

AID
To Library



GOVERNMENT OF THE PEOPLE'S REPUBLIC OF BANGLADESH
BANGLADESH AGRICULTURAL DEVELOPMENT CORPORATION



AGENCY FOR INTERNATIONAL DEVELOPMENT
Grant Financed
FERTILIZER DISTRIBUTION IMPROVEMENT - I (388-0024)

ENGINEER CONSULTANT SERVICES FOR CONSTRUCTION
OF BAGGED PRODUCT FERTILIZER WAREHOUSES IN
BANGLADESH-PHASE III

INCEPTION REPORT
FEBRUARY 1983



AMMANN & WHITNEY
CONSULTING ENGINEERS
NEW YORK

in association with



WORLDWIDE ENGINEERS LTD.
ARCHITECTS, ENGINEERS
DHAKA



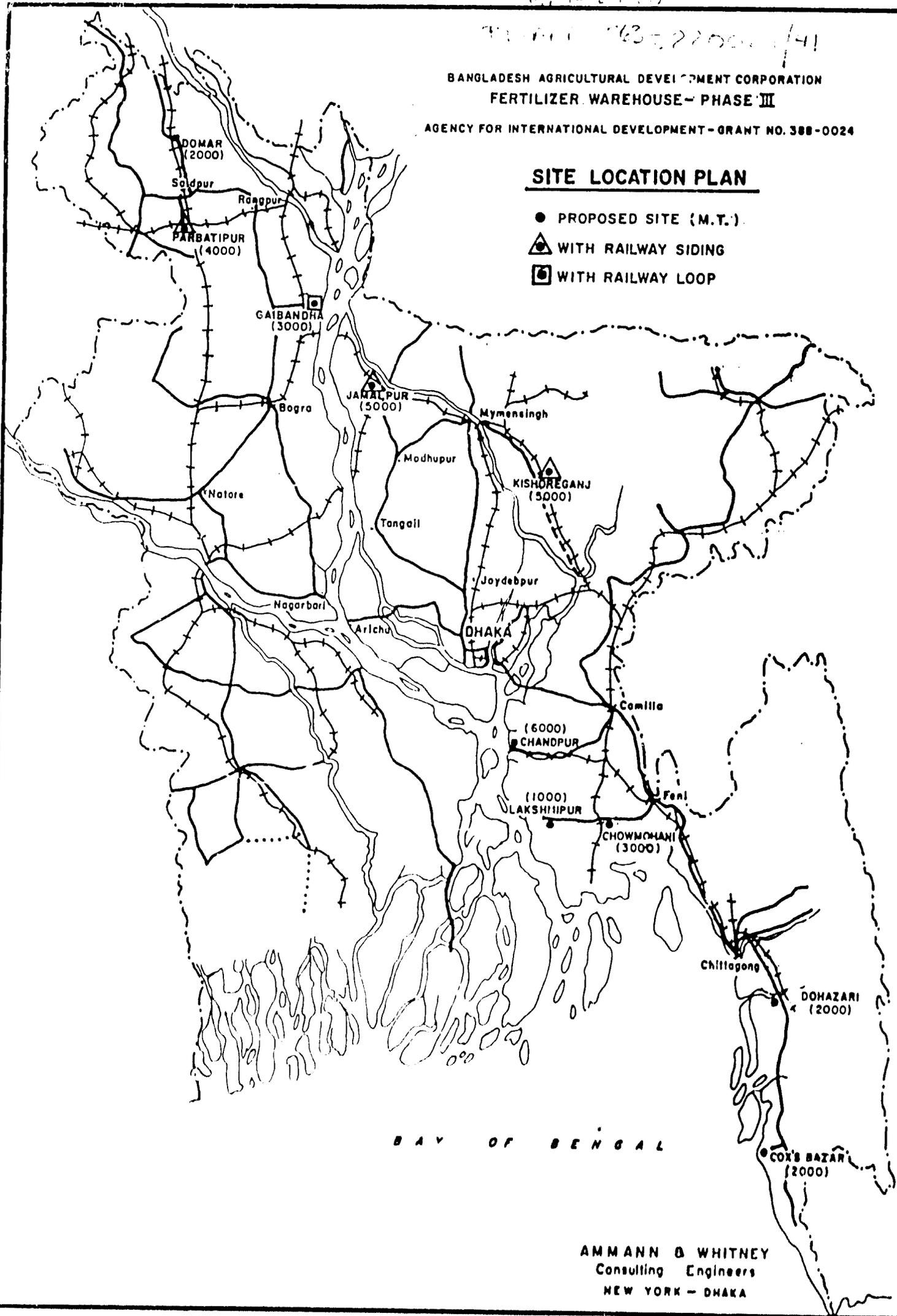
STHAPATI SANGSHAD LTD.
ARCHITECTS, ENGINEERS & PLANNERS
DHAKA

BANGLADESH AGRICULTURAL DEVELOPMENT CORPORATION
FERTILIZER WAREHOUSE - PHASE III

AGENCY FOR INTERNATIONAL DEVELOPMENT - GRANT NO. 388-0024

SITE LOCATION PLAN

- PROPOSED SITE (M.T.)
- ▲ WITH RAILWAY SIDING
- ◻ WITH RAILWAY LOOP



CONSTRUCTION OF BAGGED PRODUCT FERTILIZER WAREHOUSES
PHASE III IN BANGLADESH
UNDER USAID GRANT

INCEPTION REPORT

1. INTRODUCTION

In compliance with paragraph B.1. of Appendix A, Scope of Work, of the Consultant's Agreement, December 1982, this inception report has been prepared. The report fully updates the Consultant's proposed program of work and schedule as was originally contained in the technical proposal. It states the methodology proposed for preparing the required designs and the dates on which the designs will be complete. It also indicates the kind of data available that is relevant to the contract, the requirement for additional data and the arrangement proposed for data collection.

2. BACKGROUND

By letter 2NA(STG)107/80-81/85 dated 2/3.10.81 from Member-Director (Supply) BADC, Ammann & Whitney was notified that they were placed on the short list of A&E firms to be considered for providing engineering consultancy services for the Phase III Fertilizer Warehouse Construction Project and were requested to submit a technical proposal by November 30, later extended to 17 December, 1981 by C.E. Memo 1055 dated 20 November 1981.

By letter No.1705 dated 24 February 1982 the Chief Engineer (C) informed that BADC's selection of Ammann & Whitney for the project was concurred by USAID. Ammann & Whitney was requested to submit a financial proposal by 12 March 1982 on the basis of their technical proposal and the Request for Technical Proposal (RFTP).

Off and on negotiations were held with BADC over the eight month period between March to November 1982 on the basis of construction of warehouses and ancillary facilities at twenty locations. In November 1982, BADC informed that the number of sites were reduced to ten and that a revised financial proposal should be prepared on this basis. On 9 December 1982 a contract was entered into between BADC and Ammann & Whitney and approved by USAID.

Due to the abnormal elapsed time period between the submission of the technical proposal and the effective date of the contract; with the reduction of the number of sites from 20 to 10; and, the compressing of time available for construction to meet completion by 31 December 1984, this inception report updates our program of work and schedule contained in the Technical Proposal.

3. WORK PLAN

3.01 Introduction

This work plan presents information on the Consultant's approach to planning and performance, a break-down of work tasks, and scheduling of events.

3.02 Activities Flow Chart

Appendices 3.1 and 3.2, appended, show the activity network and highlights the major activities of the project.

3.03 Project Scheduling

Appendix 3.3, Schedule of Events, presents a reasonable estimate of the time required for the performance of each major item of work. The chart is based on the premise that BADC has acquired the land for the ten sites identified; that competent experienced contractors will submit prequalification documents and compete in the IFB, that construction materials, especially cement and reinforcing bars, are readily available in-country for the work; that no delays will be experienced in obtaining required approvals; that a contract for the construction is awarded prior to November 1983; and, that payments to the Contractor for construction work performed and accepted will be processed promptly.

A brief description of the work to be accomplished under each task follows:

3.03.1 Task 1: Mobilization

Upon signing of the contract and issuance of USAID's Letter of Commitment No. 388-0024-30381 the Consultant has started mobilizing personnel and resources and obtaining approvals of the following expatriate personnel:

Project Manager	: George A. Pecht
Chief Construction Engineer	: Harry Allen
Foundation Engineer	: Samuel Heyman
Structural Engineer	: Colin G. Landrigan

The permanent Bangladeshi administrative staff and certain key technical staff have been assigned to the project and other staff are gradually being recruited and assigned as the work load increases and the services of each of the engineering disciplines are required. The assignment of field staff for inspection services at the time construction contracts are to be awarded will be gradual and will coincide with the notice to proceed and start-up of construction work by the contractor(s).

In accordance with USAID guidelines, Chapter 3, Procurement of Equipment and Materials of Handbook 11 "Country Contracting" and USAID's source and origin requirements arrangements are being made for procurement and shipping of equipment, materials and supplies required to carry out the Consultant's services under the project.

Crucial to the performance by the Consultant is BADC's timely action in obtaining prior permission to import, opening Toka imprest account and obtaining waivers as required.

The Consultant has requested BADC to obtain prior permission from CCIE (Chief Controller of Imports and Exports) to import special project activity items (transport as well as drafting and reproduction, soils and materials, office, survey and household equipment) as per contract. Pending receipt of this prior permission all off-shore purchase orders are held in abeyance.

The Consultant has provided an estimate of Toka requirements and requested BADC to open an imprest account for payment of taxes and duties as per provision of the Consultant's contract. This fund is essential for payment of taxes on income and duties, taxes and fees on imports.

BADC has requested USAID/Thaka to accord a waiver to purchase sedans and jeeps from the local market. AID has rejected this request requiring that 'source' and 'origin' regulations be followed.

BADC has been requested to review the list prepared by the Consultant of equipment to be purchased for use in the project against BADC's stock, if any.

Three (3) motorcycles have been purchased as "shelf-item" and BADC has offered, if satisfactory to the Consultant, one (1) motorcycle from their own stock.

3.03.2 Task 2: Site Development Phase

Identification of Sites:

The sites identified and required by BADC for inclusion in Phase III construction project are:

	<u>Site</u>	<u>Rated Capacity (MT)</u>	<u>Floor Area (sft)</u>
1.	B1 Kishoreganj	5,000	26,000
2.	C3 Jamalpur	5,000	26,000
3.	F1 Dohazari	2,000	10,400
4.	F3 Cox's Bazar	2,000	10,400
5.	H2 Chowmahani	3,000	15,600
6.	H3 Lakshimpur	1,000	5,200
7.	I4 Chandpur	6,000	31,200
8.	L4 Darrer	2,000	10,400
9.	L6 Gaibandha	3,000	15,600
10.	O5T Barbatipur	4,000	20,800
	Total Capacity	33,000 M.Ton	171,600 sft.

