Bangladesh Agricultural Development Corporation
USAID Fertilizer Distribution
Improvement Grant 388–0024

Engineering Consultancy Services Contract for Bagged Product Fertilizer Warehouses Project

FINAL REPORT

JULY 1984

CONSULTING
ENGINEERS
INTERNATIONAL ENGINEERING COMPANY, INC.
A MORRISON-KNUDSEN COMPANY

UNITED STATES GOVERNMENT

2-Way Memo

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Subject: Phase II - Fertilizer Warehouse Construction
AID Project 388-0024.

To :
Mr. Hasan Hasan
Division Chief
ASIA/PD/ENGR, Room 3318
Agency for International Development
Washington D.C. 20523

DATE OF MESSAGE	ROUTING SYMBOL
August 12, 1984	

SIGNATURE OF ORIGINATOR
David Warner, PDE

TITLE OF ORIGINATOR
Chief Engineer (A)

FOLD FOLD

INITIAL MESSAGE

Enclosed herewith please find one (1) copy of the consultant's final report for the project dated July 1984 for your review. All IECO expatriats left Dhaka July 27, 1984, but the local office shall function until August 31, 1984.

Regards.

REPLY MESSAGE

Received 8/21/84
Thanks! Jack LeMair

From :
David E. Warner
Dhaka Dept. of State (I.D.)
Washington D.C. 20520

DATE OF REPLY	ROUTING SYMBOL
8/21/84	

SIGNATURE OF REPLIER

TITLE OF REPLIER

5027-106

1. TO BE RETAINED BY ADDRESSEE *(Receiver)*

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INTRODUCTION AND ACKNOWLEDGEMENT

This final report presents a summary of the planning, design engineering, construction programming and construction surveillance performed during the fifty-eight months of the Phase II Fertilizer Warehouses Project. These engineering consultancy services have been performed by IECO in accordance with the Contract between BADC and IECO, under USAID Fertilizer Distribution Improvement Grant 388-0024.

IECO, with Development Consultancy Services (DCS) our associated subcontractor, carried out the storage planning studies and field investigations in close collaboration with BADC's fertilizer supply, warehousing and marketing directors and managers worked closely with BADC and USAID officials in making arrangements for the twenty-six site construction program, and subsequently performed inspection and surveillance of the construction and maintenance work during the last thirty-three months of the program.

We wish to express our appreciation for the friendly cooperation which BADC's managers and engineers have given to IECO during the past five years. With this collaboration in accomplishing mutual objectives, this has been a successful program, from planning through engineering and construction. USAID has sponsored and funded the program and we also wish to express our appreciation to the USAID engineers and administrators who have worked with BADC and IECO at each stage of the planning and implementation.

We wish to make note in particular of the valuable contributions to this program of the following officials of BADC: Messrs. M.A. Samad, A.N.M. Yusuf, Brig.(Retd.) A.S.M. Hannan Shah, and Col.(Retd.) S.A. Ansar, successively Chairmen, BADC, whose sponsorship and support of the program was most helpful; A.K.M. Ansarul Haque, and A.K.M. Shahjahan, successively Managers (Storage) BADC, and A.M. Mohiuddin, Deputy Manager (Storage), whose assistance was always available in prosecuting the work; M.A. Chowdhury, M.A. Kalam and M.R. Chowdhury, successively Chief Engineers (Construction) BADC, whose consultation on technical matters was of great assistance; A.T.M. Najmul Alam, Member-Director (Irrigation) BADC, whose active chairmanship of the construction progress meetings made a valued contribution; and A.B.M. Anwar Hossain Project Director BADC, whose collaboration and assistance in technical and administrative arrangements was vital to success of the program.

Officials and representatives of USAID supported the program, and we wish to acknowledge their active sponsorship, policy guidance, and technical input. The following USAID staff members participated: Messrs. Frank B. Kimball and James A. Norris, successively Directors of Mission; William R. Joslin, Deputy Director of Mission; Charles H. Antholt, Chief, Ag. Div; Dean J. Alter and Jonathan M. Conly, successively Project Officers; Clarence C. Grossman, Chief Engineer, PDE; Paul B. Thorn, Project Officer and Chief Engineer, PDE; David E. Warner, Project Officer, PDE; Manuel E. Perez, Ranulfo S. Bulatao, and Shamim A.F. Rahman, Engineers, P.D.E. staff.

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The new facilities now in BADC service represent a significant addition to the national resources of Bangladesh, supporting agricultural development for increasing food production. IECO has been privileged to be of service in this program.

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SECTION 1

ENGINEERING SERVICES

A. SCOPE OF SERVICES

The services to be provided to Bangladesh Agricultural Development Corporation (BADC) by International Engineering Co., Inc. (IECO) are set forth in Appendix A of the BADC/IECO Contract which was entered into in September, 1979. The listed services were increased under Amendment No. 2, which added National Fertilizer Storage Plan preparation to the original scope of work. In outline form the services provided for were to be as follows:

Specific Services

a. 1. Prepare an Outline National Storage Plan and a final National National Fertilizer Storage Plan showing Primary Distribution Points, capacities site sketches and narrative explanation for the need of each PDP. Determine land to be acquired, prepare drawings to aid in acquisition.

2. Review right of use and ownership documents for adequacy.

3. Develop, with BADC, management and staffing plans and preliminary building sketches.

4. Assess technical suitability of sites and alternate sites.

5. Modify existing designs and prepare new designs as required.

6. Carry out soils investigations and foundations design.

7. Prepare the bill of quantities and cost estimates.

8. Prepare Contract documents.

9. Assist in contractor pre-qualification bid analysis and make award recommendation. Perform supervision, inspection, monitoring and approval of works. Prepare contract amendments and Change Orders. Accept work for progress and final payments. Prepare clarifying details, changes, and redesign of drawings as required. Interpret drawings and specifications. Conduct on-site observations. Establish baselines and benchmarks. Issue instructions to contractor. Verify contractors measurements. Assist in preparation of invoices. Report on acceptability of the work and issue Certificates. Assist in BADC/contractor differences. Prepare as built drawings. Check samples, schedules, material reports. Do soil and material testing. Approve equipment and material. Accept or reject work in place.

10. Mobilize equipment and material to perform consultant services. Turn equipment over to BADC at project completion. Within five months prepare preliminary drawings, designs and cost estimates. Monitor construction schedules.

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b. Reports. Prepare an Inception Report, Monthly Reports and other required reports.

c. Coordinate meetings for project review.

d. Select sites, do design, prepare documents, prequalify contractors, acquire sites, evaluate bids and recommend contract award within 15 months.

e. Maintain a designated level of effort of resident consultants.

f. Option to propose additional engineering can be exercised.

B. EXPATRIATE STAFF

To direct accomplishment of the site planning, design engineering, construction preparation and construction surveillance, IECO manned the project with expatriate personnel. Those who served on the project for one year or more were designated as long term resident consultants. Under an amendment to the contract, the services of several short term consultants were authorized. The staff members and assignments were as follows:

LONG TERM RESIDENT CONSULTANTS

Project Manager	
F.E. Isgrig	16 OCT 1979 - 27 JULY 1984
Contract Administrator	
D. Lovely	16 OCT 1979 - 27 JULY 1984
Chief Field and Construction Engineers	
D. H. Workman	19 OCT 1979 - 27 FEB 1983
C. F. Leonhardt	8 FEB 1983 - 7 FEB 1984
Office Engineer	
E. Sugay	19 OCT 1979 - 14 NOV 1980
Materials Engineer	
A. Htay	20 NOV 1979 - 8 MAR 1981
(Two Periods)	7 MAY 1982 - 7 JUNE 1983
Construction Engineers	
M. Lim	4 DEC 1979 - 4 DEC 1983
S. Hewick	1 JUN 1981 - 31 JAN 1984
H. Tchen	4 DEC 1982 - 27 JULY 1984

SHORT TERM CONSULTANTS

Design Engineer	
R. Girard	27 JUN - 12 SEP 1980
Specification Specialist	
H. Hoyer	20 JUL - 8 AUG 1980
Railroad Operation Specialist	
R. Adams	25 JUL - 31 AUG 1980

SECTION 2

FERTILIZER WAREHOUSE STORAGE PLANNING

The Phase II fertilizer warehouse design and construction program is an integral part of a National Fertilizer Storage Plan (NFSP). Administrative arrangements were made in 1979 by BADC/USAID for IECO to accomplish the NFSP as part of the Phase II warehouse design and construction supervision project, and an amend ment to the IECO contract included the NFSP in the workscope. The NFSP is a site-specific plan for fertilizer storage and distribution warehouses throughout Bangladesh, to accommodate the projected demand for fertilizer. The demand was forecast for 1984 85 (in terms of the annual requirement in metric tons) for all Thana in Bangladesh: in 1979 jointly by BADC/USAID, and early in 1980 by the National Planning Commission. The NPC projections, aggregating to 2.030,000 M. tons in 1984 85 were provided to IECO for use in formulating the NFSP.

A. BASIS FOR PLANNING

For the Phase II construction program, a candidate list of 35 warehouse locations, with building storage capacities ranging from 2,000 metric tons to 15 000 metric tons, was provided to IECO by BADC and USAID. The aggregate storage capacity of the 35 warehouses was 170,000 metric tons. These numbers of locations and tonnage represented the approximate extent of the engineering/ construction intended for accomplishment in the USAID Grant Phase II program.

The warehouse location/capacity study would, first, identify warehouse sites and sizes for immediate development in the current USAID Phase II program; and, second, would develop a complete list of warehouses to include in the NFSP.

In 1979 80 BADC owned and operated some 314 fertilizer warehouses throughout the country, and also operated 816 hired warehouses. For over 14 years, BADC had been stocking all such warehouses and handling sales at the local Thana level. With implementation of the New Marketing System which was introduced in the Chittagong Division in 1978, hired warehouses were to be released, and a number of the BADC-owned warehouses were to be managed by others. Fertilizer distribution and sales at the local Thana level would be a private sector enterprise. While BADC's numerous sales points would thus be substantially reduced, its annual sales tonnage was forecast to continue to increase annually.

BADC sales, to dealers and farmers, are to be primarily through a number of strategically located warehouses throughout the country, designated as Primary Distribution Points (PDP's). The PDP warehouses are so sited as to be readily accessible to the customers of the region, and readily restocked several times each year via the country's road, rail, or water transport network. Transportation is a primary consideration in developing the most serviceable fertilizer distribution facilities for all districts in Bangladesh.

Planning considerations in 1979-80 also envisioned that there would be two other types of warehouses in addition to PDP's which BADC will continue to own and operate under the New Marketing System: transit warehouses and "remote Thana" warehouses. Remote Thanas are those not served by transportation links the full year round: generally low lying areas subject to flooding and cut off from road transport for much of the year. Such areas would continue to be served by "Thana Sales Center" warehouses operated by BADC. Thana Sales Center warehouses were not part of the USAID Grant - Phase II program.

Transit warehouse facilities were, however, to be included in the Phase II program because of the transportation facilities at a number of the 35 nomina ted warehouse locations. Situated at broad gauge - meter gauge railroad junctions or on navigable waterways, these warehouses serve as transhipment points to other PDP warehouses in the program, as well as functioning as PDP's for the region in which they are located.

In February 1980, BADC provided IECO with revised 1984-85 District-wise Fertilizer Sales target figures adopted by the Planning Commission. At the same time the proposed use of unit trains (60-wagon trains exclusively for fertilizer) operating from Shitakundu, Ashuganj and Chittagong was identified. In accordance with BADC's request IECO took the new information into considera tion in formulating the NFSP. The new nationwide 1984-85 fertilizer sales target figure of 2,030,000 tons was 23% higher than the BADC/USAID 1,650,000 ton figure used in the Outline NFSP (published in January). The increased requirement resulted in the addition of some PDP warehouses to the total storage facilities being planned, as well as increasing the planned size of most of the PDP warehouses.

Planned unit train operations, from ports and plants to storage and transshipment points on the rail system, impacted significantly on IECO's site development planning for the Phase II construction program. Unit train operation to the affected PDP's involves providing rail sidings adjacent to the warehouses, with siding capacity of 30 or 60 rail wagons. At two locations, Parbatipur and Santahar, it was necessary to provide for both meter gauge and broad gauge sidings The unit train concept accordingly involved significantly more extensive site surveys, site planning with the aid of available vicinity maps and railway station drawings, and planning for railway installations and operations in consultation with Bangladesh Railways. In consultation with BADC, the groundwork for consultations with the Railways was laid and the first meetings with BR scheduled during March, 1980.

Planning of fertilizer movements from production plants and ports of importation to specific destinations was involved. A proposed increase in the capacity of the meter gauge rail ferry service, to carry shipments of 300,000 tons/year across the Jamuna to the northwest Districts, and utilization of 50 60 wagon unit trains to transport fertilizer to various points in the north and northwest, were considered in the transportation studies. Shipment volumes and routes by mode (rail, road and water), and by product (Urea, TSP, MP), established requirements for transit storage capacity and inter-modal transfer facilities at the Transit PDP warehouses.

B. PLANNING TOOLS AND METHODOLOGY

Initial studies for the National Fertilizer Storage Plan began in November, 1979 concurrently with IECO's mobilization, with the preparation of large area studymaps: one depicting Thanas, Districts and Divisions of Bangladesh, and listing projected fertilizer sales volumes for the year 1990; and a second depicting the road, rail and water transportation network in the country.

An analysis was made of present and planned BADC warehouse capacity vis-a-vis future year projected requirements, for each of the country's twenty Districts. Basic objective of planning was to provide all districts in Bangladesh with storage capacity sufficient to meet fertilizer needs in the period 1985-1990.

