three years of the project life. In FY 1982-1983, the average overrun for 15 projects was 3.7 months. For FY 1983-1984, a slight improvement was shown with an average time overrun of 3.5

months for 11 projects. In 1984-1985, for a total of 21 active projects, the average time overrun was only 1.1 months, which confirms some of the preceding statements.

4) General Remarks

As was stated in the section on road maintenance, it is not the intention of this report to rank the three districts according to their accomplishment, nor to incite a competition among the three. In the first place, this report covers only the work accomplished by each district within the parameters established by the ZRMI Project. There is no way of knowing the accomplishments of each district under other rural development programs. However, because one of the goals of the ZRMI Project is to institutionalize systems of rural roads maintenance and improvement procedures, and one of the available means of measuring such progress is improvement in construction performance levels and other observable elements of construction monitoring, comments concerning the relative achievements of each district are in order.

In view of the information presented in Exhibit XXV and Exhibit XXVI, and the evaluations just presented, it is only logical to conclude that the Faridpur District has shown that best overall record in completion of road improvement projects and appurtenant drainage structures. Sylhet District would be considered as a reasonably close second, while Rangpur would end up in third place.

However, the important consideration at this point in time is, "what lessons have been learned from the experience of the first three years of the ZRMI Project, particularly with regard to feeder road improvement?". In this respect, the following observations are presented:

- In the next phase of this project, each district (or whatever the administrative unit may be called) would do well to not undertake more projects than it is prepared to handle.

- Since compaction equipment will probably still be in short supply, road projects should be planned to make the most efficient use to that equipment which will be available; i.e., hold equipment transfers to a minimum and then to the shortest possible distances.

- Again, vis-a-vis the shortage of compaction equipment, drainage structures can be built as part of a staged road improvement program, whether they be new structures, or replacement of old ones.

- Based on past performances of local contractors, project construction time limits should be reevaluated and reasonable time limitations specified for the different construction projects.

- Once reasonable time limits for given construction tasks have been established, then enforcement procedures should be tightened to require the contractor to complete his job within the time specified. Failing this, the existing penalty provisions should be more stringently applied.

- All concerned with the contractor payment procedure should be well versed in the regulations (both BDG and USAID) so that there will be no unnecessary delays due to non-payment of contractor.

- Unit costs for materials should be sufficiently flexible to encourage the contractors to procure quality materials that will meet specification, rather than be forced to buy substandard materials simply because allowable unit prices are too low.

- Training efforts in project management should be intensified and the scope enlarged to include training in the preparation of sequence of events charts. Such charts would be of great assistance in project scheduling and monitoring.

b. Cost of the Projects

The basic agreement for funding the road improvement projects of the ZRMI Project was that BDG would allocate 30 percent of the funds required, while USAID would allocate 70 percent. It was acknowledged that the first year the BDG contribution would probably be less and the USAID contribution would be more. However, in each succeeding year the proportions would be altered until the agreed upon proportions had been attained. In actual practice, this was not attained until the third year.

Table XXI is a tabulation of road improvement fund allocations by source, district, and by year. Here it can be seen that annually the proportions varied from district to district, and that the average for FY 1982-1983 was actually 40 percent for BDG and 60 percent for USAID. By FY 1984-1985, the average proportion was about at the agreed level -- 31 percent for BDG and 69 percent for USAID. This resulted in an overall average for the three years of the Project of 31 percent for BDG and 69 percent for USAID.

It is interesting to note that, while Faridpur received by far the most money over the three-year period (Tk 52,904,000 out of a total of Tk 116,014,000), and built the most bituminous pavement (40.06 km out of a total of 80.45 km), the unit cost for bituminous pavement in Faridpur was not the lowest. Sylhet had the lowest unit cost for bituminous pavement at about Tk 674,600 per kilometer, the unit cost for bituminous pavement in Rangpur was about Tk 915,000 per kilometer, while Faridpur had the highest unit cost for bituminous pavement at Tk 985,800 per kilometer. It is not known for sure if this difference in cost between Sylhet and the other two district is due to material costs, but it is assumed that this is at least an important factor.

c. Quality Control

The construction of road improvement and drainage structure projects, and some maintenance projects, is guided and controlled by specifications for all aspects of the work, including acceptable characteristics of the materials to be used in the construction. Therefore, access to a materials testing laboratory is essential to both determine that materials to be used on the project do indeed meet specifications, as well as to monitor the contraction work in progress to determine that other elements of the specifications are being met.

At the outset of the ZRMI Project, the decision was made to establish a testing laboratory in each of the three district headquarters and provide each of them with the equipment required to perform basic material

TABLE XXI - ROAD IMPROVEMENT FUND ALLOCATIONS BY SOURCE, DISTRICT, AND YEAR

FISCAL YEAR	ANNUAL ALLOCATION (Tk)			PERCENTAGE (%)		
DISTRICT	BDG	USAID*	Total	BDG	USAID	Total
1982-1983						
Sylhet	4,214,000	4,400,000	8,614,000	48.92	51.08	100.00
Rangpur	4,144,000	4,000,000	8,144,000	50.88	49.12	100.00
Faridpur	3,042,000	8,400,000	11,442,000	26.59	73.41	100.00
Sub-Total	11,400,000	16,800,000	28,200,000	40	60	100
1983-1984						
Sylhet	1,990,000	8,100,000	10,090,000	19.72	80.28	100.00
Rangpur	1,880,000	7,700,000	9,580,000	19.62	80.38	100.00
Faridpur	1,250,000	16,200,000	17,450,000	7.16	92.84	100.00
Sub-Total	5,120,000	32,000,000	37,120,000	15	85	100
1984-1985						
Sylhet	5,750,000	9,400,000	15,150,000	37.95	62.05	100.00
Rangpur	5,432,000	6,100,000	11,532,000	47.10	52.90	100.00
Faridpur	3,612,000	20,400,000	24,012,000	15.04	84.96	100.00
Sub-Total	14,794,000	35,900,000	50,694,000	31	69	100
ALL YEARS (TOTAL)						
Sylhet	11,954,000	21,900,000	33,854,000	35	65	100
Rangpur	11,456,000	17,800,000	29,256,000	39	61	100
Faridpur	7,904,000	45,000,000	52,904,000	15	85	100
TOTAL	31,314,000	84,700,000	116,014,000	28	72	100

* USAID Project Implementation Letter (PIL) Numbers:

F.Y. 1982-1983 -- PIL No. 07, dated 02/03/83, Tk 16,800,000
F.Y. 1983-1984 -- PIL No. 12, dated 13/09/84, Tk 32,000,000
F.Y. 1984-1985 -- PIL No. 14, dated 04/02/85, Tk 35,900,000

Total USAID Allocations Tk 84,700,000

tes' s. More sophisticated tests, which would be required less frequently, would be performed in the central materials testing laboratory in Dhaka. This decision not only adequately solved the quality control problem, but also provided an excellent vehicle for on-the-job training. As an additional benefit, participants in the more formalized training programs were thus provided with a laboratory for practicing the basic soil tests presented in the materials testing module.

Table XXII is a compilation of the soil and material tests performed at each of the three district material testing laboratories and at the central testing laboratory in Dhaka. The fundamental tests, such as the grain-size analysis, specific gravity, and Atterberg Limits, which are used basically to identify soil types, predominate, as might be expected. However, since the soils available for use as engineering materials in all three districts are quite uniform in their distribution, once identified in the laboratory, can be easily identified in the field with a few simple tests. This partially accounts for the relatively small number of tests conducted over a three-year period. Other factors limiting the volume of output from the field laboratories include:

- The concept of available material testing facilities at the district level was a new one and it requires time for the technical personnel at that level, and lower, to become convinced that such facilities are really available for their use.
- The personnel provided by the Project for each laboratory was a minimum level -- one soils technician, who was often in the field collecting samples or performing in-situ tests, and one laboratory technician, who spent full time in the laboratory.
- Facilities for drying soil samples for moisture content determination were limited, so that large number of samples could not be handled at one time even if all other restraints were removed.

In any event, the conclusion must be drawn that the soils and material testing laboratories were highly successful. The recommendation for the next phase is that steps be taken to alleviate the constraints just discussed so that use of these facilities will become a common-place event in future planning and management of rural road improvement and maintenance projects.

TABLE XXII - MATERIAL TESTS PERFORMED IN ZRMI PROJECT LABORATORIES

DESCRIPTION	LOCATION OF LABORATORY				TOTAL
	Sylhet District	Rangpur District	Faridpur District	Dhaka City	
SOIL TESTS					
Grain-Size Analysis (Sieve/Hydrometer)	65	80	19	66	230
Specific Gravity	28	70	28	55	181
Atterberg Limits	10	47	4	12	73
Field Density	50	37	26	14	127
Proctor Compaction					
Modified	51	3	18	22	94
Standard	—	29	58	—	87
California Bearing Ratio (CBR)					
Unsoaked	33	17	40	17	107
Soaked	6	12	10	9	37
Unconfined Compression	—	—	—	6	6
Triaxial Compression	—	—	—	5	5
Consolidation	—	—	—	2	2
SAND AND GRAVEL TESTS					
Fineness Modulus (Sand)	51	91	134	6	282
Gradation (Pea Gravel)	1	30	—	—	31
BRICK AND STONE TESTS					
Gradation (Crushed Stone/Broken Brick)	—	27	—	—	27
Brick					
Size	—	16	—	—	16
Water Absorption	—	16	—	—	16
CONCRETE TESTING					
Compression Test to Failure	72	6	40	26	144
In-Situ Strength Testing (Concrete Test Hammer)	—	4	—	—	4
BITUMINOUS MATERIALS TESTS					
Penetration	—	—	—	24	24
Softening Point	—	—	—	20	20
Specific Gravity	—	—	—	18	18

F. PREPARATION OF TECHNICAL SPECIFICATIONS AND DESIGN MANUALS

1. General

The Inception Report took the position that these activities would be oriented principally around the road improvement/construction process. However, as previously stated, any measure to improve construction procedures and techniques will be reflected in a subsequent reduction in maintenance requirements. It was felt that the best means to achieve these goals would be the introduction of standardized designs, improved construction techniques, and quality control procedures.

It was proposed that this would be done in two stages or phases. In Phase I, the Consultant would prepare preliminary design and specification manuals early in 1983 so that they would be ready for trial in the 1983-1984 construction season. How these manuals were received and the results obtained from their use would be observed and noted by the Consultant. In Phase II, the Consultant would utilize the experience thus obtained to review the two manuals and make any indicated changes in either or both of them. Aspects of the construction and maintenance processes which would receive particular attention included:

- Drainage
  - + Surface and Subsurface
  - + Lateral and Cross
  - + Local and Basin
- Earth Compaction
  - + New Embankments
  - + Existing Embankments
  - + Backfills and Side Slopes
- All-Weather Surfacing
  - + Asphalt Surface Treatments
  - + Hot or Cold Applications
- Access Aprons
  - + Approaches to New Roads
  - + Approaches to Existing Roads

- Drainage Structures
  + Bridges
  + Culverts
  + Retaining Walls

- Quality Control
  + Field Procedures
  + Laboratory Procedures

2. Phase I

a. Design Manual

Design and Construction Manual for ZRMI Project was submitted by Lawrence, WSA, in June 1983. It was first subjected to an in-house review by all concerned before it was released to other interested parties. The manual was ready for general distribution by October 1983 (in time for the 1983-1984 construction season). In essence, the manual covered the design of a typical pavement recommended for physical and social environment in Bangladesh, material and construction specifications for maintaining and improving the existing roads of the recommended design, and quality control procedures during construction.

In many respects, the manual was well-received, but there were also many recommendations for changes and improvements. These were all taken under consideration when the manual revisions were undertaken in Phase II.

b. Specifications Manual

A companion to the manual just described was the Specifications and Construction Manual, which was submitted by Wong, WSA, in July 1983. This manual was also subjected to an in-house review prior to release to other interested parties. The manual was ready for general distribution by October 1983 (also in time for the 1983-1984 construction season). The first half of the manual covered specifications for the construction of feeder-type roads, while the second half was a construction manual which concentrated on the

identification, sampling, testing, and use of soil as a construction material. There were also many suggestions for changes and improvements in the first half, but the second half was generally accepted. This was as might be expected, as the first half touched upon subjects that would involve changes in prevailing practices, while the second half was limited to internationally accepted standards for soil sampling and testing. In any case, all suggestions for improvement and/or changes were considered during the revision process of Phase II.

c. Mechanical Analyses of Soils Manual

Perhaps one indication of the acceptance of the second half of the manual just discussed was the request for the same specialist to prepare a manual for mechanical analyses of soils. This manual, Standard Methods of Mechanical Analysis of Soils, prepared by Wong, WSA, was submitted in July 1983. Copies were distributed to all Project soil testing laboratories and it was used to supplement the Soil Sampling and Testing Manual prepared for the training sessions.

3. Phase II

a. Design Manual

Road Construction Manual was submitted by Lugenbeel, WSA, in final form in June 1985. The work on this revised form of the design manual had been started in December 1983, and resumed in February 1985. It was considered that this was the final form of the design manual and no further revisions were contemplated. The revision was a much more comprehensive work than the original work, and it found much better acceptance. A section on the use and fabrication of gabions for erosion control was included, which added to its usefulness.

b. Specifications Manual

Standard Specifications for Road Construction was submitted by Lugenbeel, WSA, in final form in June 1985. The work on this revised form of the specifications manual had also been started in December 1983, and resumed in February 1985. It was considered that this was the final form of the specifications manual and no further revisions were contemplated. This revision was a much more comprehensive work than the original, and it too found much better acceptance. The section on soil surveying, which had been included in the original manual, was deleted and included in a separate manual (as will be discussed subsequently). The inclusion of sections on the different types of asphalts and their uses and on slope protection added to the usefulness of the manual.

c. Soil Survey Manual

Soils Survey Manual was submitted by Lugenbeal, WSA, in final form in June 1985. As with the two previously discussed manuals, this was considered to be the final form of the soil survey manual and no further revisions were contemplated. The soil survey manual, as a separate document, was much more useful than having the same information included within a manual on construction techniques.

4. Bridge Design

The Terms of Reference of the Contract included provisions for the review of the design and construction techniques for concrete bridges and culverts as currently practiced in Bangladesh. This responsibility was handled in different ways in the three Project districts, to wit:

a. Faridpur District

In this Project district, a third-party local consultant, Rahman and Associates, Ltd., was hired to execute the actual design work. These designs were reviewed by WSA, and in June 1984, WSA issued its report,

"Review of Design of 16 Bridges Under Zila Parishad, Faridpur." This review included general observations on assumed loading, design of superstructure, design of substructure, siting, and specific observations for each of the 16 bridges.

b. Sylhet and Rangpur Districts

For these two Project districts, WSA performed the actual design of the drainage structures, with finished plans being issued in December 1984 and January 1985. Completed works included the following structures:

- Sylhet District
  + Dhakadakshin - Beanibazar Road, Radhajuri River
  + Dhakadakshin - Beanibazar Road, Lula River
  + Tajpur - Syedpur Road, Nayabandar River

- Rangpur District
  + Rajarhat - Ullaghatta Road, Deulia Bil
  + Rajarhat - Ullaghatta Road, Baddayar Bazar
  + Rajarhat - Ullaghatta Road, Pangahat
  + Gaibandha - Kamarjani Road, Kumarpara
  + Baradarga - Venderbari Road, Sharifpur

G. PROCUREMENT OF EQUIPMENT

1. General

The Consultant's responsibilities for equipment procurement were of two separate and distinct categories; that is, equipment procured with funds provided in the Technical Assistance element of the Project, and equipment procured with funds provided in the Equipment Procurement element. For the first category, the Consultant obtained and evaluated bids, awarded and paid for supply contracts, and was then reimbursed from Contract funds. For the second category, the Consultant acted as procurement agent; i.e., prepared a list of recommended equipment and the RFQ's for proposals, evaluated bids and made recommendations to LGEB for selection of the successful bidder, assisted in arranging contracts between the selected supplier and BDG and in the preparation of documents for BCom's issued by USAID, arranged for marine or air transportation to Bangladesh, assisted LGEB in port-of-entry clearance formalities, and arranged for overland transportation to the three district headquarters, or to Dhaka, as warranted by conditions.