The floor area of the warehouse is based on 5.2 sft per ton of rated capacity.

Site Inspection

The Consultant in collaboration with personnel from BADC Storage and Construction Division have inspected all the sites identified by BADC. A summary of each site report is shown below.

The following summarizes the observations made by the Consultant on technical feasibility of sites during the site inspection and review phase. These observations are subject to adjustment depending on results of soil exploration and testing and field surveys.

B1 Kishoreganj

Proposed Capacity : 5,000 MT
Proposed Floor Area : 26,000 sft.
Reference : Phase II
Land Plan LS-B1-002, 31.1.81 (Rev.)
(9000 ton, 460'x 140')
Site Plan C-B2-1001, 8.3.80
(4000 ton, 480'x 60')
Site Inspection Report : 724-2.1.1/027, 22 Dec 82
Ancillary Buildings : Asst. Manager's Office 1 @ 750 sft.
Residence 1 @ 750 sft.
Storekeeper's Quarters 4 @ 550 sft.
Darwan's Quarters 4 @ 400 sft.
Observations : Site acceptable.
Land acquisition to be finalized by
BADC with Sugar & Food Corpn. and
others.
BADC to determine requirements for
railway siding.

C3 Jamalpur

Proposed Capacity : 5,000 MT
Proposed Floor Area : 26,000 sft.
Reference : Phase II
Land Plan LS-C3-005/A/Suppl., 26.7.80 (Rev.)
(5000 ton, 300'x 120')
Site Plan C-C3-1001, 20.08.80
(5000 ton, 300'x 120')
Site Inspection Report : 724-2.1.1/096, 27 Jan 83
Ancillary Buildings : Asst. Manager's Office 1 @ 750 sft.
Residence 1 @ 750 sft.
Storekeeper's Quarters 4 @ 550 sft.
Darwan's Quarters 4 @ 400 sft.
Observations : Site acceptable.
Electric transmission lines to be
relocated.
BADC to determine requirements for
railway siding.
Existing dirt access road to site
requires improvement.

F1 Dohazari

Proposed Capacity : 2,000 MT
Proposed Floor Area : 10,400 sft.
Reference : Phase II
Land Plan LS-F1-004, 16.2.81
(2000 ton, 100'x 220')
Site Plan C-F2-1001, 27.04.80
(2000 ton, 140'x 200')

Site Inspection Report : 724-2.1.1/046, 04.01.83

Ancillary Buildings : Asst. Manager's Office 1 @ 750 sft.
Residence 1 @ 750 sft.
Storekeeper's Quarters 2 @ 550 sft.
Darwan's Quarters 2 @ 400 sft.

Observations : Site acceptable.
Provide access to river.
DO (Ctg) to acquire land
(2NA (STG) 153/81-82/1488, ,19,01.83)
Layout to avoid relocating electrical
line.

F3 Cox's Bazar

Proposed Capacity : 2,000 MT
Proposed Floor Area : 10,400 sft.
Reference : Phase II
Land Plan LS-F3-001, 28.11.80 (Rev.)
(2000 ton, -240'x 60')
Site Plan C-F4-1001, 24.04.80 (Not used)
(4000 ton, 240'x 120')

Site Inspection Report : 724-2.1.1/047, 04.01.83

Ancillary Buildings : Asst. Manager's Office 1 @ 750 sft.
Residence 1 @ 750 sft.
Storekeeper's Quarters 2 @ 550 sft.
Darwan's Quarters 2 @ 400 sft.

Observations : Site very narrow and confining.
Consultant to determine if additional
lands required.
B.A.D.C to determine if access to river
should be provided.

H2 Chowmuhani

Proposed Capacity : 3,000 MT
Proposed Floor Area : 15,600 sft.
Reference : Land Plan LS-H2-006, 20.11.80 (Rev.)
(5000 ton, 140'x 260')
Site Inspection Report : 724-2.1.1/064, 12.01.83 and /109,
06.02.83

Ancillary Buildings : Asst. Manager's Office 1 @ 750 sft.
Residence 1 @ 750 sft.
Storekeeper's Quarters 4 @ 550 sft.
Darwan's Quarters 4 @ 400 sft.

Observations : Site acceptable. Alternative site
available on Government land.

H3 Lakshampur

Proposed Capacity : 1,000 MT
Proposed Floor Area : 5,200 sft.
Reference : Phase II
Land Plan LS-H3-001, 17.02.81 (Rev.)
(2000 ton, 100'x 140')
Site Plan C-H3-1001, 28.04.80
(3000 ton, 180'x 120')
Site Inspection Report : 724-2.1.1/064, 12.01.83 and /109,
06.02.83

Ancillary Buildings : Darwan's Quarters 2 units on existing
building

Observations : Site (Phase I) acceptable.

I4 Chandpur

Proposed Capacity : 6,000 MT
Proposed Floor Area : 31,200 sft.
Reference : Phase II
Land Plan LS-I4-003, 05.02.81 (Rev.)
(6000 ton, 260'x 160')
Site Plan C-I4-1001, 21.08.80
(6000 ton, 260'x 160')
Site Inspection Report : 724-2.1.1/064, 12.01.83 and /109,
06.02.83

Ancillary Buildings : Asst. Manager's Office 1 @ 750 sft.
Residence 1 @ 750 sft.
Storekeeper's Quarters 4 @ 550 sft.
Darwan's Quarters 4 @ 400 sft.

Observations : Site acceptable.
BADC to finalize godown capacity.
Provide access to river for loading/
unloading barges and country boats.

L4 Dumar

Proposed Capacity : 2,000 MT
Proposed Floor Area : 10,400 sft.
Reference : No site plan or land plan prepared under Phase II. Refer to Dumar S.M. Farm Plan.
Site Inspection Report : 724-2.1.1/086, 25.01.83

Ancillary Buildings : Asst. Manager's Office 1 @ 750 sft.
Residence 1 @ 750 sft.
Storekeeper's Quarters 2 @ 550 sft.
Darwan's Quarters 2 @ 400 sft.

Observations : Site at S.M. Farm acceptable.
BADC final decision on location and capacity of PIE required.

L6 Gaibandha

Proposed Capacity : 3,000 MT
Proposed Floor Area : 15,600 sft.
Reference : No land plans or site plan prepared under Phase II.
Site Inspection Report : 724-2.1.1/088, 26.01.83

Ancillary Buildings : Asst. Manager's Office 1 @ 750 sft.
Residence 1 @ 750 sft.
Storekeeper's Quarters 2 @ 550 sft.
Darwan's Quarters 2 @ 400 sft.

Observations : BADC to review proposed godown capacity requirements. Corp.
Site in Warehouse/Compound acceptable.
BADC to review requirement for railway loop.

O5T Parbatipur

Proposed Capacity : 4,000 MT
Proposed Floor Area : 20,800 sft.
Reference : Phase II
Land Plan LS-O5T-005/SUPPL., 27.07.80 (Rev.)
(12,000 ton, 600' x 140')
Site Plan C-O5T-1001, 10.08.80
(12,000 ton, 600' x 140')
Site Inspection Report : 724-2.1.1/087, 26.01.83

Ancillary Buildings : Asst. Manager's Office 1 @ 750 sft.
Residence 1 @ 750 sft.
Storekeeper's Quarters 4 @ 550 sft.
Darwan's Quarters 4 @ 440 sft.

Observations : Site acceptable.
Consultant to review layout.
BADC to determine railway siding requirements due to reduce proposed capacity from 12,000 to 4,000 ton.

The Consultant while inspecting the sites reviewed the land plans and site plans available with BADC as prepared under Phase II. The Consultant is in the process of revising the layout plans as necessary to reflect the revised capacity and the criteria of allotting 5.2 sft of warehouse area per ton warehouse designated capacity. The revised drawings will be submitted for BADC and USAID approval.

The sites at Jamalpur, Kishoreganj and Parbatipur may require railway sidings in accordance with the unit train concept. At Gaibandha the need for a railway loop will be investigated. The planned facility at each of these sites will be coordinated with Bangladesh Railway (BR). The Memorandum of Understanding dated 14 October 1982 between BADC and BR outlines the responsibility of each of these organization in construction of railway sidings.

The sites at Cox's Bazar, Dohazari and Chandpur may require access to the rivers. At Cox's Bazar and Dohazari providing a finger pier with a hinged gang-plank will be investigated while at Chandpur the requirement of terminal pontoons will be reviewed. The work will be coordinated with Bangladesh Inland Water Transport Authority (BIWTA) as required.

We will schedule review meetings from time to time with the Manager (Storage), Chief Engineer (Construction) and Project Director (USAID Construction Project) to discuss each site position, problems faced and actions taken by BADC, and further actions required by BADC and/or Consultant and/or AID.

Warehouse Management and Staffing Plan

In response to the Consultant's request, BADC has indicated the management and staffing plan at each of the proposed sites and the requirement and space allocation for ancillary buildings. (Refer to Site Inspection above.) The Consultant's design review will include investigation of building materials, plan layouts, roof design, finishing, and other details to provide a least initial cost and low maintenance structure.

Preliminary Site Drawings, Building Layouts, and Land Plans

Under Phase II land plans and site plans were prepared for seven of the sites:

Jamalpur
Kishoreganj
Chandpur
Lakshmipur
Dohazari
Cox's Bazar
Parbatipur

These plans were used in identifying and in investigation of the proposed sites and to evaluate the layout as shown in the plans. The Consultant has requested BADC to furnish for their review as required under the Scope of Work mouza maps for each site and purchase/acquisition or other right of use documents against current site drawings to assure that the land available is adequate for the required construction and access. The Consultant will provide BADC and USAID copies of the review after the above information is made available. BADC has previously informed that the planned sites have been acquired.

The Domar (S.M. Farm) and Gaibandha (Warehouse Corp.) site are located on BADC owned land. Site/land plans will have to be prepared for these sites.

Preliminary site layouts are being prepared orienting the warehouse and ancillary buildings to make best use of the available lands and to provide easy access to the various transport modes to the warehouse. Placement of the ancillary building takes into consideration privacy of occupants in the living units and orientation for the greatest advantage of prevailing winds.

In general, all godown sites will be located some distance away from areas where massive erosion is known to have occurred or presently takes place.

Where there is a flood protection embankments, or district or council road embankment, the godown should invariably be located on the inland side of the embankment.

Excavation for embankment will be located away from structure site since the borrow pits could turn into inland streams and likely flood channels.

