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EVALUATION OF PILOT PROGRAM ACTIVITIES

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CONSTRUCTION OF APPURTENANT STRUCTURES
ON FOOD FOR WORK ROADS

FINAL REPORT
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INTRODUCTION

This Final Report summarizes the information contained in four monthly interim reports (attached appendices) and recommends changes to enhance the implementation of follow-up activities under the Title II Section 206 program. The comprehensive nature of the interim reports in detailing the various pilot program activities, with special regard to the queries/problems encountered and their solutions, precludes further detailed description in this Final Report; therefore, for a full understanding of the day-to-day workings of such a program it is highly recommended that the four attached interim reports be read carefully.

Two separate pilot programs are evaluated. In the Local Government Pilot (LGP) program, 13 Upgraded Thanas in 13 Districts were visited three times each; in the CARE Pilot (CP) program, 3 Thanas (not yet upgraded) in Rangpur District were visited twice. The visits in preparation of this evaluation were conducted between 18 April and 2 August 1983. Each visit in the LGP program involved interviews with the Thana Nirbahi Officer (TNO) and the Thana Technical Staff (TTS), while the visits to the CP program involved interviews with the CARE-Rangpur Unit Administrator and his technical staff (twice), as well as the thana Circle Officer (CO) and his TTS and 3 of the 6 Union Parishad Chairmen (UPCs) involved (once). In addition, a total of 195 construction site inspections were made in preparation of this evaluation. The fundamentally different administrative approaches used in these two pilot programs necessitate separate presentations in the Summary section that follows, although the Recommendations section is presented in a singular format.

The high degree of motivation and innovation displayed by all parties involved in these pilot programs is not only a tribute to their enthusiasm and professionalism, but has also contributed significantly to the breadth of information that was generated as presented in the many pages that follow. In particular, the Ministry of Food's liberal flexibility in dealing with a seemingly constant flow of problems and requests, giving maximum latitude to the thanas to evolve their unique solutions, CARE's innovative experimental approach to this pilot, giving much information in a relatively small program, and the logistical support provided by the staff of the U. S. Agency for International Development are greatly appreciated. Finally, much credit must go to the TNOs and TTSs who, under a brand new Upgraded Thana administration, displayed considerable courage and perseverance in meeting seemingly endless problems of natural and human origin.

SUMMARY

LOCAL GOVERNMENT PILOT

Activity began in the Local Government Pilot with the Ministry of Food's memoranda of 7 February and 20 February to the 5 Zonal Martial Law Administrators and the 4 Divisional Commissioners specifying the purpose, scope, scheme selection criteria, time schedules, and details of local administration for this program. With the sole exception of the Dhaka Zone, the main points of these documents were not passed down to the thanas in a clear and uniform manner. Until this "communication gap" was fully closed in late April, the remaining 10 thanas were not able to proceed toward tendering of schemes for the full allocation of 16 lakh taka per thana. (Only in Shariakandi Thana did the Deputy Commissioner and the TNO jointly decide that it was too late to prepare for additional tenders in early May, and therefore only utilized 4 lakh taka.) Although each thana expeditiously carried out the orders relayed to them, 9 out of 13 did not complete the issuance of work orders until May (and in 5 thanas, late May). Therefore, it is not surprising that only 4 thanas were able to complete all of their structures within the original 30 June deadline. (See Table 1.)

Scheme Selection

The scheme selection criteria from the Ministry specified that the schemes chosen must be on a CARE FFW road and must complete a road or a segment of a road to an existing completed road network. Five thanas did not receive these instructions. All the 13 TNOs stated that they appreciated (or would have appreciated) these criteria in dealing with the many Union Parishad Chairmen (UPCs) that can invariably control the Thana Parishad which must approve the schemes.

All schemes were chosen from the Thana Planbook, and site pre-surveys were conducted by the TTSS in consultation with local residents. In several thanas, the local residents did not initially supply correct information regarding flood water levels and other local requirements and major corrections had to be made during construction. In Mirzapur Thana, this resulted in their not meeting the 30 June deadline. Most thanas did not have their own measuring tapes, rods, and levels to do an accurate job in determining scheme dimension requirements, and soil testing equipment was only used by Zilla Board staff for one 50-foot bridge in Sarail Thana.

TABLE 1
SUMMARY OF THE LGP PROGRAM AND CONSTRUCTION PROGRESS

Thana	No. Roads Completed	No. Roads Partially Completed	Total No. Schemes	No. Schemes Completed By:				Next Season ^e	Date(s) of Work Orders
				May 31	June 30	July 31	August/Sept. ^e		
Mirzapur	1 ^a	-	10	2	8	9	9	10	16 Mar.
Madarganj	2	-	16	-	2	?	?	?	16 Mar., 5 Apr.
Serajdikhan	-	1 ^b	7 ^c	2	5	5	7		25 Mar.
Shailakupa	6	2	24	-	24				6, 16, 24 Mar.
Alandanga	-	4	11	-	11				4 May
Shymnagar	3	2	15	-	7	10	12	15	3 May
Fatikchhari	3	-	22	-	7	?	21	22	9, 18 May
Ishurdi	3	-	32	10	26	32			21 Apr.
Puthia	7	1	19	-	19				10, 18 May
Shariakandi	-	6	8	-	8				5 May
Sarail	1	1	10	-	1	8	9	10	14 May
Chunarughat	2 ^d	-	28	-	4	8	26	28	19 May
Begunganj	-	7	13	-	3	12	13		5, 25 May
Total:	28	24	215	14	125	(155)	(195)	(215)	

a. 3 small pipe culverts needs.

b. 3 large bridges + 2 small culverts needed.

e. anticipated completion.

c. an 8th scheme (75-foot bridge) was built at the same with District funds.

d. a major bridge over the Kowai River is needed to complete both roads.

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The lack of measuring equipment led to delays in Mirzapur, Ishurdi, Sarail, and Shariakandi Thanas, while pre-survey soil testing would have avoided significant delays experienced in Alamdanga, Fatikhari, and Mirzapur Thanas.

The types of schemes selected in the pilot program reflect three major factors: (1) the compressed time schedule for scheme selection (especially in the 10 thanas that received irregular instructions) - for example, there was no time to adequately determine the availability and quality of locally manufactured reinforced concrete (rcc) pipe culverts (most Sub-Division and District towns have such manufacturers); (2) the tendency to build a greater number of smaller structures with the given funding such that the maximum number of unions can be involved (due to pressure from the UPCs in the Thana Parishad); and (3) the types of schemes familiar to the TTS through previous experience or that exist in the thana files, and those types available in the District Council, Zilla Board (ZB), Water Development Board (WAPDA), Roads and Highways, and Public Works Department (PWD). It should be noted that the TTSs had little familiarity with the LCRD Ministry's Design Manual For The Construction of Culverts, Small Bridges and Sluices, and without specific instructions to do so, were not in a position (considering the short time factor) to spend time studying it.

The results of the scheme selection process are summarized in Tables 1 and 2. Table 1 indicates the number of roads fully or partially completed with this pilot program as well as the total number of schemes planned in each thana. Table 2 indicates the LGP-wide breakdown of structural types selected.

TABLE 2
TYPES OF STRUCTURES IN THE LGP PROGRAM

Description	Span (feet)	No.	%	No. Thanas
Bridge	20 - 90	37 ^a	17	12
Open Foundation Culvert	3 - 15	97	45	9
Brick Box Culvert	4 - 8	38	18	3
RCC Box Culvert	5 - 8	17	8	3
RCC Pipe Culvert (single & double)	3 - 6	18	8	3
RCC Arch Culvert	8	8	4	1

a. 3 are repairs in Madarganj Thana.

It should be noted that in Serajdikhan Thana the Zilla Board and District Council engineers in Dhaka controlled most phases of the pilot program, including scheme selection and design, tendering and selection of contractors, most supervision, and payments; the Thana Parishad only maintained its approval functions and the TNO's signatory functions in the process.

Design Preparation

Although most Thana Engineers (TEs) were familiar to some degree with the Design Manual, upon questioning, they stated they felt compelled to use acceptable designs from other sources (mentioned above) that are half the cost. (In Mirzapur Thana, the only pilot thana that used the Design Manual for all its schemes, the cost of each scheme was nearly double that of similar schemes in other pilot thanas.) These TEs felt that the specifications called for in the Design Manual fit the requirements for expensive paka (permanent) road construction, and that the better designs available in the District and Sub-Division offices were adequate for heavy use on earthen roads or lightly used paka roads. Nevertheless, the use of any designs other than those with which they were readily familiar was precluded by the fact that most thanas were given only one to four days to submit their scheme designs to their Deputy Commissioners (DCs).

District Council/Zilla Board executive engineers prepared all the designs for Madarganj and Serajdikhan Thanas (in Serajdikhan Thana, the District hired an architect/engineering company to draft the designs for their large bridges), the two larger bridges (30- and 50-foot spans) in Chunarughat Thana, and the 40-foot span bridge in Ishurdi Thana. Otherwise, all designs were prepared by sub-assistant (graduate) engineers or diploma engineers in the TTSs, reviewed by the TE (time permitting), and checked by District Council/Zilla Board executive engineers. (In Shymnagar Thana, the District-level engineers did not review the thana's designs until June, resulting in last-minute changes that will cause 3 of their 4 large bridges to await the dry season until they can be completed.) Although many designs submitted by the thanas had minor omissions (such as missing dimensions, specifications, and multiple views), in general, all thanas have TTS members who have adequate understanding of small structure design.

Tender Preparation and Contracting

All of the LGP thanas prepared their tender documents using the LGRD Ministry's standard format. Cost estimates were generally based on Zilla Board (ZB) rates, although several thanas used rates from PWD, WAPDA, or Roads & Highways when time permitted "comparison shopping" for the most current rates. Since most of the ZB rates were two or three years old, construction progress was often slowed due to contractors' hesitancy to purchase materials (especially cement) that were undergoing wild price fluctuations in the local markets in hopes that the TNOs could arrange for government-purchased commodities at cheaper rates. (Although, in several cases, the DCs did arrange for government procured cement, in most thanas, the TNOs insisted that the contractors purchase their commodities in the local markets, with little resulting hardships.) Tender fees collected from bidding contractors generally payed for the thanas' tender preparation and advertizing expenses.

Although several thanas advertized their tenders in national dailies, the vast majority of contractors with winning bids were from the Thana, Sub-Division, or District (generally, in that order). Most thanas also advertized tenders in government offices. This combination produced competitive bids in all pilot thanas. (Only in Chunarughat Thana, where tenders were floated in local offices and a local weekly newspaper, did most schemes not receive competitive bids.) Most tenders were floated for 7 days. With very few exceptions, all contracts were awarded at or below the tenders' estimate. Savings from below-estimate contracting was used to tender for additional schemes or for upgrading of already tendered schemes in 4 pilot thanas (after approval by the Ministry of Food). In accordance with generally followed practice, a total of 10% of the contract value was collected from the winning contractors to cover earnest and security money, which will be refunded either 6 months or one year after the completion of work. Most thanas included contingency money(1-5%) in each contract or as a lump sum in the thana account to cover unforeseen cost overruns. (Many of the thanas had to use these funds, while several had to request even more funds from the Ministry in order to make corrective changes during construction.) The dates of issue of work orders is given in Table 1.

Supervision

The level of prior road construction experience in the TTSS varied considerably among the pilot thanas. Although, at first, Sub-Divisional- and District-level engineers offered supervisory assistance in several thanas, with the exception

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of Serajdikhan Thana, all supervision was done solely by the TTSs. It should be noted that when the TE made daily or frequent visits to the construction sites, supervision quality was generally very good. The quality of supervision seen in 6 of the 13 pilot thanas during the second round visits was not adequate as evidenced by the relatively unsatisfactory quality of completed works seen, and the supervisors, when present, were not fully aware of their duties. It is to their credit that 4 of these 6 thanas showed marked improvement in the quality of supervision during the third round visits following the advice offered during the prior visit.

Although supervision techniques were readily and enthusiastically learned by the TTSs, the transportation of supervisors to the construction sites was a major problem that was not amenable to immediate correction. Although each TNO claimed to have 3 to 11 TTS supervisors available for use in this pilot program, generally, 3 or 4 supervisors were assigned to full-time supervision in each thana. In Mirzapur, Serajdikhan, and Sarail Thanas, supervisor transport was not a problem since the construction sites were all on one easily accessible road. In Alamdanga and Puthia Thanas several motorcycles were available to the supervisors, and the intensity of supervision was very good. In the remaining 8 pilot thanas, the transport of supervisors was a severe problem. Without motorized transport (bicycle transport was impractical due to the distances and road conditions involved), slow and/or costly modes of transport such as buses, baby-taxis, rickshaws, and foot-power had to be used; most thanas had no funds to pay for daily transport of several supervisors; and the excessive transport and the monetary and physical time drain on the individual supervisors certainly discouraged intense supervision. In Ishurdi, Sarail, Shariakandi, and Shailakupa Thanas, Union Parishad members were actively involved (in most cases, at the encouragement of the TNOs) in non-critical supervision, which proved to be very helpful.

Quality of Construction

Under adequate supervision, the contractors and their craftsmen and laborers were able to construct paka structures of good quality; without good thana supervision, the quality of construction was drastically lowered. In the end, the quality of construction in the large majority of pilot thanas was good or very good.

Reinforced concrete work, given proper materials, rod bending and placement, and adequate thana supervision, was in all cases at least of satisfactory quality. On the other hand, brickwork required daily knowledgeable supervision to ensure satisfactory results. Such poor construction practices as

course-by-course bricklaying with resulting unmortared vertical joints, over-watered mortar, vertically aligned joints, and inadequate curing of concrete and mortar were only corrected after the thana supervisors were instructed as to the proper construction techniques. The quality of construction materials delivered to each site was generally good, although there remained a constant need to segregate the inevitable small but significant percentage of materials (especially bricks) that were not of adequate quality; the aforementioned problems of supervision, especially with respect to lack of transport, led to deficiencies in such quality control. Dangerous vertical excavations were seen at almost all construction sites, regardless of soil conditions, and cave-ins were reported in 4 thanas and probably occurred elsewhere as well. Finally, in general, the placement of weepholes was not understood by the TTSs.

Construction Progress

Table 1 summarizes the overall construction progress in the LGP program. The late start (work orders could not be issued until May in most thanas), with construction activities beginning well into the pre-monsoon storms and carrying into the full monsoon, caused major delays of several weeks in duration in Shymnagar, Fatikchari, Sarail, Chunarughat, and Alamdanga Thanas. The inadequate time and/or equipment for pre-survey activities and design preparation led to mid-construction delays in Mirzapur, Alamdanga, and Shymnagar Thanas. Finally, extreme problems in materials transport and/or availability caused by weather, road conditions, availability of materials transport vehicles, sheer remoteness of the thanas from suppliers, and difficulties in procuring cement caused agonizing delays in Madarganj, Shymnagar, Serajdikhan, Fatikchari and Chunarughat Thanas. But as exemplified by the experiences of Puthia, Shailakupa, and Ishurdi Thanas, in the absence of natural calamities and major logistical problems, and with adequate and timely supervision, very good quality bridges and culverts (up to 40 feet in span) can be constructed in 4 to 8 weeks.

Payments

With the dual exceptions of Serajdikhan and Sharikandi Thanas, where payments to contractors were made directly by the DCs, the TNOs in the LGP program controlled all payments. Most TNOs were not willing to issue tenders for the full 16 lakh taka-worth of schemes until at least the initial disbursement of 8 lakh taka per thana was received by the DCs

from the Ministry. Even though smaller structures (up to 10-foot span) only took 2 or 3 weeks to complete after materials delivery (and with favourable weather conditions), many contractors could not be payed on their final bills submitted in June and July, since the Ministry did not release additional funds (another 6.34 lakh taka) until the first week of August. This time lag in release of funds placed the TNOs under great pressure, both in placating the concerns of contractors who had completed their structures and in trying to avoid work slowdowns by contractors who were yet to complete their works.