The District by District study of warehouse locations and sizes was begun, utilizing available data to evaluate a list of some 92 candidate warehouse locations nationwide, which had been prepared by BADC in mid 1979. This list was published in the Inception Report, issued in November 1979.

With the advice of BADC's Storage Manager, an inventory of existing warehouses and their storage capacities was made. As a number of such warehouses were still under construction in current programs (Hardcore & USAID Plant Phase I) the list was revised from time to time throughout preparation of the NFSP, which ran until March, 1981. The Outline NFSP published in January, 1980 identified some 117 warehouse sites throughout the country.

C. FIELD ACTIVITIES: SITE SELECTIONS

With the appointment of Mr. Michael Lim, Construction Engineer, early in December 1979 and the participation of Mr.F. Wahhab, Agro-Economist, plus rail and water transportation specialists, intensive warehouse location investigations were begun, initially in the Chittagong, Noakhali and Comilla Districts. Field inspection of actual properties either owned by BADC or proposed for purchase was carried out. An analysis of fertilizer supply and distribution requirements for the Chittagong and Noakhali areas was made, with the result that alternative locations were found for several warehouses, sizes were adjusted, and the transportation requirements for supply to the warehouses identified. Findings were incorporated into NFSP preparation. This same procedure was subsequently followed in developing planned warehouses in all sections of the country.

Based on results of the initial inspection trip to the southeast districts, following trips were planned and scheduled in close collaboration with BADC; site inspections and property selections were made with BADC District Managers present and participating; and trips were made in company with BADC's Manager of Storage (or his representative) as well as with a representative of USAID.

D. NATIONAL FERTILIZER STORAGE PLAN

The Outline NFSP was prepared and submitted to BADC and USAID in January, 1980. It provided the basis for further detailed site planning for PDP warehouses throughout the country, and was the subject of discussions with BADC Storage Managers visited in the various Districts as well as at Dhaka Headquarters.

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A number of changes in the planned locations for warehouses were generated by the District-by-District consultations.

In May, 1980 NFSP planning had identified 82 locations for provision of new warehouse facilities. Site selections proceeded through June, July and August, aimed at selecting the advantageous sites to include in the Phase II construction program. In August, 1980 the (Draft Final) National Fertilizer Storage Plan was published. The first three volumes consist of Narrative, Tables, and Exhibit Maps. The fourth volume contains the Land Plans for the site acquisition, but was not published at that time pending identification and survey of a site on Hatiya Island which was inaccessible due to sea conditions.

During the following months, the draft NFSP was extensively reviewed at both BADC and USAID, and as the result of a series of comments and suggestions received a number of proposed additional, or alternate, warehouse locations and site properties were investigated. The preparation of site development layout plans continued. A proposal for a transit warehouse at Chalna Port was extensively investigated.

In January 1981 the field survey work in progress for potential new sites was curtailed, and in a series of conferences during January, February and March 1981 the sites for eventual development were selected for inclusion in the NFSP. Decisions about several of the final sites were referred to the Chairman, BADC for his review and final selection. With these planning decisions made by March 17, 1981 finalization of the various NFSP Warehouse location maps, transportation analyses and movement plans, texts and tables could proceed.

The National Fertilizer Storage Plan was published in June 1981, with submission of 200 copies to BADC and 10 to USAID.

SECTION 3

ENGINEERING AND CONSTRUCTION PROGRAM PLANNING

A. DESIGN AND PLANNING OPTIONS

Design of the warehouse building began in October, 1979 in IECO's San Francisco Office. The studies of building types included examination of both reinforced concrete and steel frame structures. Considerations included structural adequacy and performance, speed of construction, comparative initial cost, and ease of future expansion. In terms of structural integrity and permanence as well as overall costs, concrete and steel structures appeared comparable. However when speed of construction is considered, steel presents a definite advantage over concrete. The steel frame structure also offers greater ease in future expansion.

It had been emphasized that time was of the essence in building additional fertilizer storage capacity; hence a rapid construction schedule was a prime objective. Here steel construction had a decided advantage over concrete. As to cost, IECO had initially estimated steel and concrete construction to be comparable, within the range of US$17 - 19 per square foot of floor area. The steel building required only 1/3 of the volume of concrete used in the concrete warehouse, and contributed substantially to lowering the overall cost of the steel frame building. Also, the steel frame structure is considerably lighter than concrete and thus distributed foundation loading would be appreciably lower.

As to the ancillary buildings, those built in the Phase I program were nominated for the Phase II program also, to be modified in some details to suit BADC preferences.

IECO's proposal to develop a steel frame warehouse building became a matter of controversy. USAID Mission engineers disagreed with the use of steel, and preferred a concrete frame building. Corrosion and deterioration was their concern. The choice between steel frame or concrete frame construction was under consideration by the BADC Chairman following IECO's presentation of the factors involved on January 30, 1980. IECO's Division Chief Engineer and Project Engineer subsequently arrived in Dhaka, and at a mid-February meeting arranged by the Chairman the Project Engineer presented a detailed report on IECO's research into warehouse building configurations and materials of construction.

At BADC's request, IECO's study of building design alternatives had included an evaluation of prestressed concrete. This design was discussed by the Project Engineer at the February 14 presentation, along with information about other alternative building configurations. This as well as a number of other possible structural systems had been eliminated due to the various disadvantages which they presented. The building-type alternatives identified as offering the best combinations of constructibility with reasonable estimated costs had been narrowed down to a steel frame building constructed as a 20' x 60' repetitive

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module to make up different sized buildings of various sites, and a concrete frame building also constructed repetitively on a, nominally, 24' x 24' repetitive basis to the total building dimensions required.

Following the February 14 presentation, the Chairman gave the matter further consideration, and on February 22, he advised IECO of his decision to opt for design of a concrete-frame building. IECO developed the design and submitted preliminary drawings, estimates of cost, etc. In March, following study of alternate reinforced concrete building configurations and structural systems, final design was started on a beam-and-slab structural system employing a 20' x 20' repetitive unit, for use in constructing any size of building desired; incorporating reinforced concrete shear walls at the end bays to resist seismic forces and minimize column sizes.

B. DESIGN PROGRAM

Development of the details of the warehouse building continued for the next several months in IECO's San Francisco Office, while at the same time site development engineering was accomplished in IECO's Dhaka office and at the various sites (31 were then identified for the USAID-funded Phase II program, and 5 were identified during the course of the work for separate construction with IDA funds). IECO's field crews carried out subsurface drilling, and excavated test pits for the foundation determinations. Building foundations developed for individual site conditions included spread footings where soil bearing values of 1 ton/SF were present or could be attained by consolidation of the shallow soil layers by compactive methods. At sites where this bearing capacity was not attainable or where underlying soil layers are subject to significant long term consolidation under load, the foundation adopted was precast reinforced concrete piling, with piles designed for 30 ton bearing capacity.

A parallel design effort involved the ancillary buildings utilized in the preceding USAID funded Phase I warehouse program, incorporating modified features for building hardware. Minor dimensional changes were made to conform to latest governmental directives for allocable living space for the BADC storekeepers and guards. Features incorporated into the buildings for the Phase II program included complete water supply, sanitary and electrical systems.

Submissions of in progress warehouse drawings and preliminary specifications were made in the course of the work, from April August 1980, and a number of changes made as the result of design conferences: in roof skylights and low level wall vents were eliminated; and godown doors were changed to 2-panel track-mounted units instead of rollup type.

C. PLANS AND SPECIFICATIONS

In September, 1980 the project drawings and technical specifications were in final form. The specifications were reviewed with USAID, approved, and were reproduced. The project drawings consisted of general drawings for the buildings and the site development details common to all the sites, and site-specific

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drawings for each individual site, including Cover Sheet, Site Plan, Warehouse Key Plan, Soils Boring Logs and Geologic Sections. These drawings were approved by BADC, awaiting USAID approval.

In October, 1980 some minor revisions/adjustments were made in contract documents, technical specifications and contract drawings in response to USAID comments. The USAID advocated lighting the warehouses, a feature which had not been previously included in the design/engineering program. It was arranged to include the warehouse lighting as an Addendum to the bid package. Changes could also be accommodated because the IFB could not be issued in October; BADC's rights to occupy and construct on BR lands (14 sites involved) were not yet fully arranged for. The documents were reproduced in quantity and assembled into sets, ready for issuance to the bidders.

SECTION 4

CONSTRUCTION CONTRACTING

A. PREQUALIFICATION OF BIDDERS

The Phase II construction work was to be carried out under a single contract by a contractor with the experience, organization and financial resources to prosecute the multi-site, multi-million dollar program on a planned schedule. The bidders were accordingly prequalified. Prequalification documents were solicited by advertizing in the Commerce Business Daily, by notifications to U.S. Embassies in Code 941 countries, and locally by advertizing in the Bangladeshi press.

In June 1980, twenty five firms and joint ventures submitted prequalification documents. These were evaluated, and IECO recommended eight for prequalification:

Chin Hung	- Korean
Daewoo Development Co.	Korean
Fischbach-Oman	- U.S.
Grove Overseas Corp.	- U.S.
Korea Development Corp.	- Korean
Pirini Corp.	- U.S.
Poong Lim Industrial Co.	- Korean
Vinnell Corp.	- U.S.

In July, Jurong Engineering Pte. Ltd. of Singapore was added to the list of firms recommended for prequalification. In August, all firms which had submitted prequalification documents were advised of their status, and the above nine firms were confirmed as prequalified. Word was subsequently received from Pirini Corp. that they would not be submitting a bid. In October, at USAID's request, the remaining eight prequalified firms were asked to confirm their eligibility as Code 941 Contractors. In November, Poong Lim notified IECO that they would not be able to submit a bid.

The Invitation for Bids was issued to the remaining seven prequalified contractors on Tuesday, 9 December 1980. Bid opening was scheduled for 23 February 1981 (later extended to 25 March) and a prebid conference scheduled for 15 January 1981.

In January 1981 Chin Hung and Daewoo Development Co. informed IECO that they would not be submitting bids. Jurong Engineering's eligibility as a Code 941 contractor was in question throughout the month. Ownership information submitted by Jurong did not satisfy AID requirements, and AID accordingly determined Jurong's ineligibility.

B. TENDERING AND CONTRACT AWARD

The 15 January prebid conference was held as scheduled, and representatives of three prequalified American Contractors - Fischback-Oman, Grove Overseas and Vinnell Corp. attended, as did those of Korea Development Corp. and Jurong

Engineering (Singapore). The Korean firms Chin Hung and Daewoo were not represented.

The issues raised by individual bidders and discussed at the meeting included requests for (1) acceptance of Bank guarantees in lieu of bid and performance bonds, (2) a one-month extension to the bid period. (3) provision of a mobilization advance, (4) an increase in the mobilization bid item limit from 5% to 10%, (5) more liberal payment provisions for major materials (6) relaxation of gradation requirements for coarse aggregates. (7) clarification of handling and processing requirements for on-site materials used in fills, (8) modification of the specifications for sodding, (9) a change in the specification for fill sand, and (10) elimination of the requirement for mechanical compaction of backfill in trenches.

Other matters brought up included questions about the required on-site sanitary facilities (requirement confirmed), arrangements for site electrical power (Contractor's responsibility), and clarification that borrow sites have not been designated.

IECO agreed to take many of the (above enumerated) matters under advisement. A second prebid conference was scheduled for the following week on Thursday, 22 January, to make known the changes which would be incorporated in the bidding and contract documents by Addendum. IECO developed recommendations for decision. Agreement about the various changes was reached and these were announced and discussed with the bidders on 22 January. Of the ten requests for modifications listed above, all but the first, acceptance of bank guarantees in lieu of bonds, were accommodated . At the January 22 meeting, discussion also concerned retentions, bank guarantees, a bonus, piling construction, concrete hardeners, and washing of aggregates. Questions were answered and no further changes to the documents were considered. Subsequently, the announced changes were incorporated in Addendum No. 4.

Addendums 1, 2 and 3 were issued to the bidders in January:

Addendum No. 1 - corrected a Bill of Quantities omission.

Addendum No. 2 - added chimneys to the ancillary buildings.

Addendum No. 3 - provided for warehouse lighting.

Addendums 4, 5 & 6 were issued in February:

Addendum No. 4 - extended the bid period to March 25, established a mobilization advance and reworded certain specifications.

Addendum No.5 - clarified the drawings and amended the Bill of Quantities as relating to box culverts.

Addendum No.6 - established a Provisional Sum in the amount of three million dollars to finance Contractor procurement of rail material.

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In February, all bidders were informed that the four sites listed as provisional: Barisal, Comilla, Chuadanga and Bogra, were confirmed and would be part of the program.

On 21 March IECO was advised by Vinnell Corporation that Vinnell and Grove Overseas Corporation would bid as a Joint Venture. On 25 March, at 12 noon, the bids of Fischbach-Oman International, Vinnell-Grove Constructors and Korea Development Corporation were received and opened by IECO in the presence of the bidders. Also present were representatives of BADC and USAID. Each bid was first checked for inclusion of the required documents and schedules and for signature, and the total amount of the bid was announced. The bids and amounts announced were as follows:

Bidder	Bid Amount (U.S. Dollars)
Fischbach-Oman International (JV)	$ 62,983,125.00
Vinnell-Grove Constructors (JV)	$ 61,843,509.00
Vinnell-Grove Constructors Alt.No.1	$ 61,255,074.00
Korea Development Corporation	$ 53,000,000.00

All of these bids are inclusive of a $ 3,000,000 Provisional Sum to finance purchase of rail materials.