The procedures followed to acquire equipment/supplies/materials required for the ZRMI Project can also be categorized in the following manner:

- International (Offshore) Procurement and
- Local (Domestic) Procurement.

All costs in connection with those items procured internationally were usually paid in US dollars, but there were some exceptions where costs were paid in currency of the supplying country and then converted to US dollars. Costs for those items procured locally were paid in local currency and then converted to US dollars at the exchange rate prevailing at that time.

Equipment/supplies/materials procured for this Project can also be classified according to source of authorization and available fund to defray costs of acquisition. The several sources of authorization and concomitant funds were as follows:

• Project Grant Agreement, PIL 19 (Amended)	US$	674,299
• Contract, Table 6 - Allowances, and Sub-Tables (Amendment 6)	US$ Tk	549,332 2,872,775
• Contract, Table 8 - Equipment, Materials/ Supplies, Vehicles, and Sub-Tables (Amendment 6)	US$ Tk	83,095 4,238,690
• Contract, Table 9 - Special Equipment and Sub-Tables (Amendment 6)	US$ Tk	117,740 48,989
• Contract, Table 10 - Training (Amendment 6)	US$ Tk	164,082 1,036,429

In general, equipment/materials/supplies procured directly by the Consultant were obtained in an orderly and timely manner. Unfortunately, the same cannot be said of the equipment procured with Project funds. The major part of the heavy equipment required for road and structure work was procured with PIL 19 funds under international procurement procedures. The many difficulties and obstacles encountered are discussed in more detail in the following section.

2. Project Grant Agreement, PIL 19 (Amended)

a. Background

As stated in the Inception Report, the Consultant's Maintenance Equipment Specialist would prepare a report covering the following features associated with rural road maintenance and improvement:

- An evaluation of existing repair shop facilities and equipment in each of the three Project districts,
- An evaluation of existing road construction and repair equipment available in each district for use in the ZRMI Project,
- The preparation of a recommended list of equipment, along with relevant specifications, for procurement by the Project, and
- The preparation of a list of spare parts needed to effectively service and maintain the recommended equipment in an operating condition for a period of three years.

b. The Report

Maintenance Equipment Report, Zarifian, WSA, May 1983. This report formed the basis for the Consultant's subsequent recommendations concerning equipment procurement for road maintenance and improvement operations. A resume of the report's findings concerning the four principal features just outlined follows.

1) Existing Facilities

All of the three Project districts contract the repairs of their road maintenance equipment to private workshops. Faridpur also contracts the lubrication of their equipment to local service shops, while Rangpur and Sylhet require the driver or operator to lubricate their assigned equipment. Except for preventive maintenance procedures, the Consultants recommend that the practice of contracting equipment repairs to private workshops be continued for the following reasons:

- The Project districts do not have the shop structures, facilities, workshop equipment, hand tools, or the technical personnel to repair their equipment by force-account methods.
- The total items of "serviceable" equipment in the Project districts, plus the number of additional units recommended, do not warrant or justify the expenditures needed to establish and equip three "in-service" equipment maintenance shops.
- Although contract repairs of equipment are not cost effective, it is a practice that helps the local economy and encourages technical growth and concepts in agricultural areas.

2) Existing Equipment Available for Use

An inventory of available road maintenance and improvement equipment in the three districts was disheartening to say the least — 6 out of 9 static weight rollers were deadlined for repairs, or were obsolete, 4 out of 5 of the flatbed trucks were obsolete, and 6 out of 8 concrete mixers

were obsolete. The detailed results of the inventory are shown in Table XXIII. Minor pieces of equipment, such as motorcycles and concrete vibrators were reported to be in good condition. However, an inspection revealed that some 35 percent of the motorcycles required major overhaul or replacement. On the other hand, the concrete vibrators, which were 1980 models, were in such good condition that they must not have been used very much.

3) Recommended List of Equipment and Relevant Specifications

The first list of equipment recommended by the Consultant is shown in Table XXIV. Relevant specifications were included for all units of equipment. This list of equipment was redacted to provide maximum utilization of Project equipment at minimum cost, and the number of units recommended was based on the proposed road maintenance and improvement schemes and equipment requirements in the three districts.

The size and capacities of the equipment recommended was based on a consideration of the following factors:

- Road maintenance and improvement operations in Bangladesh are labor-intensive oriented,
- The characteristics of the materials available for road maintenance and improvement in the three Project Districts,
- Performance requirements of the equipment to meet projected road maintenance standards, and
- A desire to obtain equipment having the same general characteristics as those equipment items currently in the road maintenance and improvement fleet, and which have performed efficiently and effectively in the past.

4) Recommended List of Spare Parts

As mentioned previously, the recommended list of spare parts for each item of equipment was based on the amount estimated to maintain the equipment in good running condition for three years. For some of the categories of equipment, the cost of the spare parts was about 20 percent of

Table XXIII - INVENTORY OF EXISTING EQUIPMENT

Description of Equipment	District	Operating	Deadlined	Obsolete
Roller, 3-Wheel, 8 - 10 Ton	Faridpur	1	-	1
	Rangpur	1	-	3
	Sylhet	1	1	1
	Percentages	33	11	56
Truck, Flatbed, 5 Ton	Faridpur	-	-	1
	Rangpur	-	-	2
	Sylhet	1	-	1
	Percentages	20	-	80
Concrete Mixers, 5 - 7 and 8 - 10 cft	Faridpur	1	-	2
	Rangpur	-	-	4
	Sylhet	1	-	-
	Percentages	25	-	75

Table XXIV - ORIGINAL LIST OF RECOMMENDED EQUIPMENT

Description of Equipment	Number Recommended
Roller, 3-Wheel, 8 - 10 Ton	6
Truck, Flatbed, 4x2, 30,000 GVW	4
Truck, Pickup, 4x4, 6,000 GVW	4
Concrete Vibrator, 10,000 to 12,000 VPM	9
Plate Compactor, Vibrator, 5,000 Pound Impact Force	6
Trailer, Tile Type, 32,000 Capacity at 30 MPH	3
Mechanics Tool Set, Inch and Metric Sizes	3
Shop Equipment and Tool Set	3
Field Librication Equipment, Manually Operated	3
Concrete Mixer, Portable, 7/10 Cubic Feet	6
Water Tank, Trailer-Mounted, 350 Gallon Capacity	6
Water Pump, Portable, 40 Foot Head	3
Motorcycle, Minimum 96 cc	18

NOTE: List submitted 01/06/83

the estimated FOB cost of the equipment, while for others, the cost was as low as 10 percent. It was stipulated that all spare parts must accompany the equipment when shipped.

c. The Procurement Process

In subsequent negotiations, the original recommended equipment list was revised somewhat, and it was decided that some of the items could be procured locally. In any event, the original intent was to have all equipment on hand for the 1983-1984 construction season (see USAID Letter No. 89, dated 22/01/84), but in fact the major part of the heavy equipment did not arrive in Bangladesh until August 1986. A brief review of the many decisions and counter-decisions that took place quickly reveals the reasons for this unfortunate state of affairs.

1) At the end of May 1983, the Consultant submitted the original recommended list of equipment to be procured.

2) By Memo No. DCE/M-33/83/24, dated 03/08/83, WPW (later LGEB) suggested that the flatbed trucks should be no larger than 15000 GVW, that the tilt trailers and field lubrication equipment should be deleted, and that the balance of the list reflected the needs of the Project Districts.

3) By WSA/01/216, dated 18/08/83, the Consultant submitted a revised equipment list and cost estimate per instructions in 2).

4) By Memo No. DCE/M-33/83/131, dated 11/12/83, WPW instructs the Consultant to proceed with the procurement of equipment as recommended in 3).

5) By WSA/01/304, dated 19/01/84, the Consultant advised that 3-wheel rollers are no longer manufactured in the USA, and recommended that WPW approve procurement of 2-wheel roller, which is available in the USA.

6) By AID Letter No. 89, dated 22/01/84, USAID advised WPW of approval to use informal competitive procurement practices for the equipment listed in 3), except for the change of roller as recommended in 5) and the deletion of the baby taxi item.

7) By Memo NO. DCE/M-33/83/42, dated 25/01/84, WPW rejects the recommendation for a two-wheel roller and requests Consultant to obtain waiver for purchase of 3-wheel roller in a third country.

8) By Memo No. DCE/M-33/83/48, dated 29/01/84, WPW advised USAID that BDG procurement regulations cannot be bypassed as suggested in 6, and instructs the Consultant to proceed as advised in 4).

9) By AID Letter No. 398, dated 14/03/84, USAID responded to 8) and advised WPW that informal procurement procedures have been used in other BDG agencies with good success, that a waiver for the roller for countries mentioned by WPW could not be granted, and that further pursuit of such issues would delay the procurement process to the point that the advisability of proceeding at all might be questionable.

10) By Memo No. DCE/M-33/83, dated 09/06/84, WPW instructs the Consultants to proceed with international procurement according to guidelines in 6) and 9).

11) By WSA/01/463, dated 21/07/84, the Consultant advised WPW that certain equipment procurement problems had to be clarified before international procurement could proceed.

12) By AID Letter No. 1137, dated 07/08/84, USAID advised WPW that modifications should be made to the equipment list before procurement could proceed.

13) By WSA/31/574, dated 10/11/84, Consultant discussed the possibility of procuring left-hand drive trucks if waiver for right-hand drive trucks from a code 935 country was not approved.

14) By WSA/31/583, dated 12/11/84, the Consultant advised WPW that only one responsive bid for road rollers was received. As quotes were made on both 6-9 and 8-10 tandem rollers, the Consultant suggested preference for the 6-9 ton rollers.

15) By WSA/31/585, dated 14/11/84, the Consultant advised WPW that a decision on final configuration of the flatbed and pickup trucks is necessary before procurement could be implemented.

16) By Memo No. DCE/M-33/83/433, dated 02/12/84, LGEB (formerly WPW) advised the Consultants to forward analysis for all equipment bids (except trucks) for review.

17) By AID Letter No. 1720, dated 02/12/84, USAID advised BDG officials of their reasoning for informal procurement procedures as recommended in 6).

18) By Memo No. 3-IV/2R-5/83/332(4), dated 20/12/84, BDG requests waiver from USAID to procure right-hand drive trucks from Code 935 countries.

19) By AID Letter 947, dated 05/06/85, USAID issued PIL No. 16 to cover the costs of international procurement of seven items of equipment and local procurement of three items of equipment. Total funds authorized, including contingencies, US$ 594,580. This action was in response to Memo No. S-IV/2R-S/83/86, dated 22/04/85, from the Ministry of Finance, BDG.

20) On 23/06/85, WSA was notified by SAMY Trading Co. that four units of Jeep Pickup Truck CJ-10, right-hand drive, were available for immediate shipment from Houston, Texas, USA. The offer was subject to prior sale unless order was placed immediately.

21) Meanwhile, by Memorandum dated 12/08/85, USAID began the process of approval of waiver for the purchase of right-hand drive pickup trucks from AID Code 935 countries.

22) By AID Letter No. 1351, dated 02/09/85, USAID informed LGEB that because the Jeep Pickups were no longer available USAID had approved the request for waiver to purchase the right-hand drive pickups from AID Code 935 countries. LGEB was requested to instruct the Consultants to proceed with the request for quotes from such suppliers.

23) By Memo No. S-IV/2R-5/85/200, dated 09/09/85, MLG advised USAID of approval of Consultant's recommendation to accept the bid of Vibromax Co. to supply the six road rollers.

24) By AID Letter No. 1471, dated 22/09/85, USAID responded that the Case Vibromax offer could not be accepted because the rollers would be assembled in a country that was not included in AID Code 941 countries. Because Van Lott, Inc., an American firm had submitted an acceptable proposal, a waiver for procurement in AID Code 935 countries could not be granted. USAID concurred with the decision to accept the Van Lott offer as the best, and only, alternative.

25) By AID Letter No. 1587, dated 10/10/85, USAID advised LGEB that approval was granted for the procurement of four flatbed trucks from International Harvester, as recommended by the Consultant.

26) By Memo No. PM(ZRMIP)/M-9/85/457, dated 18/11/85, LGEB notified the Consultants to proceed with the procurement of six units of tandem road rollers from Van Lott, Inc.

27) By Memo No. PM(ZRMIP)/M-9/85/507, dated 08/12/85, LGEB acknowledged receipt of RFQ's for the signing of contracts for the road rollers and the flatbed trucks.

28) By WSA/38/937, dated 05/02/86, the Consultant submitted to LGEB his evaluation of the bids received for the supply of four 4x4 pickup trucks.

29) By AID Letter No. 275, dated 20/02/86, USAID advised LGEB of approval of the waiver to procure diesel powered concrete vibrators and plate compactors for AID Code 935 countries.

30) By Aid Letter No. 301, dated 24/02/86, USAID acknowledged receipt of signed contracts and prepared to issue the Letters of Commitment:

- Letter of Commitment No. 388-005602, US$ 229,692, Van Lott, Inc., for the supply of six road rollers (6-9 ton) under RFQ No. 85-01, LCom dated 02/03/86.
- Letter of Commitment No. 388-005603, US$ 121,844, International Harvester Co., for the supply of four flatbed trucks under RFQ No. 85-03, LCom dated 02/03/86.
- Both LCom No. 388-005602 and LCom No. 388-005603 were subsequently amended (terms and conditions only) on 20/05/86.

31) By WSA/38/976, dated 12/05/896, the Consultant forwarded his evaluation of the bids received for six units plate compactors and nine units concrete vibrators.

32) By Memo No. S-IV/2R-5/83(Part-I)/175/(10), dated 03/06/86, MLG issued the decision to accept National Trading Co.'s bids to supply Japanese-made plate compactors and American-made concrete vibrators, with an alternate choice being NTC's offer of Japanese-made concrete vibrators. All approvals contingent on the availability of funds in PIL 16.

33) By AID Letter No. 867, dated 19/06/86, USAID advised LGEB that the Consultant had reviewed the commitments to PIL 16 and had found that there were sufficient funds remaining to allow the procurement of the plate compactors and concrete vibrators to proceed, and that USAID would issue appropriate LCom's on Request.