Godowns and ancillary buildings will be located on high ground with at least 1.5 feet of freeboard above known high-water level. Usually godowns should be founded in undisturbed natural ground, and any location where the godown would be located on natural ground and part of freshly placed fill should be avoided.

Generally, godowns will preferably be oriented with their long axis parallel to the most common or most likely direction of the wind forces. The prevalent direction of cyclone storms is southwest to northwest, so that the godown would preferably face southwest or northwest. However, cyclone wind directions may be quite different from the cyclone path; and in many locations the cyclone tidal wave may pose a greater threat, and may make it advisable to orient the long axis of the godown

in a general southerly direction toward the nearest major river. As the cyclone tidal wave diminishes in force as it travels overland, this latter consideration is of lesser importance for inland locations.

Invariably, the godowns will be located away from adjoining buildings to provide sufficient clearance, and to avoid damage to an existing building during or subsequent to godown construction. The minimum clear distance is 10 feet from the outside edge of the existing building foundation to the outside edge of the godown foundation or a minimum of 15 feet from an existing building wall to the face of the columns in the long wall of the godown.

Regulations relating to electric transmission lines is being sought from the Chief Electrical Inspector and will govern placing of buildings, if site conditions warrant, in relation to these lines without having to relocate the lines.

Soils Investigations and Land Surveys

The detailed field investigation will consist primarily of (a) Field Survey and (b) Soils Investigations.

a. Field Survey:

The first part of the field investigation will involve topographic and property survey illustrating the relationship of the property with neighbouring features in plan and elevations. Existing facilities such as electricity, telephone, water and sewer connections, structures etc., if any, shall be shown so that their locations are identified and taken into consideration while drawing layout plans and will determine if their removal/relocation necessary. High-water elevations will be noted.

An accurate transit and tape boundary and detailed topographic survey will be made by qualified surveyors. Details are shown in the Appendix 3.8 and 3.9.

A site contour map will be prepared showing existing ground elevations at 10 ft. interval grid and indicating the permanent bench mark, high flood level, finish ground level and proposed plinth level.

b. Soils Investigations:

The Consultant has collected soils reports and geotechnical information available with BADC for Parbatipur, Jamalpur, Cox's Bazar, Dohazari, Chowmahani and Chandpur and is reviewing them. For this review the Consultant will determine the supplemental soil exploration and testing requirements in order to form a judgement and recommend the type of foundation required at each site and the suitability of use of on-site materials.

The detailed soils investigation, based on the recommendations of the Foundation Engineer under Task 2, will consist of borings to determine depth and thickness of various soil strata and to evaluate bearing capacity and settlement of the subsoil under the loading of the proposed warehouses.

This item of work constitutes a vital role in the acceptability of the site, in the foundation design of buildings, and, consequently, on the construction cost of the installations.

The foundation teams are assigned the problem of conducting a detailed on-site and subsurface soils investigation with back-up from laboratory testing of recovered samples at each of the sites. The investigation is primarily intended to determine the maximum allowable loading pressures that could be safely tolerated at each site from the in-situ soils, and from this determination, select the foundation design appropriate to the site.

In some instances, the foundation consultant would recommend modification of the surface soils conditions by excavation and back-fill with superior materials such as sand or placement of the footings on a more favorable horizon, and thus allow the selection of the foundation design with a higher allowable bearing pressure than would have been permitted without this modification.

Location of borings will be located on the preliminary site drawing. As the work progresses the Foundation Engineer will add to or decrease the number of borings or type of sampling, so as to obtain the best possible geotechnical information required for foundation design at each site.

The sites are initially covered for visual inspection of topography, location of khals/rivers, signs of erosion, prevailing river current, tanks, and other features important to the area. Depending on the characteristics of the site, a hand-excavated test pit would be located and dug to a depth of at least five (5) feet, however, the high-water table may at times restrict this depth.

Refer to Appendix 3.10 for program of Soil Exploration and Testing.

The ground water level varies appreciably with the season. The determination of allowable load pressures and settlement are undertaken with the consideration of ground water elevations. The foundation design should reflect this.

The determination of final ground elevation for the construction of each godown would be based on the known high flood levels for the area. In the case of areas affected by cyclone driven tidal wave flooding, this exceptional case is considered. In many instances the determination of the maximum annual flood level, and thus the ground level, is made on the ground level at existing major buildings adjacent to the proposed site. Local information on maximum flood levels is often confusing and the use of construction data determined from nearby large buildings is justified because of the unreliability of local information at many sites.

A number of alternative foundation solutions may be proposed for the sites. These are based on several factors, among which are the following:

1. Original ground level relative to the maximum annual flood level.
2. Character of soils profile.
3. Regularity or irregularity of site topography.
4. Indications of exceptionally poor soil horizon at surface.
5. Indications of excessive settlement under loading and possibility of differential settlement.

Consideration of all these factors results in the selections of the final ground level of the construction. It is usually based on the highest recorded flood level at the site. In areas where flooding is not a consideration, the final ground levels are selected to conform with the local construction or topographic expression of the site.

Where possible, and confirmed by soils borings, the footings are placed on a sand horizon. Settlement in the sand will be minimum and will usually be completed by the time construction is finished.

In general the placement of footing elevations above the existing ground elevation will be avoided because of the possibility of erosion of the fill exposing the unsupported footing.

In areas with relatively high annual flood levels reported, the site will be in fill. The surface soils will generally be removed due to their high organic character. The soil could be reused as sodding in some cases, or as landscaping surface for planting in others.

The primary purpose of the foundation investigation is to determine the order of magnitude of the soil settlements under the weight of the structure and the anticipated live load (fertilizer). Refer to Appendix 3.5.

If the above noted subsurface explorations and laboratory tests indicate that the settlements will be small and that the differential settlement between columns is within the ability of the structure to resist such settlements, the footing may be designed as spread footings. If the estimated settlements are too great, the site may be improved by preloading (surcharging) the site with a temporary earth fill.

If time is not available for surcharging, or if the estimated settlements after surcharging are still estimated to be excessive, then the structure will have to be supported on piles. We will provide the most economical pile foundation, including type of pile, size, estimated length, and recommendations on the equipment necessary to install the pile, as may be required and suitable to practices in Bangladesh.

Upon completion of borings, testing, and analysis at each proposed site the Foundation Engineer will prepare an assessment report including recommendation for required foundation.

Finalize Land Plans

Upon completion of the soil investigation and land surveys and after review in collaboration with BADG of preliminary layouts, the site drawings and land plans will be modified as required by the review and finalized.

2.03.3 Task 3: Design and Estimate Phase

The design and preliminary drafting work shall be undertaken in the Dhaka office under the direction of Ammann & Whitney's structural engineer. The design will be based on information obtained from field investigations, and will follow the design criteria established. Our experience with local materials, local contractors, availability of equipment, and local conditions shall be duly considered while designing the buildings and phasing the construction. To assist in the design our New York Office will be called upon to furnish computer programs essential to evaluate and expedite design analysis, which programs can be used or adapted to computer systems available in Bangladesh.

The design will be checked by our New York staff and the drawings modified, if required, before final submission.

Design Review

The criteria governing the structural aspects and forming the basis of design of warehouses and ancillary buildings in each of the regions will be discussed and agreed upon with the BADC engineering staff prior to completing the design review. The criteria will define concrete compressive strengths, type of reinforcing steel (plain or deformed), live load, wind load, seismic forces, temperature variations, and factors influencing design of the structure. Refer to Appendix 3.6 and 3.7.

We have scheduled the existing design review and inspection and evaluation of performance of existing fertilizer godowns as early as possible to complete and provide BADC and USAID with recommended designs for Phase III warehouses and related structures within 120 days of the effective date of the contract.

Our staff will continue to inspect and evaluate the performance of various fertilizer warehouses and review design drawings and will formulate preliminary recommendations which will be elaborated.

Design calculations and analysis will be prepared as a report suitable for indexing and binding. It shall indicate the engineering basis and procedure leading to the development of design and detailed calculations to support conclusions reached.

Architectural features and treatment will be incorporated in the design. Designs, drawings, and specifications for electrical, water supply, and sanitary will be prepared. The drawings will include landscaping of the area and disposal of rainwater.

Studies are being made to attempt to control and limit entry of humid air to the warehouses. The critical relative humidity of the fertilizer will be a controlling factor. The system to be adopted will be appropriate technology for Bangladesh.

Ancillary buildings are being sized in accordance with Government directives and in accordance with BADC's management and staffing plan.

Access and internal road network including parking area will be provided. Attention will be given especially to turning radius and maneuverability of trucks in the layout of road and placement of barriers to prevent their intrusion on non-paved areas.

At sites to be serviced by the Bangladesh Railway (BR) plans will be developed in coordination with BR. Refer to Appendix 3.11.

Designs and drawings prepared for BADC of pontoon and connecting bridge will be reviewed and if found acceptable incorporated in the design at sites to be serviced by barges or alternate designs will be provided to suit site conditions.

Contract Drawings

We will prepare, and submit to BADC and AID for approval, architectural, structural, mechanical, and electrical working drawings sufficiently complete to satisfy all review, bidding, and construction requirements.

Bill of Quantities and Cost Estimates

We will prepare the bill of quantities for construction and the cost estimate for each site for BADC and AID approval. The bill of quantities will be in a format approved by BADC and AID and suitable for inviting competitive bids.

Cost experience on recent civil construction projects in Bangladesh will be reviewed. We will obtain current unit prices for the major construction materials (cement, reinforcing steel, brick), current prices for skilled and unskilled laborers, and transport cost for preparing the cost estimates.

We will consider in preparing unit rates for a particular site the accessibility to the sites and physical variation influencing cost to develop the site.

Specifications

Technical specifications will be prepared for all phases of the work, i.e. site development, building work, sanitary, water supply, electrification, pontoons, etc. Specifications prepared for Phase I and Phase II as well as those prepared by BADC are under review to develop project specifications. The specifications will consider use of indigenous materials, methods of construction, and local practices.

The Construction Specifications Institute (CSI) Masterformat is adopted in organizing the project specifications. This format gives greater assurance that specifications are coordinated and complete and provides increased efficiency by standardization. The broadscope section titles are shown in Appendix 3.4.1 and 3.4.2.

Conditions of Contract and Special Conditions

Conditions of Contract (International) For Works of Civil Engineering Construction are being reviewed and considering USAID's regulations, and BADC's and GOB's requirements, modified in Conditions of Particular Application as required.

Conditions of Contract conforming to FIDIC International Standard Form of Civil Engineering Contract has wide acceptance in Bangladesh as well as internationally and poses no problem as to familiarity by construction firms.

The contract will be a unit price contract where the contractor is paid for the actual quantities of work accomplished at a unit price established in the contract for the specific kind of work.