Immediately following opening of the bids IECO began the review, checking and evaluation process. BADC and USAID were furnished a copy of each (sealed) bid.

Initial review disclosed that the Bill of Quantity sheets for electrical installations in the ancillary buildings were not included in the Korea Development Corporation bid documents. IECO, as BADC's agent, promptly asked KDC for a clarification. The KDC response stated that its bid includes all items of work under the IFB. Electrical installation for the ancillary buildings would be done and its costs included in the other items of work in the ancillary buildings, as provided for in the Instructions to Bidders in the IFB.

IECO completed review and evaluation of the bids during April, reporting findings and recommendations on the Korea Development Corporation bid on 4 April, and reporting findings and recommendations on the Vinnell-Grove and Fischbach-Oman bids on 20 April.

IECO found that all three bids were responsive, and recommended award to KDC on the basis of its low bid. The arithmetical check revealed some minor errors in the Vinnell-Grove and Fischbach-Oman bid subtotals and totals which did not affect the ranking order. The bids and the corrected total amounts, ranked from low to high, were as follows:

Bidder	Bid amount (U.S. Dollars)
Korea Development Corporation	$ 53,000,000
Vinnell-Grove Constructors (JV)	$ 61,846,464
Vinnell-Grove Constructors (Alternate)	$ 61,258,028
Fischbach-Oman International (JV)	$ 62,974,922

All of these bids are inclusive of a $ 3,000,000 Provisional Sum to finance purchase of rail materials.

BADC was concerned about the excessively high costs of ancillary buildings and plumbing (Parts C & D) of the KDC bid, tabulated below against the other bids and the Engineer's Estimate:

	KDC	VINNELL GROVE	FISCHBACH - OMAN	ENGINEER'S ESTIMATE
A. Site Prep.	$ 15,652,398	$ 25,484,824	$ 21,474,669	$ 13,716,669
B. Godown	24,678,719	25,836,870	28,620,308	23,696,072
C. Ancillary	6,289,684	4,164,612	6,075,058	3,095,154
D. Plumbing	1,660,253	1,595,881	1,848,783	519,628
E. Electrical	968,622	1,094,283	1,488,558	844,532
F. Marine	750,324	669,994	467,546	297,542
TOTALS	$50,000,000	$ 58,846,464	$ 59,974,922	$ 42,169,597

(This tabulation excludes the $ 3,000,000 Provisional Sum for procurement of rail materials).

IECO's analysis of the amount of KDC's bid, presented in its 4 April 1981 letter to BADC, is quoted as follows:

"there is little similarity in pricing of the site preparation work. The Part A prices reflect each bidder's appreciation of the risks involved in subcontracting the procurement of local materials, and the performance of earthwork and paving, to local firms. KDC's Part A prices reflect considerably more confidence than the other bids.

For Part B Godown construction, both KDC and Vinnell-Grove bids reflect an appreciation of the simplicity of this building. KDC's bid exceeds the Engineer's Estimate by only 4%.

The Part C Ancillaries as well as the Part D Plumbing, Part E Electrical and Part F Marine work are inconsistently priced (as between the three bids); and this may be the result of large differences in prices quoted by local contractors, suppliers and fabricators. We experienced this in formulation the EE. However, Parts C,D,E & F constitute only 19.3% of the total work, and while the total of $ 9,668,883 bid by KDC for C,D,E & F is very high, KDC appears

to have included "Caution Money" in this portion of its bid rather than in Part A. The total bid of $ 50,000,000 by KDC is within acceptable limits for this program, based on comparison of Phase II costs with costs experienced in the Phase I program, escalated to mid 1982 pricing.

The bids of Fischbach-Oman and Vinnell-Grove were complete, in that all of the items 1 through 9 above were received. A spot check of the arithmetic turned up only minor errors. A complete check and evaluation has not been done as the bids were so far in excess of KDC's. This can be done if required."

IECO's 4 April letter concludes with this recommendation:

"In summary, our evaluation has brought nothing to light which would preclude acceptance of KDC's offer. Funds available are sufficient to make a $ 50,000,000 award, according to advice from USAID. The $ 3,000,000 provisional sum for rail material procurement can be added to the contract later, as soon as next F.Y. funds are available.

We recommend that the construction contract be awarded to Korea Development Corporation."

IECO and USAID formulated suggested schedules of events and actions required to award, sign and fund the contract, and begin construction. These were presented and discussed with the Chairman, BADC.

On 5 May, BADC and USAID met and discussed the proposed construction contract, available means and measures to reduce costs of construction, and intended award procedures. Decision to award was reserved by Chairman Samad. On the morning of 8 May a meeting of BADC, USAID and IECO convened under the auspices of new BADC Chairman Mr. A.N.M. Yusuf. Options for partial award were considered, but it was USAID's position that award would have to be made for the whole of the works.

On 9 May the BADC Tender Committee No. 1 met to consider the bids. IECO presented a summary of events, comments and analyses of the bids, and made the recommendation for award of the contract to the low responsive bidder, Korea Development Corp. The Tender Committee, after considering all aspects and alternatives, decided to recommend the bid of KDC for acceptance. On 18 May the Bangladesh Government's Council Committee on Tenders convened at the Ministry of Finance and, after considering the recommendations of BADC and IECO, authorized award of the contract to KDC.

BADC communicated this decision to USAID. USAID submitted its recommendations to AID Washington for award to Korea Development Corporation. Following AID Washington approval, USAID notified BADC on June 17 of AID's concurrence in award of contract to KDC.

On 20 June, BADC issued to KDC a letter of intent to award the contract, in the tendered amount of $50,000,000. Delivery, within ten days, of a Performance Bond for the amount of the contract was condition precedent to execution of the contract. The other bidders, Vinnell-Grove and Fischbach Oman, were concurrently notified of KDC's selection.

On 24 June, KDC requested BADC approval of a bank guarantee in lieu of the performance bond, and additional time to furnish the surety. BADC's reply of 29 June did not address the bond/guarantee matter, but gave KDC an additional ten days (to 10 July) for due submission of the bond. There the matter stood at the end of the June. On 6 July KDC asked for further clarification concerning the bond or guarantee required to secure performance of the Warehouses Project, Phase II, and indicated that additional time (beyond 10 July) would be needed to provide a bond. BADC's reply on 7/8 July extended the due date for submission of the required 100% performance bond to 17 July, furnished a format for the bond, advised KDC that it could take the form of an irrevokable letter of credit, and specified that the bond submitted is to be confirmed in Dacca or in the United States by a Bank acceptable to BADC and USAID.

KDC's letter reply, of 11 July, again questioned the bonding requirements, and requested advice as to acceptability of several banks operating in Dacca. BADC's responses of 13 July and 14 July dealt with the various issues raised by KDC, restated the requirement for furnishing of the 100% performance bond on 17 July, 1981, and named several acceptable banks.

A meeting between BADC, KDC, USAID and IECO convened on 15 July. The surety requirement was discussed in detail, and the submittal deadline of 17 July for a performance bond reaffirmed. It was agreed that a confirmed telex message from Hanil Bank, Seoul assuring bond issuance, would be acceptable as a first step. On the following day, 16 July, KDC agreed, under protest, to furnish a 100% performance bond in the form of a bank guarantee: to extend the bid bond (and tender period) by thirty days: and to have the performance bond confirmed by an acceptable bank.

The required messages from Hanil Bank in Seoul, to be telexed through American Express Bank facilities, were not received on 17 July. Representatives of BADC, USAID and IECO accordingly departed on the evening plane for Bangkok and Seoul, arriving Seoul on the evening of 18 July.

On 20 July, the BADC-USAID-IECO party met with KDC. The language and format of the performance bond was agreed upon and prepared in final draft. A meeting with officials of Hanil Bank was then scheduled, and issuance of the performance bond arranged for. The bond was issued on 24 July, and was brought to Dacca by the USAID Regional Legal Advisor.

On 11 August KDC transmitted a copy of American Express' commitment to provide the confirming performance bond under certain terms and conditions. It was determined that BADC must have a bond callable in Dacca and that the call must be made to one bank only, regardless of the syndication structure: in this case the bond would be called from American Express. It was agreed that Indo-Suez Bank would be an acceptable co-manager of the syndicate. It was further decided that the contract would not be signed until the performance bond was in hand and that the bid bond must be extended to allow time for the PB to be executed.

JD

Arrangements between KDC and the co-sponsoring banks (AMEX and BIS) to issue the required performance bond centered in Hong Kong and in Seoul. Reports reaching Dacca indicated that financial terms for the bond, to be issued in the form of a bank guarantee, were agreed upon in Hong Kong; and that certain corroborating documents were yet to be delivered to AMEX/BIS at the end of September.

During the first half of October, arrangements to syndicate the confirming KDC performance bond were finalized by the co-sponsoring banks. On 15 October the bond, in the form of a 100% bank guarantee, was presented by AMEX/BIS, and reviewed with BADC and USAID. The bond was accepted on 16 October, and the construction contract between BADC and KDC signed immediately. On the same date, 16 October, USAID approved the contract and issued the initial Letter of Commitment to fund the work. IECO thereupon issued the Notice to Proceed to KDC, also on 16 October 1981. The 821 day period of contract performance was accordingly established to commence on 31 October 1981.

SECTION 5

CONSTRUCTION PROGRAM

A. FIELD INSPECTION AND QUALITY CONTROL

1. ORGANIZATION AND STAFFING

As the construction contractor, Korea Development Corp., mobilized for construction operations, KDC's plan to organize its work into three separate zones was identified. The three zones were those established by IECO in previous planning studies. These were:

Zone I - east of the Jamuna, extending from Netrakona in the north to Barisal and Bhola in the south.

Zone II - the northwest districts, lying west of the Jamuna and north of the Ganges.

Zone III - the southwest districts west of the Jamuna and south of the Ganges.

The accompanying map (Exhibit I) depicts the zones and construction sites.

As it was KDC's intention to establish a headquarters in each zone, and direct the construction programs in each zone under separate zone managements, IECO organized its field forces on the same zonal basis. IECO assigned an expatriate Construction Engineer, to each zone. He had supervisory responsibility for control and direction of engineering activities, supervision of site inspection and quality control. He had to communicate and work effectively with KDC's Zone Manager and staff in planning and coordinating construction inspection activities for scheduled construction work. The Construction Engineers reported to the Chief Construction Engineer as well as to the Project Manager in seeking solutions to particular field problems and in reporting progress of the work on a regular weekly basis.

To assist the Construction Engineers in zone-wide supervision, a Senior Field Engineer (SFE) was posted in each zone. Based at zonal headquarters, the SFE had responsibilities to oversee and provide technical guidance and support to the on site personnel. The SFE travelled throughout the zone to monitor inspection work and quality control testing procedures.

As each site was opened for construction, IECO posted a Field Engineer (FE) and an Inspector to the site. The FE functioned as site in-charge for liaison with the Korean Superintendent, planning and scheduling quality control work and inspection services; and inspected work in progress. The Inspector, in addition to inspecting work in progress, was responsible for recording daily the Contractor's manpower and equipment in use, and the work in which it was employed.