34) By WSA/38/1003, dated 28/06/86, the Consultant advised LGEB and USAID that the American-made concrete vibrators contained more than 51 percent non-American-made components, and therefore was ineligible for further consideration. It was recommended that approval be given to procure

the first alternative, which was a Japanese-made, diesel-powered, concrete vibrator.

35) On 10/03/86, USAID issued Letter of Commitment No. 388-0005604, US$ 24,980, Kinsho - Mataichi Corp., for the supply of four pickup trucks under RFQ No. 85-02.

36) On 15/07/86, USAID issued Letter of Commitment No. 388-0005605, US$ 59,149, ARMCO, International, for handling, insurance, and marine transportation of six road rollers and four flatbed trucks from the USA to Bangladesh.

37) In late August 1986, four pick-up trucks arrived in the port of Chittagong, were cleared by local agents, and delivered to the Project.

38) In September 1986, six road rollers and four flatbed trucks arrived in the port of Chittagong, were cleared by local agents, and delivered to the Project.

A thoughtful perusal of the preceding outline of events makes it abundantly clear that when the bureaucratic procurement procedures of two governments are involved, the time span associated with the concurrence and approval process is not merely doubled, rather it is raised to an exponential power. However, a negative experience of this type often results in positive benefits -- principally that LGEB (and the Consultant) have now learned the USAID procurement system so that future international procurement should not be subject to the same delays and obstacles. A tabulation of the current status of all equipment purchased with PIL 16 funds is shown on Table XXV. This tabulation includes equipment items procured locally as well as internationally.

Table XXV - EQUIPMENT PROCUREMENT FOR ZRMI PROJECT (PIL 16)

Equipment Item and Description	Number of Units	Source of Funds	Amount Allocated US$	Amount Allocated BTK	Amount Spent US$	Amount Spent BTK	Comments
1. TANDEM, STATIC WEIGHT ROAD ROLLERS, 6 - 9 Ton	6	PIL 16	222,390	-	229,692	-	LCom 005602 (FOB)
Spare Parts		PIL 16	14,400	-	-	-	No spare parts included in LCom 005602
CIF (Chittagong)		PIL 16	16,200	-	59,149	-	LCom 005605
2. FLATBED TRUCKS, 20,000 lbs. GVW	4	PIL 16	93,800	-	121,844	-	LCom 005603 (FOB)
Spare Parts		PIL 16	18,000	-	-	-	No spare parts included in LCom 005603
CIF (Chittagong)		PIL 16	33,000	-	See Item 1	-	LCom 005605
3. PICK-UP TRUCKS, 6,000 lbs. GVW, 4 x 4	4	PIL 16	30,992	-	24,380	-	LCom 005604 (CIF)
Spare Parts		PIL 16	6,200	-	-	-	No spare parts included in LCom 005604
CIF (Chittagong)		PIL 16	12,800	-	-	-	CIF costs included in the bid
4. PLATE COMPACTORS, 5,000 lb. Impact, Diesel	6	PIL 16	13,800	-	13,512	-	LCom will be prepared after new PA signed
Spare Parts		PIL 16	9,078	-	-	-	Spare Parts included in bid
CIF (Chittagong		PIL 16	1,500	-	-	-	CIF costs included in bid
5. CONCRETE VIBRATORS, 10,000 - 12,000 VPM, Diesel	9	PIL 16	22,923	-	31,585	-	LCom will be prepared after new PA signed
Spare Parts		PIL 16	8,307	-	-	-	Spare parts included in bid
CIF (Chittagong)		PIL 16	1,800	-	1,800	-	CIF costs included in bid
6. MECHANIC'S TOOL SETS	3	PIL 16	2,334)	-		-	(Direct payment and reimbursement to WSA. All
CIF (Chittagong)		PIL 16	450)	-		-	(equipment delivered and on hand in the Consultant's
			)		6,036	-	(storeroom in Dhaka. All equipment will be
7. SHOP EQUIPMENT AND TOOL SETS	3	PIL 16	2,829)	-		-	(distributed when the Project becomes operative
CIF (Chittagong)		PIL 16	450)	-		-	(again.
8. MOTOR CYCLES, Minimum 96 cc	15	PIL 16	16,500	-	-	375,000	P.O. WSA/05/879, 13/11/85, purchased 19/11/85. All units delivered and distributed to the 3 districts.
9. TAR BOILERS, 60 gal	12	PIL 16	9,720	-	-	240,000	W.O. WSA/05/728, 17/07/85, purchased 16/10/85. All units delivered and distributed to the 3 districts.
10. TRAILER-MOUNTED WATER TANKS, 350 gal	3	PIL 16	11,400	-	-	300,000	W.O. WSA/05/727, 17/07/85, purchased 29/09/85. All units delivered and distributed to the 3 districts.
CONTINGENCIES	—	PIL 16	45,707	-	-	-	
Total, Offshore and Domestic Procurement			594,580		488,625	915,000	At US$ 1.00 = BTk 26.80, converts to US$ 34,142
Total Spent					34,142		
					522,767		There remains a total of US$ 61,058 available for other uses. If spare parts for road rollers and flatbed trucks are estimated at US$ 55,000 CIF, and clearing charges at US$ 1,500, then the funds remaining will be enough to cover these requirements.
COMMITTED, PORT CLEARANCE AND INLAND TRANSPORT, ROAD ROLLERS, FLATBED TRUCKS, PICK-UP TRUCKS		PIL 16	-	-	10,755		
Total					533,522		

d. Local Procurement

As mentioned before, the original recommended equipment list was revised somewhat, and it was suggested that some of the items be procured locally. For the equipment items procured locally, the procurement process, while lengthy, did produce results in a reasonable manner. A listing of chronological events bears out this contention.

1) By Memo No. DCE/M-33/83/131, dated 11/12/83, WPW instructed the Consultant to proceed with the procurement of equipment, and to immediately acquire the items which were available locally.

2) By Memo No. DCE/M-33/83/21, dated 12/01/84, WPW again stressed early procurement of equipment items available locally.

3) By WSA/01/308, dated 26/01/84, the Consultants requested clarification of procurement procedures to be followed.

4) By Memo No. DCE/M-02/84/62, dated 06/02/84, WPW provided the Consultant with drawings and cost estimates for the local fabrication of deep soil boring equipment.

5) By WSA/01/323, dated 12/02/84, the Consultant submitted recommendations to WPW for the local procurement of various items of equipment.

6) By Memo No. DCE/M-33/83/75, dated 19/02/84, WPW responded to 5) and requested further clarification.

7) By WSA/01/362, dated 01/04/84, the Consultant responded to 4) and requested approval to purchase three deep soil boring sets our of savings from special equipment.

8) By Memo No. DCE/M-02/84/166, dated 26/04/84, WPW responded to 7) and approved purchase with some preconditions.

9) By AID Letter No. 509, dated 05/04/84, USAID concurs with the purchase of three deep soil boring sets under AID regulations for shelf item procurement.

10) By AID Letter dated 12/03/84, USAID issued PIL No. 9 to cover the cost of local procurement of four items of equipment. Total funds authorized, Tk 2,004,000 (US$ 79,718).

11) Equipment authorized by 10) was procured by the Consultant on the following schedule:

- Motorbikes, 18, PO WSA/10/378 issued 16/04/84, received about the end of May 1984
- Concrete Mixer, Portable, 6, WO WSA/10/390, issued 30/05/84, received about mid-July 1984
- Trailer-Mounted Water Tanks, 350 Gal., 6, WO WSA/31/556, issued 23/10/84, received about the end of January 1985.
- Water Pumps - It was decided to include the hand-operated pumps as an integral part of the trailer-mounted water tanks; therefore, no further procurement action for pumps.

12) By AID Letter dated 30/07/84, USAID issued PIL No. 13 to cover the cost of local procurement of six additional motorcycles. Total funds authorized, Tk 132,000. Procurement by PO WSA/05/508, issued 05/09/84, received about the end of September 1984.

13) By Memo No. DCE/M-33/83/401, dated 04/11/84, LGEB requested the Consultant to expedite procurement of the tar boilers.

14) By AID Letter No. 1648, dated 20/11/84, USAID requested LGEB to supply more details on the tar boilers so that a PIL could be issued.

15) By WSA/31/603, dated 01/12/84, the Consultant, in response to 13), submitted quotations and total cost estimates for 12 tar boilers, 60 gal. each.

16) By WSA/31/709, dated 09/05/85, the Consultant submitted his recommendations for the local procurement of 15 motorcycles, 12 tar boilers, and 3 trailer-mounted water tanks, all to be financed from PIL 16.

17) By Memo No. DCE/M-33/83(Part-II)/85, dated 27/05/85, LGEB informed the Consultant of approval of all recommendations in 16). Equipment was procured by the Consultant on the following schedule:

- Tar Boilers, 60 Gal., 12, PO WSA/05/728, issued 17/07/85, received about mid-October 1985
- Trailer-Mounted Water Tanks, 350 Gal., 3, WO WSA/05/727, issued 17/07/85, received about the end of September 1985
- Motorcycles, 15, PO WSA/05/879, issued 13/11/85, received about the end of November 1985.

e. Miscellaneous

The remaining equipment items authorized under PIL 16 (and part of the original recommended equipment list) were the mechanics tool sets and the shop equipment and tool sets. These items were procured by the WSA home office through competitive bidding procedures, paid directly by WSA, with reimbursement upon presentation of cost vouchers.

With funds remaining from Line Item Table 9, Special Equipment, and with the approval of WPW and concurrence of USAID [see 4), 7), 8), and 9)], the Consultant also procured locally three sets of deep soil boring rigs and three sets of laboratory compaction equipment. These miscellaneous local procurements, along with items procured under PIL 9 and PIL 13, are summarized in Table XXVI.

3. Contract, Table 6 - Allowances and Sub-Tables

Fund allocations contained in Table 6-1 and 6-2 were concerned with household appliances and furnishings. As can be seen from Table XXVII, the major household appliances were procured internationally at a total cost of US$ 37,482. These appliances arrived in April 1983 and were available for

Table XXVI - EQUIPMENT PROCUREMENT FOR ZRMI PROJECT (VARIOUS)

Equipment Item and Description	Number of Units	Source of Funds	Amount Allocated US$	Amount Allocated BTK	Amount Spent US$	Amount Spent BTK	Comments
1. CONCRETE MIXER	6	PIL 9	-	870,000	-	889,200	W.O. WSA/10/390, 30/05/84, purchased 28/07/84 All equipment delivered and distributed.
2. TRAILER-MOUNTED WATER TANKS, 350 gal.	6	PIL 9	-	600,000	-)	562,200	W.O. WSA/31/556, 12/10/84 All equipment itesm delivered and distributed to the 3 districts.
3. WATER PUMPS	3	PIL 9	-	75,000	-)		
4. MOTOR CYCLES, Minimum 96 cc	18	PIL 9	-	459,000	-	528,000	P.O. WSA/10/378, 16/04/84 All equipment delivered distributed.
Total PIL 9				2,004,000		1,979,400	BTk 34,600 (US$ 1,291) available for other uses.
1. MOTOR CYCLE, Minimum 96 cc	6	PIL 13	-	132,000	-	132,000	P.O. WSA/05/508, 05/09/84 All equipment delivered and distributed.
1. DEEP SOIL DRILLING SETS	3	Contract Special Equipment	-	78,132	-	78,132	P.O. WSA/05/445, 26/06/84 All equipment delivered and distributed.
2. COMPACTION EQUIPMENT SETS	3	Contract Special Equipment	-	19,110	-	19,110	All equipment delivered and distributed.
3. JEEPS/SPARE PARTS	6	Contract	83,980	-	83,980	-	International procurement by direct payment and reimbursement to WSA. All units have been delivered and distributed in the 3 districts and the Dhaka office.
CONTINGENCIES	—	PIL 16	45,707	-	-	-	
Total, Offshore and Domestic Procurement			594,580	488,625		915,000	At US$ 1.00 = BTk 26.80, converts to US$ 34,142
				34,142			
Total Spent				522,767			There remains a total of US$ 61,058 available for other uses. If spare parts for road rollers and flatbed trucks are estimated at US$ 55,000 CIF, and clearing charges at US$ 1,500, then the funds remaining will be enough to cover these requirements.
COMMITTED, PORT CLEARANCE AND INLAND TRANSPORT, ROAD ROLLERS, FLATBED TRUCKS, PICK-UP TRUCKS		PIL 16	-	-	10,755		
Total				533,522			

Table XXVII - PROCUREMENT OF HOUSEHOLD APPLIANCES

Equipment and Description	No. of Units	Total Cost (US$)
Air Conditioners, White-Westinghouse	33	14,223
Washing Machine, White-Westinghouse	5	1,745
Refrigerator, White-Westinghouse	8	3,008
Freezer, Chest-Type, White-Westinghouse	5	1,695
Range, 4-Burner, w/Oven and Grill, Gas	8	1,888
Ocean Freight, Insurance, Handling	-	14,923
Water Heater, Gas/Electric	) These items were procurred	
Exhaust Fan	) in local currency,	
Ceiling Fan	) see Table 6-2	
Total Household Applicances		US$ 37,482

* This appliance list refers to Table 6-2, Page B-9 of the Contract.

distribution by the end of May 1983. Table XXVIII indicates that the household furnishings, including some appliances, were procured locally. These items were also ready for distribution in May 1983. There were no problems in connection with the procurement of the items in this category, and they were eventually distributed to the following sites:

- Consultant's Residences in Dhaka - 2
- Consultant's Residence and Guest House in Sylhet - 2
- Consultant's Residence and Guest House in Rangpur - 2
- Consultant's Residence and Guest House in Faridpur - 2

4. Contract, Table 8 - Equipment, Materials/Supplies, Vehicles, and Sub-Tables

The only major items of equipment originally included in this category were six 4x4 field vehicles, one sedan (1200 cc) earmarked for the COP, and one diesel microbus for use by the training group. As shown on Table XXVI, the field vehicles procured were six JEEPs, Model CJ7, 4-wheel drive, diesel engine, right-hand drive, with appropriate parts. An attempt was made to obtain competitive bids, but the Jeep offer was the only US-manufactured vehicle what could meet all the specifications, so there was no choice but to select it. The Jeeps and their spare parts were on hand in June 1983, and were assigned as follows:

- Consultant's Dhaka Office - 2
- Sylhet Field Office - 1
- Rangpur Field Office - 2
- Faridpur Field Office - 1

Later, after the first group of motorcycles became available for field use, one Jeep from the Rangpur Field Office was reassigned to the PM's Office in the WPW (later LGEB) Headquarters in Dhaka.