We will recommend inclusion of payment for specified materials brought to the site to encourage contractors to collect materials in advance which is a key to the smooth progress of the work. We will also review the materials of the inclusion of an escalation clause to pay increased prices of specified materials as may be required.

Tender Papers

The tender, invitation for bid (IFB), papers will consist of:

- . Notice to Tender
- . Form of Tender with Bill of Quantities
- . Instructions to Tenderers
- . Forms of Bid and Performance Bonds and/or Guarantees
- . Form of Agreement
- . Conditions of Contract
- . Conditions of Particular Application
- . Technical Specifications
- . Contract Drawings

The tender documents will be prepared in accordance with USAID guidelines as set forth in USAID Handbook 11 (Chapter 2), Handbook 1 (Supp. B), and other USAID contracting policies, rules and guidelines, and approved by BADC and USAID prior to inviting bids.

3.03.4 Task 4: Contract Document Phase

Prequalification Documents

The Consultant has prepared and submitted a synopsis of the project, "Notice For Prequalification of Contractors" and "Invitation To Prequalify" for BADC's and USAID's review. Upon approval the "Notice" will be published in the "Commerce Business Daily" and in the local newspapers to notify interested firms of the project and the availability of the prequalification questionnaire.

The firms submitting a questionnaire will be advised promptly whether or not they are qualified for the work.

In accordance with AID Handbook 1 :

"When the host country is an authorized source for services, and the estimated cost of the contract for construction services is \$5 million or less, a corporation or partnership which is determined by AID to be an integral part of the local economy is eligible.

However, such a determination is contingent of first ascertaining that no U.S. construction company with the required capability is currently operating in the host country or, if there is such a company, that it is not interested in bidding for the proposed contract. In the latter case, inquiries on a company's interest should be addressed to its headquarters."

Preparation of the Invitation for Bids (IFB's)

As the designs, reviews, site selection, and site acquisition are completed, the prequalified contractor(s) will be notified of the construction package and invited to submit quotations under a competitive bidding procedure.

Our staff has prepared numerous IFBs suitable for international and Bangladesh participation and is totally familiar with the guidelines in USAID Handbook 11, Chapter 2. We have administered construction contracts and participated in arbitration hearings on the basis of Conditions of Contract published by the Federation Internationale des Ingenieurs - Conseils (FIDIC).

Specification of Bids

The prequalified contractors will be notified of the construction package(s) provided with the IFB and invited to participate in the bidding.

To familiarize the interested parties with local conditions and contract documents, a pre-bid conference and visits to the proposed construction sites will be scheduled.

To allow bidders sufficient time to receive the IFB, prepare responsive bids, and submit their bids at a specified time and place, the closing date for the submittal of bids will be fortyfive days after the IFB is mailed to the prequalified firms.

If clarification of the IFB is required, addenda to IFB will be issued and the closing date extended, if necessary, for firms to evaluate and incorporate the information in their bid.

Contract Award

The sealed tenders received at the specified place on or before the closing time specified in the IFB shall be opened at the designated time and the name of the bidder and total bid price announced.

The Consultant will immediately conduct an evaluation of the bids and determine if they are responsive and meet the test of reasonableness of price.

Upon completion of the evaluation an abstract of bids will be prepared, recommending either award, rejection, or other action. Upon approval of proposed award by BADC and USAID, we will notify the successful bidder(s) that they have been awarded the contract and request them to send a representative with power-of-attorney and furnish the bonds and/or guarantees specified in the IFB and to duly execute a formal contract agreement.

Unsuccessful bidders will then be notified of the award by letter and their bid bonds returned.

Construction Schedule

Ten (10) sites with a total capacity of 33,000 M.Tons have been included for construction under Phase III. Since BADC states all the sites are available it is anticipated that construction at all the sites will begin simultaneously. It is estimated that the awards will be made by November 1983 so that the construction can begin work by the dry period of 1983. This will allow the contractor to utilize the maximum available dry period of 1983-1984 (November 1983 to April 1984) to complete the works by 31 December 1984. The 5000 MT capacity godowns at Jamalpur or at Kishoreganj with rail sidings may be the critical to scheduling completion by end of 1984. Our information of performance by KDC for similar works under Phase II indicate that a competent contractor can construct the critical sites within 15 (fifteen) months anticipated for the construction work.

The schedule, Appendix 3.3, coordinates with the prequalification of contractors, site investigation, design, drawings, preparation of tender documents, and maximum use of the dry season for construction work and allows fortyfive (45) days for tendering and sixty (60) days for analysis of bids and award.

3.03.5 Task 5 : Construction Phase

The contract administration and construction supervision relating to the inspection and approval program is described in the Scope of Work, Appendix 3.12, which forms a part of the Agreement between BADC and the Consultant.

Upon issue of the Notice to Proceed to the Contractor(s), we would immediately mobilize our field staff concurrently with the contractor(s) mobilization.

The Consultant's central office will be at Dhaka and field offices will be established to facilitate timely visits to the sites under construction.

All administration and coordination will be done from the central office while the field supervision force will operate field offices.

An organization chart, Appendix 3.13, attached herewith shows the staffing pattern by the Consultant.

The Consultant has a license from the Government to operate Consultant-owned SSB shortwave radios for communication between the central office, regional offices, and mobile stations. BADG has been requested to obtain permission from the Government to operate the tele-communication systems which will greatly assist the Consultant (and BADG) to coordinate construction and inspection services.

The contractor(s)'s work program, schedules of equipment and materials delivery, and site staffing arrangements, will be reviewed in detail to determine their practicability. Discussions will be held with the contractor(s) on setting out methods, working methods, labor force requirements and utilization, quality control arrangement and cash flow planning consistent with the most efficient allocation of resources.

The Consultant shall assist the Contractor to prepare critical path of events covering the various construction activities including the requirements for supply of materials so as to enable the scheduled construction deadlines to be met.

During the course of the contract, the contractor(s) will be required to update their work program should it become apparent that they are deviating substantially from the approved work schedule.

As required the supervision staff will notify the contractor in writing with respect to techniques, methods and sequence of construction, size and computation of work forces, and rate of progress to the extent that these affect compliance with the drawings and specifications, the quality, completion, or cost of the work.

We will conduct laboratory tests as required and approve the quality of materials to be incorporated in the final work.

We will monitor availability and projected availability of construction materials nationwide and report on same in the monthly reports. We will advise Trading Corporation of Bangladesh (TCB) of the material requirements of the project at periodic intervals to assure availability of these materials.

Contacts will be made with the Director of Trade and Commerce, TCB and BMEDC to ensure a regular and adequate supply of cement from the in-country cement factories at Chittagong and Chhatak.

Contingency plans will be made for off-shore procurement, in accordance with USAID regulations, if this course of action is required.

The Contractor will be asked to prepare the bills for each site separately and submit to the Consultant's field personnel for verification and certification for payment. The Consultant proposes to assist the Contractor with standard measurement sheets, if required. Work completed during the month will be measured as needed to define quantities which will be certified by the Consultant's designated field personnel. Quantities of materials brought onto a site will be checked and appropriate costs derived. Based on these measurements, monthly certificates and bills of quantity of works completed on each contract during the month will be prepared and entered into the Measurement Book. Fully detailed records will be kept, including expenditure records.

The monthly payment on each contract will be made out following the verification of the progress claim and will be certified prior to submission for payment.

Our senior staff will regularly review the progress of the works and shall propose any measures needed to keep the works on schedule as required and will keep the BADC and USAID informed accordingly.

Regular monthly meetings will be held on each contract to review the contractor's progress and where necessary to arrive at satisfactory means of expediting the work by adjustment of work methods, the size and composition of work forces or other means.

Monthly progress reports containing a brief history and description of the project, contract milestones reached during the reporting period, problems, actual or anticipated with recommended solutions, the financial status of the project, staffing levels, and other items that may have an effect on the contract are being submitted to BADC and USAID within ten days after the end of each reporting period.

3.03.6 Task 6 : Contract Completion Phase

Final Inspection

On substantial completion of construction and the work has passed final test a joint inspection with BADC engineering and supply/storage personnel will be made of the works to verify the completeness and acceptability of the work and the contractor will be advised of the details of work to be completed during Period of Maintenance.

Certify Completion

Subject to the works being acceptable and in accordance with the approved contract documents a report will be made to BADC and USAID certifying the completion of the works so that a Certification of Completion can be issued to the Contractor so that the Contractor will be released from his liabilities as of that date except as covered by the maintenance period.

As-Built Drawings

Over the duration of the work any amendments or changes brought about by design or unforeseen circumstances will be marked up on a set of original plans and will form the basis for the production of as-built drawings showing actual details of the finished construction.

Final Measurements

Within thirty days of completion of the works at each site, final quantities of work carried out will be measured and computed as a basis for the final account and payment and certification will be prepared with respect to compliance with approved specifications.

Certify Final Account

Following submission by the Contractor of his final progress claim, the final account for the work will be prepared, taking into consideration all change work orders and variations of contract rates or of material prices because of escalation. The final account shall be supported fully by all relevant invoices, claims, etc.

Final Construction Report

Immediately following final inspection and acceptance of the work and the final account for payment, a comprehensive report will be made covering the entire contract period and including all relevant documentation. The final report will accompany drawings showing changes, if any.