Most TNOs accepted one running bill plus a final bill from contractors building smaller structures; contractors with larger bridges were generally allowed 2 or 3 running bills plus a final bill. As per common practice, no contractor was given advanced payments. All bills submitted to the TNOs were prepared by the TTS supervisors and checked by the TEs at the sites.

CARE PILOT

The CARE Pilot program included many innovative administrative procedures as well as experimental designs and construction techniques. The Union-level was the main focus of activity, being charged with front-line supervision and payment responsibilities, while the Thana-level involvement was largely restricted to technical design and oversight of construction activities. CARE staff provided overall technical guidance in the form of design checking and third-line construction supervision and the monitoring of all pilot phases. Scheme selection was accomplished by all 3 parties. A total of 19 schemes were undertaken in 3 thanas (6 unions). A summary description of schemes is given in Table 3.

The CARE Pilot program began in late February with the selection of thanas, unions, and initial site visits (through March); in early April all parties concerned were notified of their responsibilities in this pilot program and design and tendering phases proceeded; by the last week in April all the project money was in the local banks and construction works were assigned to respective contractors and local craftsmen. Without extreme hardships caused

TABLE 3
CARE PILOT SCHEME SUMMARY

Nos.	Description
1 ^a	Completion of 15-foot Open Foundation Culvert
1	Refitting of double AREMCO Corrugated Pipe Culvert
1	Refitting of RCC Pipe Culvert - double pipe
1	Brick Arch Culvert - 5-foot span
4	RCC Pipe Culvert - single pipe
2	" - double pipe
5	Open Foundation Culvert - 4-foot span
3 ^b	" - 5-foot span
1	" - 6-foot span

- a Only abutments had been constructed.
- b One culvert has a brick floor (box culvert).

by weather, poor soil conditions, or materials delivery problems, construction activities were able to proceed smoothly. Sixteen of the nineteen total schemes were completed to slab casting by the original 31 May deadline; the other three schemes were "completed" by 10 June.

For the sake of brevity the following summary description does not include the details of all the administrative parameters or all the technical findings, but highlights the major results of the more innovative approaches used, especially those which add to the breadth of knowledge gained in the LGP program. For a more comprehensive discussion of the administrative aspects of the CARE pilot program, please refer to the First Interim Report; for more details on the technical aspects of this pilot please refer to the First and Third Interim Reports.

Administrative Aspects

CARE asked 4 unions in 2 thanas to contribute 2½% or 5% of the construction costs. Although one UPC claimed that this contribution caused a hardship on the other funds in the union, all UPCs interviewed stated that they were happy to contribute these funds, and that it was a positive motivating factor.

TTS participation in supervision in 2 of the 3 thanas was sporadic at best. Without primary supervisory (and payment) responsibility, these TTSs were not motivated to give enthusiastic assistance to a joint effort. The assignment of the UPCs as primary supervisors at the construction sites worked out satisfactorily since the TTSs and the CARE technical staff in their supervision oversight roles could assure proper construction practices at critical phases; but the UPCs generally had neither the time nor the interest to learn how to be technically sound construction supervisors - certainly, without a basic technical background, UPCs cannot be expected to supervise construction activities beyond simple materials quality control checks and routine construction operations.

Tenders for those works done by contractors (half the unions used contractors, while the other half used local craftsmen) were only floated union-wide. This limited advertisement attracted a limited number of bids, many from contractors with relatively little experience. All winning bids were at the tenders' estimated cost. Earnest and security money which, by standard practice, is withheld for 6 to 12 months to ensure total completion of all contractual obligations and is considered as insurance on at least the structure's short term integrity, was not included in the contracts written under the CARE pilot. Contingency funds were provided in only two unions: a 15% contingency was needed in Gharialdanga Union - Lalmonirhat Thana to cover the higher costs of brick and cement brought to the sites, and a small contingency was needed in Borobari Union - Lalmonirhat Thana to cover cost overruns.

A number of novel payment methods were tried in this pilot, and although several inevitable problems resulted, the comprehensive role that CARE retained ensured timely and accurate payments. In at least one of the three unions where the UPC controlled the direct payments, the funds were prematurely withdrawn from the account by the UPC. In the three unions which were required to obtain co-signatures of the thana development committee chairman for payments, difficulties arose

in getting these committee chairmen to show enough interest in the projects to fulfill their obligations. Contrary to standard practice, advances of 25% of the contract price were given to each contractor for materials purchase. This was adopted by CARE to ensure the participation of contractors who might not yet be able to afford this initial outlay, although it would have been a risky practice if the contractors were solicited from a wider area, and is generally not considered necessary since reliable contractors should have enough capital in their business to not only start with initial materials purchases but also to cover possible expenses in redoing structures (as required by supervisors due to the mistakes of their hired craftsmen/laborers). Finally, all final payments were made to contractors/craftsmen by 10 June, before the completion of earthwork, slab curing, the removal of shuttering/formwork, and final plastering. This again would be a very risky practice if dealing with contractors/craftsmen from outside the union.

Technical Aspects

Although numerous small technical decision-making errors were made in the CARE Pilot program (as enumerated in the Interim Reports), the structures produced were generally sound. A number of structures may experience minor pre-mature failures, but overall structural integrity should remain intact. The brickwork craftsmanship, which was a major problem seen in the LGP program, could not be judged in the CP program since no brickwork was being done during the first evaluation visit, and all the brickwork was plastered over by the time of the second visit.

CARE promoted the use of cost-effective designs and construction practices throughout their pilot. Each TTS was required to provide alternative designs for each scheme. (The CARE-Rangpur Unit Administrator stated that even lower-cost alternative designs-as well as construction techniques - are available through the Rangpur-Dinajpur Rehabilitation Service-RDRS - who promote the use of such "appropriate" materials as bamboo for reinforcement in pipe culverts. Their designs are said to be "proven" with 10 years of experience in the sub-continent and to be adequate for earthen roads carrying loaded bullock carts or lightweight vehicles.) CARE's use of low-cost designs, local craftsmen and contractors, and on-site pipe casting, combined with the irregular nature of supervision, produced structures that were necessarily not as aesthetically pleasing as those seen in the LGP program, but they should generally perform the basic service intended. Finally, it should be noted that there was no significant difference

between the quality of structures produced by contractors or by local craftsmen; this is not surprising since the contractors hire these same craftsmen to do their work, and with an equally good and intense level of outside supervision, construction quality should be equal for such small structures.

RECOMMENDATIONS

The recommendations that follow are largely directed toward the implementation of a program for small bridges and culverts (up to 40-foot span) on Food For Work (FFW) roads on a nationwide scale, assuming the involvement of the Ministry of Food and CARE as the first-line monitors/administrators. Although the need for bridges larger than 40 feet in span on FFW roads was evident through the experiences of this dual pilot program, such large-scale construction should be considered only after experience gained through a separate pilot program. Finally, it should be noted that most of the recommendations presented forthwith are based on direct experience gained from problem-solving by TNOs and other administrators and technical staffs involved in the evaluated pilot programs. In addition, as the requirements of a full-scale program became more clear during the course of these pilots, all parties involved were solicited for their own ideas regarding such recommendations.

General Administration

1. Since the cost of a 40-foot span bridge using Design Manual specifications is at least 5 lakh taka, this amount should be considered as a minimum yearly allocation per thana involved in this program. Alternatives may include:
 - a. A smaller yearly allocation per thana with the option to combine 2- or more- years' allocations to build these larger structures.
 - b. A larger allocation per thana every two or three years, distributed to half or one-third (respectively) of the thanas in each district each year.
(This alternative was endorsed by 11 of the 13 LGP TNOs citing advantages such as the greater visibility and resulting motivation from a larger program, the ability to more easily deal with the competing desires of the UPCs during scheme selection in the Thana Parishad, and the completion of roads during each allocation year. Those thanas not involved in the construction program in any particular year could be encouraged to seek onsite training in nearby thanas with active construction.)
2. Once thanas are chosen, instructional circulars and follow-up correspondence from CARE/Ministry of Food should be sent directly to the TNOs with informational copies sent to the DCs and other involved parties.

3. Funds for construction activities should be allocated directly to the TNOs (after approvals of schemes/designs by higher authorities) and placed in thana branch banks, with all records of such accounts maintained in the project files in the thana offices for higher authority review. (Most TNOs are not willing to float tenders until funds are available to them.)

4. Five percent of the allocated project funds per thana should be reserved in the thana account as contingency to cover potential cost overruns on all their projects. Any request on any individual scheme for over 5% of that scheme's contracted cost may be referred to a higher authority for approval. Unused contingency funds may be added to subsequent allocations for additional funding of schemes.

Alternative: This 5% contingency money may be solicited through thana/union contributions. (Such local contributions will not only allow more donor funds to be used for scheme construction, but will also motivate the local people to assist supervision and scheme selection, and motivate the TTS to do a more comprehensive job in pre-construction phases since cost overruns are largely caused by oversights committed in these early phases.)

5. All agencies involved in field monitoring and reviewing of technical program activities should only send experienced graduate-level (4-year degree) engineers to oversee thana activities. (Upgraded thanas have at least one, and more often 2 or 3 graduate-level engineers, who must respect any overseer sent to monitor and advise them to ensure a healthy and motivating relation for accepting guidance.)

6. The erection of signboards indicating the project cost and responsible parties (donors, contractors, etc.) should be encouraged at all project sites to help motivate public interest and scrutiny.

7. Final payment to contractors (less security money) should not be made prior to full completion of construction site activities, eg: curing, formwork/shuttering removal, final plastering, and earthwork.
8. An assessment should be made, using the already available Thana Planbooks, as to the total taka needs for appurtenant structures on FFW roads in each thana. (This would greatly assist administrative decision-making for such a long-term program.)

Scheme Selection

1. The construction of appurtenant structures in any year's allocation should be limited to the completion of roads or segments of roads to an existing completed road network.
(All TNOs and COs involved in the pilot programs stated that such a selection criterion is necessary, since, if left to the UPCs who make up most of the Thana Parishad, the Parishad would likely agree to one structure in each union.)
2. Structures should not be built on roads where, during the same work season, major earthwork construction or reconstruction will be going on simultaneously (otherwise, delivery of construction materials to the sites will be a major problem).
3. The repair or completion of fundamentally sound existing bridges or culverts, as well as the total replacement of unsound structures, should be permitted as acceptable schemes in future programs.
4. The availability of good quality rcc pipe culverts should be ascertained by each TTS, and consideration made for their use, where appropriate.
(Only after considerable training by highly qualified technical persons may on-site construction of rcc pipes by contractors be considered; in addition, well designed water-proof shuttering must be used under intense expert supervision.)

5. All thanas involved in future appurtenant structures programs should be provided with a minimum of leveling instruments, measuring tapes and rods in order that they may effectively accomplish pre-survey, construction, and post-construction activities.
6. A brief form should be prepared by the monitoring agency and completed by each thana indicating pre-survey measurements, soil conditions, the scheme's beneficial uses, and other considerations. This form should be returned to the monitoring agency for approval and possible site verification prior to final design and tendering.

Design Preparation & Review

1. Given adequate time and necessary training or review the TTSs are able, and should be encouraged, to develop their own designs for structures up to 40 feet in span.
2. Cost effective designs should be encouraged.

For example, one way this might be done is to request all thanas to categorize their FFW roads as A, B, C, or D roads:

A roads - top priority for paka surfacing.

eg: a. roads that connect a union center to a paka network.

b. roads that connect several unions.

c. roads that may offer a new advantageous connection to another thana or district.

B roads - second priority for paka surfacing.

eg: roads that connect union centers.

C roads - low priority for paka surfacing (ie: the road will not serve a major communication function in the area).

eg: roads that only connect villages to union centers.

D roads - no need for paka surfacing.

eg: a. roads that only serve foot traffic.

b. roads that serve only light transport of marketable goods.

This categorization can be easily incorporated into the Thana Planbook, according to all TNOs questioned; and, for example, appurtenant structures on A and B roads could be done using Design Manual specifications, C roads with the readily available designs from WAPDA, Zilla Boards, District Councils, etc., and D roads with the equivalent of RDRS designs. All of these design options (and certainly more are available in Bangladesh) should be studied for appropriateness relative to the ultimate potential road use over the next 40 or 50 years (the length of time a well-built structure designed for local conditions should minimally last). This is not only appropriate and will lead to the most cost-effective designs, but will also save donor funds in the long run and, at the same time, allow development to follow a more rapid pace while in keeping with the ultimate goal of the best use of these funds.

3. The Design Manual requires revision to correct minor errors and to reorganize the chapters for clearer presentation. Designs of rcc arch culverts and the popular brick masonry box culvert should be included. These revised manuals should then be adequately distributed (2 or 3 manuals per thana).

4. All design and tender estimates should be checked, corrected and approved in a timely manner by an engineer of the executive engineer-level or an assistant-level engineer with considerable experience in appurtenant structure design, following a review by the Thana Engineer and prior to tendering.

Tendering & Contracting

1. Although the use of local craftsmen through Union Project Committees might provide a small savings to the program, it is recommended that thanas only float tenders for contractors. (Since the use of local craftsmen is only appropriate for simple structures up to 6 or 8 feet in span, several of these small spans can be built by one contractor; and under one contractor, supervision and monitoring would be much easier and an awkward and potentially cumbersome dual thana/union administrative situation would be avoided.)
2. Zilla Board and other widely used tender rates should be updated at least yearly.
3. Thanas should be encouraged to use only updated rate schedules for tender estimates.
4. All tender estimates should include a provision for earthwork backfilling behind completed structures and for gradually sloped approaches back to 100 feet on both sides of the structure. Consideration should also be given to the inclusion of provisions for compaction by mallet (every 6 to 8 inches) or by water compaction (where soils are appropriate), at least for the earthwork backfilled in the excavation.
5. Tenders should be floated in all government offices and in at least one daily newspaper up to District-level circulation. (Local contractors are able to make more reasonable bids with an understanding of local conditions, and this will reduce work slowdowns due to misunderstandings during construction.)

Supervision

1. The TTS should be given full responsibility for construction site supervision. Although unions cannot generally provide technical people to take a major part in supervision, UPCs should be encouraged to take an active role in the schemes built in their unions; this may include assistance to the TTS in the gathering of pre-survey information as well as full-time qualitative supervision at construction sites by UP members (as needed).

2. The most effective supervision is done with a minimum of once daily visits to each site. At a minimum, the supervisor should be present (by appointment if daily visits are not possible):
 - a. to check the quality of all materials used at the construction site before they are used; all inferior quality materials should then be isolated and instructions given to contractors, craftsmen, and laborers as to which materials are approved for use.
 - b. after completion of excavation and prior to piling or soling for foundations to check final elevation and to assure a safe angle of excavation.
 - c. to check concrete mixing and pouring of foundation slabs.
 - d. to check brick masonry during initial courses.
 - e. to check the final elevation prior to the construction of shuttering for slabs.
 - f. to check the placement and specifications of reinforcing bars in place prior to rcc pouring.
 - g. at rcc mixing and pouring operations.
 - h. to check all running bill and final bill estimates.
 - i. to make the final inspection after all contract obligations are fulfilled in preparation of final payment.