However, the sedan and microbus authorized under this Contract line item were never procured. There were several reasons why orders for these

Table XXVIII - PROCUREMENT OF HOUSEHOLD FURNISHINGS

Household Furnishings and Description	No. of Units	Total Cost (Tk)
Dining Table	8	14,000
Dining Chair	50	19,690
Sideboard	13	25,890
Drawing Board	3	1,500
Ironing Board	5	2,000
Kitchen Table, Formica Top	8	5,900
Food Cabinet	6	17,200
Kitchen Cabinet	5	4,750
Sofa, 3-Seater	7	58,537
Armchair	12	5,630
Coffee Table	2	1,270
Verandah Chair, Rattan Cane	16	3,755
Side Table, Formica Top	3	600
Single Bed, w/Foam Mattress	14	53,000
Single Bed, w/Coil Mattress	8	16,000
Double Mattress, w/Cover	4	17,756
Double Bed, w/Mattress	3	21,315
Bedside Table, w/One Drawer	23	8,950
Wardrobe, 72" x 42" x 24"	11	44,200
Chest of Drawers, w/Five Drawers	13	31,600
Dressing Table, w/Stool	6	10,700
Writing Table, w/Three Locked Drawers	15	16,200
Chair, Padded Seat, Armless	31	18,400
Water Heater, Gas/Electric	9	73,500
Water Filter	1	1,200
Lamps		3,602
Rugs	14	10,350
Drapes and Other Soft Furnishings		55,832
Ceiling Fans	31	43,400
Crockery and Cutlery		51,207
Miscellaneous Items		10,444
TOTAL HOUSEHOLD FURNISHINGS		Tk 648,364

* This furnishings list refers to Table 6-2, Page B-10 of the Contract.

two vehicles were never placed, but the principal reasons for failure to procure them were as follows:

- Necessary approval for the purchase and import of these vehicles was never obtained from BDG.
- USAID funds could not be used to pay import and other taxes included in the floor price of either of these two vehicles that might have been available for local purchase. A viable substitute solution was never achieved.

It was later decided to procure some locally fabricated field and laboratory deep soil sampling equipment and compaction and density testing equipment with savings from this category. The items procured and their respective total costs are shown on Table XXIX. The equipment procured in this manner was distributed equally among the soil laboratories in each of the three Project districts.

5. Contract, Table 9 - Special Equipment and Sub-Tables

a. Contract Table 9 - 1

This particular category was concerned with office furniture and equipment. As shown on Table XXX, the major part of the office furniture, and some of the equipment, was procured locally. However, an indicated on Table XXXI, the major part of the office equipment was purchased offshore. A large part was obtained in Singapore, and the costs were paid in Singapore dollars. These costs were then converted to US dollars at the conversion rate prevailing at the time of acquisition. Some of the equipment, including drafting equipment, was procured by WSA in the USA. One typewriter was procured locally and the cost paid in Bangladesh Taka. Except for the punching/binding machine and the Olympia Typewriter, all of this equipment was on hand by mid-1983 and was distributed among the Consultant's four offices.

Table XXIX - PROCUREMENT OF SOIL SAMPLING AND TESTING EQUIPMENT

Equipment and Description	No. of Units	Total Cost (Tk)
Compaction Mold, w/Collar	6	5,400
Hammer, Modified Proctor	3	1,800
Hammer, Standard Proctor	3	1,500
Straight-Edge, w/Handle	6	360
Iron Bar, w/Handle	6	600
Mixing Pan, Steel	6	2,700
Tray, Steel	6	1,200
Core Cutter Mold, w/Plate	6	4,800
Spade, w/Handle	3	300
Hammer, for Core Cutter	3	450
Sub-Total		Tk 19,110
Deep Soil Boring Equipment	3	78,132

Using a conversion rate of US$ 1.00 = Tk 24.29 for the compaction equipment, and a rate of US$ 1.00 = TK 25.69 for the deep soil boring equipment, the total expenditure in US dollars is US$ 3,822

* This equipment list refers to Table 8, Page B-15 of the Contract.

Also see Table XXVI of this report.

Table XXX - PROCUREMENT OF OFFICE FURNITURE

Equipment/Furnishing and Description	No. of Units	Total Cost (Tk)
Executive Desk, w/Chairs	20	55,050
Staff Desk, w/Chairs	19	39,800
Typist Desk, w/Chair	3	8,500
Office Chair	53	21,450
Conference Table	1	4,000
Drafting Table	16	40,000
Diazo Printer Table	1	1,500
Duplicator Machine Table	1	900
File Cabinet, 4-Drawer	17	28,950
Supply Cabinet, 2-Door	12	34,460
Book Cases, 4-Shelf	11	17,600
Sofa Set	1	8,363
Coffee Table	1	630
Ceiling Fans	30	42,205
Blackboard	1	1,000
Blackboard, w/Easel	5	3,450
File Cabinet, 4-Drawer	1	3,560
TOTAL OFFICE FURNITURE AND EQUIPMENT		Tk 312,048

* This furnishings and equipment list refers to Table 8-1, Page B-16 of the Contract.

Table XXXI - PROCUREMENT OF OFFICE EQUIPMENT

Equipment and Description	No. of Units	Total Cost (S$)
Typewriter, Manual, 26", Olivetto	4	4,000
Typewriter, Electronic, 18", Xerox	2	5,492
Desk Calculator, 10-digit, Adler	2	500
Plain Paper Copier, w/Spare Parts, Xerox 2300	3	20,400
Plain Paper Copier, Reduction Facility, w/Spare Partss, Xerox 2350	1	7,750
Diazo Ammonia Printing Machine	3	10,560
Slide Projector, 35 mm, Kodak Carosel	3	1,950
Overhead Projector	3	3,885
Projector Screen, w/Tripod	1	490
Camera, 35 mm, Cannon AE-1	4	2,320
Punching/Binding Machine	1	1,650
Total		S$ 58,997
		or
Sub-Total		US$ 28,257.37
		Total Cost (US$)
Air Conditioners	7	3,017
Fluid Duplicator Machine	4	3,323.40
Spirit Master	20	188
Lettering Set, Leroy	6	798
Triangles, Assorted Sizes and Conformations	24	85.44
Scales	4	75.44
Air Freight, Insurance, Handling, Etc.		1,650.85
Sub-Total		9,138.13
		Total Cost (US$)
Typewriter, Manual, 18", Olympia	1	Tk 22,000
		or
Sub-Total		US$ 882.16
TOTAL ALL OFFICE EQUIPMENT		US$ 38,277.66

* This equipment list refers to Table 9-1, Page B-20 of the Contract.

b. Contract Table 9 - 2

In the Contract, the funds allocated for this category, as well as the previous one and the following one, were all included within the funds shown for Table 9. Table XXXII shows that this category covered all surveying equipment with the exception of some small items procured with training funds. The equipment was on hand by mid-1983 and, with the exception of the planetable, cover, tripod, alidade, trough compass, and scales, the equipment was distributed equally among the four offices. In the case of the planetable and alidade and associated equipment, one set was retained in the Dhaka office and one set was sent to the Sylhet field office. All of this equipment was procured directly by WSA and reimbursement was effected upon presentation of invoice.

c. Contract Table 9 - 3

As shown on Table XXXIII, all equipment procured in this category was related to soil and material testing. The items were procured directly by WSA on an international basis. The equipment was on hand my mid-1983, and the soil testing equipment was distributed equally to the three field soil laboratories. The material testing equipment was assigned to the central laboratory in Dhaka.

6. Contract, Table 10 - Training

Table XXXIV indicates that equipment procured under this category for training purposes covered the spectrum from office equipment, through surveying equipment, to purely training equipment. All items, except the Olympia typewriter, was procured on an international basis by WSA. Reimbursement was made upon presentation of the invoice. The typewriter was procured locally and the cost paid in Bangladesh Taka, which cost was later converted to US dollars at the prevailing exchange rate.

Table XXXII - PROCUREMENT OF SURVEYING EQUIPMENT

Equipment and Description	No. of Units	Total Cost (US$)
Theodolites, Wild T-1, w/Accessories	2	7,190.00
Level, Wild, NAK-O, w/Accessories	4	2,358.00
Tripod, Wild, GST-20	6	1,215.00
Eyepiece Filter, Wild, GOF-4	2	57.60
Alidata, Wild, RK-1, w/Accessories	4	19,368.00
Trough Compass, Wild	4	1,054.80
Tripod, Wild, GST-50, w/Universal Head	4	1,928.00
Plane Table, Wild	4	1,051.20
Cover, Plane Table, Wild	4	471.60
Range Finder, Wild, TMO - 500 m	4	1,692.00
Stadia/Leveling Boards, Wild, GNLE-2, 4 m	4	1,011.60
Stadia/Leveling Boards, Wild, GNLF-2, 12 ft	4	1,011.60
Surveyors Chain, 100 ft	4	322.00
Surveyors Chain, 66 ft	4	221.68
Tape, Steel, Whytface, K & E	4	300.52
Scale, 1 : 100, Metric	2	—
Scale, 1 : 200, Metric	2	—
Scale, 1 : 250, Metric	2	—
Scale, 1 : 500, Metric	2	—
Inland and Ocean Freight, Insurance, Handling, Etc.		3,358.40
Total Survey Equipment		US$ 42,618.00

* This equipment list refers to Table 9-2, Page B-21 of the Contract.

Table XXXIII - PROCUREMENT OF SOIL LABORATORY EQUIPMENT

Equipment and Description	No. of Units	Total Cost (US$)
Laboratory CBR Set	3	6,768.00
Hydrometer, w/Graduated Jars	4	5,756.00
US Standard Sieve Set, #4 to #200, Brass, w/Lid and Pan	4	2,237.40
Liquid Limit Set, Atterberg	3	489.00
Shrinkage Limit Set	3	95.25
Pycnometer Top and Jar	3	28.35
Sieve Shaker, Mechanical	3	1,050.00
Asphalt Penetration Test Set	1	912.50
Softening Point Apparatus	1	68.00
Float Test Apparatus	1	98.75
Solubility of Bitumen Set	1	47.00
Marshall Test Set	1	3,455.00
Hot Plate, 12" x 12"	3	832.50
Water Content Apparatus	1	589.00
Air Freight, Insurance, Packing and Handling		7,130.72
Total Soils/Material Field and Laboratory Equipment		US$ 29,557.47

* This equipment list refers to Table 9-3, Schedules 2 and 3, Pages B-21, B-22 and B-23 of the Contract.

Table XXXIV - PROCUREMENT OF TRAINING EQUIPMENT

Equipment and Description	No. of Units	Total Cost (US$)
Typewriter, Manual, Olympia (Tk 21,000)	1	809.60
Public Address System, Portable	1	2,085.30
Trimmer, Hunt 2624	1	100.75
Shipping Charges		180.06
Camera and Accessories, 35 mm	1	195.09
Compass, Bruton	6	719.70
Tripod for Brunton Compass	1	57.50
Ball and Socket Head for Brunton Tripod	1	20.50
Insurance Charges		6.00
Hand Levels	10	294.48
Wire Levels	3	19.40
String Levels	40)	
Hand Levels	20)	1,018.50
Metallic Tapes, Metric and English	20)	
Slide Sorting Table	1)	
Media Slide Files	6)	247.15
Slide Trays, Kodak Carosel	6)	
Shipping and Handling Charges		491.84
Total Training Equipment		US$ 6,245.87

* This training equipment list refers to Table 10-, Page B-19 of the Contract as amended.

7. Conclusions

Local procurement and international procurement of small items functioned in a satisfactory manner. As mentioned previously, the procurement procedures of two government agencies for the acquisition of large items of equipment often created problems that were time-consuming to resolve. International procurement is further complicated by the lengthy time factor caused by the manufacturer's production schedule, inland transportation to a port of embarcation, marine transportation, and clearance procedures at the port of debarcation. Local procurement of large equipment is complicated by the local fabricator's shortage of working capital, inate tendency to ignore contract terms and specifications, and lack of familiarity with USAID's procurement regulations. However, all parties concerned with the procurement activities have learned from these sometimes rather unfortunate experiences. There is every reason to be optimistic that future procurement activities will proceed in a much smoother fashion and that equipment and materials will be on hand at the time that they are needed by the Project.

IV - CONCLUSIONS AND RECOMMENDATIONS

A. CONCLUSIONS

1. General Conclusions

a. From the point of view of operations, the ZRMI Project successfully accomplished its goals; that is, achieved progress in training was 95 percent of scheduled progress, all design and specification manuals were completed, some 95 percent of all road reconstruction/construction projects were completed (although an extra construction season was required to accomplish this), and pilot road maintenance projects were underway in all three Project districts. However, the institutionalizing of the system required to accomplish these operations (including the development of sound program and project management guidelines) was quite another thing. There is very little evidence to indicate that any of these segments so essential to the accomplishment of long-term goals will remain in place once the foreign assistance funds are no longer available.

b. In all three Project districts, over the three-year life of the Project, there was a steady improvement in the quality of the work performed by the local contractors, with regard to both road work and drainage structure work. This may be taken as positive evidence of the beneficial impact of the ZRMI Project. However, it remains to be seen whether this improvement in contractor performance is of a lasting nature, or if it is merely a reflection of a temporary expediency to satisfy the demands of the organization holding the purse strings. Since demand for adherence to contract terms and specifications is one of the aspects of a viable construction system, it may well be that this improvement will not last.

c. Procurement of equipment, especially international procurement, consumed much more time than it should have. As pointed out in the main text of the report, this was due to a combination of many factors, and cannot be said to be the fault of any one group or organization. The Project was

fortunate that these unforeseen delays in procurement did not adversely affect work operations (WPW/LGEB was able to obtain enough equipment from other sources to keep the program moving). However, most of the delays were occasioned by a lack of knowledge on the part of one party of the requirements of the other party. Now that the result of the lack of such knowledge is known, there is no reason why such unseemly delays should ever again be experienced on the Project in any of its follow-up phases.

d. As previously stated, the training element of the ZRMI Project enjoyed considerable success. However, a weak point of the program was the failure to develop a testing system as one means of actually measuring the impact of the program. The participants were enthusiastic, and to the observers it would appear that they did some sort of a testing system, no matter how simple, would aid in conforming or denying the observations.

2. Problems Common to All Districts and Their Solutions

a. Every year delays due to heavy rainfall and the accompanying flooding were reported by all three districts. Admittedly there is little that can be done about the weather. On the other hand, it is well known to all that Bangladesh lies within the monsoon area, and that the approximate beginning and end of the monsoon rains is also known to all. Therefore, good management would take this factor into account when planning and scheduling the projects; that is, those projects least liable to be disrupted by rain and high water could be scheduled for initiation/completion during the transition periods from rainy weather to dry weather and from dry weather to rainy weather, while those projects most liable to be affected by rain and high water would be scheduled for the periods when dry weather is more sure to prevail.

b. Many times delays were reported as being "due to lack of funds." This usually meant that reimbursement had been delayed for one or more reasons, but usually because the documentation required by USAID had either not been supplied at all, or, if supplied, had been improperly prepared. The

obvious solution here is to know what is required and then submit the properly prepared documentation with every request for reimbursement.

c. Another obstacle to full reimbursement was the practice of undertaking projects whose total cost exceeded that amount approved for the district by LGEB and USAID. Again, the solution was obvious -- stay within the approved budget until advised in writing by LGEB that the budget had been revised.

d. In all three districts, the projects suffered contract time overruns most of which would normally be considered as of unacceptable duration. The reasons given for the time overruns were many and varied, but it was felt that the major part of the overruns were due to two principal factors; i.e., impractical contract time durations and poor contract scheduling. It is a relatively simple matter to correct both of these factors. Future contract time durations should be realistic and compatible with the scope of work and the environment in which it is to be done. A project particularly susceptible to delays due to rain and/or flood damage should not be undertaken too early, or too late in the dry season.

e. Quality control is a key factor in assuring contractor adherence to contract specifications. During the life of the ZRMI Project, good use was made of the material testing laboratories located in each Project district, but the laboratories could have been used to a much greater extent. The laboratories are also available for obtaining data for design parameters.

f. Equipment management and maintenance, especially preventive maintenance, was seldom practiced in any of the three Project districts. Since both construction and maintenance equipment will always be in relatively short supply, it is critical that optimum service be obtained from that which is available. With good equipment management and preventive maintenance, it is reasonable to expect an availability factor for at least 66 percent during the relatively short construction season in the Project areas.