Maintenance Period

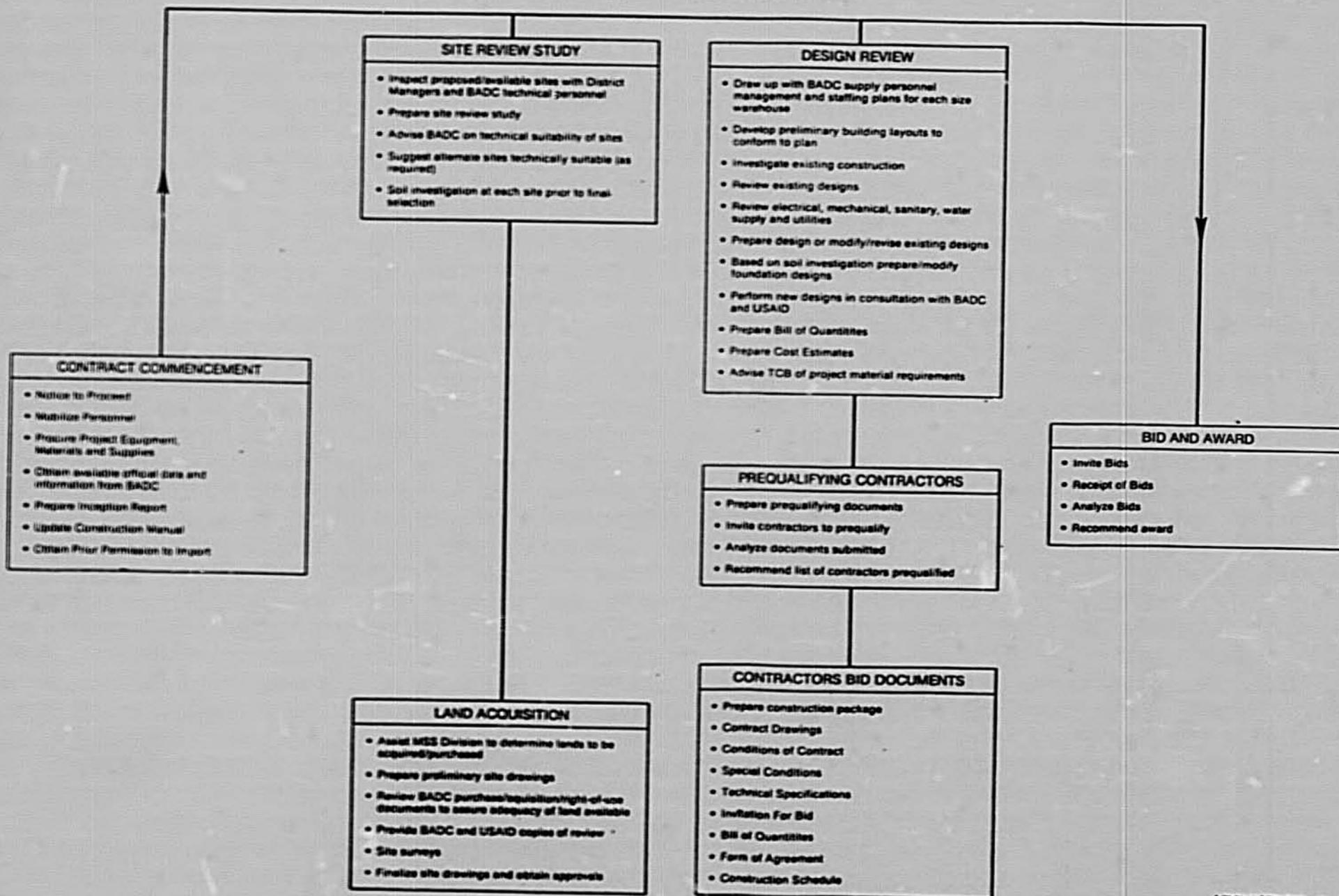
The Contractors will be required to maintain the works for 180 days following their completion. The Consultant will certify maintenance of work during the contract period of their consultancy.

3.03.7 APPENDICES

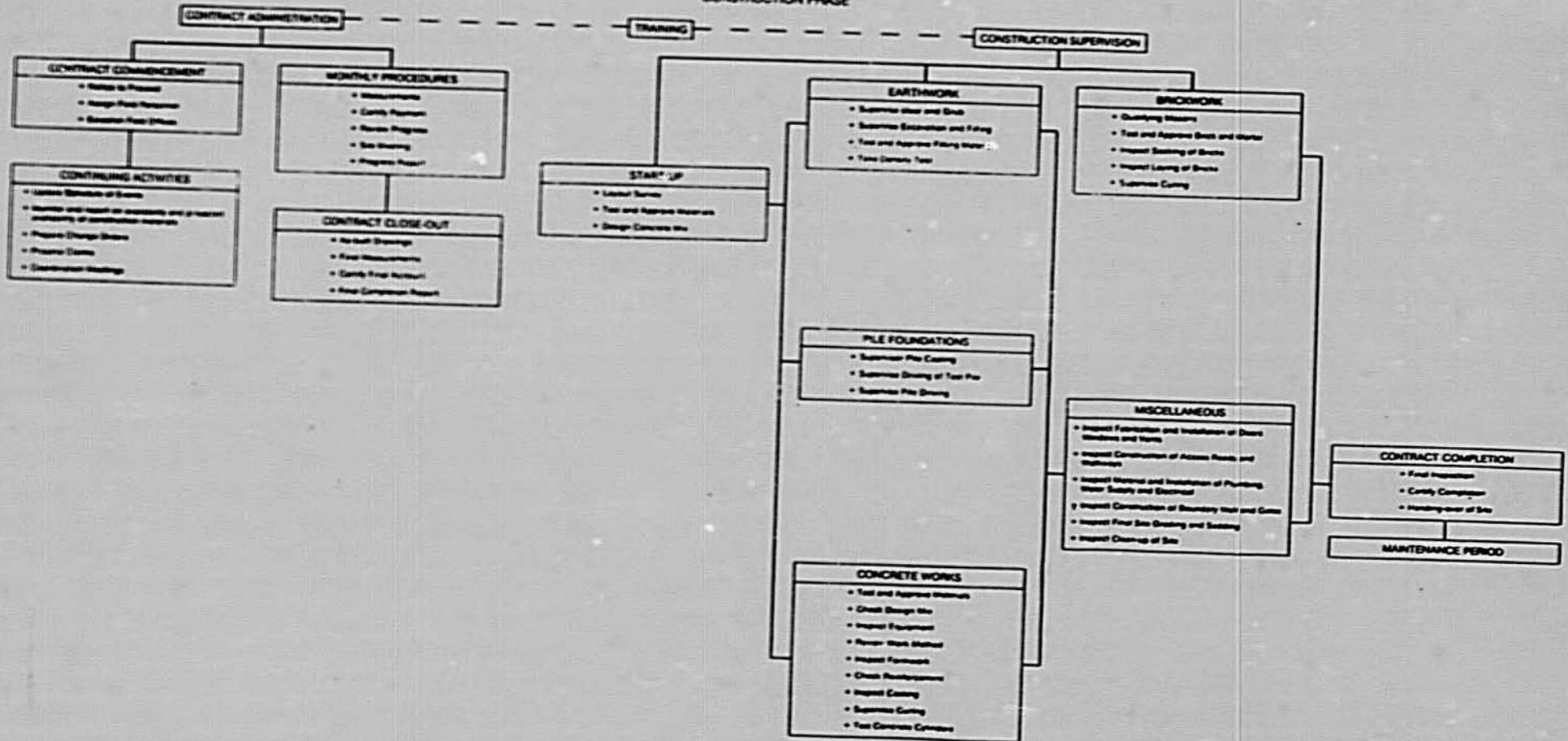
- 3.1 Pre-Construction Activities Flow Chart
- 3.2 Flow Chart of Activities - Construction Phase
- 3.3 Schedule of Events
- 3.4 Masterformat
- 3.5 Weight of Stacks of Different Heights
- 3.6 Seismic Zoning Map of Bangladesh
- 3.7 Maximum Depth To Ground Water
- 3.8 Requirements For Boundary and Topographic Surveys
- 3.9 Site Development Questionnaire
- 3.10 Soil Exploration and Testing
- 3.11 Memorandum of Understanding (BADC and BR)
- 3.12 Scope of Work
- 3.13 Organization Chart

**CONSTRUCTION OF BAGGED PRODUCT FERTILIZER WAREHOUSES
FERTILIZER DISTRIBUTION IMPROVEMENT I
(US AID PROJECT 388-0024)**

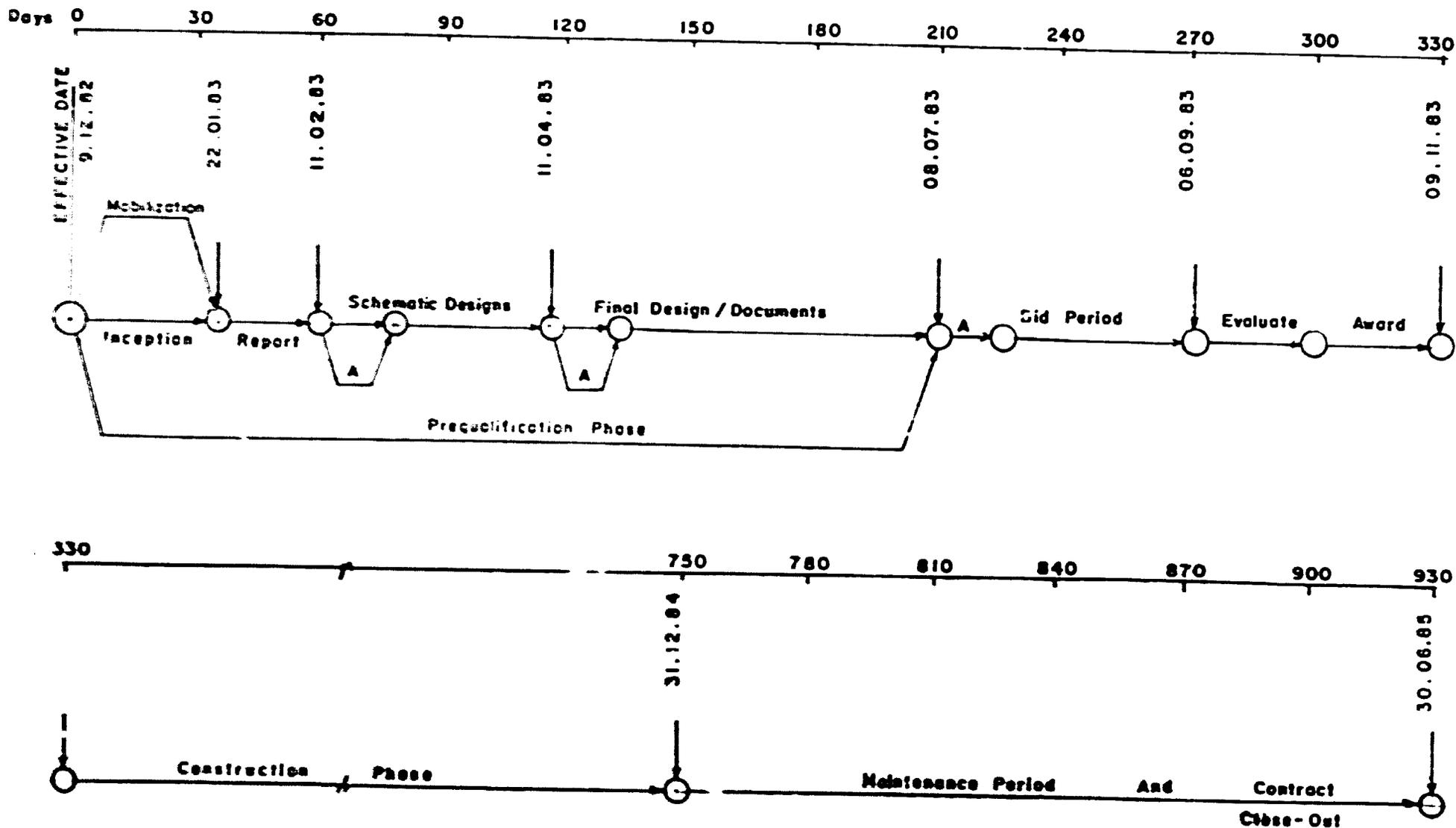
PRE-CONSTRUCTION ACTIVITIES FLOW CHART



FLOW CHART OF ACTIVITIES
CONSTRUCTION PHASE



WAREHOUSES PHASE III SCHEDULE OF EVENTS



APPENDIX 3.3

A : APPROVALS

AMMANN & WHITNEY
Consulting Engineers
31 January 1983

MASTERFORMAT, Broadscope Section Titles

DIVISION 0 - BIDDING AND CONTRACT REQUIREMENTS

00010 PRE-BID INFORMATION
 00100 INSTRUCTIONS TO BIDDERS
 00200 INFORMATION AVAILABLE TO BIDDERS
 00300 BID/TENDER FORMS
 00400 SUPPLEMENTS TO BID/TENDER FORMS
 00500 AGREEMENT FORMS
 00600 BONDS AND CERTIFICATES
 00700 GENERAL CONDITIONS OF THE CONTRACT
 00800 SUPPLEMENTARY CONDITIONS
 00850 DRAWINGS INDEX
 00900 ADDENDA AND MODIFICATIONS