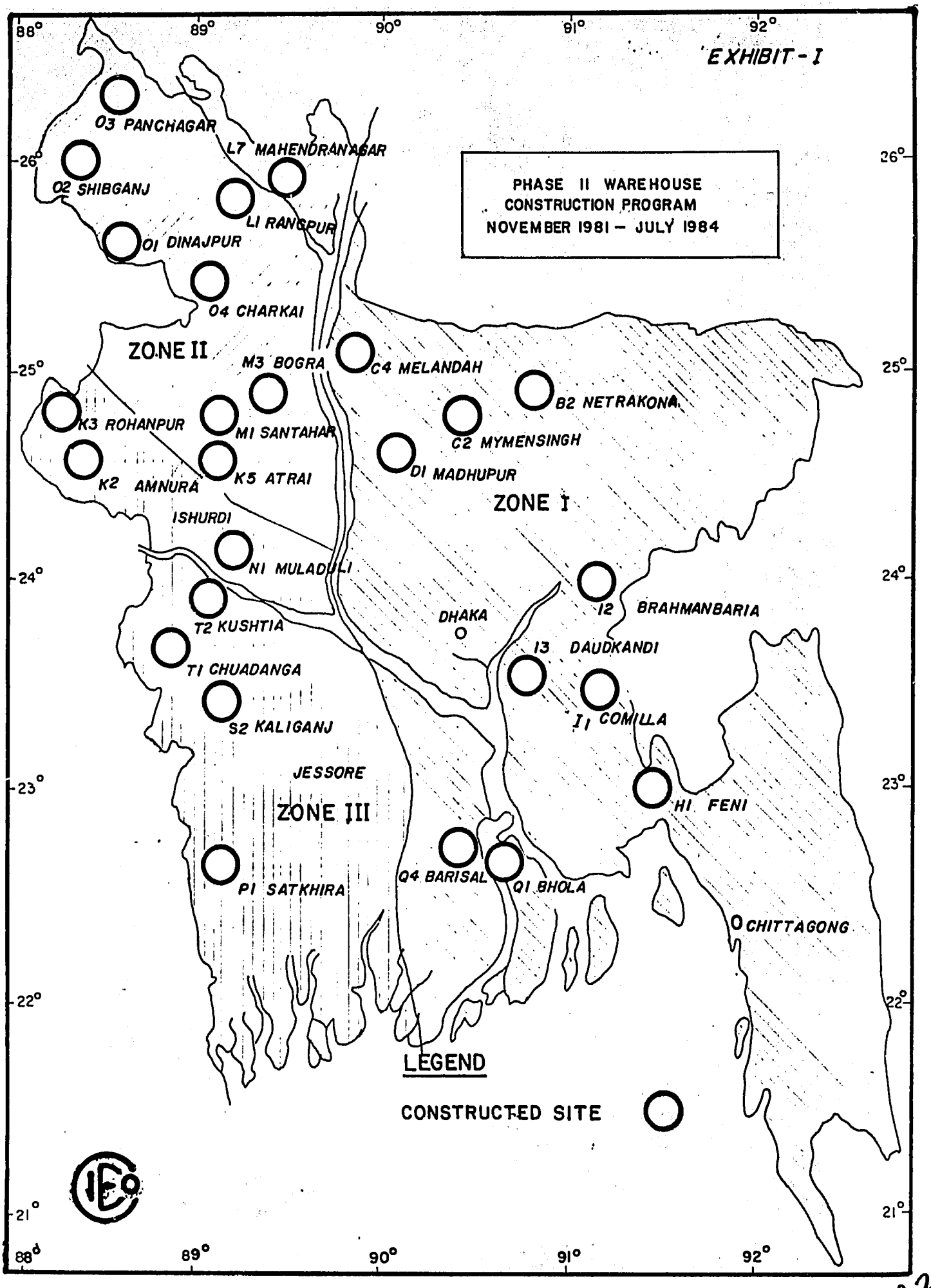


EXHIBIT - I
PHASE II WAREHOUSE CONSTRUCTION PROGRAM NOVEMBER 1981 – JULY 1984
88°
89°
90°
91°
92°
26°
25°
24°
23°
22°
21°
03 PANCHAGAR
L7 MAHENDRANAGAR
02 SHIBGANJ
LI RANGPUR
01 DINAJPUR
04 CHARKAI
ZONE II
M3 BOGRA
C4 MELANDAH
B2 NETRAKONA
K3 ROHANPUR
MI SANTAHAR
C2 MYMENSINGH
K2 AMNURA
K5 ATRAI
DI MADHUPUR
ZONE I
ISHURDI
NI MULADULI
12 BRAHMANBARIA
T2 KUSHTIA
DHAKA
13 DAUDKANDI
TI CHUADANGA
I1 COMILLA
S2 KALIGANJ
JESSORE
ZONE III
HI FENI
P1 SATKHIRA
Q4 BARISAL
Q1 BHOLA
CHITTAGONG
LEGEND
CONSTRUCTED SITE
IFC

Supplementing these personnel, IECO employed Soils Technicians and Asst. Soils Technicians in each zone to perform the quality control tests on materials at all stages of construction; from compaction of native soils and imported fill materials at the beginning and intermediate stages of construction; verification of construction materials delivered to site; and making concrete test cylinders, and testing these cylinders (at 7 & 28 days) to verify that concrete of design strength was being placed.

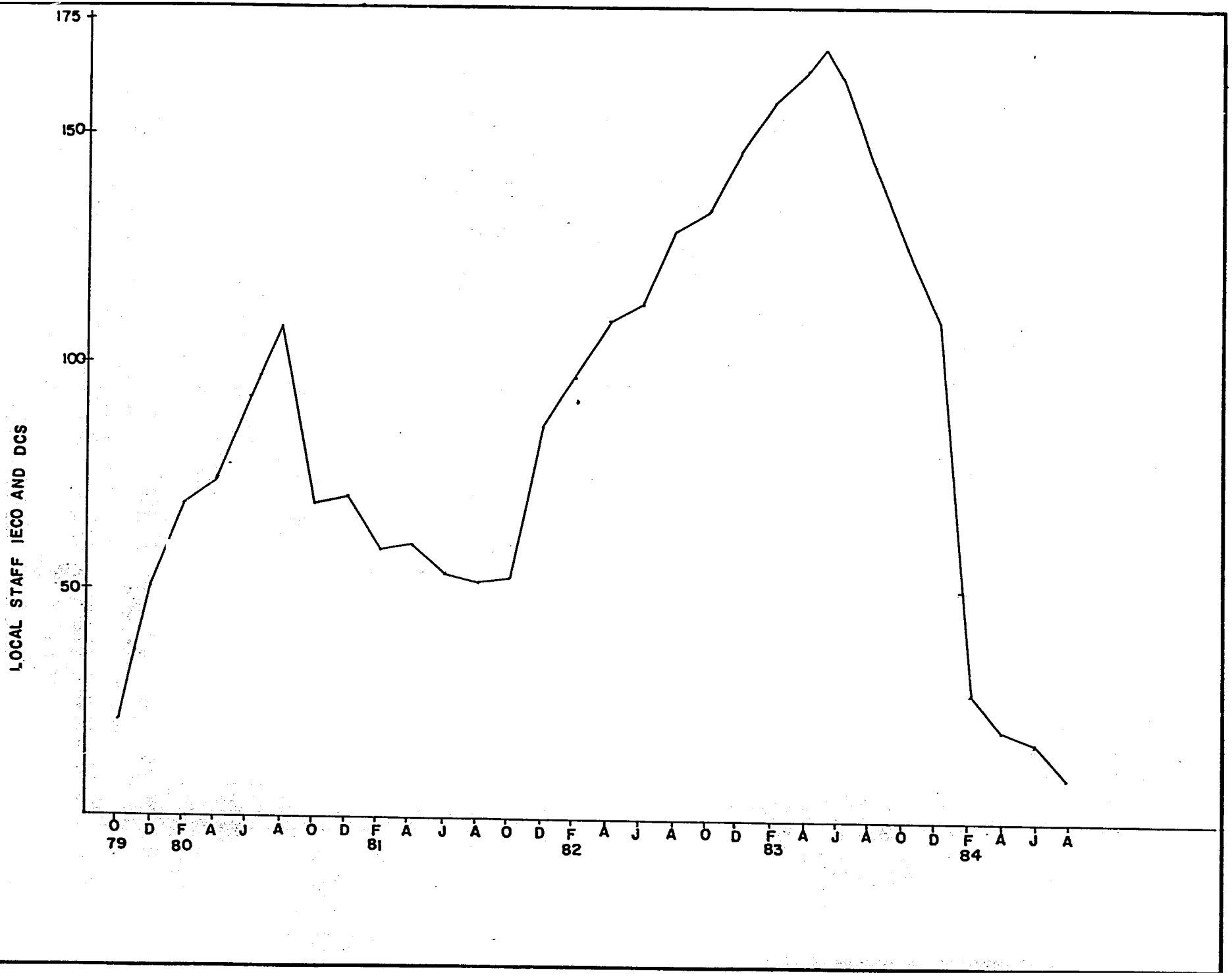
IECO's associated subcontractor, Development Consultancy Services (DCS), provided the services of the local technical and support personnel of the IECO/DCS staff. The DCS staff level had peaked at 108 personnel during the latter part of the design phase of the program in August 1980. This staff was reduced to some 50 total personnel personnel during 1981 prior to the inception of construction operations. Establishment of site boundary monuments by survey and verification testing of shallow soils layers at several sites was undertaken during 1981, prior to construction.

The accompanying manpower chart (Exhibit 2) illustrates the rapid augmentation of IECO/DCS field forces beginning in November 1981, when KDC began construction operations. The IECO/DCS field staff peaked in May 1983 when all 26 sites were in stages of construction at the same time. The need for this degree of peak-load inspection staffing had not been forecast at the start of the construction program because the initial schedules submitted by KDC reflected intention to accomplish nine sites first (priority sites), and then move into the other sixteen sites to complete them by the end of the 821-day construction contract period. It didn't work out in exactly that way, as some delays were experienced at the priority sites; completions were delayed for various reasons, and transfers to new sites of KDC superintendents and foremen was deferred. As the result, additional construction personnel were employed by KDC in the peak construction period in 1983, and IECO/DCS had a staff of some 165-170 personnel to cover operations in the spring of 1983. Thereafter, the field forces of the Engineer were reduced each month as various sites were completed. At completion of construction of the last sites at the end of January 1984, DCS manpower decreased from 109 to 25 during February. The remaining field personnel, selected for their satisfactory previous work, continued their service during the following 6-month maintenance period.

2. QUALITY CONTROL FACILITIES

Four complete soils/material testing laboratories were operated by IECO/DCS throughout the 27 month construction period. The laboratory at Dhaka headquarters was set up in November, 1980 and used first in support of the site location and subsurface soils investigation programs underway during 1980 and 1981. With the beginning of construction, three additional laboratories were set up: at Comilla site in Zone I; at IECO's Bogra office in Zone II; and at IECO's Ishurdi office in Zone III. Each of the

EXHIBIT-2


LOCAL STAFF IECO AND DCS
175
150
100
50
O D F A J A O D F A J A O D F A J A O D F A J A O D F A J A
79
80
81
82
83
84

laboratories was equipped with

- o concrete tester (cylinder crusher) with associated molds & capping equipment
- o soil classification testing equipment
- o soil graduation test set
- o Atterberg limit test set
- o ovens, burners & miscellaneous

For at sites field density test equipment and aggregate gradation equipment were provided, and operated by the Soils/Materials technicians who moved from site to site within a zone as required.

3. TESTING PROCEDURES

Soils testing equipment was used on site to classify imported fill materials by drying and screening to verify conformance to specifications; and later to perform the same tests on sand and coarse aggregates used in concrete.

Concrete test cylinders were made daily for 7-day and 28-day crushing in the zonal laboratories. A third cylinder was also made, for backup testing if 28-day strengths (3000 psi for Class A or 2000 psi for Class B) were not met with the first 28-day Cylinder. Occasionally, the strength of the Class A concrete did not test out at 3000 psi at 28 days and the backup cylinder also failed. When this occurred the in-place concrete was tested with a Schmidt hammer; and in the few instances where these results verified understrength concrete, it was broken out and removed. Concrete quality was generally very good at all sites; and the quality control measures verified this.

Bricks were tested in the zone laboratories for conformance to the strength requirements (2200 psi for individual bricks and 2500 psi average for 5-brick samples). Quality of bricks manufactured throughout Bangladesh varies widely, often differing significantly within daily production from a particular brickyard. Samples of bricks of specific "Frog Mark" were provided by KDC for testing in IECO's Dhaka laboratory. Bricks approved for supply to sites were however subsequently sampled at site, and tested in the zone laboratory. Often, the delivered bricks did not pass and were ordered removed from the site. To better cope with this situation, especially when large shipments by barge from Dhaka to Barisal/Bhola were involved, stacks of 10,000 bricks were sampled and tested before being approved for loading and transport to site. These procedures were necessary to maintain a reasonable degree of control over brick quality. The effort that this matter involved during the construction made it the single most persistent quality control problem.

B. CONSTRUCTION PROGRESS

Upon receipt of the NTP on October 16, 1981, KDC started organizing the work effort, Initial steps included submission of insurance coverages, a request for the $ 1,000,000 Mobilization Advance, submission of proposed construction schedules and an overall mobilization schedule, submission of preliminary lists of materials and equipment, and transmittals of specific materials information and samples requesting approvals for procurement.

The sites and warehouse capacities in the Phase II construction contract as bid are as follows:

Site No.	Site Location	Rated Warehouse Tonnage
03	Panchagar	4,000
01	Dinajpur	6,000
		3,000
04	Charkai	6,000
M1	Santahar	10,000
		6,000
		6,000
K3	Rohanpur	4,000
L7	Mahendranagar	12,000
L1	Rangpur	5,000
N1	Muladuli	5,000
K2	Amnura	6,000
K5	Atrai	3,000
02	Shibganj	10,000
C2	Mymensingh	3,000
D1	Madhupur	5,000
B2	Netrakona	5,000
C4	Melandah Bazar	5,000
I2	Brahmanbaria	6,000
I3	Daudkandi	4,000
H1	Feni	3,000
T2	Kushtia	3,000
S2	Kaliganj	4,000
Q1	Bhola	8,000
P1	Satkhira	3,000
M3	Bogra	12,000
I1	Comilla	8,000
T1	Chuadanga	7,000
Q4	Barisal	3,000
	TOTAL	165,000

INITIAL CONSTRUCTION
NOVEMBER 1981 - JUNE 1982

KDC selected nine sites for immediate development work and provided general schedules for their construction, as follows:

Panchagar	-	4,000	ton warehouse
Santahar	-	22,000	" "
Amnura	-	6,000	" "
Shibganj	-	10,000	" "
Brahmanbaria	-	6,000	" "
Daudkandi	-	4,000	" "
Satkhira	-	3,000	" "
Bogra	-	12,000	" "
Chuadanga	-	7,000	" "

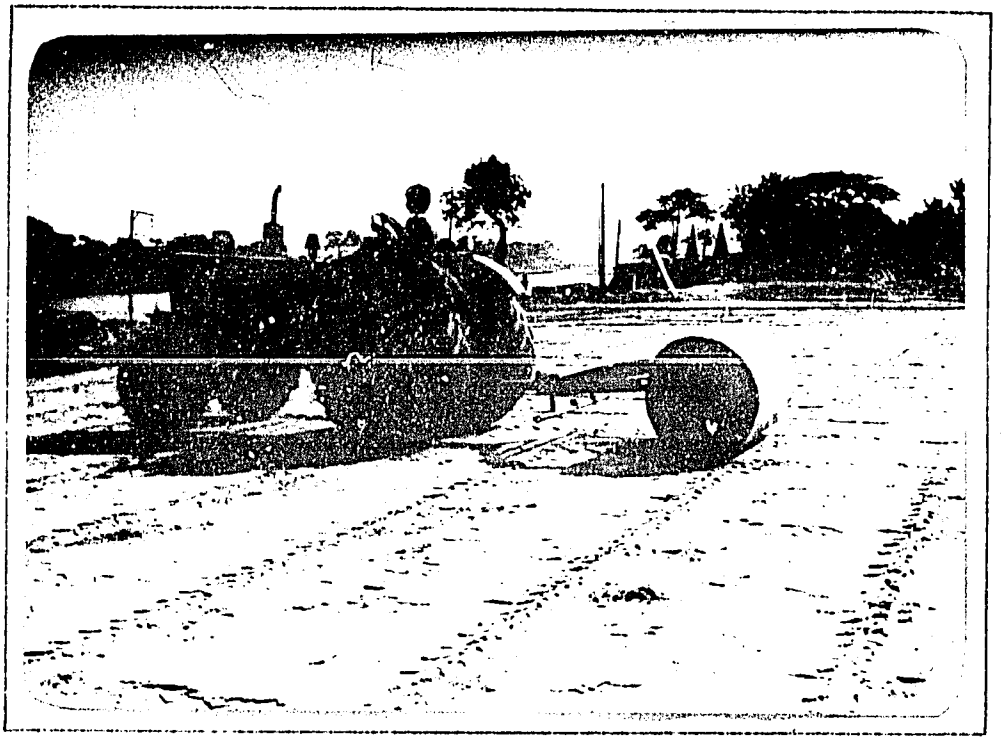
The schedules submitted designate these sites, totalling 74,000 tons of rated warehouse storage, for completion in 14 months.