3. The purchase of two motorcycles per thana would play a significant role in intensifying supervision, and therefore, in improving the quality of construction. Motorcycles would allow each supervisor to cover 4 to 6 schemes per day, spending full days at the sites. (Bicycles are an impractical alternative in most cases, considering the distance and road conditions often involved. The remaining alternative is expensive, tiring, and time consuming public transportation to the earthwork road, rickshaws, and walking; each supervisor could cover only 2 or 3 schemes on the same road per day, spending only part-days at the sites.)

4. Without motorcycles, thanas should be provided funds for the transport of supervisors, since this is often a significant expense.
5. Thana Engineers should take an active role in oversight supervision.

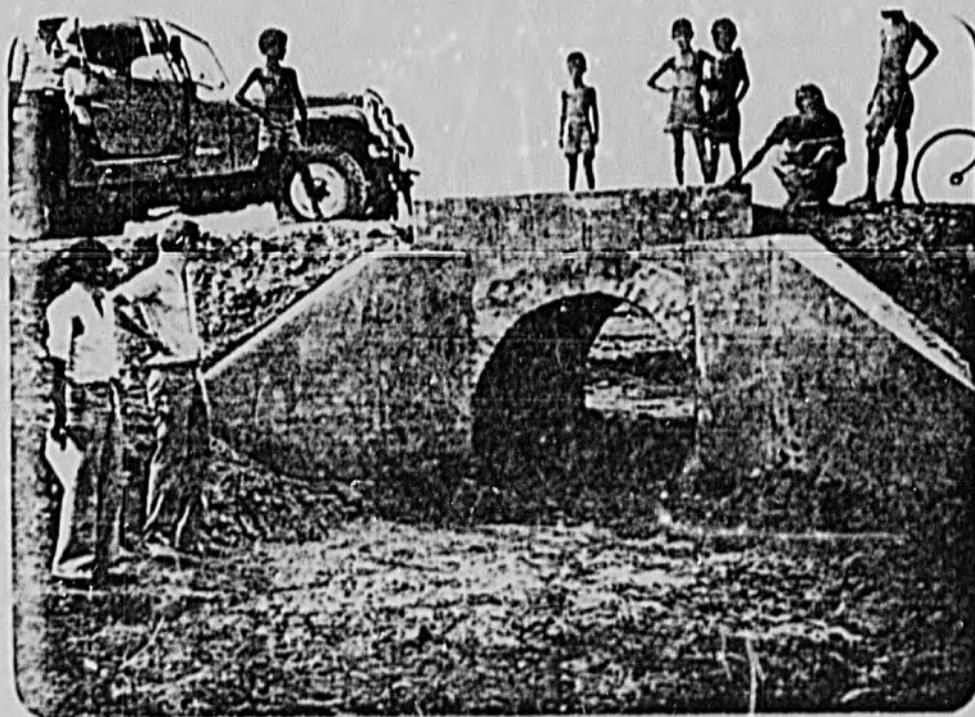
Construction Activities

1. Except in cases of extreme shortages in the markets, contractors should be made to procure their own construction materials (and not depend on government assistance).
2. Excavations should be sloped at a minimum vertical-to-horizontal ratio of 3-to-1 for good compact soil, and 2-to-1 in poor loose soils.
3. In order to expedite the completion of several appurtenant structures on the same road, all construction materials should be delivered first to the site farthest from the main source of materials prior to the excavation of the next farthest site; etc.
4. Plastering should be completed during the upcoming dry season on those plastered structures (in this year's pilot programs) that were under water during final plastering operations.

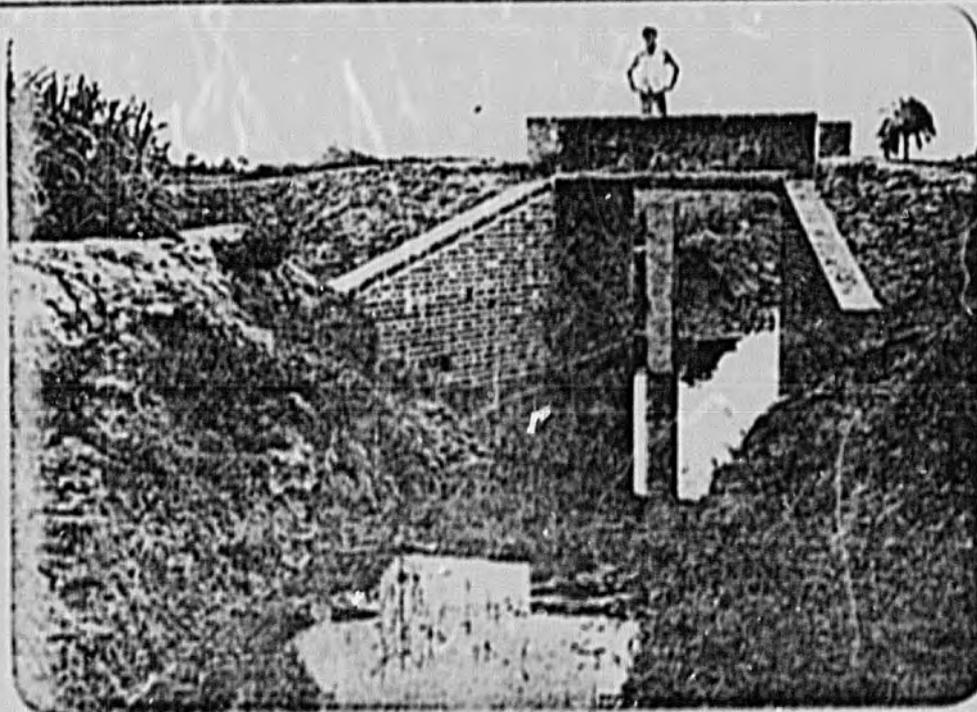
Training

A short training course should be developed and implemented as soon as possible for all involved TTS members. Such a training course should include "hands-on" experience at active construction sites. From observations made in the preparation of this evaluation, the training course should emphasize:

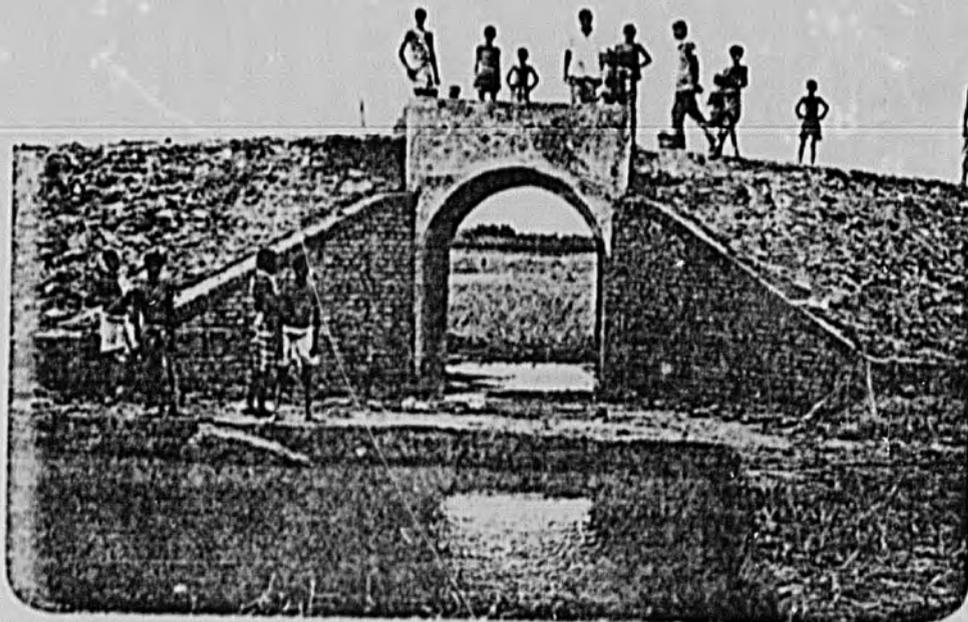
1. pre-survey topics such as:
 - a. hydrologic needs.
 - b. simple soil testing techniques.
 - c. site/cost-effective scheme selection.
2. awareness of readily available design alternatives.
3. the art and science of construction site supervision, with special emphasis on:
 - a. proper brick masonry construction techniques.
 - b. quality control of construction materials.
 - c. weephole theory and placement.
4. earthwork compaction techniques.



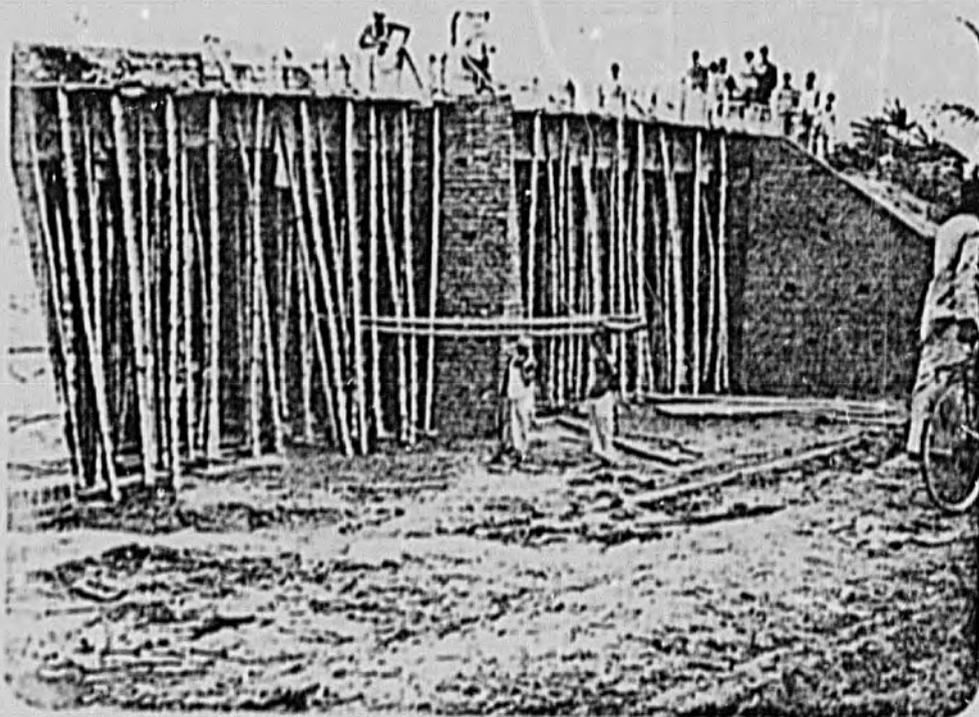
Thana: Pirganj District: Rangpur Date: 21 June 1983
Subject: Completed 5-foot span brick arch culvert
(CARE Pilot)
Cost: 27,790 tk.



Thana: Puthia District: Rajshahi Date: 26 July 1983
Subject: Completed 10-foot span open foundation culvert
with sluice gate (gate not shown).
Note pointing of brickwork.
Cost: approx. 1,05,000 tk.



Thana: Ishurdi District: Pabna Date: 25 July 1983
Subject: Completed 8-foot span rcc arch culvert.
Cost: 84,000 tk.



Thana: Ishurdi District: Pabna Date: 25 July 1983
Subject: 40-foot span bridge, slab cast on 10 July.
Note: formwork/shuttering in place during
curing and guardrail casting.
Cost: approx. 4,00,000 tk.

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EVALUATION OF PILOT PROGRAM ACTIVITIES
CONSTRUCTION OF APPURTENANT STRUCTURES ON FOOD FOR WORK ROADS

FIRST INTERIM REPORT

15 MAY 1983

by Dan Hallett

SCOPE OF REPORT

This First Interim Report reflects information obtained in 17 interviews and 12 construction site visits conducted from 18 April 1983 to 5 May 1983. Interviews were held with Upgraded Thana and other involved officials and technical staffs in 10 (of the 13) Local Government Pilot Thanas¹, the CARE-Rangpur Unit Administrator, Thana personnel involved in all 3 CARE pilot Thanas, and 3 (of the 6) Union Parishad Chairmen who are participating in the CARE pilot. The table on the following page summarizes the interviews and site visits conducted in preparation of this report.

Although the scope of these interviews covered both completed and anticipated pilot activities, only those activities which were completed by the large majority of Thanas seen at the time of this initial round of interviews are presented in detail in this First Interim Report. Some discussion of future pilot activities is also included in this report in the hope that the information provided will foster some minor corrective changes in these upcoming activities during the interlude between reports.

The fundamentally different approaches used in the Local Government Pilot and CARE Pilot necessitate separate discussions of these two programs, as presented forthwith.

¹ Mr. Gene George of the RDE section of USAID-Dhaka conducted the interview in Fatikchari Thana in Chittagong District in my absence.

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<u>Pilot Program</u>	<u>Thana/(Union)</u>	<u>District</u>	<u>Interview Date</u>	<u>No. Structures Seen</u>
Local Government	Mirzapur	Tangail	18 April	3
	Nadarganj	Jamalpur	19 April	1
	Shymnagar	Khulna	24 April	-
	Shailakupa	Jessore	25 April	-
	Alamdanga	Kushtia	26 April	-
	Serajdikhan	Dhaka	28 April	3
	Ishurdi	Pabna	1 May	1
	Puthia	Radjshahi	2 May	-
	Shariakandi	Bogra	3 May	-
	Fatikchari	Chittagong	5 May	-
	CARE	Pirganj	Rangpur	4 May
(Madankhali)		"	4 May	-
Lalmonirhat		"	5 May	n.a.
(Borobari)		"	5 May	1
(Ghariaaldanga)		"	5 May	3
Kotwali		"	5 May	n.a.
[CARE U.A.]		"	4 May	n.a.

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LOCAL GOVERNMENT PILOT

The major purpose of the Local Government Pilot (beside providing necessary appurtenant structures on FFW roads) is to gain valuable information on the performance of Upgraded Thanas in the execution of a relatively large road construction project. It was understood at the outset that since this is the first major construction program undertaken in these newly Upgraded Thanas, uniform guidance from the Ministry of Food was necessary for the overall success of this pilot program. To this end, the Ministry sent two memoranda, on 7 February and 20 February, addressed to the 5 Zonal Martial Law Administrators (ZMLAs) and the 4 Divisional Commissioners, specifying the purpose, scope, scheme selection criteria, time schedule for major program phases, and pertinent details of local administration.

It was the hope of all those persons involved in the higher levels of administration of this pilot program that the entire first phase of activity, from the conception of schemes to the issuance of work orders to contractors, would be completed by the time of the first evaluation visits. This was not the case due to unforeseen communication difficulties; specifically, the ZMLAs only relayed the scheme selection criteria from the above-mentioned 20 February memorandum to the selected District Deputy Commissioners (DCs) and Thana Nirbahi Officers (TNOs) instead of the entire contents of the memo as directed by the Ministry. A subsequent memo issued by the Ministry to the involved DCs on 14 April prompted further release of small pieces of instructional information from the DCs to the TNOs through their Additional Deputy Commissioners in the form of telegrams. This erratic and piecemeal release of basic instructional information from the Ministry to the Thanas led to general confusion and hesitancy on the part of the TNOs.

As a result of this "communication gap", schedules and instructions, as originally ordered in the 20 February memo, were not adhered to on a uniform basis throughout the country. For example, although all of the Thanas submitted their selected schemes in February as per the Ministry's orders, several Thanas submitted schemes for considerably less funding than the 16 lakh taka total allocated per Thana as mentioned in the memo. Work orders were to be issued by March 15, but in only 3 Thanas (Mirzapur, Madarganj, and Serajdikhan) were work orders issued in March, and only Ishurdi Thana issued work orders since then (in April). Also, since the TNOs did not receive confirmation - and in some cases, the basic knowledge - that 50% of the money for construction was available in the District bank until the DCs informed them in the fourth week of April, in most of the pilot thanas, tenders were not floated for contractor bidding by the time of this initial evaluation visit. Further evidence of the inconsistency in scheduling as well

as the quality of work will be brought up throughout the remaining pages of this report.