DIVISION 4 - MASONRY

04000 MASONRY PROCEDURES
 04100 MORTAR
 04150 MASONRY ACCESSORIES
 04200 UNIT MASONRY
 04400 STONE
 04500 MASONRY RESTORATION AND CLEANING
 04550 REFRACTORIES
 04600 CORROSION RESISTANT MASONRY

SPECIFICATIONS—DIVISIONS 1-16

DIVISION 1 - GENERAL REQUIREMENTS

01010 SUMMARY OF WORK
 01020 ALLOWANCES
 01030 SPECIAL PROJECT PROCEDURES
 01040 COORDINATION
 01050 FIELD ENGINEERING
 01060 REGULATORY REQUIREMENTS
 01070 ABBREVIATIONS AND SYMBOLS
 01080 IDENTIFICATION SYSTEMS
 01100 ALTERNATES/ALTERNATIVES
 01150 MEASUREMENT AND PAYMENT
 01200 PROJECT MEETINGS
 01300 SUBMITTALS
 01400 QUALITY CONTROL
 01500 CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS
 01600 MATERIAL AND EQUIPMENT
 01650 STARTING OF SYSTEMS
 01660 TESTING, ADJUSTING, AND BALANCING OF SYSTEMS
 01700 CONTRACT CLOSEOUT
 01800 MAINTENANCE MATERIALS

DIVISION 5 - METALS

05010 METAL MATERIALS AND METHODS
 05050 METAL FASTENING
 05100 STRUCTURAL METAL FRAMING
 05200 METAL JOISTS
 05300 METAL DECKING
 05400 COLD-FORMED METAL FRAMING
 05500 METAL FABRICATIONS
 05700 ORNAMENTAL METAL
 05800 EXPANSION CONTROL
 05900 METAL FINISHES

DIVISION 6 - WOOD AND PLASTICS

06050 FASTENERS AND SUPPORTS
 06100 ROUGH CARPENTRY
 06130 HEAVY TIMBER CONSTRUCTION
 06150 WOOD-METAL SYSTEMS
 06170 PREFABRICATED STRUCTURAL WOOD
 06200 FINISH CARPENTRY
 06300 WOOD TREATMENT
 06400 ARCHITECTURAL WOODWORK
 06500 PREFABRICATED STRUCTURAL PLASTICS
 06600 PLASTIC FABRICATIONS

DIVISION 2 - SITEWORK

02010 SUBSURFACE INVESTIGATION
 02050 DEMOLITION
 02100 SITE PREPARATION
 02150 UNDERPINNING
 02200 EARTHWORK
 02300 TUNNELLING
 02350 PILES, CAISSONS AND COFFERDAMS
 02400 DRAINAGE
 02440 SITE IMPROVEMENTS
 02480 LANDSCAPING
 02500 PAVING AND SURFACING
 02580 BRIDGES
 02590 PONDS AND RESERVOIRS
 02600 PIPED UTILITY MATERIALS AND METHODS
 02700 PIPED UTILITIES
 02800 POWER AND COMMUNICATION UTILITIES
 02850 RAILROAD WORK
 02880 MARINE WORK

DIVISION 7 - THERMAL AND MOISTURE PROTECTION

07100 WATERPROOFING
 07150 DAMPPROOFING
 07200 INSULATION
 07250 FIREPROOFING
 07300 SHINGLES AND ROOFING TILES
 07400 PREFORMED ROOFING AND SIDING
 07500 MEMBRANE ROOFING
 07570 TRAFFIC TOPPING
 07600 FLASHING AND SHEET METAL
 07800 ROOF ACCESSORIES
 07900 SEALANTS

DIVISION 3 - CONCRETE

03010 CONCRETE MATERIALS
 03050 CONCRETING PROCEDURES
 03100 CONCRETE FORMWORK
 03150 FORMS
 03180 FORM TIES AND ACCESSORIES
 03200 CONCRETE REINFORCEMENT
 03250 CONCRETE ACCESSORIES
 03300 CAST-IN-PLACE CONCRETE
 03350 SPECIAL CONCRETE FINISHES
 03360 SPECIALLY PLACED CONCRETE
 03370 CONCRETE CURING
 03400 PRECAST CONCRETE
 03500 CEMENTITIOUS DECKS
 03600 GROUT
 03700 CONCRETE RESTORATION AND CLEANING

DIVISION 8 - DOORS AND WINDOWS

08100 METAL DOORS AND FRAMES
 08200 WOOD AND PLASTIC DOORS
 08250 DOOR OPENING ASSEMBLIES
 08300 SPECIAL DOORS
 08400 ENTRANCES AND STOREFRONTS
 08500 METAL WINDOWS
 08600 WOOD AND PLASTIC WINDOWS
 08650 SPECIAL WINDOWS
 08700 HARDWARE
 08800 GLAZING
 08900 GLAZED CURTAIN WALLS

DIVISION 9 - FINISHES

09100 METAL SUPPORT SYSTEMS
 09200 LATH AND PLASTER
 09230 AGGREGATE COATINGS
 09250 GYPSUM WALLBOARD
 09300 TILE
 09400 TERRAZZO
 09500 ACOUSTICAL TREATMENT
 09550 WOOD FLOORING
 09600 STONE AND BRICK FLOORING
 09650 RESILIENT FLOORING
 09680 CARPETING
 09700 SPECIAL FLOORING
 09760 FLOOR TREATMENT
 09800 SPECIAL COATINGS
 09900 PAINTING
 09950 WALL COVERING

DIVISION 10 - SPECIALITIES

10100	CHALKBOARDS AND TACKBOARDS
10150	COMPARTMENTS AND CUBICLES
10200	LOUVERS AND VENTS
10240	GRILLES AND SCREENS
10250	SERVICE WALL SYSTEMS
10260	WALL AND CORNER GUARDS
10270	ACCESS FLOORING
10280	SPECIALTY MODULES
10290	PEST CONTROL
10300	FIREPLACES AND STOVES
10340	PREFABRICATED STEEPLES, SPIRES AND CUPOLAS
10350	FLAGPOLES
10400	IDENTIFYING DEVICES
10450	PEDESTRIAN CONTROL DEVICES
10500	LOCKERS
10520	FIRE EXTINGUISHERS, CABINETS AND ACCESSORIES
10530	PROTECTIVE COVERS
10550	POSTAL SPECIALITIES
10600	PARTITIONS
10650	SCALES
10670	STORAGE SHELVING
10700	EXTERIOR SUN CONTROL DEVICES
10750	TELEPHONE ENCLOSURES
10800	TOILET AND BATH ACCESSORIES
10900	WARDROBE SPECIALITIES

DIVISION 11 - EQUIPMENT

11010	MAINTENANCE EQUIPMENT
11020	SECURITY AND VAULT EQUIPMENT
11030	CHECKROOM EQUIPMENT
11040	ECCLESIASTICAL EQUIPMENT
11050	LIBRARY EQUIPMENT
11060	THEATER AND STAGE EQUIPMENT
11070	MUSICAL EQUIPMENT
11080	REGISTRATION EQUIPMENT
11100	MERCANTILE EQUIPMENT
11110	COMMERCIAL LAUNDRY AND DRY CLEANING EQUIPMENT
11120	VENDING EQUIPMENT
11130	AUDIO-VISUAL EQUIPMENT
11140	SERVICE STATION EQUIPMENT
11150	PARKING EQUIPMENT
11160	LOADING DOCK EQUIPMENT
11170	WASTE HANDLING EQUIPMENT
11190	DETENTION EQUIPMENT
11200	WATER SUPPLY AND TREATMENT EQUIPMENT
11300	FLUID WASTE DISPOSAL AND TREATMENT EQUIPMENT
11400	FOOD SERVICE EQUIPMENT
11450	RESIDENTIAL EQUIPMENT
11460	UNIT KITCHENS
11470	DARKROOM EQUIPMENT
11480	ATHLETIC, RECREATIONAL AND THERAPEUTIC EQUIPMENT
11500	INDUSTRIAL AND PROCESS EQUIPMENT
11600	LABORATORY EQUIPMENT
11650	PLANETARIUM AND OBSERVATORY EQUIPMENT
11700	MEDICAL EQUIPMENT
11780	MORTUARY EQUIPMENT
11800	TELECOMMUNICATION EQUIPMENT
11850	NAVIGATION EQUIPMENT

DIVISION 12 - FURNISHINGS

12100	ARTWORK
12300	MANUFACTURED CABINETS AND CASEWORK
12500	WINDOW TREATMENT
12550	FABRICS
12600	FURNITURE AND ACCESSORIES
12670	RUGS AND MATS
12700	MULTIPLE SEATING
12800	INTERIOR PLANTS AND PLANTINGS