B. RECOMMENDATIONS FOR FUTURE ACTION

1. General

Any recommendations for future action in feeder road maintenance and improvement in Bangladesh must necessarily take into account the new rural administrative emphasis on the Upazila concept. Throughout the text of this interim report, the Consultant has stressed that good management principles are basic, no matter what the format of the administrative unit. Therefore, this report puts the foundation and framework in place, but in some cases additional work will be required to supply the complete details. One thing is quite certain, since most of the personnel in the newly-organized Upazilas are unacquainted with the concepts of this feeder road maintenance and improvement project, the early stages of the next phase of this project will require a great deal of orientation, particularly with regard to program and project management.

2. Recommendations

a. One of the first actions of the next phase should be a seminar held at some central location, perhaps in Dhaka, for top-level personnel of all Upazilas included in the Project. The seminar would have a dual purpose of both introducing Project personnel to the Upazila personnel, as well as orienting Upazila personnel concerning Project goals, purposes, and operating procedures. Since only key personnel would be invited to attend, the seminar need not be of long duration, perhaps two days at the most. It should be chaired by someone of the stature of the Engineering Advisor of LGEB with the Secretary, MLG, and the Project Officer, USAID, being principal speakers. The details of how the Project would be managed and explanations concerning documentation procedures could be handled by the PM and the PE.

b. A second early action should be a visit to all the Upazilas by Project personnel to again explain Project goals and procedures. At this time, the RE and the ARE should be present to establish their position in the

Project operations and to encourage the Upazila personnel to utilize their services in program and project management and scheduling.

c. At an early stage, the fallacy of planning for projects whose resource requirements exceed those that are available should be clearly demonstrated. The system of subsequent budget reduction by the amount that a current budget is underutilized should be used as a lever to discourage attempting too big a work load.

d. In the next phase of this Project, there should be a heavy emphasis on the institutionalization of maintenance and construction systems for feeder roads and appurtenant structures. This is not meant to imply that new organizations should be created, but rather that existing ones should be encouraged to take steps to institutionalize rational systems for managing these two operations so vital to rural development.

e. The Phase II Project Training Program should get underway as quickly as possible after the start of the new Phase. It will be necessary to interface with the LGEB centralized training program not only to avoid duplication of effort, but also to make use of all resources that organization may be able to supply. There is every reason to believe that the Upazila personnel will all require additional training, especially those who will be working with the maintenance and construction of feeder roads. The full extent of training requirements can only be determined after a training needs survey has been completed.

f. If the needs survey indicates that significantly large numbers of technicians will require training in the basic skills of surveying, soil sampling and testing, and road maintenance, then it may be desirable to consider holding the training session(s) in some centralized location (such as Dhaka) where the facilities for handling comparatively large numbers of trainees are available.

g. The program and project management training sessions should receive a high priority in the in-country training schedule. These sessions can be

held at a central location, or in the various project sites, whichever is the more convenient.

h. Soon after the start of the next phase of this Project, negotiations should get underway for the combined in-country/third-country training course which was discussed in some detail in the main body of this report. Since several months will be required to plan and negotiate such a course, a practical tentative course data might by July/August 1987.

i. In line with the recommended early emphasis on management of maintenance and construction, it is recommended that the necessary short-term foreign specialists required for revising/updating the management reports be scheduled to report to the Project soon after the start of the next phase.

j. To date, it is generally agreed upon that the ZRMI Project has had its beneficial socioeconomic impacts, but there is no way available to actually measure such benefits. Therefore, it is highly recommended that one of the first activities of the next Project phase be the development of a base-line survey to provide a base for measuring the future impacts of the Project.

k. Additional road maintenance/construction equipment will be required in the next phase. However, because of the change in emphasis from district to Upazila concept, it would be unwise to assume that the equipment required would be of the same type as that required (and procured) under the ZRMI Project. It is recommended that all concerned sit down together and discuss this matter and try to determine just what type of equipment would be most useful under the new concept. It must be recognized that it is not just a question of equipment type alone, but also consideration must be given to operating personnel, mechanical maintenance, and equipment mobility within the Upazila area.

l. Another question involving heavy equipment is that of equipment management -- should the equipment be managed from a central equipment pool, or should it be assigned to the individual Upazilas? If assigned, should the

assignment be permanent, or only for the duration of one construction season? If the equipment is assigned, who will be responsible for upper echelon maintenance? All of these questions must be resolved before the equipment is released to anybody's charge, be it a central pool, or an individual Upazila.

m. Once the decision is made concerning the acquisition of additional equipment, action should be started to obtain bids, evaluations, and approvals for purchase within the shortest possible time. It is recommended that new equipment procurement be handled with the idea that, at the very latest, it will be on hand for use during the 1987-1988 construction season.

n. Most surveying and materials testing equipment items are shelf items that can be procured quickly once the requisite number of quotations have been received. Therefore, this additional equipment should be procured for use during the 1987 training sessions and then distributed for use during the 1987-1988 construction season.

o. It is recommended that all equipment and spare parts approved for procurement during the ZRMI Project phase, and not procured because of Project time limitations, should be procured as early as possible in the next phase of this Project.

ZILA ROADS MAINTENANCE AND IMPROVEMENT (ZRMI) PROJECT

USAID PROJECT NUMBER 388-0056

PROJECT INTERIM REPORT

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APPENDIX I - BIBLIOGRAPHY (continued)

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38 Recommended Third-Country Training Course, Proposed by Asian Institute of Technilogy, AIT, PAS, April 1985.

39 Survey Manual, ZRMI Project Training Program, PAS, July 1984.

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SYLHET DISTRICT
CONSTRUCTION ACTIVITIES
TAJPUR – SYEDPUR – KHADIMPUR ROAD (ZRMIP/20/1982-83)

View of breach in the road before culvert installation was undertaken.

View of the same spot following completion of the culvert.

SYLHET DISTRICT
CONSTRUCTION ACTIVITIES
FENCHUGANJ -- MAIJGAON – GHILACHARA ROAD (ZRMIP/17/1984-85)

View of the earth road before improvement work had been undertaken.

View of the same road following completion of bituminous pavement.

SYLHET DISTRICT
CONSTRUCTION ACTIVITIES
TAJPUR – SYEDPUR – KHADIMPUR ROAD (ZRMIP/13/1983-84)

Because of poor siting, the old structure had never been put into service.

View of the same spot following completion of new, properly-sited structure.

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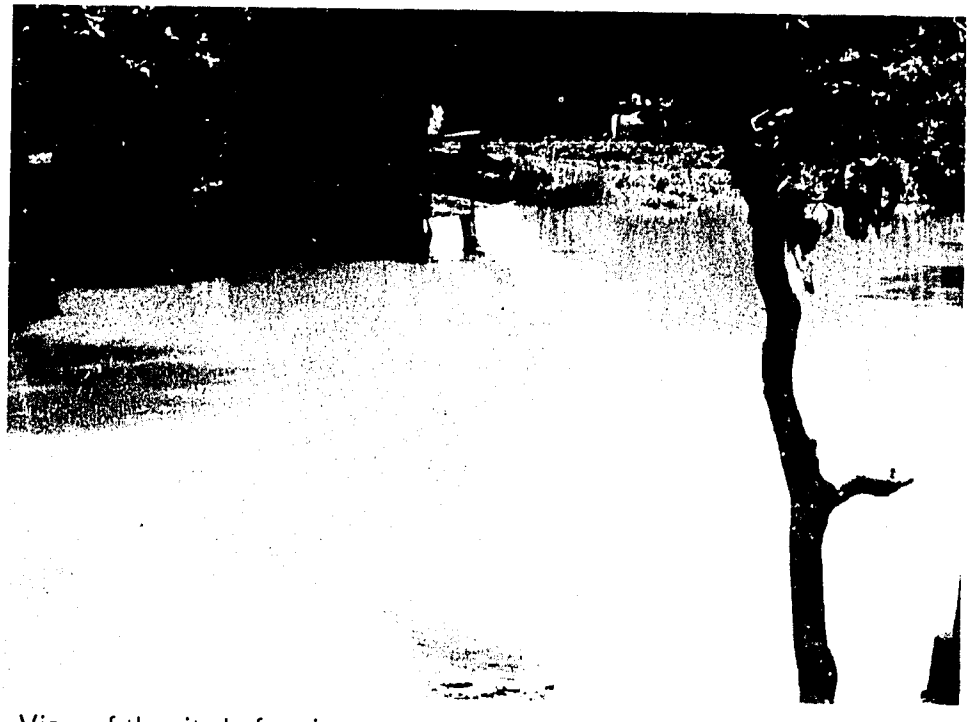
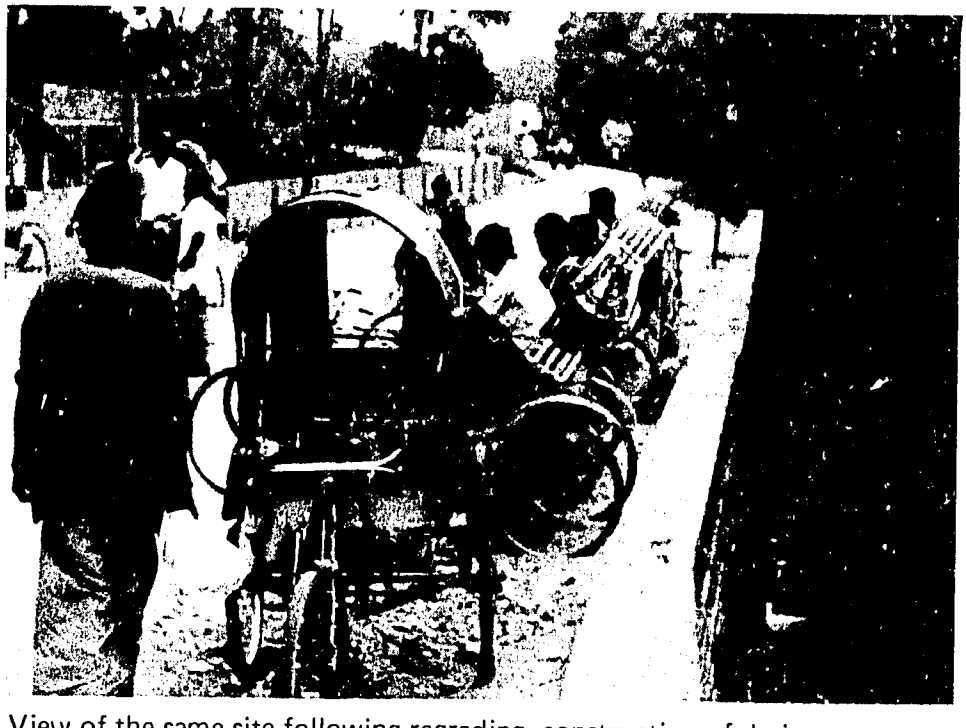
SYLHET DISTRICT
CONSTRUCTION ACTIVITIES
DHAKADAKSHIN – BEANIBAZAR ROAD
(ZRMIP/24/1982-83 & ZRMIP/21/1984-85)



View of the site before improvements were undertaken.



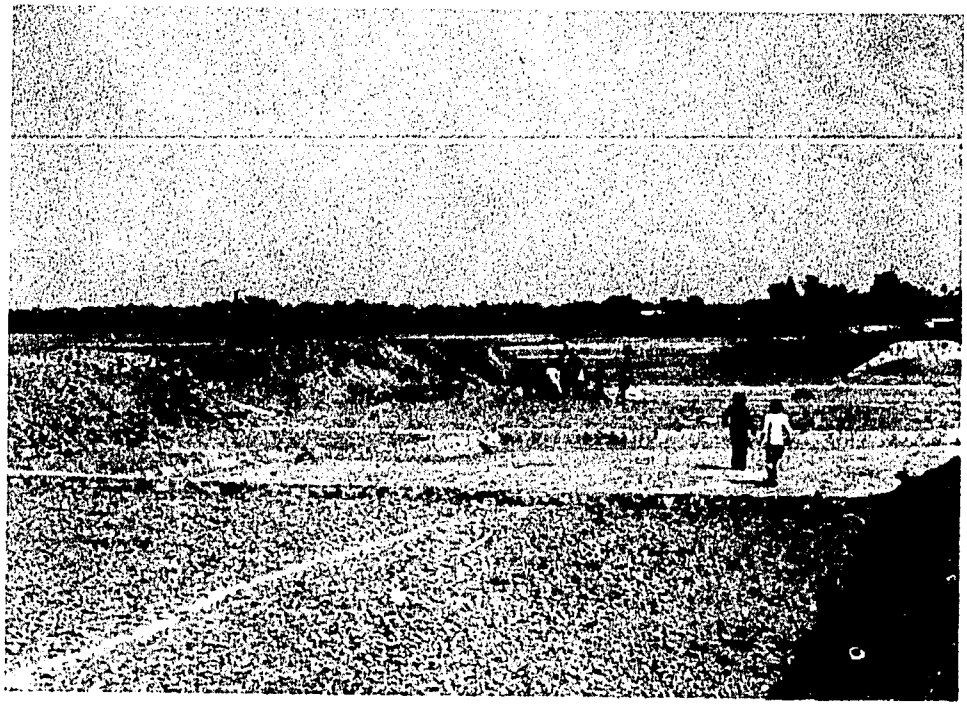
View of the same site following regrading, construction of drainage structure and retaining wall, and completion of bituminous paving.

SYLHET DISTRICT
CONSTRUCTION ACTIVITIES
BAHUBAL – PUTIJURI – BIJNAGHAT ROAD (ZRMIP/16/1982-83)

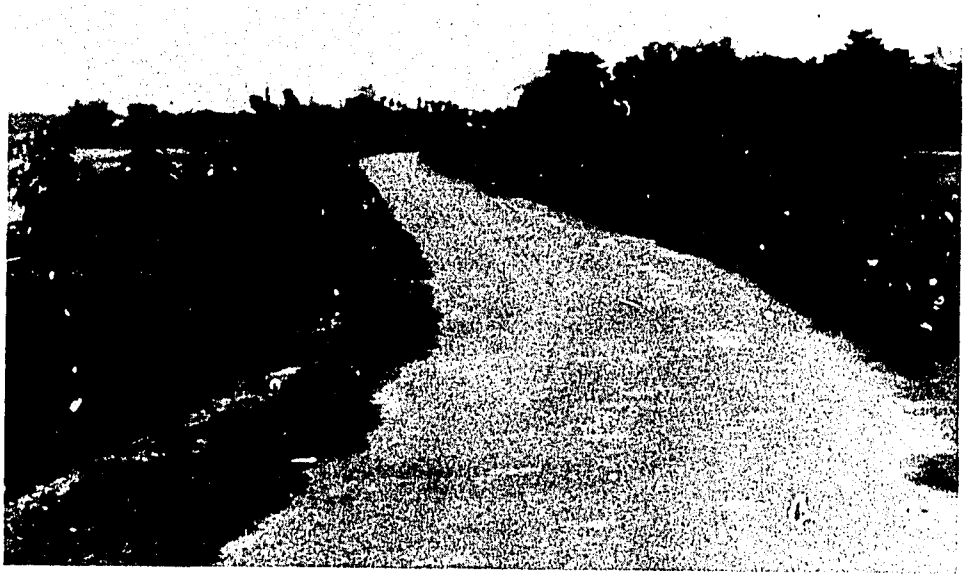
View of box culvert construction with bottom slab and abutment walls partially complete.