It is important to note that although a large degree of confusion and hesitancy did exist in the early stages of the development of this pilot, the Thanas involved demonstrated considerable flexibility and hard work in meeting tightened time schedules, and the ultimate quality of work was not compromised considerably. (In several cases, my personal assurances regarding the guarantee of funding and the importance of this pilot project prompted immediate development of tender documents and other preparatory actions prior to the late April guarantee of funds from the DCs.) Finally, it should be noted that all the TNOs involved expressed confidence that these pilot structures will be completed by the 30 June deadline.

Scheme Selection

All of the Upgraded Thanas involved in the Local Government pilot submitted their schemes to the Ministry through their respective DCs in February as per the individual instructions they received from the ZMLA/Divisional Commissioner. In addition, all of the basic scheme selection criteria in the Ministry's instructions were strictly adhered to in all Thanas.

The location of schemes (structures) selected largely reflected the limiting 5-day time period given by the Ministry to perform pre-survey activity and to submit schemes. In general, site selection was determined by referring to priority sites as enumerated in the Thana Planbook. This was followed by site pre-surveys conducted by the Thana Technical Staff (TTS) in consultation with local residents - who were most familiar with the depths of flood water and both road and channel transport requirements - and final approval by the Thana Parishad (TP) or Thana Project Implementation Committee (TPIC, where established). The exception to this procedure was Serajdikhan Thana where the executive engineer of the Zilla Board chose the schemes in consultation with local residents, and the DC approved them after the TP's initial approval. The use of scientific methods for soil identification and testing was not employed in the pre-survey activities in any of the Thanas.

It should be noted that a legitimate concern was expressed in several Thanas that a lack of basic surveying equipment (e.g. levels, measuring tapes, plumb bobs, etc.) for use by the TTS likely limited the accurate assessment of quantitative details necessary to determine the most cost-effective structure size and site location. In addition, during the construction phase it will be awkward (at best) when the Thana supervisors will have to borrow tapes, levels, etc. from the contractors to perform intensive supervision,

make accurate judgements regarding work progress, and make running bill estimates.

The types of structures selected also reflects the limited time frame available to the TTS for scheme submittal. In most cases, this meant the selection of structure types that were merely familiar to the staff. Since prior to upgrading, the TTS had little or no collective experience with paka ("permanent" - as opposed to earthen) road construction, the newly acquired Thana Engineer (TE) was likely to be the only engineer on staff with any scope of experience from which to choose. (In several cases, the TE had not arrived at this new Upgraded Thana position until after the February scheme selection deadline; and in many other cases, he was not involved at all in the development or even the review of final designs.) Time constraint, lack of paka construction experience, and the absence of specific instructions to use - or familiarity with-the Design Manual (see the 'Design Preparation' section) led the TTS to rely on types of structures generally adopted by the Zilla/District engineers.

Since in all cases the schemes were approved by the Thana Parishad, there was a strong tendency in most Thanas to build the most number of structures with the money at hand (promised) in order to satisfy as many Unions as possible. In addition, the 20 February Ministry memo did not indicate the possibility of future significant paka construction on earthwork roads in the pilot Thanas. In fact, it stated specifically that in the event of a successful pilot program, other Upgraded Thanas will be selected for next year's program ; and this also may have played a role in "stretching" the number of schemes selected for this pilot program. With the exception of Mirzapur Thana, these same factors also directly led to the use of a 1:2:4 reinforced concreted mix ratio as used by District/Zilla engineers as opposed to the richer and more expensive 1:1½:3 mix ratio called for in the Design Manual.

The result of all of the above mentioned concerns was a relative lack of diversity in the types of structures chosen for this pilot. Bridges and open foundation culverts made up 111 out of the total 157 schemes chosen by the 10 pilot Thanas visited; the TTS members involved were evidently most comfortable designing these types of structures. Pipe culverts were only used in Mirzapur and Serajdikhan Thanas because they have reasonably close access to Dhaka - one of the few cities in the country where there are manufacturers of such pipe. Ishurdi Thana included 8 reinforced concrete arch culverts and Puthia Thana included one 10-foot span sluice-gate bridge. There are a total of 16 bridges in the 10 Thanas of 30- to 40-foot span. In Serajdikhan, where scheme selection and design were controlled by District/Zilla staff, two 90-foot bridges and one 75-foot bridge (this bridge is included in the pilot program, but funded by District funds beyond the Ministry's 16 lakh taka disbursement) were designed by a Dhaka-based consulting engineering firm.

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Design Preparation

It was hoped at the outset of this pilot program that the Design Manual For The Construction of Culverts, Small Bridges and Sluices prepared by the Ministry of Local Governments (MLG) would be used as the basic guidance document for all phases of the pilot. This manual had been distributed through the Districts to all Thanas in the country over one year ago along with a standing order from the LGRD Works Program to use it for all future paka road construction. At the time of this initial evaluation visit, all the Thanas, except Serajdikhan Thana, had at least one copy of the Design Manual on hand (although 3 copies were originally supposed to be distributed to each Thana). Fatikchari Thana had received their copy of the manual only two weeks prior to the evaluation visit. Five out of the ten Thanas visited claimed to have used the Design Manual (to one degree or another) in designing their structures for this pilot program. One common reason given for the sparse use of the manual (beyond the fact that there was no direct order to do so included in the instructions passed down plus the reasons stated in the previous "Site Selection" section) was the fact that since the DCs (with the exception of Dhaka and Tangail Districts) told their TNOs not to submit designs until they received specific orders to do so (i.e. when the District received the project funds from the Ministry), the Thanas, at that point in time, were still not sure this pilot program would actually become a reality, and were, therefore, not motivated to further familiarize themselves with the Design Manual. In most cases, the DCs finally gave the TTSs only one to four days to submit all their designs, and most TTSs had to either seek assistance from the executive engineer (3 Thanas) or refer to an older PWD standard design manual with which they were more familiar.

All designs were available in the Thana Offices for my review, and to the credit of the TTSs involved, in general, the designs seen were good. Of the 10 Thanas visited, 5 Thanas had totally complete designs, 3 others were complete except for reinforcing bar bending schedules (which they later said they would include in the design "packages" given to the contractors at the site), one had drawings that were not completely dimensioned, and one did not include the wingwall in the plan view (in Shariakandi, where only one day was given to sketch the design, and only one 10-foot span culvert was submitted as a sample design for all their structures). In 3 Thanas, the designs were made by District/Zilla-level engineers.

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Tender and Contract Development

The quantitative details used in the tendering documents were generally developed by the TTS (or in the case of Serajdikhan Thana, by the Zilla Board engineer) at the time of design development. In all Thanas, the MLG's standard format was used for quantity estimation.

In those Thanas where time was an extreme constraint (or where specific instructions were given by the DC), Zilla Board (ZB) rates were used for unit price estimates. The ZB rates obtained in at least 4 Thanas did not reflect current market rates since they were known to be two years old. To help alleviate this problem, and also to cover other possible cost overruns, most Thanas wrote up to 5% contingency money into each scheme (or kept it in the Thana account as a lump sum - with the DC's approval). In several cases, the DC arranged for cement to be available in the District town in a sufficient quantity and at a guaranteed price. (Cement prices on the ZB schedule was generally listed as 105 Taka per bag, while the present market price was known to be 135 to 150 Taka per bag.) Other rates used in the Thanas visited were from Roads and Highways, MLG, Public Works Department, or Water Development Board schedules.

In accordance with generally followed practice, a total of 10% of the contract value was collected (held) from the awarded contractor to cover earnest money (2 to 3 %) plus security money. This money is to be reimbursed to the contractor either 6 months or one year after the completion of work. In contrast, the use of contingency money varied considerably. In 3 Thanas (Madarganj, Ishurdi and Fatikchari), no contingency was included in the contract; in Serajdikhan Thana, less than 1% was included as a lump sum contingency; in Mirzapur Thana, approximately 7½% of the contract price was kept in contingency as a lump sum; and in the remaining four Thanas, a 5% contingency was withheld in the Thana account. In all cases, the contingency money will be used to cover cost overruns, and in 4 Thanas it was also used for tender preparation costs (advertizing, design printing, stationery, etc.).

At the time of this initial round of visits, tenders were floated by 5 Thanas. The tenders had not been floated in 4 of the other Thanas because they were still waiting for orders from their respective DCs to proceed, pending the receipt of project funds at the District bank. Finally, in Shariakandi, only some of the schemes were tendered due to communication misunderstandings.

In all the Thanas, with the exception of Ishurdi Thana, tenders were floated in a District daily newspaper; in Ishurdi Thana, they were floated in government offices throughout the District (and response was extremely good). In most cases, tenders were floated for 7 days.

Contract Letting

Since a majority of the Thanas had not completed the tender floating at the time of this visit, a summary discussion of the results of this process will have to be deferred to the Second Interim Report. The following paragraphs present the highlights of the results obtained through this original round of interviews.

Tenders completed floating in 5 Thanas. In all cases, contractor participation was good, and bids were not accepted by the Tender Committees at over the estimated costs. In the several cases where the lowest bids were above the tender estimate, the contractors negotiated with the Tender Committees down to the tender estimate.

In Fatikchari Thana, all the bids were 15% to 20% over the tender estimate, and a re-tender was issued. When the results of the second tender were the same, all the contractors were asked if they would do the work at the tender's estimated cost; upon receiving negative answers, the Tender Committee proceeded to recommend awards, but they had to await District approval.

Availability of Construction Materials

With the single exception of Madarganj Thana, where all construction materials had to be obtained in the District center of Jamalpur (a 2-hour drive on very rough roads), all Thanas reported that good quality first-class bricks as well as sand and bamboo are available locally. Cement and reinforcing bars are available in nearby Sub-Division and/or District centers and in many cases, these materials were supplied at a guaranteed price by the PWD or the WDB. As previously mentioned, reinforced pipe culverts were only available in Dhaka, and therefore, only Mirzapur and Serajdikhan Thanas incorporated them in their scheme selection. It should be noted that pipe culverts are relatively inexpensive and would have served well as a lower-cost alternative to many of the smaller open foundation culverts in many of the Thanas, but their lack of availability precluded their consideration.

Site Supervision

Although a complete evaluation of the level of supervision at the construction sites will be reserved for future reports, it should be noted at this point that a great deal of concern was expressed by the Thana staffs as to the intensity of supervision that can be accomplished once

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full-scale construction is underway.

All the TNOs stated that their entire technical staffs will be used to supervise the construction work. Given the fact that the total number of structures that must be inspected by each potential staff member varies from 2 structures per supervisor to 6 structures per supervisor, even if all the supervisors are available full-time for the two straight months of construction activity anticipated (and this is highly doubtful since other Thana technical activities will be ongoing as well), in most cases, the intense level of supervision required will likely be lacking.

In addition to the basic facts stated above, transportation provisions for the supervisors to the job sites is the primary concern stated by the TNOs since, in the large majority of cases, the technical staffs have no assigned jeeps or motorcycles. In a few Thanas, it was reported that one or two motorcycles will be borrowed (on occasion) from other Thana-based departments. In other cases, personal bicycles will be used when available; but bicycles will not be adequate for the supervision coverage necessary, considering the distances and road conditions involved.

According to the 20 February memo from the Ministry of Food, the District-level technical staffs are to assist in supervision of this pilot program as required. From interviews conducted at 10 Thana Offices, only two TNOs (in Ishurdi and Serajdikhan Thanas) stated that they will receive supervisory assistance from the District. It is hoped that the remaining Thanas will receive supervisory assistance from the District level in the form of staff and motorized transportation so that this most critical phase of the construction process can be accomplished in a comprehensive manner.

Construction Site Visits

A total of 8 construction sites were seen in this initial visit in only 4 Thanas, and all projects were in the early stages of construction. Although it could be stated that, in general, construction practices looked adequate and work progress was good, any conclusions concerning overall construction practices and levels of supervision will be reserved for future reports.

One site visit is worthy of note in this report since it indicated a flaw in site selection practices. In Ishurdi Thana, the site for a proposed 40-foot span bridge to replace an old 20-foot span bridge was visited. This bridge serves river traffic during flood season. It was evident upon inspection of the drainage pattern that the road alignment is skewed at about a 40-degree angle from a perpendicular with the river's course, and no plans were made to re-align this highly elevated earthwork road to provide a perpendicular crossing with the river channel.

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CARE PILOT

From its conception, the CARE pilot was highly experimental in nature, involving many innovative management procedures as well as technical designs and construction techniques. CARE chose to emphasize the Union-level as the main focus of activity, with the Thana-level involvement largely restricted to technical design and general project oversight, and with CARE itself providing overall technical guidance and monitoring of all the pilot phases.

For this pilot experiment, CARE selected three Thanas in Rangpur District based on their good performance in the Food For Work program and their easy accessibility. Two Unions were then selected in each Thana based on their FFW performance, need for appurtenant structures and willingness to participate. All three Thanas chosen were not upgraded, and the selection of Unions in two of the Thanas (Pirganj and Lalmonirhat) was done without consulting with the Circle Officers in charge (much to their consternation).

Guidelines enumerating the responsibilities of the various participants in the pilot were distributed at the inception of the program. The pertinent particulars of this guidance package and the resulting outcome will be described in the remaining sections of this as well as future reports.

Financing

The financing of projects varied in each Thana. In Kotwali Thana, the projects were financed totally by CARE; in Lalmonirhat Thana, 2½ % of the total contract money required for each project was deposited in a Thana bank account by the Union Parishad (UP) involved before CARE contributed the remaining 97% to each account; and in Pirganj Thana, the same procedure was involved as was in Lalmonirhat Thana, except that the UP's contribution was 5%, with CARE providing the remaining 95%.

CARE felt that the "small" contributions by the UPs involved would motivate them in carrying out their many responsibilities in this pilot. In reality, the Union Parishad Chairmen (UPCs) interviewed expressed their willingness to contribute financially to these projects, but they had limited resources from which to draw their funds. Their contributions came from their road maintenance accounts (up to 25% of the annual road maintenance budgets), and therefore, all the UPCs interviewed expressed concern that they could not afford a similar program that involved any more structures per year than was included in this present pilot without creating an extreme hardship in these and other Union accounts.

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CARE informed each Union that the project accounts would be closed on 31 May, whether the projects are completed or not, and that CARE would withdraw the remaining project funds at that time.

Scheme Selection

The major part of the scheme selection process had its beginnings in CARE's initial conception of the pilot program. CARE based the scheme selection on a desire to include a good cross-section of structural types with small spans. This was done to assure the inclusion of some of the more cost-effective structural types in this pilot. An overall budget for the pilot was then prepared using this variety of schemes, based on a desk calculation of average costs per scheme. With this budget and scheme variety in hand, CARE staff participated in scheme selection with the UPC (and generally) one member of the Thana Technical Staff (TTS).

The UPCs were first asked to submit a priority list of the 5 most important structures needed in their respective Unions. This was followed by visits to the selected scheme locations with CARE staff, the UPC, and the TTS member(s) to determine the final site, structural type, and size, using a CARE pre-survey form as guidance. Of course, the scheme types and sizes chosen were ultimately adjusted to fit the pre-conceived varieties that CARE had originally planned.

In the end, a total of 19 schemes were selected. Of this total, there are 5 single-ring culverts, 3 double-ring culverts, one arch culvert, and 9 open foundation culverts.