The above nine sites are scattered, and in order to control the work locally in different parts of the country, KDC established three area offices: at Santahar, Muladuli and Comilla. Accordingly, Muladuli and Comilla sites were to be occupied immediately, and developed to the extent necessary to install temporary offices and quarters, equipment and materials yards and buildings, workshops, etc. At October's end, KDC advised of inability to enter and occupy the Comilla site (due to continuing possession problems and the presence of growing crops), steps were taken to resolve this problem with the assistance of BADC and local Government authorities.

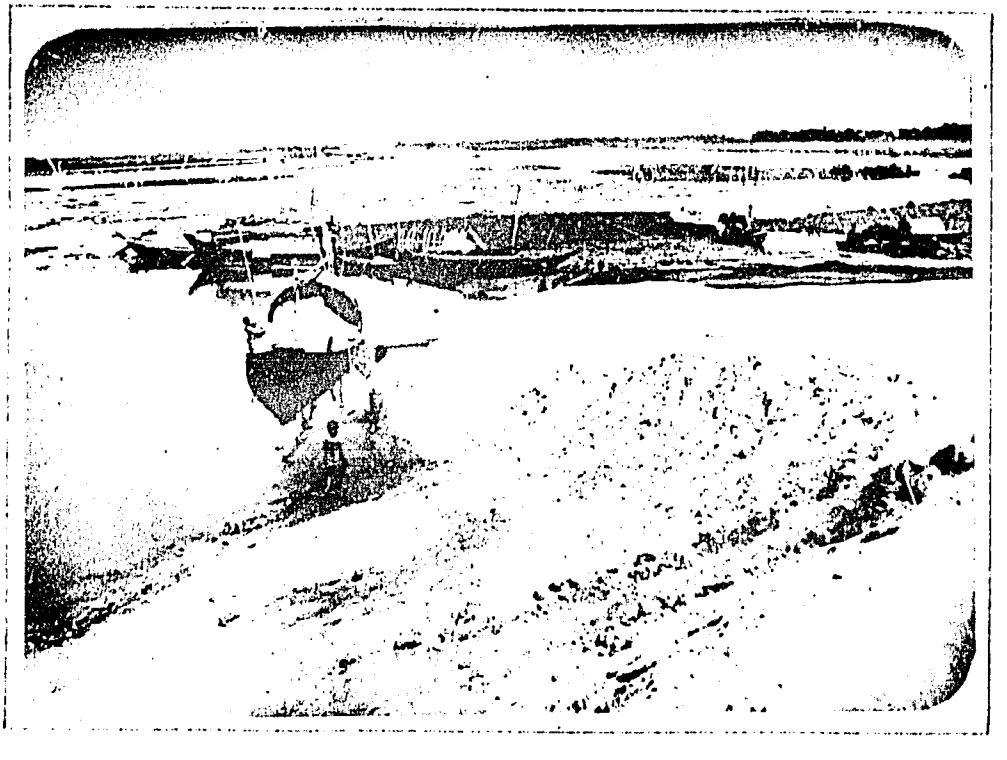
Implementing a decision taken earlier by BADC and USAID, IECO issued a Change Order in October, deleting the smaller 3,000 ton warehouse from the workscope at Dinajpur site. The 6,000 ton warehouse along with associated sitework remained in the Phase II program.

In November and December, required administrative arrangements for authorization of shipments of materials and equipment were in process. Sample materials of construction (bricks, embankment material) were submitted by KDC and tested in IECO laboratories. Shop drawings for piling manufacture and formwork were reviewed, modifications identified, and approved for initial piling at Daudkandi.

IECO/DCS mobilized forces to zonal offices at Bogra and Ishurdi and to the priority sites selected by KDC for initial construction operations. Control surveys for location of structures and improvements, and measurement of sitework were carried out and checked.



Fill Compaction in Godown Area at Brahmanbaria Site



Fill in the Pontoon Area at Daudkandi Site

Much of the work in hand by KDC in November December involved construction of temporary site offices, materials sheds and other temporary facilities. Other sitework construction included clearing and grubbing, stripping, and the beginning of filling work, notably at Brahmanbaria. Fill materials were located and samples submitted for testing by IECO: importation of material into on-site stockpiles was underway. On-site tests of imported material, for gradation and compaction control, was performed by IECO.

Overall progress of construction reported by KDC at the end of December 1981 stood at 2% complete, with work certified for payment amounting to 1.43% of the estimated construction contract amount.

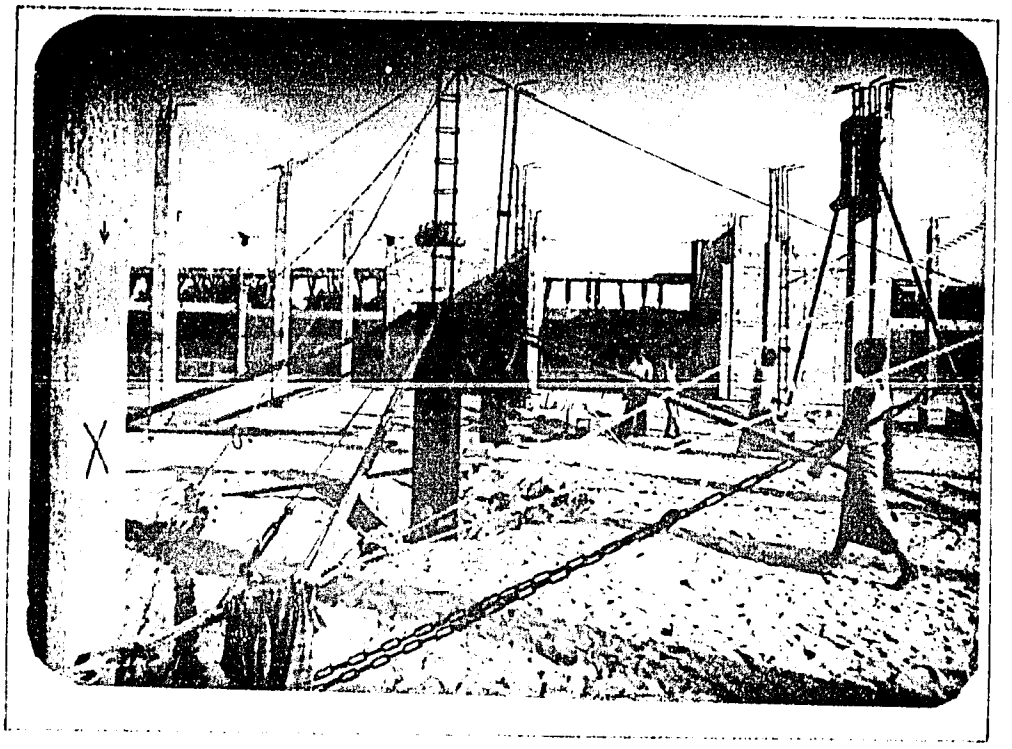
In January 1982, with delays in possession of the Comilla site overcome, KDC opened up the Comilla and Muladuli sites for development (both sites are KDC Zone headquarters. With the Comilla site in possession, IECO made arrangements to open up its Zone I Office.

KDC's construction operations were in progress at ten sites throughout February, with earth filling in the building structure areas receiving a major share of the effort. The initial shipment of imported construction materials which arrived in January (cement, rebar, plywood forms, tie wire, etc.) was distributed to the various construction sites from KDC's depot at Khulna. A shipment of heavy earthwork and concreting equipment arrived from Singapore and was in process of port clearance in late February. Construction was in progress at eleven sites during March. IECO made preparations to cover work at two additional sites (Kushtia and Feni) beginning in April; and also made arrangements to supervise the five-site program of sand pile foundation construction to begin at Mymensingh. also in April. The sites under construction in March were Comilla, Brahmanbaria and Daudkandi in Zone I· Santahar, Bogra, Panchagar and Shibganj in Zone II· and Amnura, Chuadanga, Muladuli and Satkhira in Zone III.

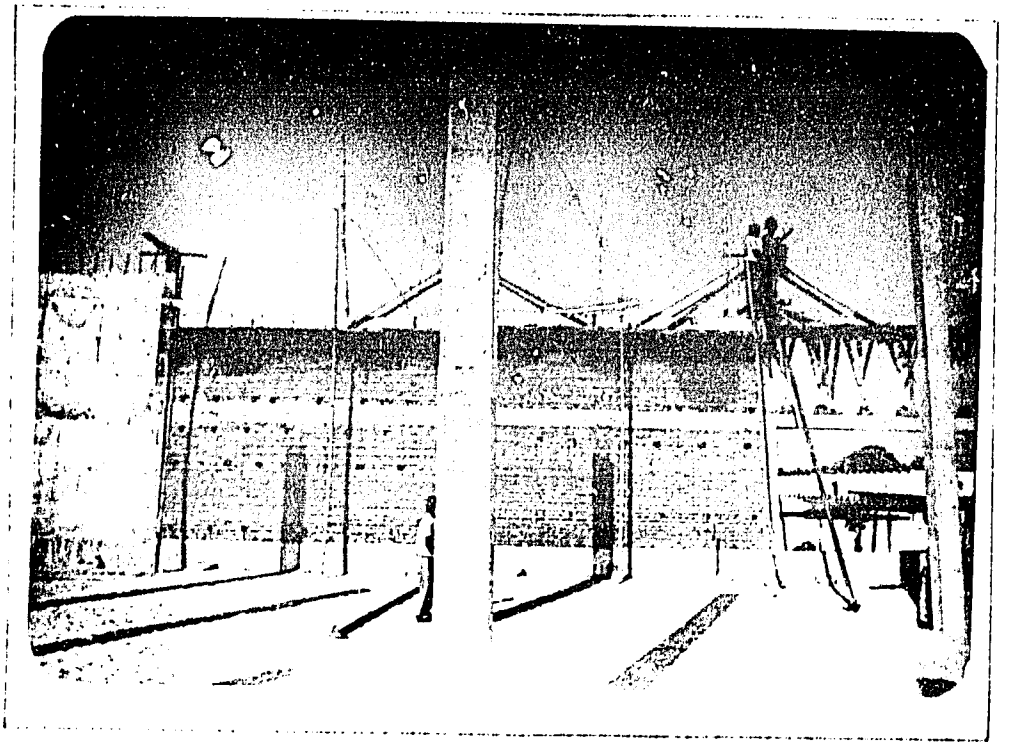
Three new sites,Mymensingh, Feni and Kushtia, were started in April, for a total of fourteen operating sites at month's end. During May earthwork, principally engineered filling, continued at thirteen of the sites, with some 2.07 million CF of fill placed and compacted. In total 9.3 million CF of earth fill has been placed to date, approximately 68% of the fill quantities at the active sites. Concrete foundation, pile casting, pile driving, column and beam forming, and pouring columns were in progress at various sites. Ancillary buildings were in initial stages of construction at several sites, and boundary walls and fencing also begun.

During May and June, sand compaction pile installation methods were field tested. Based on the unsatisfactory test results obtained, using alternate methods to attempt to achieve the required densification of soils layers, IECO decided to change the foundation to R.C. piles and so notified KDC. Mobilization for the pile casting work was in the preliminary stage at the end of June.

3D



Godown Construction at Brahmanbaria Site



Godown Construction at Brahmanbaria Site

In June, KDC's construction activities were in progress at Zone-I sites Brahmanbaria, Daudkandi, Comilla and Feni, with concrete pours the major activity at first three. The foundation earth work at Feni was effectively stopped due to rains and flooded excavation. Zone-II sites Santahar, Bogra, Panchagar and Shibganj progressed with major activity in column construction and peripheral activity in roadway grading, slope protection and boundary wall construction. In Zone III, pile casting was in progress at Muladuli. Spread footing construction was being started at Chuadanga and in preparation at Satkhira, and preparations were being made for pile casting at Kushtia. Work was suspended at Amnura due to access problems. Kaliganj site was opened up for development and partially mobilized in June.

Prework surveys were carried out by IECO, jointly with KDC, at Rangpur, Mahendranagar, Dinajpur and Charkai. IECO also carried out field investigations and supplemental soils tests at the first three sites. A subsurface investigation including bore holes and test-pits was made at the new Madhupur site, with results confirming the suitability of spread footing construction. The site had been shifted to a new location on the BADC seed farm.