View of the same spot following completion of the drainage structure.

SYLHET DISTRICT
CONSTRUCTION ACTIVITIES
DHAKADAKSHIN – BIANIBAZAR ROAD (ZRMIP/16/1983-84)



Workers utilizing old road fill as borrow material for new realignment.



View of same road following completion of realignment and bituminous pavement.

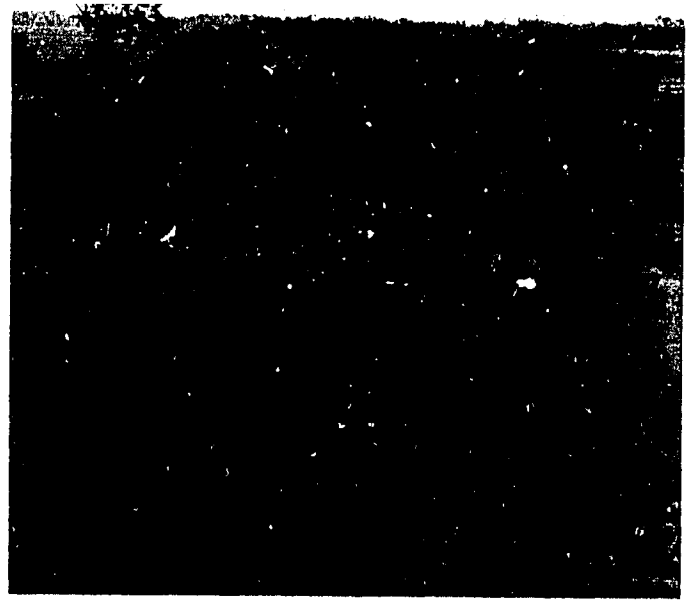
SYLHET DISTRICT
CONSTRUCTION ACTIVITIES
NABIGANJ – BANIYACHUNG ROAD (ZRMIP/25/1984-85)

View of one of the five gaps that existed on this road prior to the start of the drainage structure construction program.

View of one of the gaps closed by the completion of a drainage structure.

SYLHET DISTRICT
CONSTRUCTION ACTIVITIES
ATGRAM – ZAKIGANJ ROAD (ZRMIP/18/1982-83)

View of earth road before improvement work had been undertaken.



View of the same road following completion of bituminous pavement.

SYLHET DISTRICT
CONSTRUCTION ACTIVITIES
SHAHBONDAR – SHAMSHERGANJ ROAD (ZRMIP/17/1982 - 83)

View of earth road before improvement work had been undertaken.

View of the same road following completion of bituminous pavement.

SYLHET DISTRICT
CONSTRUCTION ACTIVITIES
ATGRAM – ZAKIGANJ ROAD (ZRMIP/09/1983-84)

View of large gap in the old road before drainage structure work was undertaken.

View of the same spot showing the improved earth road and completed drainage structure. (Picture taken from opposite direction from No. 19)

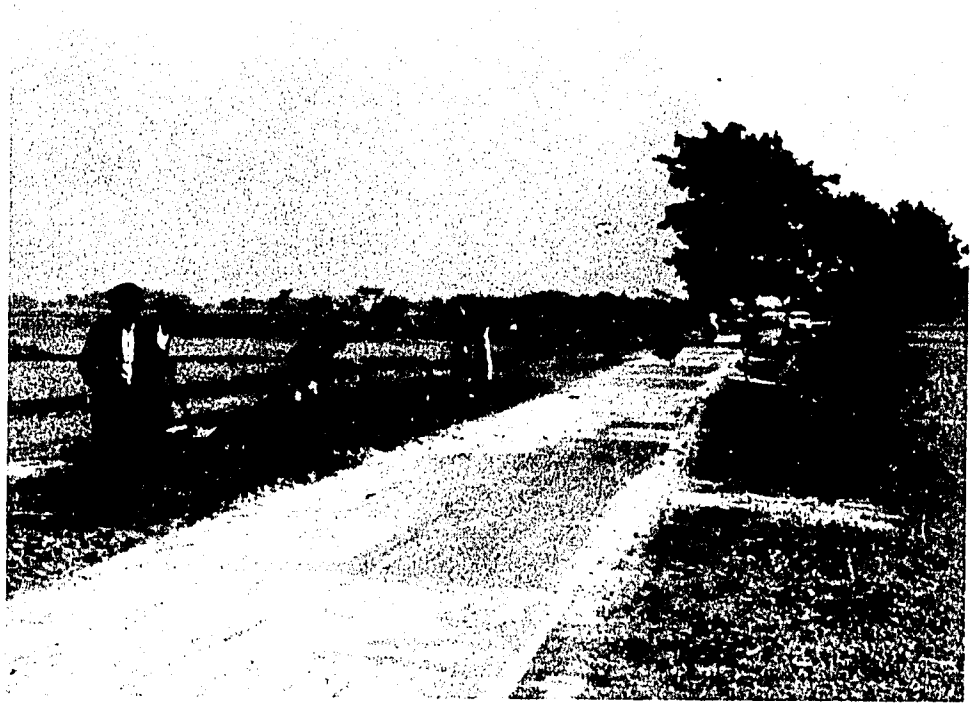
RANGPUR DISTRICT
MAINTENANCE ACTIVITIES
RANGPUR – KAKINA ROAD (1984-85 SCHEME)

Condition of the road before undertaking maintenance operations.

A view of the same road after maintenance operations have been completed.

RANGPUR DISTRICT
MAINTENANCE ACTIVITIES
RANGPUR – BADARGANJ ROAD (1984-85 SCHEME)

Cleaning of the road surface is underway before initiating patching work. Destitute women were employed for this purpose.



A view of the same road after providing seal coat. Shoulder improvement is underway.

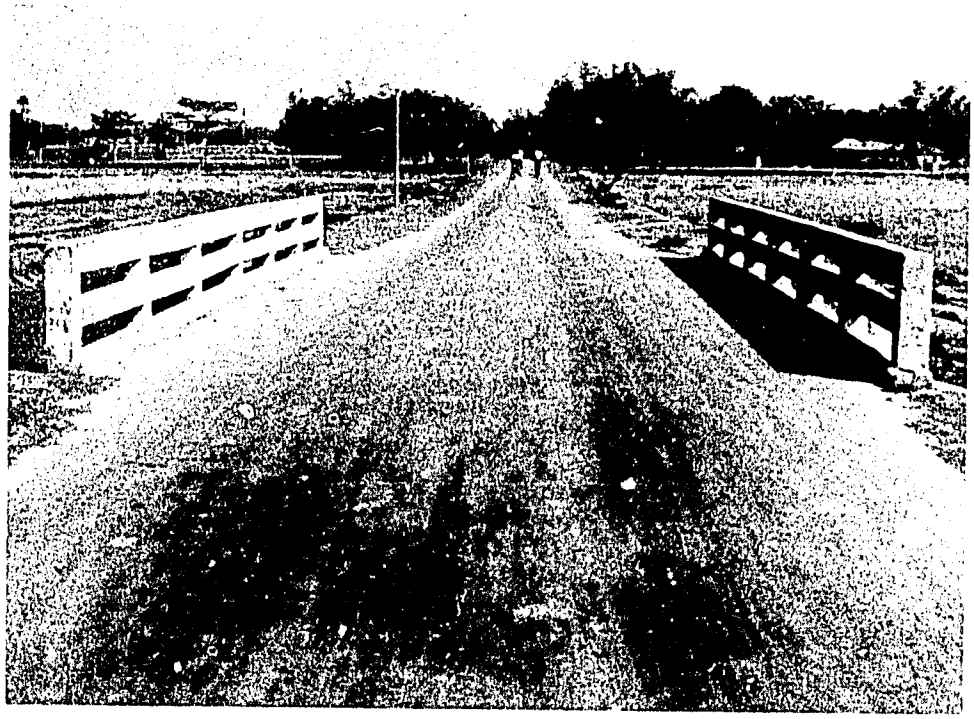
RANGPUR DISTRICT
MAINTENANCE ACTIVITIES
BARODARGA –BHENDABARI ROAD (1984-85 SCHEME)

Section of the road before undertaking shoulder improvement work.

A view of the same road after completion of the maintenance work. Maintenance works include patching of depressions, potholes, application of seal coat and improvement of the shoulders.

RANGPUR DISTRICT
MAINTENANCE ACTIVITIES
MIRGANJ – JALDHAKA ROAD (1984-85 SCHEME)

Maintenance work is complete on the far side of the bridge approach.



A view of the same spot after maintenance operations were complete. Maintenance operations included patching of depressions, pot-holes and application of seal coat.

RANGPUR DISTRICT
MAINTENANCE ACTIVITIES
RANGPUR – MAHIGANJ ROAD (1983-84 SCHEME)

A view of the site just after undertaking the scheme. Some activities like aggregate screening and roadway surface cleaning before applying prime coat are seen underway.

A view of the same scheme after patching of depressions and pot-holes and the application of seal coat.

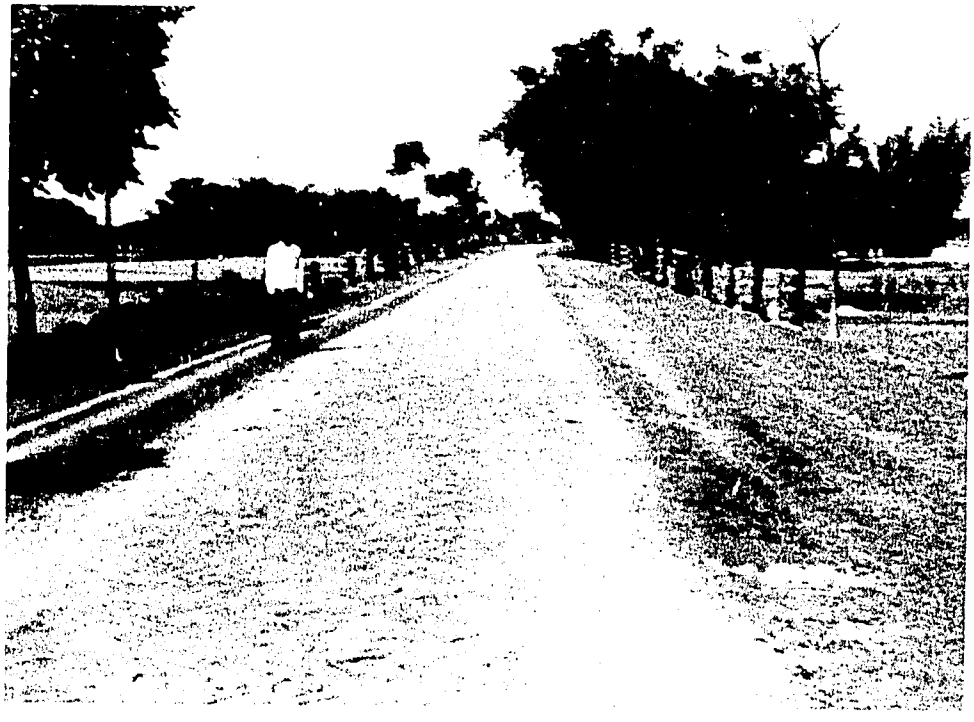
RANGPUR DISTRICT
CONSTRUCTION ACTIVITIES
RAJARHAT – ULLAGHATA ROAD (GROUP D/1982-83)

A view of the road being inspected for certification. Any defects noted were to be rectified before final certification.

A view of the same HBB road after correction of all defects.

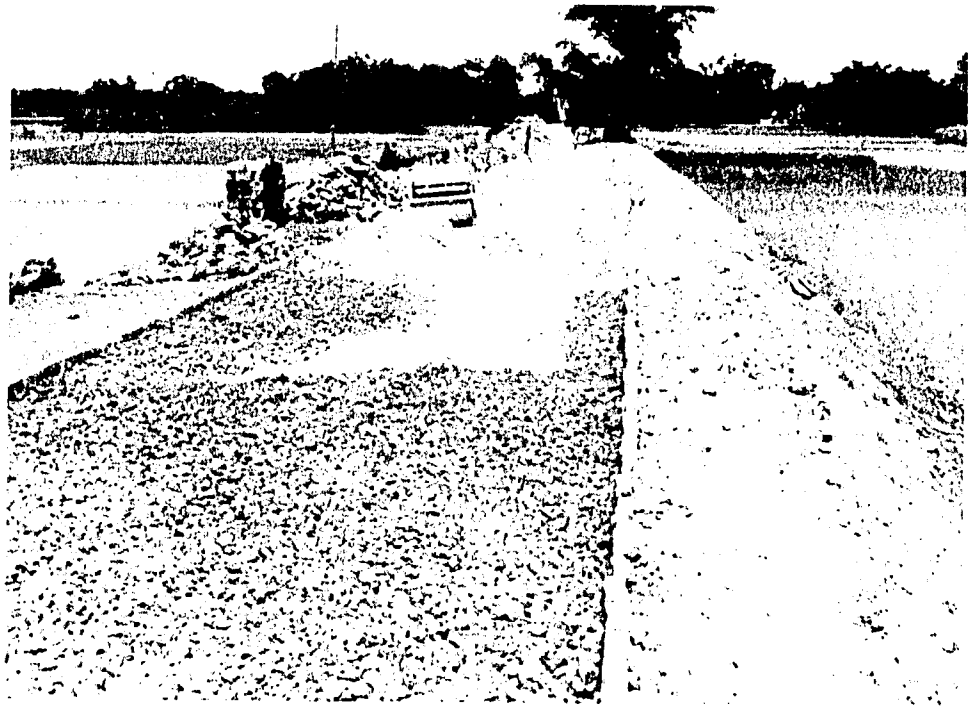
RANGPUR DISTRICT
CONSTRUCTION ACTIVITIES
MIRGANJ – JALDHAKA ROAD (GROUP F/1982-83)

HBB work underway for the scheme. Resident engineer is explaining how the work is required to be done.



Final condition of the road after completion of HBB pavement, tree planting and shoulder improvement.

RANGPUR DISTRICT
CONSTRUCTION ACTIVITIES
BARODARGA –BHENDABARI ROAD (GROUP B/1983-84)



Construction materials and equipment are seen stockpiled at site ready for initiation of the work.

A view of the same spot showing the development achieved after completion of bituminous pavement.