DIVISION 13 - SPECIAL CONSTRUCTION

13010	AIR SUPPORTED STRUCTURES
13020	INTEGRATED ASSEMBLIES
13030	AUDIOMETRIC ROOMS
13040	CLEAN ROOMS
13050	HYPERBARIC ROOMS
13060	INSULATED ROOMS
13070	INTEGRATED CEILINGS
13080	SOUND, VIBRATION, AND SEISMIC CONTROL
13090	RADIATION PROTECTION
13100	NUCLEAR REACTORS
13110	OBSERVATORIES
13120	PRE-ENGINEERED STRUCTURES
13130	SPECIAL PURPOSE ROOMS AND BUILDINGS
13140	VAULTS
13150	POOLS
13160	ICE RINKS
13170	KENNELS AND ANIMAL SHELTERS
13200	SEISMOGRAPHIC INSTRUMENTATION
13210	STRESS RECORDING INSTRUMENTATION
13220	SOLAR AND WIND INSTRUMENTATION
13410	LIQUID AND GAS STORAGE TANKS
13510	RESTORATION OF UNDERGROUND PIPELINES
13520	FILTER UNDERDRAINS AND MEDIA
13530	DIGESTION TANK COVERS AND APPURTENANCES
13540	OXYGENATION SYSTEMS
13550	THERMAL SLUDGE CONDITIONING SYSTEMS
13560	SITE CONSTRUCTED INCINERATORS
13600	UTILITY CONTROL SYSTEMS
13700	INDUSTRIAL AND PROCESS CONTROL SYSTEMS
13800	OIL AND GAS REFINING INSTALLATIONS AND CONTROL SYSTEMS
13900	TRANSPORTATION INSTRUMENTATION
13940	BUILDING AUTOMATION SYSTEMS
13970	FIRE SUPPRESSION AND SUPERVISORY SYSTEMS
13980	SOLAR ENERGY SYSTEMS
13990	WIND ENERGY SYSTEMS

DIVISION 14 - CONVEYING SYSTEMS

14100	DUMBWAITERS
14200	ELEVATORS
14300	HOISTS AND CRANES
14400	LIFTS
14500	MATERIAL HANDLING SYSTEMS
14600	TURNTABLES
14700	MOVING STAIRS AND WALKS
14800	POWERED SCAFFOLDING
14900	TRANSPORTATION SYSTEMS

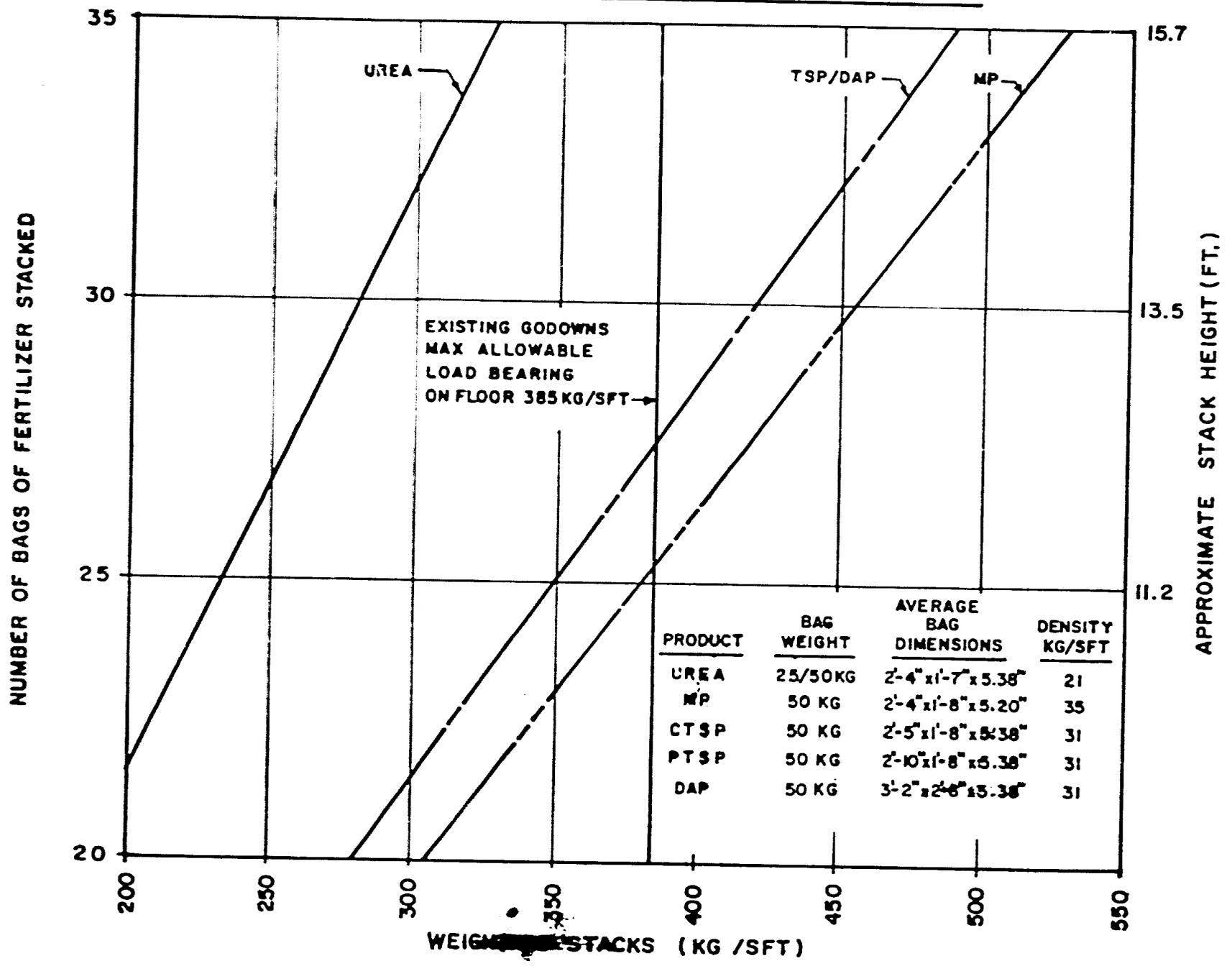
DIVISION 15 - MECHANICAL

15050	BASIC MATERIALS AND METHODS
15200	NOISE, VIBRATION, AND SEISMIC CONTROL
15250	INSULATION
15300	SPECIAL PIPING SYSTEMS
15400	PLUMBING SYSTEMS
15450	PLUMBING FIXTURES AND TRIM
15500	FIRE PROTECTION
15600	POWER OR HEAT GENERATION
15650	REFRIGERATION
15700	LIQUID HEAT TRANSFER
15800	AIR DISTRIBUTION
15900	CONTROLS AND INSTRUMENTATION

DIVISION 16 - ELECTRICAL

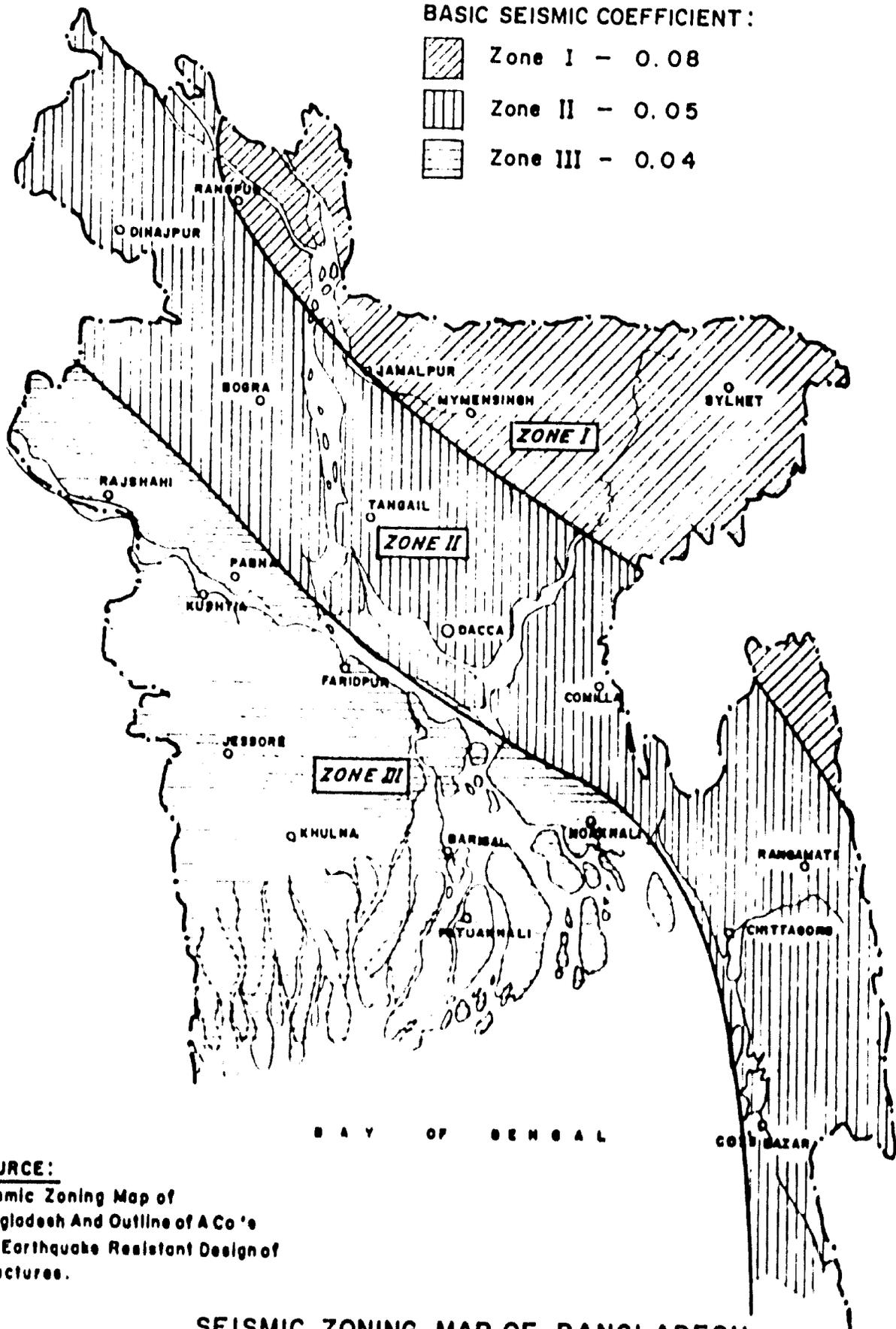
16050	BASIC MATERIALS AND METHODS
16200	POWER GENERATION
16300	POWER TRANSMISSION
16400	SERVICE AND DISTRIBUTION
16500	LIGHTING
16600	SPECIAL SYSTEMS
16700	COMMUNICATIONS
16850	HEATING AND COOLING
16900	CONTROLS AND INSTRUMENTATION

FERTILIZER STORAGE WEIGHT OF STACKS OF DIFFERENT HEIGHTS



BASIC SEISMIC COEFFICIENT :

-  Zone I - 0.08
-  Zone II - 0.05
-  Zone III - 0.04



SOURCE:

Seismic Zoning Map of Bangladesh And Outline of A Co 's For Earthquake Resistant Design of Structures.