Throughout the initial eight months of construction the contractor's problem in making realistic schedules, and then performing in accordance with them, was a matter for concern. For the overall program, construction stood at 2.56% complete in January, 8.6% in February, 13% in March, and reached on 15.7% by the end of June. Progress at the fifteen sites then opened up stood at 26.9% complete at end of June against the 36.6% originally scheduled. General rescheduling was ordered.

CONSTRUCTION: JULY 1982 - DECEMBER 1982

Construction progress at the fifteen sites opened and active in July was slowed by rainy days as well as by the Eid holidays. Sitewise progress and stages of completion at thirteen of these sites were now be measured against new, updated sitework schedules submitted and adopted during July. At the end of August, with the opening of Madhupur and Mahendranagar sites for initial mobilization and stripping, and reactivation of Amnura site, eighteen sites became active.

Three more sites were opened up for construction September: Dinajpur, Charkai and Atrai; and with the re activation of Amnura the active sites totaled twenty one. Sitework schedules for the final sites (Netrakona, Melandah Bazar, Bhola and Barisal) were under discussion between KDC and IECO; and arrangements for procurement of required equipment and materials for R.C. piling manufacture and installation were in progress by KDC. An overall piling program plus sitewise bar chart schedules were developed by KDC. These were under review by IECO at month-end. These schedules would serve for development of detailed CPM activity programs for implementation. The sites were to be opened up in October-November 1982 and the construction was to be completed by end-January 1984.

With the opening in October of Melandah Bazar and Netrakona sites in Zone-I and the commencement of stripping, clearing and grading work at Rohanpur site in Zone-III, twenty four of the twenty six sites were under construction at the end of October. Reconnaisance of Barisal and Bhola sites was made by KDC with a view to beginning operations at these two remaining sites in November.

Construction schedules for the last five warehouse sites, Bhola, Barisal, Atrai, Netrakona and Melandah Bazar, were submitted by KDC in mid-October in bar chart form. Completion of the work by January 1984 was targeted at these sites, corresponding to provisions of the construction contract.

Poor quality with non-specification bricks being delivered to sites, was the subject of special action. IECO promulgated a revised brick quality control procedure involving pre-sorting by KDC, and simplified strength testing by IECO, of sorted and numbered stacks. The procedure was implemented at the end of the month.

Construction program accomplishments in October included 1) signature of the BADC/BR Memorandum of Understanding for construction of rail sidings, which opens the way for procurement of rail materials, and for preparation of sitewise construction estimates by BR for the laying of ballast, ties and rail; 2) completion of concreting of the Brahmanbaria godown; 3) completion of piling construction for the Comilla godown; and 4) commencement of pile casting at Kushtia.

Work was in progress at all twenty-six sites in the Phase II construction program during November and December. The status of the construction work measured against the site schedules, summarized below for each Zone, was as follows:

Construction of the ten sites in Zone-I, four in the north (Mymensingh, Melandah Bazar, Netrakona, Madhupur), and two in the south (Bhola, Barisal) represented 33.5% of the Phase-II Construction program. Zone-I work had reached 25.9% completion against 29.2% scheduled. The shortfall rested with slow progress at Comilla, Daudkandi, Madhupur and Brahmanbaria. Work at the other six sites, where construction was in the initial stages, was on schedule.

Construction of the nine Zone-II sites in the northwest, which represented 45% of the Phase-II program, was 38.2% complete against 49.6% scheduled. Initial work was on schedule at recently opened sites Dinajpur, Charkai and Atrai, but lagging the schedules at the six other sites. The large Santahar site was some two months behind schedule. Bogra work was close to schedule. The most significant shortfall was the lack of progress at Rangpur, then over four months behind; and slow progress at Mahendranagar which did not match the schedule.

Construction of the seven Zone-III sites in the southwest, which represented 21.5% of the Phase-II program, was 31.8% complete against 33.8% scheduled. The work was 12% ahead of schedule at Chuadanga, had fallen slightly behind schedule at the other sites. Zone-III work accomplished in December lagged the programmed progress by 1%.

Overall, the Phase-II construction work stood at 32.7% complete against the 39.4% scheduled at the end of December. This represented a shortfall of slightly more than one month of construction time.

CONSTRUCTION: JANUARY 1983 - JUNE 1983

In January, some slow operations at the Bhola site, and potential delays, were identified for discussion with the contractor. At four of the Zone II sites, Dinajpur, Charkai, Mahendranagar and Atrai the slow progress of initial earthwork was generating delays in the dates that godown foundations can be started. Of most concern was the lack of progress at Rangpur where the work was six months behind· translating into the need to accelerate performance, gain three months on the schedule, and finish the work by end of January 1984. The key factors in the lagging fill construction work involved inadequate rates of supplies to site, spreading and compacting by manual labour instead of high capacity placing/compaction equipment. The sitewise performance problems were being discussed with the contractor.

Also of concern was the Rohanpur site development, which lagged due to inadequate fill material supplies and the employment of manual labour to spread the material instead of mechanised equipment. Solution to the problem was discussed with the contractor.

Arrangements were finalized and documents prepared for floating the international tender for procurement of rail siding construction materials. Negotiations were conducted with KDC for installation of R.C. piling works at Mymensingh, Melandah Bazar and Netrakona: unit prices agreed upon· and Change Orders prepared for signature.

For February, IECO was able to report that the work efforts at Mahendranagar and Rangpur were showing good progress as the result of accelerated site fill construction. Also, the pace of fill construction picked up at Atrai, but without mechanized equipment. Dinajpur progress lagged, as did work at Charkai: attributable to lack of mechanical equipment at the first, and to breakdowns of equipment at the second. Progress at the other Zone-II sites, where construction had reached the finishing stages, was proceeding satisfactorily. IECO observed that the work programs in Zone III were suffering for lack of skilled construction superintendents, and an infusion of experienced craftsmen and foremen is needed to improve quality and performance. From a position of only 4% behind schedule in January, attainment in Zone-III slipped a full 5% and was now 9% behind schedule. Fortunately, delays in completing five of these sites should not affect on-time completion of the entire program.

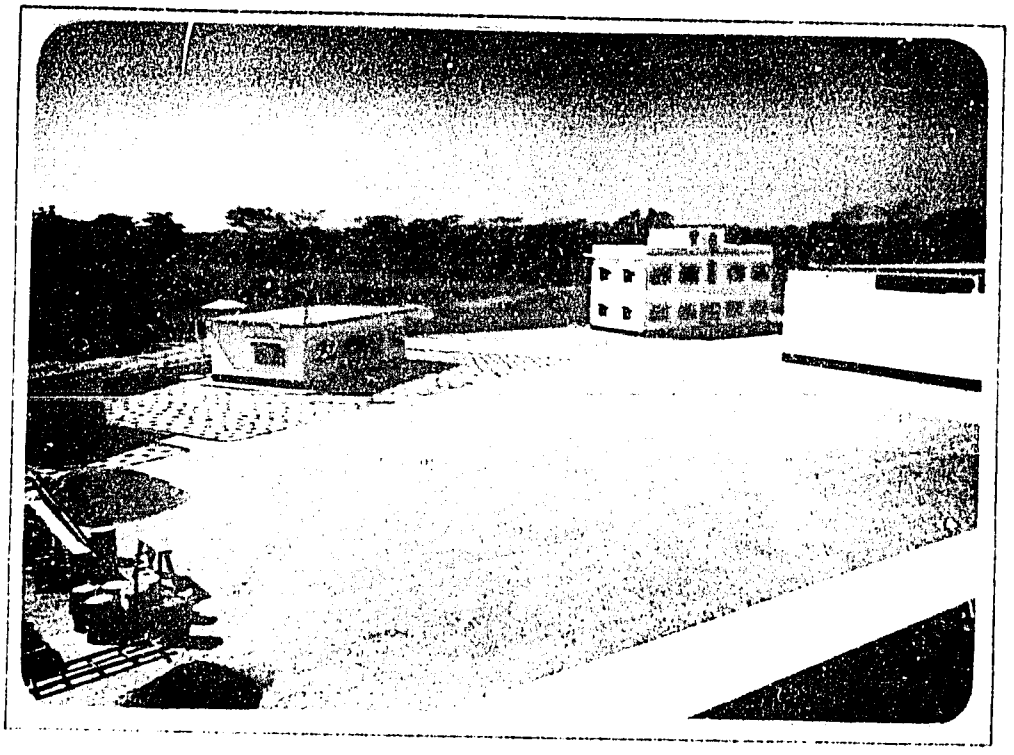
Construction progress in March insufficient to match the schedules for completion at almost all of the twenty-six sites. In general the overall progress of work has fallen behind schedule at most sites due to the inefficient prosecution of work in the following categories, most of which are subcontracted by KDC: fill construction: ancillary building construction: and brickworks outside of godown (aprons & parking areas). The entire 26-site construction program was 48.9% complete against the 61.2% planned, and the 12.3% shortfall represented two months of work. It was thought unlikely that the twelve months of scheduled work could be accomplished in the ten months of construction time remaining under KDC's contract. New site performance schedules were called for, and these prepared and reviewed during April. Following adoption of the new schedules, construction progress in May and June generally matched the targets. At the end of June, Zone I work completion was 58.1%, matching schedule. Zone II work completion was 67.7% against the 69.6% in the new schedules. Zone III construction stood at 76.5% complete against the 75.9% scheduled. Overall at the end of June 1983, the program was 66.5% complete against the 67.2% planned.

CONSTRUCTION: JULY 1983 - JANUARY 1984

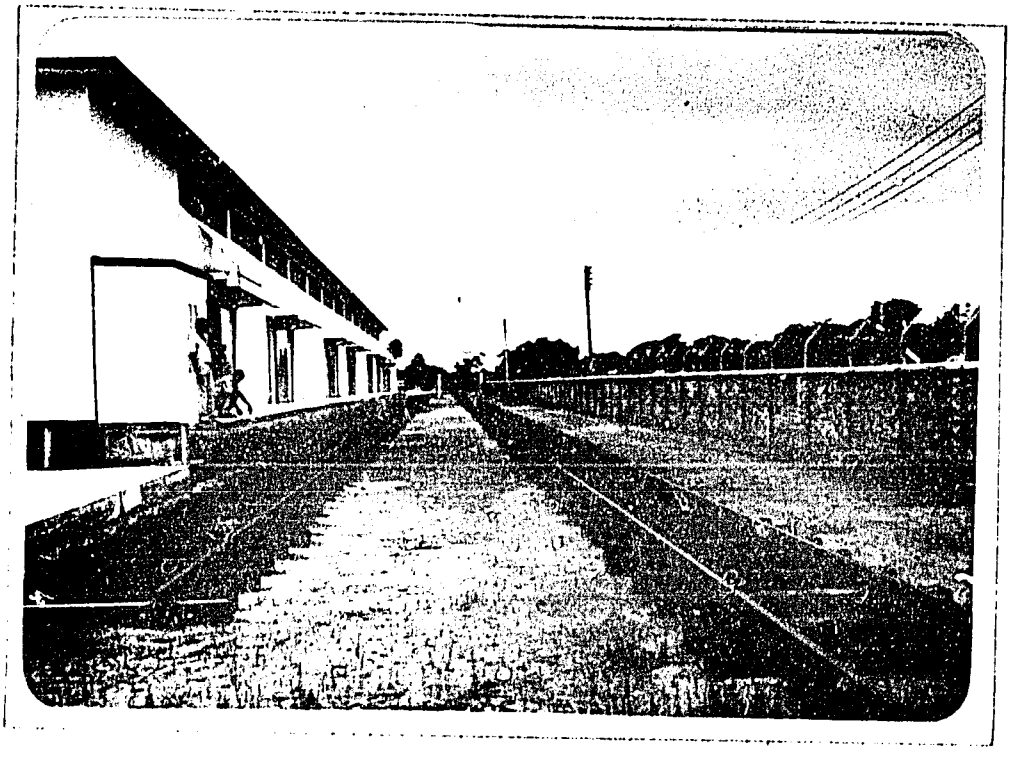
Construction at nine sites was virtually complete by end of July, but the contractor had still to accomplish various finishing works at all of them before certificates of completion could be issued. Construction progress at the sixteen sites due to be finished later generally matched the overall schedule. In August, construction was substantially completed at Daudkandi & Comilla sites, and neared this stage at three Zone III sites. At three Zone II sites however, progress in completing the final works lagged: and at a fourth site, Shibganj, no construction progress was made for the third month in a row. The Contractor was not properly organized to carry out detailed finishing works rapidly or efficiently, with the result that the last five percent of sitework required an inordinate amount of time to accomplish. At other sites, where construction has not yet reached the finishing-up stage, construction progress was good or very good at eight sites, and was satisfactory at five other sites. Slow progress, losing ground to the schedule. was recorded at three sites.

With completion of two sites and partial consolidation of field activities, DCS staff was reduced from 141 to 129 personnel, four technical and eight support personnel being released.

Construction activity came to a stop during the September Eid holidays, slowing down for several days before and picking up only slowly during the week following the festival. Partially as a result construction progress suffered. Work fell behind schedule at Feni, Netrakona, Bhola and Barisal in Zone I, and at Charkai and Atrai in Zone II. However work progress matched or exceeded the schedule at Mafhupur and Melandah Bazar, and was completed and so certified at Mymensingh, all in Zone I: exceeded schedule at Rangpur, lost ground but remained ahead of schedule at Mahendranagar and Dinajpur, and reached substantial completion at Bogra, all in Zone II:



Completed Ancillary Buildings at Bhola Site



Railroad Sidings and Godown at Melandah Bazar Site

and was satisfactory at Rohanpur where work remained a bit ahead of schedule, all other Zone III sites having reached the finishing-up stage.