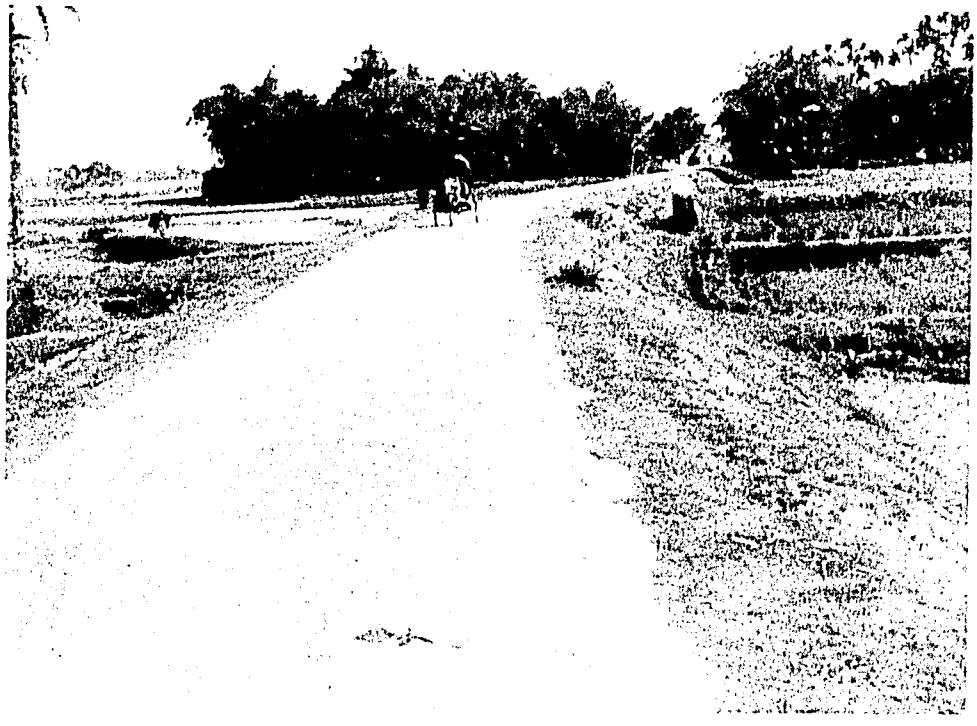
RANGPUR DISTRICT
CONSTRUCTION ACTIVITIES
BARODARGA –BHENDABARI ROAD (1984-85 SCHEME)

Site condition before undertaking the scheme. Ponding of rain water is clearly visible.

A view of the same spot after completion of bituminous pavement.

RANGPUR DISTRICT
CONSTRUCTION ACTIVITIES
BARODARGA – BHENDABARI ROAD (GROUP C/1983-84)

Site condition before undertaking the scheme.



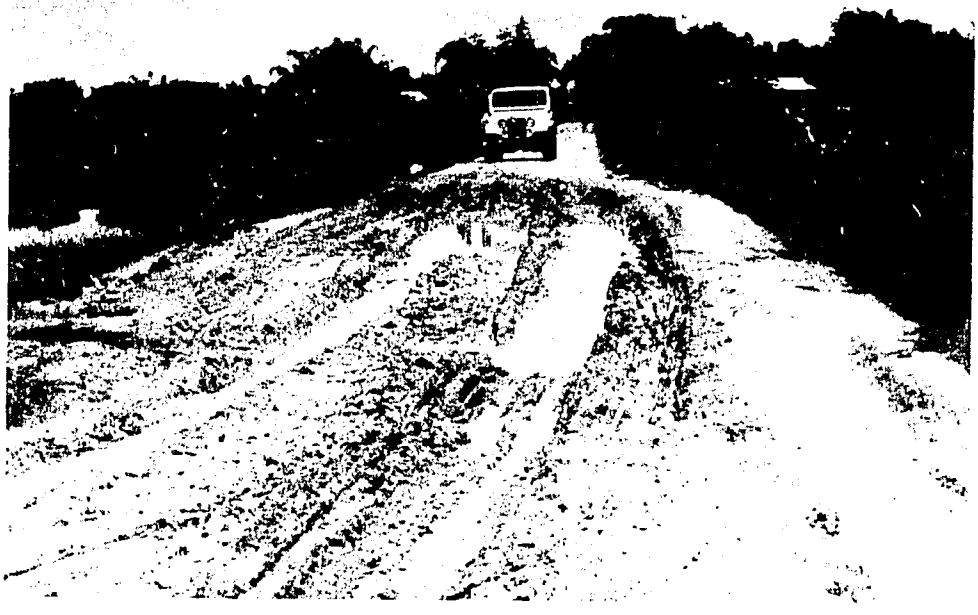
A view of the same spot when the improvement work was complete.

RANGPUR DISTRICT
CONSTRUCTION ACTIVITIES
BARODARGA – BHENDABARI ROAD (GROUP D – 1/1982-83)

Site condition before undertaking the work.

A view of the same spot after completion of the bituminous pavement and all ancillary works.

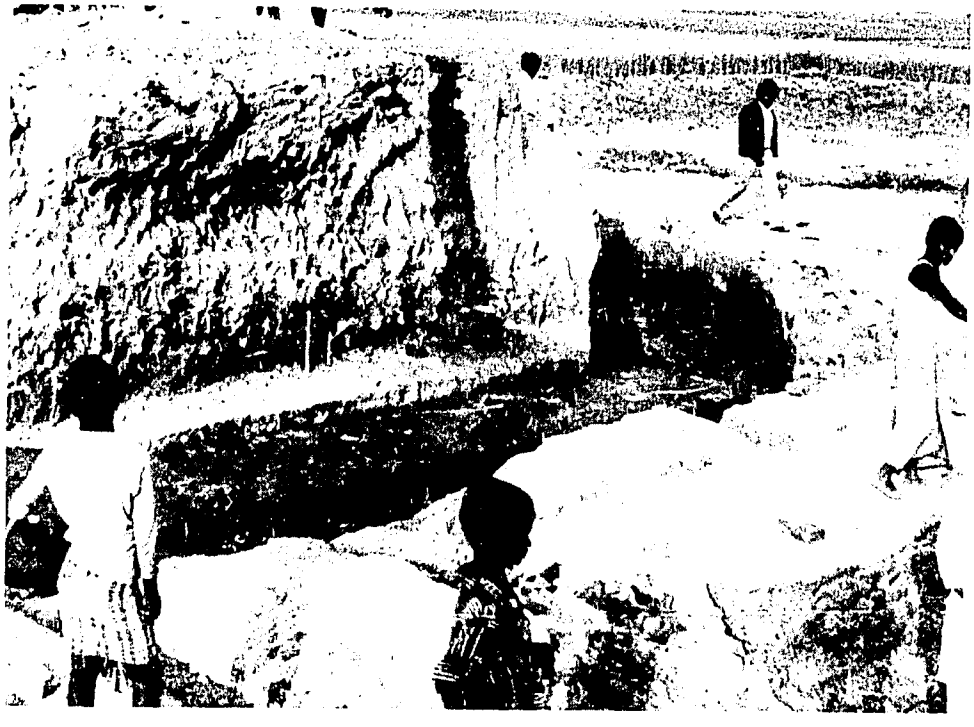
RANGPUR DISTRICT
CONSTRUCTION ACTIVITIES
BARODARGA–BHENDABARI ROAD (GROUP 2(a)C & 2(b)A/1984-85)



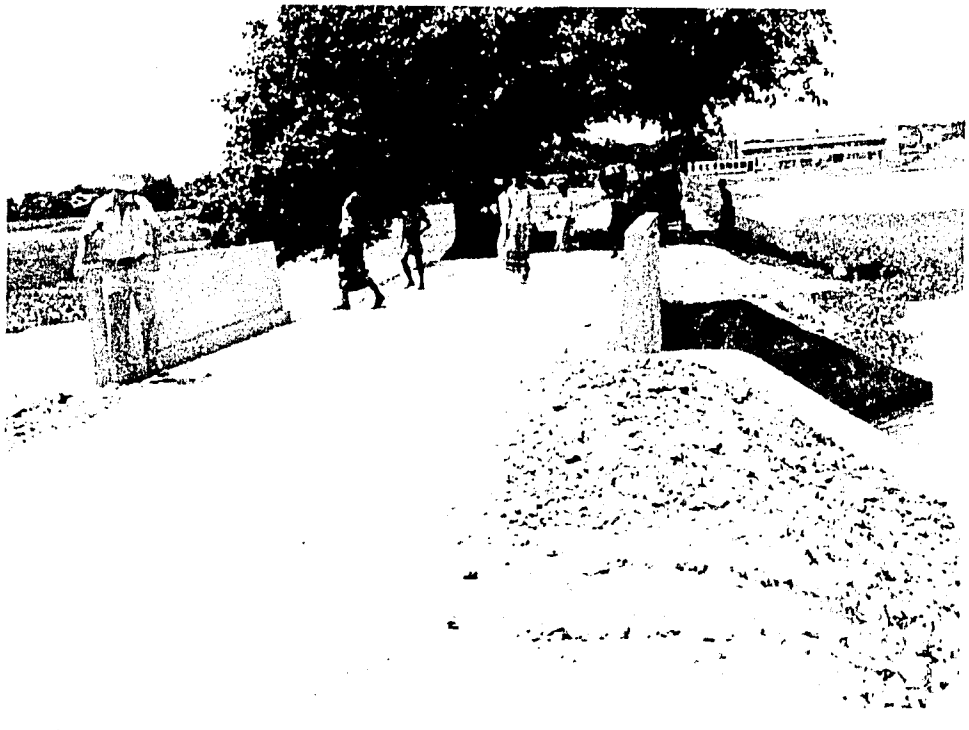
Site condition before undertaking the work.

A view of the same spot after completion of the bituminous pavement and all ancillary works.

RANGPUR DISTRICT
CONSTRUCTION ACTIVITIES
4.55M SPAN BRIDGE ON GAIBANDHA – SAGHATA ROAD
(B – 2/1984-85)

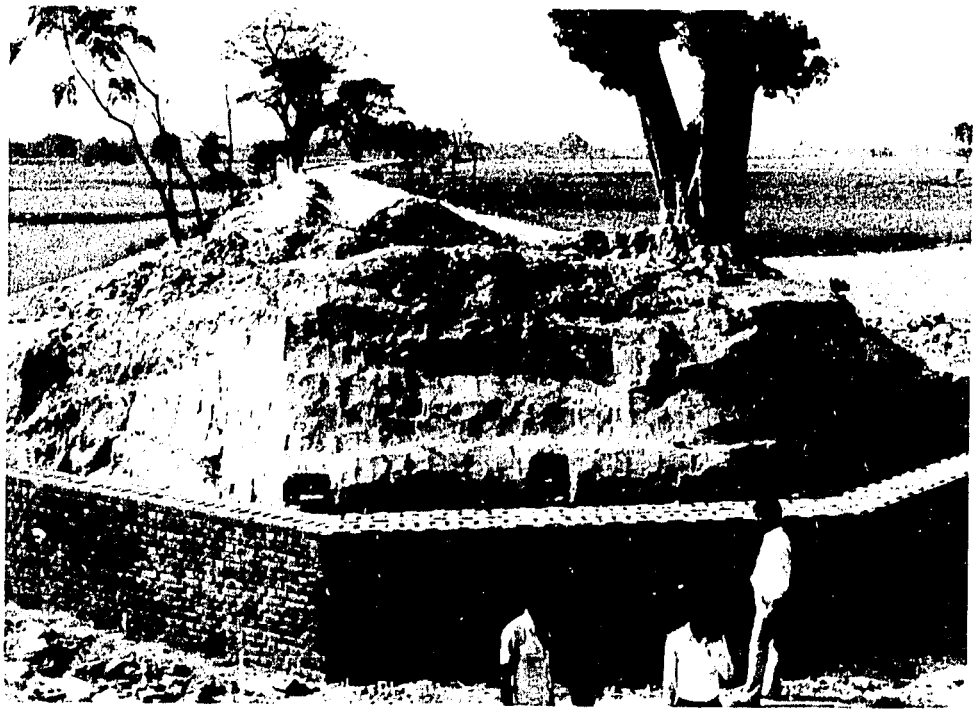


A view of the work site where brick work for one abutment is in progress.

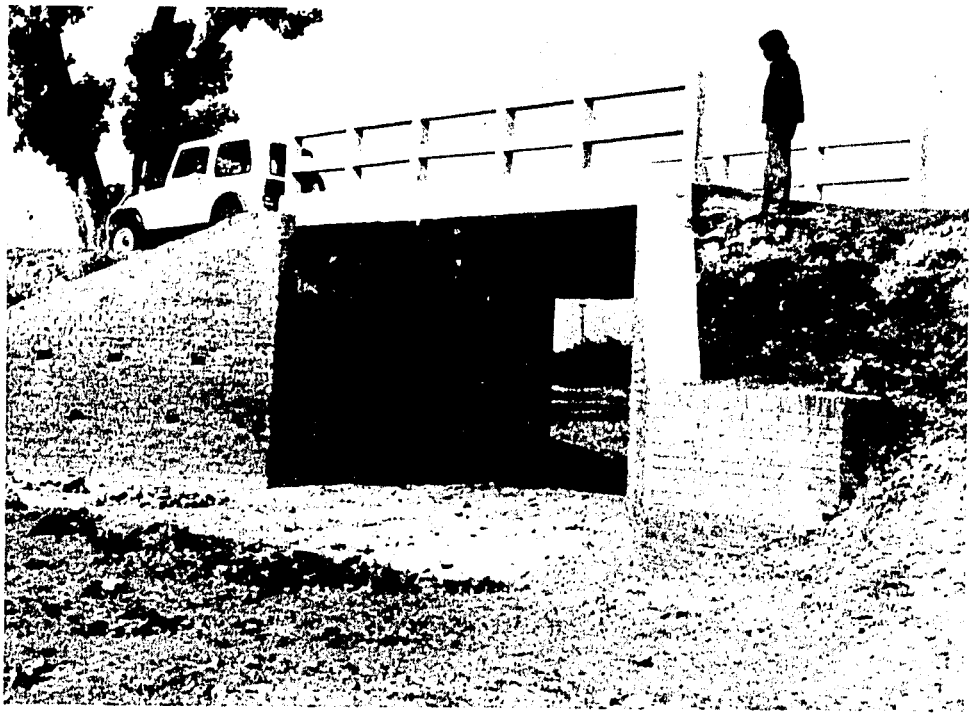


A view of the same bridge after completion.

RANGPUR DISTRICT
CONSTRUCTION ACTIVITIES
6.1M SPAN BRIDGE ON GAIBANDHA – NALDANGA ROAD (KHOLATI)



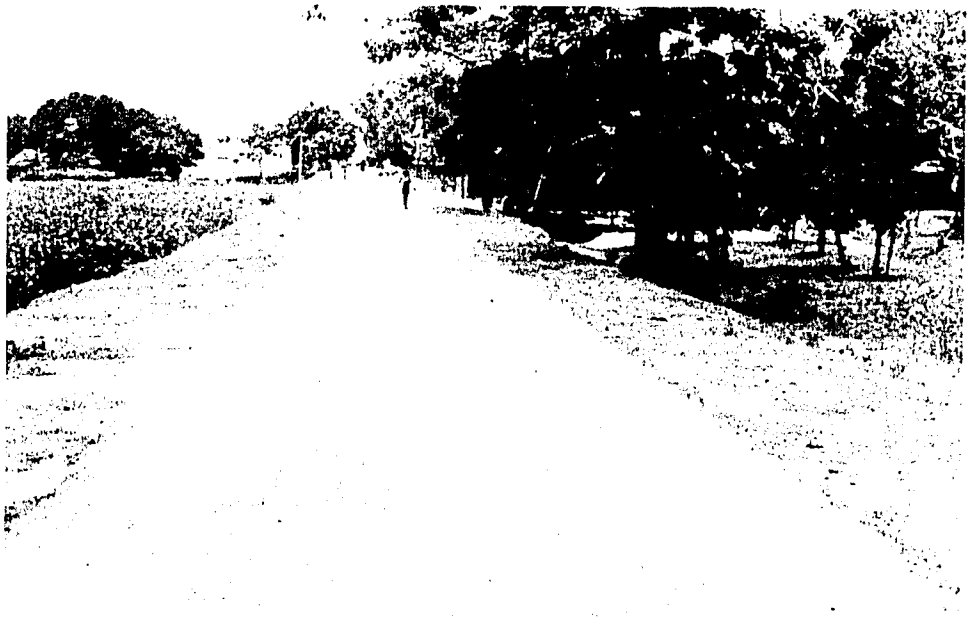
A view of the work site where brick work for one abutment is in progress.