Design Preparation and Cost Estimates

In all cases, the TTS were given approximately one week to prepare the structural designs. CARE did not give the TTS specific instructions to use any particular manual or other guidance in the preparation of these designs - in fact, the TTS were encouraged to be creative. (In Kotwali Thana, CARE asked the TTS to develop 3 different designs for each scheme).

Upon completion of the designs, the CARE technical staff reviewed and corrected them in the presence of the TTS member(s) involved. Unfortunately, copies of the final designs were only given to the UPCs, and not to the TTSs in Lalmonirhat at Pirganj Thana, and this was not appreciated by the Thana staffs.

It should be noted that in the entire design process, there were no engineers involved (TTS or CARE) who had either a 4-year degree or any significant experience in appurtenant structure design. Among the several designs seen, most were incomplete in one way or another. Drawings of reinforcing bars and instructions as to their placement were not included in the design packages of the ring culverts, and several designs were unclear and not totally labeled.

CARE instructed Pirganj and Lalmonirhat Thanas to use Zilla Board (ZB) rates in preparation of cost estimates. After contracts were already let in these Thanas, CARE realized that the ZB rates used were three years old. The CARE Rangpur Unit Administrator then asked CARE-Dhaka if they would supply a 15% contingency fund to be added to each project to alleviate the foreseen cost overruns, but CARE-Dhaka said no and told the Unit Administrator to tell the UPs to make up these costs themselves. Interviews with the UPCs involved indicated that they did not have the funds at hand for this contingency and that they would likely tell their respective contractors/craftsmen to stop work when the present funds in the account are exhausted. Fortunately, the TTS in Kotwali Thana was told to develop their own estimates; they compared three schedules, and decided to use the most current Roads and Highways schedule.

Tendering and Contracting

In Gharialdanga Union-Lalmonirhat Thana and in Madankhali Union-Pirganj Thana, the UPs were instructed to tender for local contractors within their Union, while in Borobari Union-Lalmonirhat Thana and in Chatra Union-Pirganj Thana, the UPs were told to select local craftsmen - with both Unions in both Thanas using their "normal procedures" for tendering/selecting. In Gharialdanga Union, tenders were floated as a "formality", and according to Lalmonirhat Thana staff, the UPC chose one contractor (his son) to do all 3 schemes; the Thana office was also upset that the UPC was not required to choose from the Thana's list of registered contractors. Pirganj Thana convinced CARE that the Madankhali UPC should choose only registered contractors. This Union floated tenders Union-wide (as per CARE's instructions) for 7 days, and 3 contractors reponded with 30% to 40% overbids, after which the UPC awarded both schemes to the one contractor who was willing to do the work at the tender's estimated cost. In neither case was earnest or security money required from the contractor. (It should be noted that there was initial confusion in the instructions from CARE: in one CARE circular distributed to the involved parties, entitled "Banking and Fund Release Procedures", it was stated that the Thana Parishad would float tenders in these Thanas - and this was in direct contradiction with the general instructional memorandum.)

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In Borobari Union-Lalmonirhat Thana and Chatra Union-Pirganj Thana, the UPCs chose the best local craftsmen available within their Union, bargaining them down to the estimated contract cost. In Borobari Union, a contingency of 3% was included as a lump sum in the contract.

Kotwali Thana was instructed to prepare the tender for Haridevpur Union and to float the tenders only within the Union itself. (The CO stated that he would have preferred to float the tender Thana-wide). A total of 10% of the contract price was collected from each winning contractor for earnest plus security money to be refunded six months after the completion of the construction. Four bids were submitted per scheme, and the three contractors chosen were those who submitted bids at the tenders estimated costs. In Satgara Union, the UPC chose the most qualified craftsmen in his Union.

Payment Provisions

In all Thanas, contractors/craftsmen are to submit running bills/muster rolls (under no specified schedule) to the UPC, with measurements verified by the TTS. In both Unions of Pirganj Thana and in Borobari Union-Lalmonirhat Thana, the UPC co-signs payment drafts with the Thana Development Committee Chairman (TDCC) (or his designate); in both Unions in Kotwali Thana and in Gharialdanga Union-Lalmonirhat Thana, payments are totally controlled by CARE.

In order to comply with these payment procedures, Lalmonirhat Thana had to create a TDC. In Pirganj Thana, where all project payments have to be co-signed by the TDCC, the Thana officials and the UPCs are upset because the TDCC is not readily available and is showing little interest in the projects.

Construction Materials

The UPCs were instructed to purchase all materials required for projects done by local craftsmen. The CARE-Rangpur Unit Administrator ordered all pipe culverts to be cast at the construction site, although ready-made pipes are available in Rangpur. The UPC of Borobari Union-Lalmonirhat Thana stated that since locally available bricks were not of first-class quality, bricks were purchased from another Sub-division.

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Supervision

In accordance with CARE's instructions, all UPCs were trained by their respective TTSs in design interpretation and the art and science of construction site supervision. The UPCs (and their designates) are to provide full-time site supervision, the TTSs are to assist supervision during critical construction phases and to verify running bill estimates, while CARE will do occasional spot-check supervision. (One UPC stated that he didn't feel qualified to supervise, even after training.)

Construction Site Visits

On-site construction of reinforced concrete pipe culverts was observed in Gharialdanga Union-Lalmonirhat Thana. The UPC stated that CARE staff instructed the contractor as to all pertinent aspects of this experimental construction activity, and that CARE staff and TTS supervised the first day of pipe construction (and were not present in the two days since then).

One reinforcing bar frame was seen prior to placement. The hooked ends were not properly aligned and the length of the rods beyond the hooked portion was too short.

Four-inch (approx.) wooden boards, vertically aligned, were strapped together with metal bands to form the shuttering (mold) into which the completed reinforcing rods were initially placed, followed by the pouring of concrete. (There was no evidence of the use of lateral wooden braces, wooden spacers, or wires connecting the horizontal braces; all this is necessary to maintain a uniform shuttering.) The resulting pipes produced showed the telltale signs of an unsealed mold, with the water-cement leaking out of the spaces between boards and khoa chips visible in vertical lines (4 inches apart) - a visible indication that the strength of the concrete is reduced due to the loss of cement through the cracks. In addition, the thickness of each ring seen varies from 2½ inches to over 3 inches for the nominally 3-inch thick pipe.

There was no shuttering in evidence on the bottom edge of each pipe - it seemed to be only resting on the muddy earth. Since these pipes were still being cured, the final result on the edges of the pipes pressed into the earth is yet to be seen; best judgement indicated that this edge will be uneven, with reinforcing bars visible at the surface since no wooden seats were seen in place to keep the bars from sinking to the bottom. One hooked end of a reinforcing bar was seen protruding ½-inch above the exposed edge of one of the completed pipes.

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It was stated that the shuttering was removed 3 or 4 hours after the concrete was poured in some cases, and up to 15 hours in other cases, while proper engineering practice generally calls for about 3 days of setting before shutters should be removed from vertical structures.

Finally, at the site of the double-ring pipe, it was observed that although the contractor had sunk a shallow tubewell at the site, the head of the well was missing, leading to the obvious conclusion that muddy ditch water at arm's-reach away from the workers was being used for the curing operation observed. If this ditch water was also being used for concrete mixing, the result would be a weakened concrete that will likely limit the life of the culvert. This practice is itself a testimony to the importance of intensive site supervision.

(It should be noted that proper construction techniques that could have been easily adapted to this experiment are simply explained in the Design Manual.)

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EVALUATION OF PILOT PROGRAM ACTIVITIES

CONSTRUCTION OF APPURTENANT STRUCTURES
ON FOOD FOR WORK ROADS

SECOND INTERIM REPORT

13 June 1983

by Dan Hallett

SCOPE OF REPORT

This Second Interim Report reflects information attained in 10 interviews and 35 construction site visits conducted from 16 May to 5 June 1983. Interviews were held with Upgraded Thana and other involved officials and technical staffs involved in the Local Government Pilot program. The table on the following page summarizes the interviews and site visits conducted in the preparation of this report.

The visits to the first three Thanas listed in the table mark the completion of the initial round of visits to all of the Thanas involved in the pilot program. The remaining 7 Thanas were visited for the second time - the purpose of which is to observe construction practices, the quality and intensity of supervision, and, in general, to document the problems encountered during the construction process as well as the resolutions to these problems adopted by Thana staffs.

Thana	District	Interview Date	No. Structures Seen
Sarail	Comilla	16 May	1
Chunarughat	Sylhet	17 May	-
Begumganj	Noakhali	17 May	-
Mirzapur	Tangail	22 May	10
Madarganj	Jamalpur	23 May	3
Serajdikhan	Dhaka	25 May	5
Shailakupa	Jessore	30 May	6
Alamdanga	Kushtia	31 May	4
Shymnagar	Khulna	1 June	4
Fatikchari	Chittagong	5 June	2

FIRST ROUND INTERVIEWS

First round interviews were completed with the visits to the three Thanas in the Comilla Zone - namely Sarail, Chunarughat, and Begumganj Upgraded Thanas. Again, as detailed in the First Interim Report, the Ministry of Food's instructions to the Zonal Martial Law Administrator (ZMLA) was not passed down to the Thanas in a clear or uniform manner.

Although all three Thanas received their initial instructions concerning their participation in this pilot program in late February, it was not until the last week of April that each of the Thanas got permission to float tenders for the total of 16 lakh taka-worth of appurtenant structures. (For example, Sarail Thana was originally instructed to submit schemes for one crore taka, Chunarughat Thana for only one road's-worth of structures, and Begumganj Thana for 5.6 lakh taka-worth of schemes.)

Scheme Selection

The Ministry of Food's scheme selection criteria were not passed down to the Thanas in this Zone. As a result, Begumganj Thana chose 13 schemes on 7 roads spread throughout the Thana, with many of the structures in isolated locations, neither completing the structural needs for a road nor providing unimpeded access to completed road networks, bowing to pressures from Union Chairmen in the Thana Parishad to "get part of the action". In Chunarughat Thana, the two roads selected each need

a 500-foot bridge over a large river to span the gap between the first structure connecting the main paka (permanent) road with the rest of the roads' structures. All three thanas chose their schemes through initially referring to the Thana Planbook, followed by site visits by the Thana Technical Staff (TTS) and interviews with Union Chairmen and villagers. In Sarail Thana, soil tests were made by the Zilla executive engineer at the site of a 50-foot bridge; only in Begumganj Thana were presurvey measurements taken at the sites to accurately assess optimum structural types and sizes needed. Of a total of 48 schemes in the three thanas, 12 are bridges from 20- to 50-foot spans, 25 are open foundation culverts, and 11 are box culverts.

Design Preparation

Designs were generally adopted from Zilla Board or District Council designs, although some of the smaller culvert designs were taken from Thana files; the Design Manual was only used in Chunarughat Thana for small culvert abutment and wing-wall designs. All designs were prepared by Thana sub-assistant engineers and checked by the Thana Engineer (TE). In Sarail and Chunarughat Thanas, a total of four bridges greater than 20 feet in span were also checked by the respective Zilla executive engineer as per government standing order. All designs seen were of adequate scope and quality.

Tender and Contract Development

Zilla Board rates (that were one or two years old) were used in the development of tender estimates. Small contingency funds to cover potential cost overruns were included in the tenders floated by Chunarughat and Begumganj Thanas.

In two of the Thanas, funds were unavailable to cover costs preliminary to contracting, and contrasting approaches to the tendering process were adopted, with contrasting results. In Sarail, the Thana Nirbahi Officer (TNO) floated tenders for 15 days in two Subdivision newspapers, one District daily, and one Dhaka daily. Fifty-five contractors responded with 171 bids on only 7 schemes; with such a response, the winning (lowest) bids averaged almost 10% below the tender estimates, saving a total of 1.5 lakh taka. The TNO is presently seeking permission from his Deputy Commissioner (DC) and the Ministry to use this surplus to cover his advertizing costs and to contract for 4 more pipe culverts under this pilot. In contrast, Chunarughat Thana advertized its tenders in only one local weekly newspaper, with the following results: During the first week, no responses were received because the newspaper failed to publish the tender; after the second week of advertizing, some responses were received, though there were too few to satisfy the minimum requirements for competitive bidding; and now, after yet a third attempt at tendering in the same newspaper, it is hoped that a sufficient number of responses will be received despite the adverse weather and time constraints

which deterred potential bidders from responding during the previous week.

In Begumganj Thana, tenders for the first 6 schemes were floated in a local weekly (the Thana and nearby District centers have a large number of contractors) and response was adequate, with work orders issued to 4 winning contractors who bid at the tender's estimated cost. When the Thana received assurance of the remaining funds to 16 lakh taka for their pilot, the TNO asked for a time extension past the 30 June deadline in anticipation of extra time needed to complete two 30-foot bridges and one 25-foot bridge included in the second tender package. The TNO received verbal assurance from the ZMLA in Comilla that a time extension would be granted, and the TNO began floating the second tender on 18 May.

Site Supervision

Anticipated supervision quality and intensity also varies considerably among these Thanas. In Sarail Thana, the Zilla executive engineer will supervise the construction of the 50-foot bridge; 3 TTS, with the help of PWD work assistants, will supervise the remaining 6 bridges and culverts; the PIO will be the general supervisor, while the TE will be in overall charge - even the Union Chairmen are highly involved and will assist as needed in supervision. Since the roads are relatively near the Thana Headquarters, transport of supervisors is not a major consideration. In contrast, Chunarughat and Begumganj Thanas have only 4 technical staff members, each with no significant means of transport to the sites, and the number of schemes (28) in Chunarughat Thana and the fact that the schemes are so spread out in Begumganj Thana, will necessarily hurt the intensity of supervision in these Thanas. (Chunarughat Thana is planning to house its supervisors in temporary camps at the work sites, although concern for payment of overtime for supervisors was also expressed.)

As a final note, where excavation has already begun in Begumganj Thana, the low lying areas (most of the sites) are experiencing severe groundwater infiltration problems.

SECOND ROUND VISITS

The second round of visits to each of the Local Government Pilot Thanas began this month with the return to 7 Thanas. The major purpose of this set of visits is to observe the intensity and quality of construction site supervision as well as the quality and progress of construction activities, and to report on any problems encountered and their ultimate resolutions by the Thana staff. In addition, information regarding tendering and contracting was obtained from 4 of these Thanas, where these processes had not been completed during the initial round of visits.

Contract Letting

Work orders were issued in Mirzapur, Madarganj, and Serajdikhan Thanas in late March and early April; in Shymnagar, Shailakupa, Alamdanga and Fatikchari Thanas contracts were not awarded until May. Response to tenders was generally very good, with all successful contractors submitting bids at or up to several percentage points below the tender estimates.

Of particular note, in Fatikchari Thana, where the first phase tender and re-tender produced bids no lower than 17% above tender estimates, the TNO submitted these lowest bids to the DC for higher approval (the DC can only approve tender offers up to 15% over tender estimates) on 14 April. The DC relayed the final approval on 16 May. In the meantime, a second phase tender was floated (for additional schemes up to the total of 16 lakh taka) and work orders were issued on 9 May with all winning contractors bidding 5% to 7% below tender estimates. This difference of over 20% in the bids between the two tenders is due to the relative proximity of the earthwork roads to the suppliers of necessary construction materials - the first phase tender road is located such that materials must be procured from Chittagong (several hours' drive away), while the second phase tender road leads directly to nearby cement and brick suppliers. (These two roads are at opposite ends of this large Thana, and travel time between them is at least two hours.)

Supervision

It is a well-known fact that construction site contractors can greatly increase their profits through the short-cutting of proper construction practices; this can range from the use of poor quality materials (or their adulteration) to the use of "quick-and-dirty" construction techniques. In addition, the level of craftsmanship varies considerably among contractors. All of these factors may combine to produce very detrimental effects on the quality of the structures built, ultimately reducing their useful life in a significant way.