Accordingly, only Mymensingh and Bogra could be certified substantially complete on the basis of work accomplished as of 30 September. Inspections for certification purposes were made in Zone III during the last week of September, but it was found that necessary work remained to be done at Muladuli, Kushtia, Chuadanga, Kaliganj and Satkhira.

With completion of two additional sites and further partial consolidation of field activities in September, DCS staff was reduced from 130 to 123 personnel, 8 technical and 1 support personnel being released, and 2 personnel being appointed.

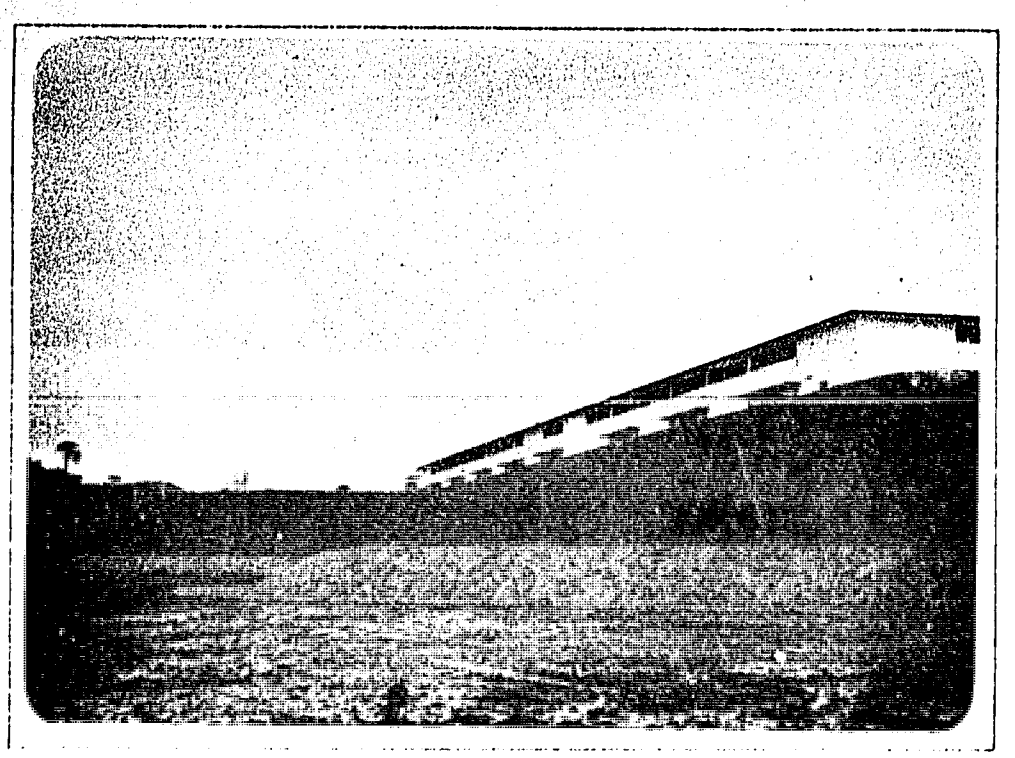
Construction activity during the month of October increased considerably over the previous month and the Engineer was able to certify the substantial completion of the following nine sites:

Zone II		Zone III	
Panchagar	4,000 Tons	Muladuli	5,000 Tons
Santahar	22,000 Tons	Chuadanga	7 000 Tons
Shibganj	10,000 Tons	Amnura	6,000 Tons
		Kushtia	3,000 Tons
		Satkhira	3,000 Tons
		Kaliganj	4 000 Tons

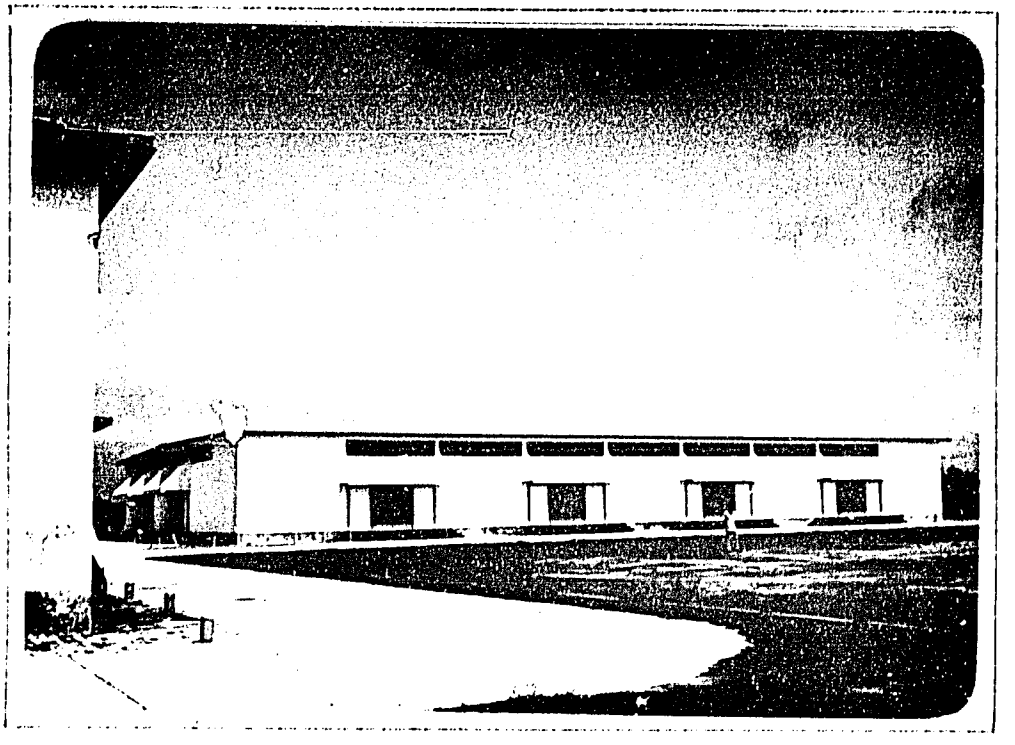
With completion of nine additional sites and further partial consolidation of field activities in October, DCS staff was reduced from 123 to 112 personnel, 10 technical and 2 support personnel being released, and 1 person being appointed.

Construction work continued on the twelve remaining Phase II sites in November, and progress generally met scheduled accomplishments except at five sites: Bhola, where work stood a full month behind schedule; Feni, where lack of an adequate supply of construction material hampered work and resulted in a shortfall of 9.7% against the schedule: and at Charkai and Atrai, where the 10-14% progress nevertheless failed to make up the 10% lag in work completions called for in the schedules. The Contractor's progress at Rohanpur, the only unfinished site in Zone III, did not match the schedule: and at 86.7% complete the work was about 3 weeks behind the target.

At month-end the Contractor formally requested an extension of time for completion of construction at Bhola site and also at Rohanpur site, citing delaying factors at Bhola and extended works at Rohanpur. This matter was under consideration by the Engineer at the end of November. The request was evaluated early in December and. based on some of the factors causing delays, the Engineer granted an interim extension of time of 31 days, to Feb. 29, 1984. As it turned out, this extension did not formally come into effect.



Finished Slope Protection Works at Rohanpur Site



View of Completed 3,000-Ton Godown and Concrete Road. Feni Site

Construction reached substantial completion at two sites, Melandah Bazar and Madhupur in December, and certificates of substantial completion were issued by the Engineer with effective date of 31 December 1983. Work neared completion at six other sites: Netrakona, Barisal, Rangpur, Mahendranagar, Dinajpur and Atrai. At three sites, Bhola, Charkai and Feni, the Contractor could complete all work in January by adopting double-shift work programs to expedite the finishing operations. Double-shift operations had been adopted at Bhola, and at Feni where pavement construction progress was slowed by rainy days. The Contractor was asked to expedite his operations at Charkai to meet the end-January schedule. At the remaining site, Rohanpur, the buildings could easily be completed in January but the riverbank slope protection works would require until mid-February to complete.

Construction progressed to the final stages and to completion at the ten remaining sites during January, and certificates of substantial completion were issued to the Contractor by the Engineer for all of these sites during the month. Some of these sites were taken over by BADC for operations. At several sites the Contractor continued completing the last minor construction items, at Rohanpur, Bhola, Feni, and Atrai. The last construction activities were being accomplished along with site clean up work during the first half of February, and involve finishing off the exterior siteworks such as riverbank slope protection at Rohanpur and Atrai, water supply works at Bhola, and a brick apron parking area at Feni.

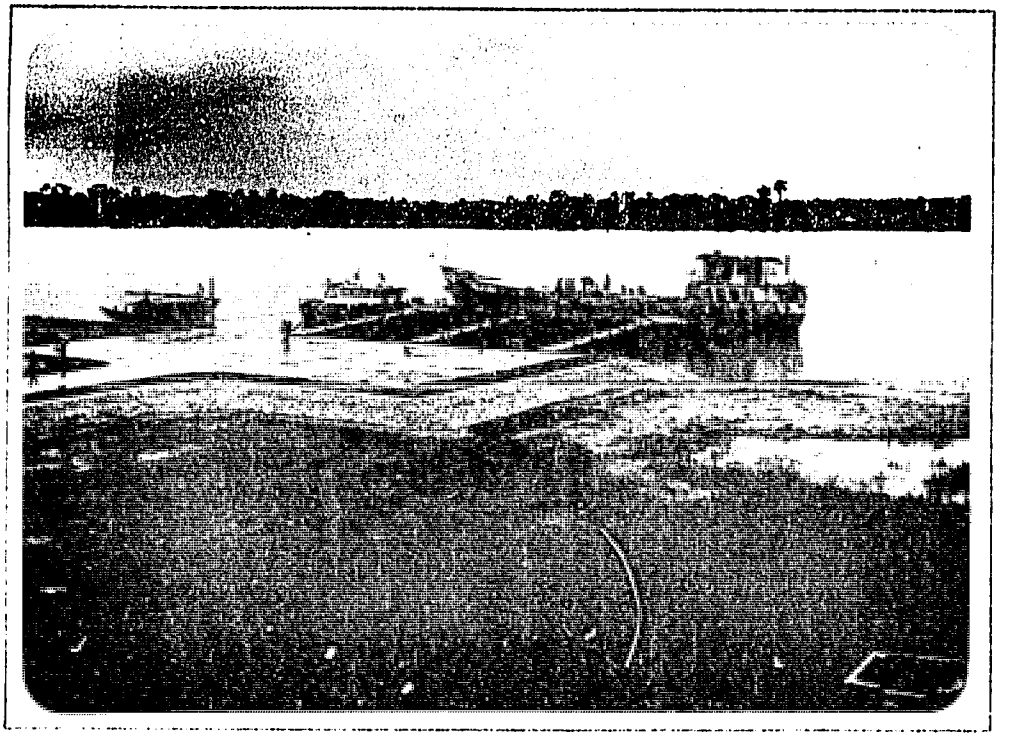
KDC performed minor grading on the rail siding embankments at nine sites during January, finishing these to final gradeline for BR's construction operations. BR delivered various siding construction materials to five sites during January, consisting of rail, turnouts, fishplates and fishbolts, and ordinary and special sleepers. Partial materials for construction were on hand at eleven of the sites, but no ballast had been delivered to any of the sites. BR did not start any siding construction work during January, and no schedules were furnished for siding construction.

At the end of January, with certificates of substantial completion issued for all twenty six sites, the construction work was 100% complete. The ensuing maintenance program was started in January.

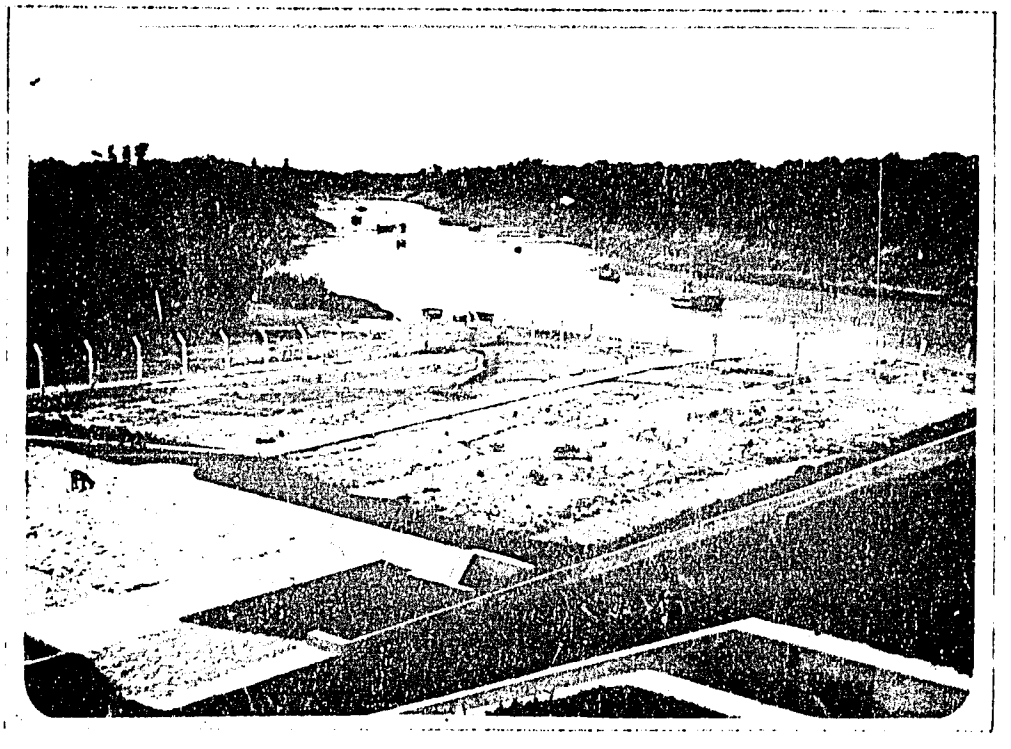
With completion of the construction work, field personnel and office personnel were released by DCS, reducing the DCS staff to 31 employees to carry on in February. IECO local staff was reduced to 12 personnel.