A view of the same bridge after completion.

RANGPUR DISTRICT
CONSTRUCTION ACTIVITIES
MIRGANJ – JALDHAKA ROAD (GROUP B/1983-84)

A view of the work site. Construction materials are seen stockpiled at site and some brick aggregates have been laid ready for rolling.



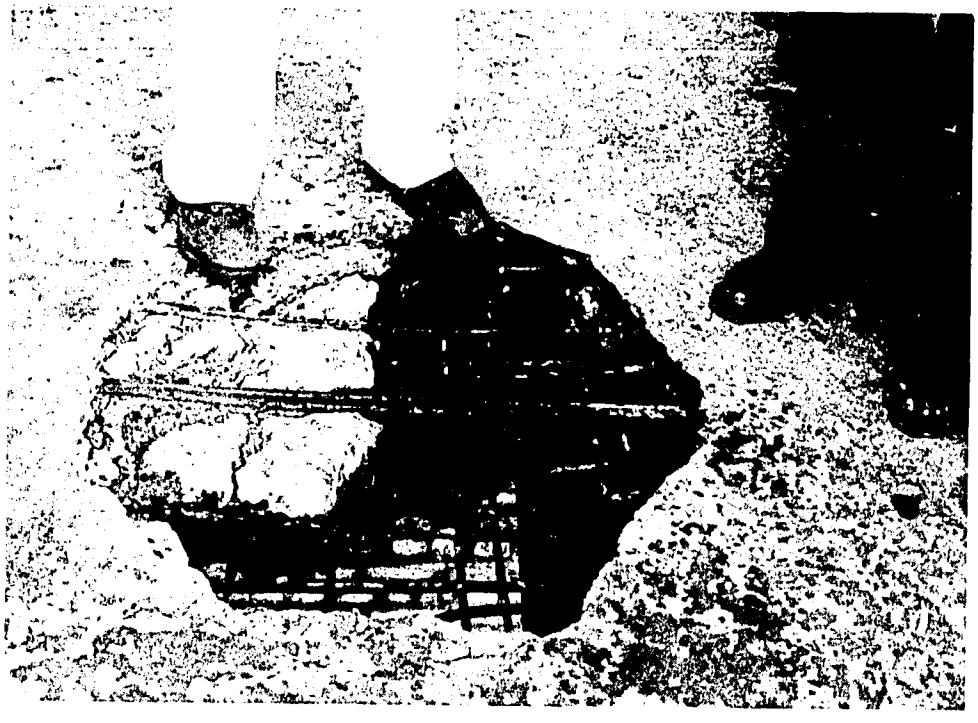
A view of the same road after completion of bituminous carpeting.

FARIDPUR DISTRICT
MAINTENANCE ACTIVITIES
BALIAKANDI – RAJBARI ROAD (1983-84 SCHEME)

A view of HBB surface deterioration before undertaking maintenance operations.

A view of the same road showing the improvement achieved after completion of maintenance operations.

FARIDPUR DISTRICT
MAINTENANCE ACTIVITIES
MADHUKHALI – BALIAKANDI ROAD (1984-85 SCHEME)



A view of the damaged deck slab of Mathurapur bridge.

A view of the same spot during patching operations.

FARIDPUR DISTRICT
MAINTENANCE ACTIVITIES
TALMA – NAGARKANDA ROAD (1983-84 SCHEME)

Typical soft spot requiring patching.

A view of the same road after maintenance operations have been completed.

FARIDPUR DISTRICT
MAINTENANCE ACTIVITES
TALMA – NAGARKANDA ROAD (1983-84 SCHEME)

A view of brick wingwall failure of Talma bridge.

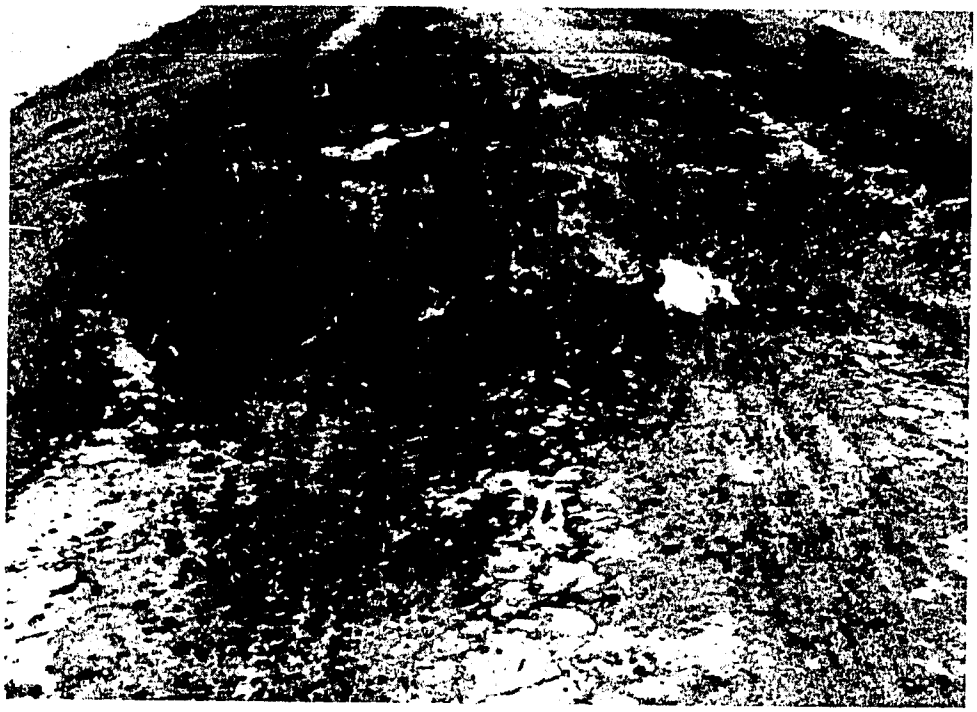
A view of the same spot after maintenance operations have been completed.

FARIDPUR DISTRICT
MAINTENANCE ACTIVITIES
TALMA – NAGARKANDA ROAD (1983-84 SCHEME)

Condition of the road before establishing a maintenance schedule.

A view of the same road after maintenance operations have been completed.

FARIDPUR DISTRICT
MAINTENANCE ACTIVITIES
PUKURIA – SADARPUR ROAD (1984-85 SCHEME)



A view of the paved surface deterioration before undertaking the scheme.

A view of the same road after patch work has been completed.

FARIDPUR DISTRICT
CONSTRUCTION ACTIVITIES
TALMA – HATKRISHNAPUR ROAD (ZRIMP/06/1984-85)

A view of the road before construction of bituminous pavement.

A view of the same road after the completion of improvement work.

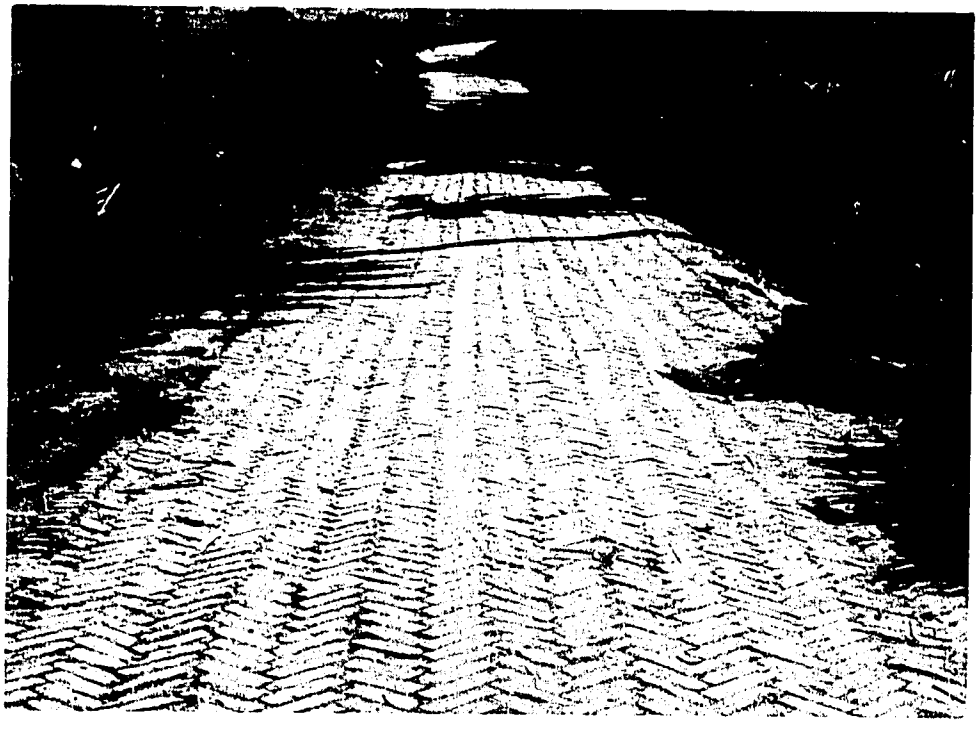
FARIDPUR DISTRICT
CONSTRUCTION ACTIVITIES
TALMA – HATKRISHNAPUR ROAD (ZRIMP/07/1984-85)

Condition of the road before undertaking the construction scheme.

A view of the same road after completion of bituminous carpeting.

FARIDPUR DISTRICT
CONSTRUCTION ACTIVITIES
HATKRISHNAPUR – SADARPUR – PIAJKHALI ROAD
(ZRMIP/11/1984-85)

A view of the road before undertaking the scheme.



A view of the same road after completion of HBB work.

FARIDPUR DISTRICT
CONSTRUCTION ACTIVITIES
HATKRISHNAPUR – SADARPUR – PIAJKHALI ROAD
(ZRIMP/10/1983-84)

A view of a gap at km 14.55.

A view of the same spot after closing the gap and providing the surface with HBB pavement.

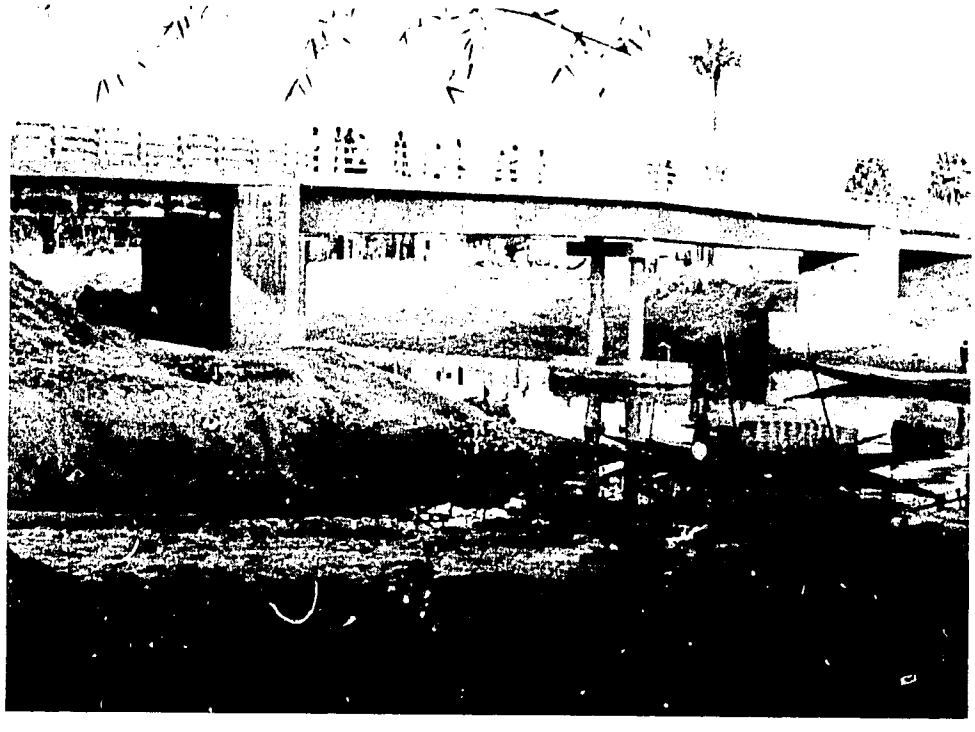
FARIDPUR DISTRICT
CONSTRUCTION ACTIVITIES
BADARPUR – SALTHA ROAD (GROUP B/1983-84)

A view of unpaved surface deterioration before undertaking the scheme.

A view of the same road after completion of bituminous pavement and all ancillary works.

FARIDPUR DISTRICT
CONSTRUCTION ACTIVITIES
DIGNAGAR – MUKSUDPUR ROAD
APPROACH SPANS (BONOGRAM BRIDGE), ZRMIP/24/1984-85

A view of the washed away approach embankments which is a typical example of incorrect sizing of the bridge length.



A view of the same bridge after being provided with approach spans on both sides.

FARIDPUR DISTRICT
CONSTRUCTION ACTIVITIES
BADARPUR – SALTHA ROAD (GROUP A/1982-83)

A view of HBB surface before construction of bituminous carpeting.

A view of the same road after completion of bituminous carpeting and all ancillary works.

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FARIDPUR DISTRICT
CONSTRUCTION ACTIVITIES
MADHUKHALI – BALIAKANDI ROAD (ZRMIP/01/1984-85)

A view of the road before construction of bituminous pavement.

A view of the same road after completion of bituminous pavement.

FARIDPUR DISTRICT
CONSTRUCTION ACTIVITIES
MADHUKHALI – BALIAKANDI ROAD (GROUP J/1983-84)

A view of the unpaved surface deterioration before undertaking scheme.

A view of the same road after completion of bituminous pavement and all ancillary works.

FARIDPUR DISTRICT
CONSTRUCTION ACTIVITIES
MADHUKHALI – BALIAKANDI ROAD (GROUP D/1982-83)

A view of the unpaved surface deterioration before undertaking the scheme.

A view of the same road after completion of bituminous pavement.

FARIDPUR DISTRICT
CONSTRUCTION ACTIVITIES
BALIAKANDI – RAJBARI ROAD (ZRMIP/21/1984-85)

A view of the WBM surface before providing with bituminous carpeting.

A view of the same road after completion of bituminous carpeting.

FARIDPUR DISTRICT
CONSTRUCTION ACTIVITIES
BALIAKANDI – RAJBARI ROAD (ZRMIP/20/1984-85)

A view of the unpaved surface deterioration before undertaking the scheme.

A view of the same road after completion of bituminous pavement.