It should be noted that the level of training/experience required for on-site supervisors is not very sophisticated and can be taught to anyone with a modicum of technical background in a brief training session; the intensity of supervision required is largely a psychological matter - a supervisor should be present at the site with a frequency that: (1) convinces the contractor to follow proper construction practices and deliver/prepare quality materials, and (2) lets the contractor know that the supervisor will be present at the time of the most critical phases of construction activity (e.g. concrete mixing and pouring, form-work, etc).

Quality of Supervision

Although each Thana claimed to have at least one member of its technical staff who is experienced in paka road construction supervision (and/or to have direct line communication with experienced engineers in the Subdivision or District offices of the PWD or LGRD), there was little evidence of well-trained supervisors at the construction sites visited. In 5 of the 7 Thanas, most of the completed construction work was not up to first-class quality, and the supervisors, when present, were not aware of their specific duties. The exceptions were in Alamdanga Thana, where the TE is highly involved in the training and oversight of his supervisors (with the occasional assistance of the Zilla executive engineer), and in Serajdikhan Thana, where the Zilla executive engineer and the assistant engineer in the Subdivision trained the TTS in supervision techniques.

Intensity of Supervision

The intensity of supervision is dependent on two major factors: (1) the transport of supervisors from the Thana Headquarters to the road under construction (as well as between the structures) and (2) the number of supervisors available to cover the structures. Of course, it should be pointed out that no matter how "intensive" the supervision may be, unless the supervisors are well-trained in both the art and science of supervision, the mere presence of the supervisors will provide little assurance of quality construction.

Four Thanas are having significant problems in the transportation of their supervisors. In Shailakupa Thana, where there are 24 structures being constructed on 45 miles of roadway, although there are a total of 10 supervisors available full-time, there are no motorcycles or other motorized vehicles in operating condition available for their use, and personal bicycles and rickshaws are their only means of transportation. In Madarganj Thana, one personal motorcycle is available for use by 3 supervisors covering 16 structures spread throughout the Thana (each supervisor must cover 5 to 8 miles of road once they arrive at the first site in the morning from Thana Headquarters). In Shymnagar Thana, 4 supervisors (available only part-time) must cover 15 structures spread throughout the Thana using only two motorcycles. The most extreme transportation

problem exists in Fatikchari Thana where 3 full-time and 2 part-time supervisors covering 22 structures must travel by bus and rickshaw for almost two hours each morning and evening (or by baby-taxi if there is more immediate need for their presence) at their own expense (30 taka each way by bus and ricksahw or 100 taka each way by baby-taxi!), since the Thana has no funds available for transportation (or overtime); the TNO is hopeful that the Zilla executive engineer, the District engineer, and Roads and Highways personnel in the Subdivision will assist when called upon during critical construction phases. Finally, in Mirzapur, Alamdanga, and Serajdikhan Thanas, the ratio of structures to full-time supervisors is about 2 to 1; several motorcycles are available in Mirzapur and Alamdanga Thanas to cover the 10 and 11 structures, respectively; in Serajdikhan Thana, the 8 structures are located within several miles of the Thana Headquarters, even though no motorized vehicles are available; and as a result these three Thanas are providing adequate intensity of supervision.

As a final note, several TNOs stated that many of their supervisors must divide their time with other Thana construction activities - in particular there is a 5 lakh taka-per-Upgraded Thana program to repair Thana-owned buildings, which also has a 30 June deadline.

Quality of Construction

The quality of construction is largely dependent upon three factors: (1) the quality of materials brought to the site (or produced at the site), (2) the craftsmanship (experience) of the contractor and his skilled labourers, and (3) the intensity of supervision by the Thana staff.

Quality of Materials

With the exception of Fatikchari Thana, where the quality of bricks at the two sites visited was not first-class (but few had been used and better batches of bricks are now being delivered), the quality of materials seen at each site was generally good. Even so, there is constant need at the sites to segregate the inevitable small (but significant) percentage of bricks that are not of adequate quality and to perform quality control checks on other materials brought to the site as well. This quality control was generally inadequate due to the supervision deficiencies discussed above.

Craftsmanship

Most of the brickwork craftsmanship at 4 Thanas (Mirzapur, Madarganj, Shailakupa, and Shymnagar) was not of first-class quality. Some of the poor practices observed include dangerous vertical excavation walls (in Shailakupa and Madarganj Thana it was reported that several cave-ins occurred during the rainy weather), insufficient (and often non-existent)

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curing of mortar and concrete, and vertically aligned mortar joints (creating weak points in the structure). One of the most common practices seen in these Thanas was the laying of bricks course-by-course instead of brick-by-brick: in this procedure, an entire course of bricks is first arranged and mortar is mixed with extra water (weakening the mortar) so that it will easily "pour" down into the spaces between the bricks; unfortunately the spaces are often too narrow and many air-pockets remain. To cover these errors, most contractors prefer to plaster over the completed brickwork. In Alamdanga Thana, where good quality brickwork was observed, pointing of mortar joints (a hardening technique that is cheaper but takes a higher degree of skill) was practiced as opposed to plastering of the entire structure.

The reinforced concrete work seen in Serajdikhan Thana (all of their structures are rcc) and in box culverts in Shyamnagar and Mirzapur Thanas was done according to proper procedures.

Construction Progress

Several factors played a significant role in curtailing the progress of construction in the Thanas visited. These included: (1) problems in construction material availability and delivery, (2) critical omissions in scheme determination and site selection procedures, and (3) poor weather conditions and the emergence of groundwater in excavations.

Materials Delivery and Availability

The price and supply of cement has been a critical factor in this work season in most parts of the country. Some of the larger or more established contractors have personal stockpiles of cement, and therefore, have been able to avoid dealing with the present market conditions. In Alamdanga Thana, the DC arranged for the supply of 600 bags of cement for several of the contractors in need in their pilot; in Shailakupa Thana, the DC was willing to help contractors with cement procurement, but none of the contractors required assistance. But in two Thanas, namely Shyamnagar and Madarganj, the paucity of cement supply combined with the remote locations of these Thanas, has produced an overall materials delivery crisis.

In Shyamnagar Thana, all the contractors involved in this pilot have approached the TAO for assistance in procuring cement, since they have to purchase cement in the local market at a price in excess of 130 taka per bag while the contracted Zilla Board rate was 95 taka per bag. The TAO then asked the DC if the District could secure 5,000 bags of cement at the government rate of 105 taka per bag for immediate use in this pilot. The DC subsequently placed an order with the Trading Corporation of Bangladesh on 29 May, but in the meantime, a

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he has not yet received confirmation of the availability of such supplies. In the meantime, the contractors involved in the pilot have been reluctantly purchasing cement from the local market, although overall construction site progress is slow since the contractors are unwilling to go to the local market often (in hopes that the TNO will soon procure cement for them at the government rate). It should also be noted that the severe isolation of Shyamagar Thana has even delayed the delivery of bricks for up to 7 days.

In Madarganj Thana, the materials delivery problems are even more severe. Transport costs have doubled and cement and bricks costs are up 20 to 40% since contracts were signed in March and April. Even though the DC arranged for cement supplies to those contractors who requested assistance, the excessive transport costs to deliver the cement and other construction materials from Jamalpur to the Thana has caused three of the contractors to delay delivery in hopes that sufficient rain will fall and allow river transport of materials as opposed to expensive bullock cart transport to the Thana. (Transport by bullock cart costs 1.5 taka per brick, which represents up to a 150% increase in the cost of bricks delivered to the sites!) Even those contractors who are delivering materials to the sites are having extreme hardships in procuring enough bullock carts from Jamalpur for such a large amount of Thana construction. The DC is threatening to cancel two of the contracts since he had made arrangements for their cement supplies but the contractors refuse to pick it up due to the steep transport costs. It should be noted that although most of the contractors are from Jamalpur and the rest are from the Thana (and therefore, they should have been aware of the transport difficulties to this remote area), the question of transport costs was not brought up by either the contractors or the Thana at the time of tendering and contracting. Finally, it should be pointed out that although a penalty of 1% per day of the contract price is written into each contract for delays in delivery of materials to the construction site, the TNO prefers to use positive persuasion to facilitate solutions to this crisis (and anyway, at this point in time a contractor can only lose up to 2% of the contract price in the form of the earnest money he has on deposit in the Thana).

In Serajdikhan Thana, materials delivery is also causing significant cost overruns to the contractors. During the first month or two following the issuance of work orders, materials had to be delivered by rickshaw (in at least one case the contractor had to purchase two rickshaws) over many miles, from the nearest point of boat access to the construction sites. Subsequently additional rainfall has allowed contractors to deliver materials by boat to points relatively close to the construction sites.

Scheme Selection Phase Omissions

The extreme time constraints placed on the Thanas involved in this pilot during the scheme selection phase, as described in detail in the First Interim Report, indirectly resulted in some significant problems in the construction phase in two of the Thanas.

In Mirzapur Thana, the elevation of the foundation of two 15-foot bridges had to be lowered 2½ feet to reach adequately supportive soil conditions. (Soil tests during preliminary site survey activities would have discovered this problem, but time and equipment was not available to accomplish such testing.) Furthermore, two other small bridges require an additional 2 or 3 feet in elevation of the roadway slab to facilitate country boat passage underneath during flood season. But the most severe crisis is at the site of their 35-foot bridge which will require at least 6 feet in additional elevation of the roadway to facilitate the passage of country boats that will cross under this point, fully loaded with bales of jute. The reason for the elevation problems encountered at these latter 3 bridges is that the TTS did not obtain adequate information regarding the ultimate high flood-water level at these sites from the local villagers through their Union Chairmen at the time of the scheme selection activities. (One Union Chairman stated that the local people did not give him considered and accurate information at that time because they did not believe the schemes would actually come to be - but with the delivery of materials to the sites the people volunteered this flood level information en masse.) It should be noted that most of the abovementioned structures have abutments and wingwalls completed to the height as per original design specifications.

As a result of these numerous problems, Mirzapur Thana has petitioned the Ministry of Food for contingency funds to cover the extra costs anticipated for their resolution. Upon receiving confirmation of the availability of such additional funds, revised designs will be submitted to the Zilla executive engineer and the Dhaka LGD office for approvals. (The 4 bridges that require an additional elevation of 2 or 3 feet should only require extra breadth and height of brickwork on the given foundation, while the 35-foot bridge will require more complex investigation of alternative solutions since it is not possible to increase the elevation of the abutment and wingwalls by the additional height required without beginning again with a larger foundation.)

In Alamdanga Thana, the lack of time for pre-survey soil testing led to a significant crisis at the site of two 8-foot open foundation culverts. One is in a swampy area while the other is near a river about two miles away. At the first culvert, the contractor had completed excavation to the design depth, laid brick soling, and poured the concrete foundation. After two hours of setting, there was a crown-in at one end of the excavation, and the concrete fractured with a number of pieces, both events caused by ground subsidence from the groundwater (containing fine sand grains) ponding in the

semi-confined aquifer. At the other culvert the contractor ran into the same aquifer three feet above foundation level. In both cases, work had been stopped for several days pending my arrival. I suggested that they discuss possible solutions such as placing the foundations on pilings or re-locating to sites of these culverts (following soil testing) with the Zilla executive engineer and District personnel with whom the Thana has good working relations.

Spring rains were a main cause of start-up delays in several of the Thanas that issued work orders in early May. In addition, the late-season start for the pilot program led to the problem of groundwater infiltration (often to a depth of 2 to 4 feet) in almost all the excavations seen. This standing water has to be pumped out by costly mechanical pumping or labor-intensive hand-bailing. During foundation casting, pumps are run continuously for 36 hours while the concrete takes its initial set.

Summary work progress tabulations were available at 4 of the 7 Thanas visited. In general, especially considering the abovementioned problems, the progress in most Thanas is surprisingly satisfactory, with the completion of most structures still on line for 30th June. Only in Madarganj, Serajdikhan, and Fatikchari Thana was it stated that the larger bridges will likely not be completed until some time in July.

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EVALUATION OF PILOT PROGRAM ACTIVITIES
CONSTRUCTION OF APPURTENANT STRUCTURES ON FOOD FOR WORK ROADS

THIRD INTERIM REPORT

16 July, 1983

By Dan Hallett

SCOPE OF REPORT

This Third Interim Report reflects information attained in 10 interviews and 67 construction site visits conducted from 14 June to 6 July 1983. The interviews in Ishurdi, Puthia, Shariakandi, Sarail, Chunarughat, Begumganj, Serajdikhan, and Mirzapur Upgraded Thanas were held with the respective Thana Nirbahi Officers (TNOs) and their technical staffs involved in the Local Government Pilot program. Madarganj Thana could not be visited since the road from Jamalpur to the thana was not jeepable and the only available speedboat in the District was under repair; therefore, the interview was conducted with the Additional Deputy Commissioner (ADC) for Relief and Development in Jamalpur, using the thana's 30 June Progress Report and the ADC's recent conversations with the TNO as the bases for discussion. The interview in Rangpur was conducted with the CARE Unit Administrator and his technical staff. The table on the following page summarizes the interviews and site visits conducted in the preparation of this report.

The visits to all the thanas listed through 28 June mark the completion of the second round of visits to all of the thanas. The last 3 thanas were visited for the third, and final, time. The second visit to the CARE pilot thanas in Rangpur District is the last since all construction was completed and all payments made in advance of this visit.

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<u>Pilot Program</u>	<u>Thana'</u>	<u>District</u>	<u>Interview Date</u>	<u>No. Structures Seen</u>
Local Government	Ishurdi	Pabna	14 June	8
	Puthia	Rajshahi	15 June	7
	Shariakandi	Bogra	16 June	2
	Sarail	Comilla	26 June	8
	Chunarughat	Sylhet	27 June	6
	Begumganj	Noakhali	28 June	3
	Serajdikhan	Dhaka	3 July	10
	Mirzapur	Tangail	5 July	4
	Madarganj*	Jamalpur	6 July	-
CARE	Kotwali	Rangpur	19, 20 June	8
	Lalmonirhat	"	20 June	6
	Pirganj	"	21 June	5

* Madarganj Thana was not visited; the interview was conducted with the ADC for Relief and Development in Jamalpur.

LOCAL GOVERNMENT PILOT

SECOND ROUND VISITS

The second round of visits to each of the Local Government Pilot thanas was completed this month with the return to Ishurdi, Puthia, Shariakandi, Sarail, Chunarughat, and Begumganj Thanas. As outlined in the Second Interim Report the purpose of this second visit was to observe the intensity and quality of construction site supervision as well as the quality and progress of construction activities, and to report on any problems encountered and their ultimate resolutions. In addition, information regarding tendering and contracting was obtained from 5 of these thanas, where these processes had not been completed during the initial round of visits.

Contract Letting

In Sarail Thana, where a savings of 1.5 lakh taka was realized from the original tenders, the TNO, through his Deputy Commissioner (DC), received permission to tender for 3 additional small culverts to replace existing pipe culverts that had deteriorated to a potentially dangerous degree (located on the same road as the other pilot structures). Contracts were awarded in Chunarughat Thana on 19 May after the third call for tender bids, even though, with the exception of their 59-foot bridge, only one bid was received for each of the remaining 5 groups of schemes - all accepted bids were at the tenders' estimated cost. In Puthia Thana, work orders were issued for 7 groups of schemes on 10 May, while the remaining 3 groups of schemes were retendered (due to lack of competitive bids) and work orders issued on 18 May. In Begumganj Thana, work orders were issued in two phases, one on 10 May and the other on 25 May. Finally, although Shariakandi Thana issued its initial phase of work orders for less than 5 lakh taka for 8 schemes on 5 May, the TNO and his DC jointly decided that it was too late to float a second phase tender, and therefore, this thana will only construct these 8 structures for this pilot.