MAINTENANCE PERIOD: JANUARY 1984 - JULY 1984

Minor initial maintenance work was performed at four sites in Zone III and at Bogra and Santahar in Zone II, in January. The Contractor's field activities in February consisted principally of performing the maintenance tasks and remedial/repair work identified on punch lists prepared by the Engineer. Maintenance/remedial work was in progress throughout February in all three Zones, inspected by IECO field engineers assigned to work in close contact with the KDC superintendents in each Zone.



Marine Landing and 100-Ft Pontoon at Barisal Site



Drainage System and River Access Works at Rohanpur Site

In February the Contractor also completed construction of the remaining sitework items at Feni and Bhola, and carried this work very close to completion at Rohanpur. At Atrai, finishing off the bottom few feet of riverbank gabion awaits further dropping of the river level.

Construction activities by Bangladesh Railways began in February at a number of the rail sidings, and construction materials deliveries continued. No overall plan or schedule for these works was in hand or offered.

With field and office work now involved in post construction activities, DCS staff was further reduced by 12 personnel, with 19 employees carrying on in March. IECO local staff was reduced by 3 to 9 personnel.

The Contractor's field activities in March involved performing maintenance tasks and remedial work at two sites in Zone I (Mymensingh and Madhupur), at four sites in Zone II (Panchagar, Shibganj, Bogra and Santahar), and at two sites in Zone III (Amnura and Kushtia). Construction of site drainage at Rohanpur and the pontoon ramp at Atrai were completed. The work is detailed in Section 8.

Bangladesh Railways continued its materials deliveries and rail siding construction activities during March. The progress in siding construction was not rapid in March, and it was not possible to predict when these sidings will be completed and operable.

The Contractor was engaged in maintenance and remedial task work at eleven sites in April, at eleven sites in May, and at eighteen sites during June. In order to be sure to complete all work during the 183-day maintenance period, running to the end of July, necessary planning and scheduling for all operations was done at the beginning of June, at mid-month, and again at month end. The constant rescheduling was necessary to make up for delays at some sites versus faster progress attained at other sites. At the end of June, the manpower available and employed on the program was adequate to make the schedule for completion of all of KDC's work by July 25. As this report is written, the work is in its final week. A Certificate of Maintenance is issued by the Engineer as the work is completed at each site, bringing the Phase II Warehouse Construction Program to an on-time, successful conclusion.

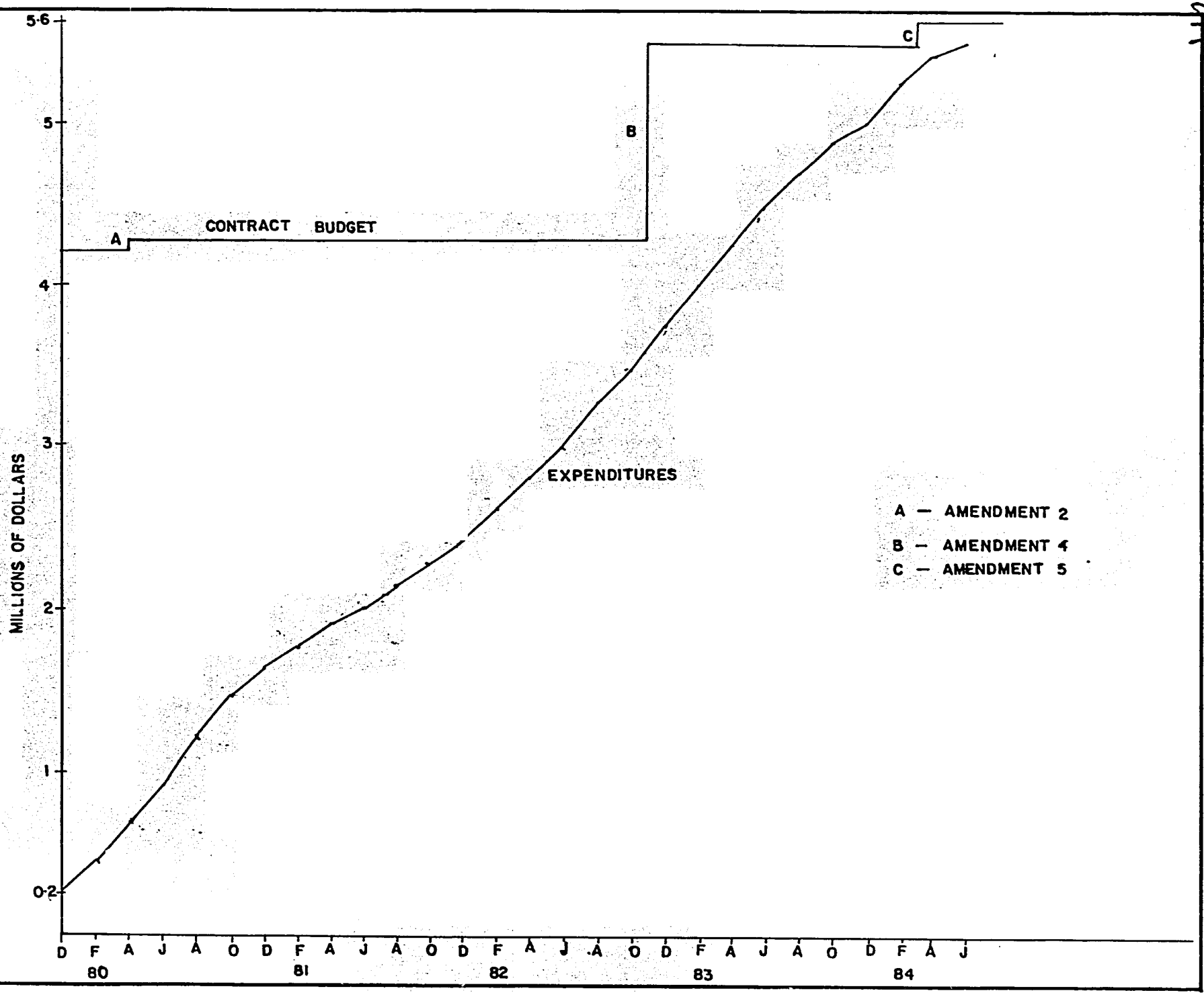
SECTION 6

FINANCIAL SUMMARY

The BADC/IECO Contract, originally funded for $4,240 000 was eventually amended on six occasions. Three of these amendments increased the funded budget to a final $5.616,139.00. The attached expenditure budget shows funds spent in San Francisco, in dollars, and funds spent in Dhaka in Taka shown as dollars, from project inception through 30 June 1984. The balance shown, approximately $109,000 is nearly fully committed. Expenditure commitments will run through 31 August, 1984 with final invoices due in the following months. A small budget surplus is now being projected.

The following chart, Exhibit 3, shows expenditures vs. budget over the life of the project.

EXHIBIT-3


5·6
5
4
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MILLIONS OF DOLLARS
A
B
C
CONTRACT BUDGET
EXPENDITURES
A — AMENDMENT 2
B — AMENDMENT 4
C — AMENDMENT 5
D F A J A O D F A J A O D F A J A O D F A J A O D F A J
80
81
82
83
84

SECTION 6

FINANCIAL SUMMARY

USAID IMPROVEMENT GRANT

IECO CONTRACT 9074

CONSULTANCY EXPENDITURE BUDGET

Schedule I	Budget	JOB TO DATE Dollars	JOB TO DATE Taka As Dollars	JUNE 1984 Dollars	JUNE 1984 Taka As Dollars	Balance
A. Salary	1,067 963	1,057,656.41		11,165.00		10,306.59
B. Payroll	1,110,686	1,100,262.67		11,611.60		10,423.33
C. Overhead						
D. Air Travel	60,000	67,323.44	1,676.42			(8,999.86)
E. Freight Cost	51,000	37,000.00	6,898.77			7,101.23
F. Excess Baggage	9,966	2,367.45	466.73			7,131.82
G. Processing Cost	3 450	2,923.92	438.75		95.47	87.33
H. Personal Automobiles	5,000					5,000.00
I. Settling in Cost	40,500	31,240.91				9,259.09
J. Housing Allowance	177,666		172,533.10		1,162.86	5,132.90
K. Furniture & Equipment	77 000	28,464.59	37,952.75			10,582.66
L. Education Allowance	15,000	10 195.82	29,925.43			(25,121.25)
M. Terminal Leave	70,524	28,943.86				41,580.14
N. Medical Care	16 425	1,856.94	1,425.04			13,143.02
O. Int'l Travel Per Diem	13,500	13,103.36	2,376.51			(1,979.87)
P. In-country Travel Per Diem	19,261		10 248.59		27.45	9,012.41
	$ 2,737,941	2,381,339.37	263,942.09	22,776.60	1,285.78	92,659.54
Say	$ 2,737,782					92,418.54

CONSULTANCY EXPENDITURE BUDGET

Schedule II	Budget	JOB TO DATE Dollars	JOB TO DATE Taka As Dollars	JUNE 1984 Dollars	JUNE 1984 Taka As Dollars	Balance
Short Term Consultant Related Cost						
A. Salaries	12,000	10 992.70				1,007.30
B. Payroll Cost						
C. Overhead Cost	14,640	13,411.10				1,228.90
D. Specialist Consultants Fees	14,700	17,529.72				(2,829.72)
E. Air Travel	6,000	6,988.00				(988.00)
F. Excess Baggage	906	87.40				818.60
G. Processing Cost	600	24.00				576.00
H. Temporary Accommodation	10,640	9,313.69				1,326.31
I. Int'l Travel Per Diem	1,350	1,520.65				(170.65)
	$ 60 836	59,867.26				968.74
Say	$ 61,000					1,132.74

CONSULTANCY EXPENDITURE BUDGET

Schedule III	Budget	JOB TO DATE Dollars	JOB TO DATE Taka Aw Dollars	JUNE 1984 Dollars	JUNE 1984 Taka As Dollars	Balance
A. Office Rental, Equipment and Maintenance						
1. Dhaka Office	54,667		60,046.39		550.32	(5,379.39)
2. Area Office Including Lab.	25,450		26,348.34		98.12	(898.34)
3. Furniture & Equipment	55,800	15,331.32	53,173.46		53.70	(12,704.78)
4. Office Supplies & Stationery.	40,325	12,380.44	29,234.98		55.45	(1 290.42)
5. Reproduction Cost	54,900	383.88	53,966.82		253.26	549.30
6. Communication Cost	13,350	60.00	12,105.59		186.99	1,184.41
B. Vehicle Operation & Maint.						
1. Vehicle Rental	11,250		12,049.13			(799.13)
2. Vehicle Operation & Maintenance	255,800		254,057.92		790.00	1,742.08
C. Direct Hire Local Admin. Personnel	130,900		157,500.57		1,389.81	(26,600.57)
D. Soil Testing Charges	33,000		30,528.25			2,471.75
E. Subcontract DCS(Table 6b)	993,450		1,004,008.32		11,315.07	(10,558.32)
F. Local Travel	23,500		28,473.89		155.36	(4,973.89)
G. Misc. Field & Office Expenses	18,000	25.00	16,335.04		96.86	1 639.96
	$ 1,710,392	28,180.64	1,737,828.70		14,944.94	(55,617.34)
	Say $ 1,710,057					(55 952.34)

CONSULTANCY EXPENDITURE BUDGET

Schedule IV	Budget	JOB TO DATE Dollars	JOB TO DATE Taka As Dollars	JUNE 1984 Dollars	JUNE 1984 Taka As Dollars	Balance
A. Salaries	93,300	100,284.73				(6,984.73)
B. Payroll Cost]	113,830	122,105.92				(8,275.92)
C. Overhead Cost]						
D. Officers & Managers' Visits	18,600	20,585.30				(1,985.30)
E. Commuter Cost	7,000	12,684.99				(5,684.99)
F. Communication Cost	19,800	13,659.91		97.90		6,140.09
G. Reproduction Cost	10,000	3,399.15		79.26		6,600.85
H. Bond Cost & Commission	5,000	2,684.08				2,315.92
	$ 267,530	275,404.08		177.16		(7,874.08)
Say	$ 267,300					
Schedule V						
A. Equipment Purchased for Project						
1. Transportation Equipment	156,700	75,520.00	14,995.56			66,184.44
2. Survey Equipment	19,000	19,036.63	871.00			(907.63)
3. Soil Lab.Equipment	21,700	10,242.89	8,181.64			3,275.47
4. Materials Lab.	26,000	21,730.30	12,955.95			(8,686.25)
5. Minor Equipment, Tools and Spare Parts	29,000	20,209.94	210.23			8,579.83
B. Shipping, Insurance and Clearance Costs	77,600	59,568.36	8,763.41			9,268.20
	330,000	206,308.12	45,977.82			77,714.06
Schedule VI						
Fixed Fee	510,000	508,200.00		1,800.00		1,800.00
	$ 5,616,139	3,459,299.47	2,047,748.61	24,753.76	16,230.72	109,090.92

Total Expenditure to Date = 5,507,048.08

Percent of Budget Spent to Date = 98.06%

Contract Time Elapsed = 98.24%