Quality of Supervision

The quality of supervision seen in these 6 thanas was generally superior to that reported in the Second Interim Report. Three of the thanas (Ishurdi, Puthia, and Begumganj) claimed that their supervisors were highly experienced in paka construction, and the quality of supervision in two other thanas (Sarail and Chunarughat) is also good as evidenced by the quality of construction. The only exception was in Shariakandi Thana, where the construction practices in evidence at the two structures seen was not at a par with the other thanas.

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(It was reported that one structure in Shariakandi Thana had to be dismantled and begun again, when it was belatedly discovered that the supervisor hadn't checked the elevation of the foundation before it was cast.)

Intensity of Supervision

The intensity of supervision witnessed in these 6 thanas varied considerably. In Shariakandi Thana, where their 8 structures are located in remote areas of the thana, the four supervisors visit the sites on an average of only once every other day, since they must travel by bicycle and have several other on-going construction projects in the thana that they must also supervise. In Begumganj Thana, where the structures are many miles apart, there are 4 full-time supervisors who must each cover an average of 30 miles per day by bus and rickshaw using their own funds. In Sarail and Chunarughat Thanas, where there are 6 and 4 full-time supervisors, respectively, to cover their structures, the Thana Engineers (TEs) also visit the sites daily, and the Union Parishad members take an active role in supervision as well. In Sarail Thana, the transportation problem is not critical since all the structures are on one road; in Chunarughat Thana, where the structures are on two long roads, each with a major river crossing, transportation is by rickshaw from the supervisors' own funds. In Puthia Thana, 3 full-time supervisors use motorcycles to easily cover the 19 schemes on 46 miles of roads.

Of particular note is the novel approach taken by the TNO in Ishurdi Thana in the face of the logistical problems associated with trying to cover 32 structures with 6 part-time supervisors and no motorized transportation. (The TNO's request to his DC to purchase motorcycles with the savings from the tendering process was rejected.) Early in the construction phase, upon hearing that the cement and bricks at several of the sites was of inferior quality, the TNO went to these sites and ordered them to be dismantled and started again - then he proceeded to order several more structures, chosen arbitrarily, to be dismantled and begun again purely as a "show of force" (a total of 10 structures were involved). The TNO then ordered the Union Chairmen to assign Union Parishad members to do full-time non-critical supervision at each of the sites; the contractors do the more critical phases of construction by appointment only as arranged by the thana supervisors. Their only large structure, a 40-foot bridge is supervised by the TE. Finally, this TNO stated that he would not make final payment to the contractors until he tested the slabs himself by driving a loaded truck over them.

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Quality of Materials

The quality of materials seen at each site was generally quite good. Materials were checked prior to use by thana technical supervisors; the exceptions were in Ishurdi Thana during the first weeks of construction (as mentioned in the previous paragraph), and in Shariakandi Thana, where supervision is relatively sporadic, and it was reported that public pressure led to one structure's demolition due to the use of inferior materials.

Craftsmanship

The quality of work seen in these 6 thanas was generally very good. The reinforced concrete (rcc) structures appear well-formed, with reinforcing bars placed according to specifications. In most of these thanas, the brickwork is adequate, with little evidence of the poor practice of course-by-course bricklaying, as described in the Second Interim Report. One undesirable practice frequently seen was the overwatering of mortar, which is easier to work with, but results in joints between bricks that are too thin. Potentially dangerous vertical excavation (with past cave-ins in evidence) were also seen in 3 of the thanas.

Most thanas are plastering over their brickwork. This is the practice that is generally preferred by the contractors. The exceptions are in Ishurdi Thana, where many of the structures are pointed, and in Puthia Thana, where after a cost comparison analysis by the TE determined that the cost of each method is nearly equal, it was decided (in the spirit of a pilot) to plaster their 5-foot and 15-foot structures and to point their 10-foot and 20-foot structures.

Construction Progress

The overall progress of the construction works seen in these 6 thanas was truly heartening. The major problems that plagued the other 7 thanas, as noted in the Second Interim Report, with a few minor exceptions, were not in evidence. In Shariakandi Thana, several contractors initially asked for government assistance in the procurement of high-priced cement and reinforcing rods, but the TNO insisted that they buy these items in the local market; in Chunarughat Thana, although materials must be hand-carried to the construction sites since a majority of the structures are located on the far side of the Kowai River, progress is slow but adequate. The very late start (mid-May) in the Comilla Zone caused high-water problems in Chunarughat Thana such that construction of their 30- and 50-foot bridges will have to wait until the next dry season (okayed by the DC), and the work on several small culverts may also have to be postponed if the water that is presently

in the excavation does not recede; in Sarail Thana, the wingwalls for the 50-foot bridge will be done during the next dry season since the foundation could not be poured due to high water; and in Begumganj Thana, where lowland groundwater problems were anticipated, 20 days of dry weather placated such concerns. Finally, in Ishurdi Thana, where their 40-foot bridge had to be lowered one foot for better soil conditions, and in Sarail Thana, where flood-level information gathered during the pre-survey was incorrect at the site of one culvert and the structure needed an extra 1½ feet in height, savings accumulated from the tendering process was used to make these minor adjustments. These savings were also used in Ishurdi Thana to contract for another small culvert (now 33 local schemes), to realign their 40-foot bridge to be perpendicular to the flood channel underneath (the earthwork road is scheduled to be rebuilt to meet this new bridge alignment next work season), and to construct a "cutwall" (to help stabilize the soil) and import Sylhet sand for the concrete slab of this 40-foot bridge. In Puthia Thana, tendering savings were used to build a 19th scheme; in Sarail Thana they paid for three additional small culverts to replace deteriorating pipe culverts located on the same road as their 7 other pilot structures.

In Ishurdi, Puthia, and Shariakandi Thanas, where work orders were issued on 17 March, 10 and 18 May, and 5 May, respectively, slab-casting is expected to be completed at all of their structures by 30 June. (In fact, in Puthia Thana, where they expect to be "completed" by 20 June, they will have constructed 19 structures - up to 20 feet in span - within six weeks; and the quality of work is unsurpassed in this pilot.) As of 14 June, 16 out of 33 schemes were completed in Ishurdi Thana, 6 out of 19 in Puthia Thana, and 2 out of 8 in Shariakandi Thana.

In Sarail, Chunarughat, and Begumganj Thanas, where work orders were issued in mid/late May, the schemes include longer-spanned bridges, and flooding problems were more common, work was beyond 50-percent completion in 4 weeks' time. In Sarail Thana, their 50-foot bridge will be "completed" by mid-August, and their remaining 9 schemes will be complete by mid-July; in Chunarughat Thana, 18 will be complete by 30 June, with 2 postponed until next year, and the other 8 hopefully completed by 31 July, weather permitting; in Begumganj Thana, 5 culverts will be complete by 30 June, and the remaining 8 bridges by 31 July.

It should be noted that "completion" of these schemes generally means only up to the casting of the final rcc slab. Thereafter, the slab has to be cured for 28 days, and then the earth has to be backfilled behind the structure, forming a smooth approach.

With the sole exception of Shariakandi Thana, where the DC controls all payments to contractors (and specific payment information was not available), the TNOs in these thanas have been making initial payments to their contractors after 50% to 70% of the work is completed. Most have gone through the first 8 lakh taka disbursed from the Ministry and are in the process of requesting the remaining 8 lakh taka. Running bills in all 13 pilot thanas are written by the thana supervisors and checked by the TEs.

THIRD ROUND VISITS

The third round of visits to each of the 13 Local Government Pilot thanas began with the return to Mirzapur, Madarganj, and Serajdikhan Thanas. The purpose of this final round of visits is: (1) to obtain a final statement on progress, (2) to attempt to see as many completed structures as weather, road conditions and time permits, and (3) to gather any other information deemed useful for the future small bridge/culvert program. To facilitate the presentation of this type of information, the results of this round of visits, as presented forthwith and in the upcoming Fourth Interim Report (as part of the Final Report) will be organized by thana.

Serajdikhan Thana

All 8 schemes were seen on this final visit to Serajdikhan Thana, where the design, tendering, contracting, payment, and much of the supervision was in the control of the District and Zilla offices in Dhaka. Of the total of 5 single- and double-pipe culverts that were in place over one month ago, only one had the earthwork fully backfilled over and in back of the structure; in fact, two of the double-pipe culverts were still totally exposed. Since the contractors left the sites several weeks before, upon questioning, the TNO stated that he would insist that the District not pay for the earthwork portion of each contract. The two 90-foot bridges were 20% and 40% complete and scheduled for completion of slab-casting by late-August. The District-funded 75-foot bridge was 60% complete, with the first third of the span ready for concrete pouring; this bridge is scheduled for completion by mid-July. All 8 structures are on one road that, after the construction of two 140-foot bridges, one 75-foot bridge, and two more pipe culverts (and, in this evaluator's judgement, one more 90-foot bridge), will connect the thana headquarters with the Asia Highway (and the markets of Dhaka).

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Mirzapur Thana

As described in the Second Interim Report, at the time of the second round visit, Mirzapur Thana was in a quandary over making mid-course corrections to several of their larger structures, largely due to misinformation on flood levels gathered during the pre-survey. As a result, work was suspended for one month on 6 schemes pending the completion of flood level measurements (and a resulting report) as requested by Mr. George of the RDE section of USAID-Dhaka and Mr. Siddique, the Deputy Chief Engineer of BDG's LGRD Ministry-Works Program Wing. Under their guidance, the Thana Engineer revised the design of the 35-foot bridge, expanding the foundation and brickwork to support an extra 3½ feet in height (allowing 5.12 feet clearance under the slab during flood conditions). In addition, two 15-foot bridges were raised 2 feet - 3 inches for flood-season clearance, another 15-foot bridge was raised 2½ feet to compensate for a similar lowering of the foundation to reach adequate load-bearing soil conditions, and the designs of two rcc box culverts were slightly revised to further stabilize the structures given the marginally satisfactory soil conditions at these sites. On June 15, with verbal approval from the Ministry of Food of the revised designs for all but the 35-foot bridge, work resumed on 5 corrected schemes. Thus, by 30 June, 8 of the 10 pilot schemes were completed, except for earthwork compaction (which will be "natural" since there is no cost provision in the contracts for payment for this item) and pointing/plastering, which is being delayed until after slab curing (box culverts will be plastered, while bridges will be flush pointed). The Ministry of Food issued a written approval of all the design changes on 27 June and sanctioned additional funding of 3.927 lakh taka above the originally contracted 14.87 lakh taka to cover the revised cost estimate. Work on the 35-foot bridge will not be continued until the next dry season since the water level is much too high to pour the additional breadth of foundation proposed. One box culvert was 50% complete on 30 June where work was suspended after excavation.

Heavy rain and slippery road conditions limited site visits to a total of 4 structures. (All 10 sites were seen in the second round visit.) All contractors were paid for 40% to 50% of their construction work, with further payments pending the receipt of the balance of 11+ lakh taka requested from the Ministry of Food on 4 July.

Madarganj Thana

A third visit to Madarganj Thana was not possible since the road from Jamalpur was unjeepable and there was no speedboat available. Thus, final information on work progress was obtained in an interview with the Jamalpur District ADC for Relief and Development, based on his recent conversations with the TNO in Madarganj, recent memoranda, and the 30 June Progress Report.

Overall progress on their 16 schemes was 50% on 30 June. The two large bridge repairs are complete, with the remaining schemes between 5% and 75% complete (with most structures 35% to 60% complete). With an understanding of the unique transportation problems facing this thana, the Ministry of Food asked the TNO what time extension was required for completion of all the pilot schemes - the TNO then requested an extension to 15 August. As a final note, it was reported that the three contractors who were balking at making initial materials deliveries to the construction sites (described in the Second Interim Report) finally made token deliveries by road until sufficient rains permitted full-scale transport of materials by country boats.

CARE PILOT

All 19 schemes in the CARE pilot thanas in Rangpur District were seen on this second and final visit. Eighty percent of the schemes were complete (to slab casting) by CARE's original 31 May deadline; the remaining 3 schemes were completed by 10 June. All payments to contractors were concluded by 10 June, and the CARE Unit Office officially "closed the book" on this pilot project on 15 June. All of CARE's records regarding this pilot were reviewed in preparation of this report, and all pertinent details seemed in order.

Quality of Construction

The quality of construction at all 19 sites in 6 Unions was generally satisfactory. There was no significant difference between the quality of structures constructed by contractors and those done by local craftsmen. Most of the brickwork was plastered, 3 structures were pointed, and the brick arch culvert was unfinished. Although most of the rcc pipes that were cast at the sites were not perfectly formed (as explained in the First Interim Report), and the resulting pipe culverts constructed (after the pipes were joined end-to-end) were therefore slightly irregular in inside appearance, the joints were well-mortared, and the resulting structures certainly seemed adequate for the purpose to be served. Most of these pipes were not plastered on the inside, which is unfortunate, since plastering would have improved the appearance and durability of the pipes and joints. The joints connecting the refitted AREMCO corrugated metal pipes was the sole exception, since the mortar mixture used easily crumbled with slight rubbing and the mortar is therefore likely to scour away with the first few flood flows through the pipes. In general, the underside of the open foundation culvert slabs were not plastered.

Technical Miscues

The absence of highly qualified technical expertise in the CARE Pilot program (as explained in the First Interim Report) resulted in several examples of technical decision-making errors that may affect the long-term integrity of a number of structures.

Curing of concrete slabs, which should continue for 28 days after pouring, was done for only 15 to 20 days. At several open foundation culverts, the wingwalls are too short to properly channel the flowing water, and may permit flood waters to seep behind the structures. In many cases, the wingwalls

were placed at the downstream side of the structure instead of the more practical placement at the upstream side (to assist in channeling the water under the slab - instead of behind the structure). A single pipe culvert in Garialdanga Union - Lalmonirhat Thana was already over half-full in mid-June, and although the CARE Unit office in Rangpur was aware of the need for a small open foundation culvert at this location, their Dhaka office was not willing to change the funding allocated for the pilot at the time the Rangpur office requested the change.

In Haridevpur Union-Kotwali Thana, CARE decided to separate the wingwalls and abutments with expansion joints at one open foundation culvert, and to connect the abutments and wingwalls at the other open foundation culvert (all in the spirit of a pilot program). Unfortunately, the culvert located on fine, loose soil was chosen for the connected structure, while the expansion joints were used where the soil is good and compact. (Expansion joints should be used where there are unstable soil conditions so that in the event of wingwall drift, the wingwalls can separate, leaving the abutments and slab intact.)

Finally, at this pilot's "large" structure, a 15-foot open foundation culvert in Satgara Union- Kotwali Thana, where the Union had financed and built the abutments last year, CARE designed separate foundations for the wingwalls, but joined the wingwalls to the abutments instead of providing expansion joints. Therefore, any differential settling will cause the wingwalls to "splinter" apart from the abutments, possibly undermining the integrity of the abutments in the process.

Earthwork

In most cases, the earthwork for the approaches to the structures was "completed" several weeks prior to this visit. At many sites, the backfilling behind the abutments and wingwalls was incomplete, and there was no evidence of turfing to stabilize the slopes (at one culvert, slight foot pressure caused the fine sandy soil to crumble down the embankment). At most of the sites, this recently placed earthwork was already undermined by deep "rain-cut" crevices and natural compaction settling. This points up a major problem, not only in CARE's pilot, but in the Local Government's pilot as well - the absence of a provision for earthwork compaction in the contracts. Without this compaction provision, these approaches will only be repaired at the leisure of the thana, or in more rare cases, by the villagers themselves. As personally experienced throughout the course of this evaluation, many of the earthen roads themselves are not jeepable over substantial portions due to the same lack of compaction, subsequent settling and rain-cutting, and the lack of repair.

Supervision and Payment

Daily supervision was provided by the UPC or his delegate. The TTSs generally assisted supervision during the more critical construction phases. (In Pirganj Thana, the TTS made very few appearances at the sites.) The CARE Technical Staff frequently assisted in supervision. The nearly completed abutments of an open foundation culvert in Borobari Union - Lalmonirhat Thana was ordered dismantled when the CARE supervisor detected poor quality mortar in the brickwork.

The Thana Technical Staff (TTS), CARE Technical Staff, and the Union Parishad Chairmen (UPCs) jointly checked all measurements for payments. In the three unions where the UPCs had control of the payments, funds were often withdrawn long before payments were made. (The UPC of Madankhali Union - Pirganj Thana withdrew funds from the bank in four installments, all long before the contractor submitted his final-and only-bill.) With the exception of one contractor, who submitted one running bill, only final bills were submitted for payment.

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EVALUATION OF PILOT PROGRAM ACTIVITIES

CONSTRUCTION OF APPURTENANT STRUCTURES
ON FOOD FOR WORK ROADS

FOURTH INTERIM REPORT

24 August 1983

by Dan Hallett

SCOPE OF REPORT

This Fourth Interim Report reflects information attained in 10 interviews and 81 construction site visits conducted from 17 July to 2 August 1983. Interviews were held with Thana Nirbahi Officers (TNOs) and their technical staffs involved in the Local Government Pilot program. The table on the following page summarizes the interviews and site visits conducted in the preparation of this report.

These 10 thanas were visited for the third, and final, time - also marking the final field work involved in the preparation of this evaluation.

Thana	District	Interview Date	No. Structures Seen
Shailakupa	Jessore	17 July	14
Alamdanga	Kushtia	18 July	9
Shymnagar	Khulna	19 July	6
Fatikchari	Chittagong	21 July	5
Ishurdi	Pabna	25 July	15
Puthia	Rajshahi	26 July	9
Shariakandi	Bogra	27 July	3
Sarail	Comilla	31 July	9
Chunarughat	Sylhet	1 August	9
Begumganj	Noakhali	2 August	2

THIRD ROUND VISITS

As stated in the Third Interim Report, the purpose of this final round of visits is: (1) to obtain a final assessment of progress, (2) to attempt to see as many completed structures as weather, road conditions and time permits, and (3) to gather any other information deemed useful for the future small bridge/culvert program.

In introduction, a few general comments are in order: In the text that follows, a "completed" scheme generally does not include the completion of guardrails, removal of formwork/shuttering, touch-up plastering, curing, or earthwork. (Only in Begumganj thana did the completion of earthwork rate 2% in the monthly progress reports.) The proper placement of weepholes in wingwalls and abutments was generally not understood. In all thanas, except Shariakandi Thana, significant improvement was seen in the quality of brickwork, evidently following guidance given during the second round visit.

In addition, in a late June memorandum, the Ministry of Food asked each thana involved in the Local Government Pilot program to complete a proforma summary of work progress with revised dates of completion. Each thana was also instructed not to begin schemes where high-water problems had already set in for the duration of the monsoon season. Finally, only Sarail and Begumganj Thanas reported receiving the second installment of 6.34 lakh taka from the Ministry through their respective Deputy Commissioners (DCs) on 1 August.

SHAILAKUPA THANA

All 24 schemes were completed through slab casting and parapet wall plastering prior to the 30 June deadline. All the structures are 5- to 10-foot span brick masonry open foundation culverts, taking approximately 2 to 3 weeks to construct once the materials are at the site. With the completion of these 24 schemes, 6 roads have their total complement of appurtenant structures, while 2 other roads are "complete" except for the need for one moderate-size bridge on each.

A total of 14 structures were seen on this visit. The brickwork was much improved over that seen in the second round visit, as reported in the Second Interim Report. All slabs were cast in the presence of the Thana Engineer (TE) by appointment. Villagers were reported to have been actively involved in reporting any anomalies in construction site activities to the Thana supervisors, and in addition, the TNO had the Unions form committees to verify the completion of work.

All structures have expansion joints between the wingwalls and abutments. Weepholes are provided in most parapet walls, wingwalls, and abutments. Due to the presence of water in some of the excavations, several courses of brick at the bottom of a number of structures could not be plastered, and will be completed during the dry season. Since most of the culverts seen were still undergoing slab curing, the formwork (shuttering) was still in place; after removal of the shuttering, the underside of the slabs will be plastered; at this time, the parapet walls will also be re-plastered since proper curing was not done after the initial plastering due to the Eid holiday. Each contract calls for earthwork approaches that are leveled back to 100 feet from the culvert. All earthwork will be redone by the contractors after a few rainy periods to allow for natural compaction; this will be followed by slope turfing.

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The TNO had not received any funds beyond the initial 8 lakh taka. All contractors had been payed 40-50% of the final estimate. Payment to 90% of the final bill (security money makes up the remaining 10%) will be made only after completion of plastering and approach work.

ALAMDANGA THANA

All 11 schemes were completed to slab casting by the 30 June deadline; 10 of the schemes are 5- and 8-foot brick masonry box culverts, while the other is a 20-foot bridge. Nine of these structures were seen during this visit. Since the Ministry's selection criteria was not received prior to the scheme selection deadline, all 4 roads that were "developed" in this pilot program require more appurtenant structures for total completion.

As reported in the Second Interim Report, there were some considerable groundwater infiltration problems which precluded the casting of foundations at two culverts. With the advice of the District Engineer and the Water Development Board (WAPDA) executive engineer, and the good fortune of several weeks of dry weather, work on these culverts commenced on 15 June, and both were completed within two weeks. With the dry spell, the water levels in the excavations went well below the foundation levels. Excavation then proceeded to about two feet below the foundation elevation; this extra excavation was filled with good quality sand from another area, on top of which was placed brick soling beds and the foundation slab (using quick-setting cement).

All the abutments and wingwalls were pointed and many were provided with grooves for optional placement of a sluice gate. All slabs will be plastered underneath. Earthwork will be leveled back to 100 feet from the culverts; there are no provisions for compaction on turfing.

It is of interest to note that the structures built in Alamdanga Thana were much more costly than similar sized spans in other pilot thanas that used WAPDA designs. When questioned about this, the TTS explained that they "beefed-up" the designs toward the Design Manual dimensions, providing a thicker foundation slab, a 6-inch concrete slab over a brick soling floor under the entire structure (forming a full box culvert), concrete angles were cast at the approach ends of each slab to protect the slab from bullock-cart impact, and slabs are on concrete seats, and wheelguards (curbs) were provided on the inside of the parapet walls.

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Partial payments of up to 60% were made to contractors for 9 of the 11 structures. The TNO has made several requests to the DC and the Ministry of Food for the release of the remaining 50% of the tendered price.

SHYMNAGAR THANA

In Shymnagar Thana, where, as stated in the Second Interim Report, availability and delivery of construction materials is an acute problem, three weeks of rain and receding flood waters combined with late design changes and funding delays to further aggravate the progress of work.

In early June, the District Council executive engineer finally reviewed the designs submitted by the TTS, and after a site visit to the four larger bridges with the Roads & Highways assistant engineer, determined that the two 40-foot bridges and one of the 30-foot bridges require mid-span piers. Only after this review did the DC release the balance of 4 lakh taka of the original 8 lakh taka disbursed by the Ministry. Since, up to that time, the TNO was not able to pay the contractors on their running bill, work progress continued to be slow; then, three weeks of flooded conditions exacerbated the already modest rate of materials delivery.

By 30 June, 7 reinforced concrete (rcc) box culverts were "completed" although all earthwork will have to await the dry season, since no earth is available in this submerged lowland area. Three other rcc box culverts will be completed by 31 July. Their other box culvert was 50% completed on 30 June when work was suspended due to high water levels and currents that made the placement of formwork/shuttering impossible. As previously mentioned, three bridges will require a central pier which, in all likelihood, will not be completed until the dry season allows casting of the pier foundations. Their other 30-foot bridge is scheduled for completion by 31 August. With the completion of these pilot schemes, 3 roads will have their full complement of appurtenant structures, and 2 other roads will be only partially complete.

Five completed rcc box culverts were seen, with varying degrees of expertise exhibited by the aesthetics of the final structure. (It should be noted that, given proper materials, thana supervision, and road bending and placement, rcc work has generally been of at least satisfactory quality throughout this pilot program.) Since these box culverts were designed without

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facewalls or wingwalls, earthen facewalls will be built using locally available good-compacting soil. This was one of the few thanas where excavations were safely sloped. Here, as in Shailakupa Thana, the quality of brickwork seen at the 40-foot bridge visited was much improved over that observed in the second round visit; several "mistries" (craftsmen) were dismissed and replaced following my criticism of their work. As a final note, the TNO will request additional funding from the Ministry for the construction of the three mid-span piers required by the District Council executive engineer; WAPDA has also offered to allow their canal to be diverted to the outside of the abutments at the site of one of the 40-foot bridges during this monsoon season if the contractor can be guaranteed extra payment for the pier and for this diversion operation.

FATIKCHARI THANA

Progress has also been curtailed in Fatikchari Thana, with little work being done in the first 3 weeks of July due to the Eid holiday and heavy rains. As of 30 June, two 10-foot open foundation culverts and 5 rcc pipe culverts were "completed". All their remaining structures, with the exception of one 30-foot bridge which cannot be started until December due to high water, are scheduled for completion by 15 August (this includes 8 bridges of 20- to 40-foot span). At one 20-foot and one 25-foot bridge, high groundwater and poor soil (loose sand) prompted the TE to consult with the District Council executive engineer; the solution reached was to drive piling down to stable soil to support the foundations. In order to expedite the general progress and to assure work through the monsoon season, the TNO has told the contractors that running bills will not be accepted until completion of works. (It should be noted that, as of 21 July, the TNO had only received 5 lakh taka from his DC, with the promise of 3 lakh taka due for transfer to the thana bank by the end of July.) All 3 roads will have their full complement of appurtenant structures with the completion of this pilot program.

Supervision still remains a severe problem in this thana, with distant roads, no personal transport, and the part-time availability of 4 TTS supervisors. Among the several bridges and culverts seen, the quality of brick masonry work varies considerably among contractors, with some very good work and some structures with brickwork done course-by-course with many vertical joints without mortar. All structures will be plastered.

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ISHURDI THANA

In Ishurdi Thana, 26 schemes were completed by 30 June, including 20 four-foot span brick masonry box culverts and 6 eight-foot span rcc arch culverts. Their 40-foot bridge was "completed" on 10 July. The remaining four 4-foot box culverts were completed on 25 July, while the other 8-foot arch culvert will be completed by 31 July; progress on these last 5 schemes was delayed by a slowdown in materials delivery due to the presence of open excavations of other culverts in this pilot program. With the completion of these schemes, 3 roads will have all appurtenant structures needs met.

All brick masonry is pointed, with expansion joints separating wingwalls from abutments. The 4-foot box culverts have curtain walls at each end with floors of brick herringbone over soling topped with mortar. The underside of all slabs will be plastered. One of the 4-foot box culverts visited appeared undersized (probably should have been a 8-foot span culvert), since it must drain a large field into a relatively large canal. The 8-foot arch culverts are aesthetically appealing structures that have good structural qualities and is cost-competitive with other box culvert designs of similar span and boat clearance requirements. These structures have 8-inch thick arches, supported by 9-inch thick rcc abutments, with rcc floors, brick wingwalls separated by expansion joints, with a thick earth covering forming the roadway on top of the arch.

By 25 July, all contractors had been given running bill payments (up to 60-70% of the contracted price) with the 8 lakh taka received by the thana. It was reported that the DC-Pabna had received an additional 6.34 lakh taka for this program from the Ministry.

PUTHIA THANA

All 19 schemes in Puthia Thana were completed by 29 June, fulfilling all the appurtenant structure needs of 7 roads, and all but one 10-foot culvert for another road. Each contractor has been payed 40-60% of the contract price, and the TMO has made 3 separate enquiries over the prior month regarding the Ministry's release of the remainder of funds for contractor payment.

As reported in the Third Interim Report, both pointing and plastering was used to finish the brick masonry. Although the bridges and culverts are described as open foundation culverts/bridges, each structure included plastered brick curtain walls and a 3-inch thick concrete floor over brick soling. The 20-foot bridge has a double-slab (6 inches and 8 inches thick), and one of the 10-foot culverts has a wooden sluice gate. No expansion joints were provided between wingwalls and abutments, although an older WAPDA open foundation culvert on one of the pilot roads had wingwalls splintered apart from the abutments, indicating that although the soil conditions seemed satisfactory, differential settling may take place in this area, and expansion joints should have been provided (just to be safe).

SHARIAKANDI THANA

All 8 schemes in Shariakandi Thana were completed by 30 June. Since, as described in the Third Interim Report, the second phase tender was not issued, these 8 schemes are scattered throughout the thana, and no roads were completed. One contractor for a 10-foot culvert was replaced by another contractor, since the original contractor would not start the work in a timely fashion. All contractors were payed up to 50% of the total contract price. The brickwork seen was not improved over that observed during the second round visit, with clear evidence of course-by-course bricklaying with many vertical joints having little or no mortar in them. All culverts/bridges are plastered. Raincuts had already occurred in the recently replaced earthwork behind the wingwalls.

SARAIL THANA

In Sarail Thana, 8 of the total of 10 schemes were completed by 31 July. At the isolated site of their 25-foot bridge, 2½ tons of bent reinforcing rods were stolen on 25 July; slab casting for this bridge is scheduled for 4 August. Shuttering was in place for beam casting at the 50-foot rcc bridge during this visit; slab casting is scheduled for 5 August. Due to high water in this lowland thana, the wingwalls for the 50-foot bridge and the earthwork for their two 20-foot, 25-foot and 50-foot bridges will have to be done during November/December.

In this thana, where half the structures are brick masonry and the other half are rcc, all the brickwork is plastered. Nine out of the 10 schemes were seen on this visit, and the overall quality of work is quite good.

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CHUNARUGHAT THANA

In Chunarughat Thana, where major flooding in July exacerbated an already difficult materials transport problem, 8 out of a total of 28 schemes were completed by 31 July. Their two large structures, a 30-foot and a 50-foot rcc box bridge, could not be started so late this season since water levels were too high for foundation pouring. All the remaining schemes will be completed by 15 August. With the completion of the two large bridge, this pilot program will "complete" the appurtenant structures needs of 2 roads. For total roadway completion, these roads require a major bridge of several hundred feet in span over the Kowai River; with this bridge, the TNO claims that crores of taka in commercial business would be created for this thana since these roads would provide a shortcut for the transport of a significant portion of the tea and timber production from this part of Habiganj Subdivision. All brickwork is plastered and there are no expansion joints provided between abutments and wingwalls due to good soil conditions.

BEGUMGANJ THANA

Begumganj Thana, which had the latest start in this pilot program, "completed" all 13 of their schemes, which included four 25-foot bridges and two 30-foot bridges in about 10 weeks time; and the quality of work is quite good. Plastering and guardrails on all the structures will be completed by 15 August; earthwork on all but 3 schemes will have to await the next dry season due to the lack of unsubmerged earth in this lowland thana. Payments to contractors are made in 2 running bills plus a final bill for schemes greater than one lakh taka in cost; less costly schemes are payed in one running bill and a final bill.

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