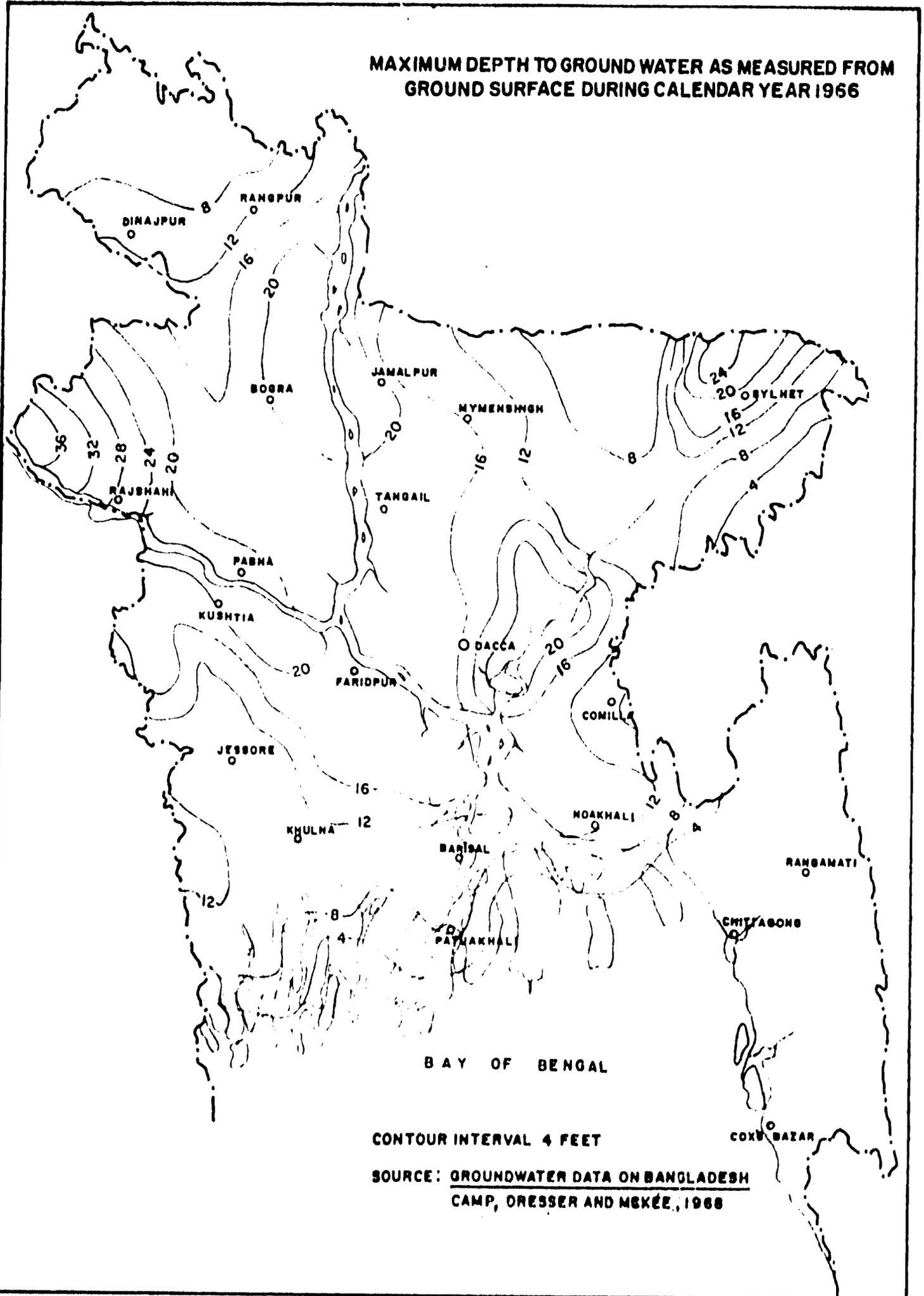
SEISMIC ZONING MAP OF BANGLADESH

Geological Survey of Bangladesh, November 1979

MILES 25 0 25 50 75 100 MILES

SCALE :

**MAXIMUM DEPTH TO GROUND WATER AS MEASURED FROM
GROUND SURFACE DURING CALENDAR YEAR 1966**



REQUIREMENTS FOR BOUNDARY AND TOPOGRAPHIC SURVEYS

I. GENERAL REQUIREMENTS

- A. An accurate transit and tape BOUNDARY and detailed TOPOGRAPHIC survey by a qualified civil engineer or land surveyor.
 1. Field work shall be of such accuracy that the unadjusted mathematical closure of the field traverse line is not less than one unit in five thousand units (1:5,000). Such minimum accuracy may be attained by measuring all angles to the nearest thirty seconds of arc or equivalent and by carefully measuring all distances horizontally to the nearest hundredth of a foot or equivalent.
- B. Permanent monuments (or markers) set at all boundary corners, angles and curve points and at least two permanent bench marks set on or adjacent to the property.
- C. Difference of elevation (altitude) shown by contours or by elevations at cross section grid intersections.
- D. Complete and detailed topographic data.
- E. Written Engineering Report.
- F. Site Photographs.

II. BOUNDARY

- A. Permanent monuments (boundary markers) shall be accurately set at all corners, angle points and curve points and shall be one of the following, in order of preference:
 1. Concrete monuments not less than four inches square at top and of length not less than 2'-6" long. Monument should be set and thoroughly tamped in place, the top 6" above the ground and the actual property corner point marked by a metal plug, drill hole or chiseled cross.
 2. One inch iron pipe or bar at least two feet six inches long driven 6" above the ground with a six-inch diameter cement collar placed around the top.
 3. Chiseled cross or drill hole in cement sidewalk, permanent wall, boulder, etc.

III. TOPOGRAPHY

- A. Two permanent bench marks shall be set on or adjacent to the property.
 1. Bench marks shall be so located as to be protected from damage or disturbance during construction.
 2. Bench mark elevations (altitude) may be referred to local or assumed datum.
- B. Differences of elevation shall be shown either by contours or cross-section grid extending at least 50 feet onto adjacent properties and completely across adjacent streets.
 1. Contour interval shall not exceed two feet.
 2. Cross-section grid shall be spaced not more than ten (10) feet apart with elevation at each intersection of grid lines. The decimal point will indicate the location of the elevation (i.e. 25.6).
- C. All buildings and structures on and adjacent to the property shall be located by measurements from property corners along and at right angles to property lines.

IV. DRAWINGS

- A. Shall be made on approved tracing media adopted for the project.
 1. Drawings shall not be larger than twenty-four (24) inches high by forty (40) inches wide, outside measurements, and title, adopted for the project, should be in lower right-hand corner.
 2. More than one drawing may be used if necessary, provided each is drawn to the same scale and properly identified match lines are shown on each drawing.
 3. Both topographic and boundary data may be shown on the same drawing provided clarity of detail can be maintained.
 4. Any convenient scale may be used as long as all details are clearly shown.
 5. The exact limits of client's ownership shall be shown by a distinctive symbol or heavier line. In the case of walls the exact location of the property line with relation to the wall shall be shown, using an enlarged detail sketch if necessary.
 6. All measurements and dimensions shall be in English units and all notations shall be in the English language.

B. Finished drawings shall show the following specific BOUNDARY data:

1. Location and description of each boundary corner monument or marker.
2. Direction and length of each property line. Direction may be shown by azimuths clockwise from north or by compass bearings in the four quadrants, referred to either magnetic or true north.
3. Distances to the nearest hundredth of a foot. If measured distances differ from the deed (recorded) distances, both shall be shown and marked "meas." or "deed".
4. All interior angles of the boundary. The total of the interior angles shall be geometrically correct.
5. The adjusted final boundary data shall show a mathematical closure of no less accuracy than one unit in ten thousand units (1:10,000).
6. Boundary lines following a circular curve shall be defined by the radius, central angle, arc length, long chord length, chord bearing and tangent distance. In cases where the boundary line follows, an irregular (non-circular) curve, it may be defined by evenly spaced and dimensioned right angle offsets from the long chord to the arc of the curve.
7. Total area of property computed to the nearest square foot and the recorded area as shown in the Title Documents in 1/100 acres.
8. Building restriction lines, easements, rights-of-way, reservation lines, etc. and all encroachments of walls, fences, balconies, eaves, electric and telephone lines, water lines, sewers, etc. shall be shown and described and shall be located by measurements.
9. Names of all adjacent streets with widths between right-of-way lines and names of the owners of all adjacent properties, if possible.
10. Coordinates of all property corners if a local coordinate grid or other survey control system is in use.
11. Boundary data and coordinates may be set up in a table on the drawing.

C. Finished drawings shall show the following specific TOPOGRAPHIC data:

1. Bench mark locations, elevations and description as well as description of the reference datum.

2. Location and outside dimensions of all buildings and structures on the property, giving type of construction, number of stories and use of building, such as "1-story Frame Garage", "2-story Brick Residence", etc. Location measurements shall be shown on drawings from property corner markers along and at right angles to property lines.
3. First floor and basement elevations of all buildings on and adjacent to the property.
4. Property mouza number.
5. Locations, types and sizes of all walls, fences, large trees, walks, roads, ponds, springs, drainage ditches, rock outcroppings, burial grounds, railway tracks, etc., on or adjacent to the property.
6. Location, size and elevation of all sewer lines, showing whether rain water, sanitary or combined, both on the property or in adjacent streets.
7. Location, size and type of all water, gas or other service pipes on the property or in adjacent streets.
8. Type and dimensions of paving, curbs, sidewalks, ditches, etc., and typical cross-sections of all adjacent streets.
9. Location of all sewer manholes, septic tanks, wells, cisterns, or other underground structures, either on the property or in adjacent streets, giving top elevation, measured depth from top and material of construction.
10. Location of all drainage inlets, headwalls, lampposts, telephone and electric poles and all overhead or underground cables or wires on the property or in adjacent streets.

D. Finished drawings should also show the following:

1. Title showing identification of property, such as lot number, block number, name, etc., city, country, name of surveyor or engineer, date of survey and drawing number, if any.
2. A small scale vicinity map showing the general location of the property with relation to prominent landmarks in the area.
3. Graphic bar scale and scale in words.
4. North arrow or meridian, showing whether true or magnetic.

5. Complete legend showing all symbols and abbreviations used.
6. A certification, signed and dated by the engineer or surveyor, that he has made a transit and tape survey, that all data shown on the drawing is correct, that property corner monuments or markers have been found or set as shown and described on the drawing and that all local requirements for land surveys have been met.

V. ENGINEERING REPORT

- A. Engineer or surveyor shall submit a signed and dated written report covering each applicable item of sections II, III and IV above which cannot be clearly shown on the drawings or which might require explanation or clarification. In addition, the report shall include the following:
 1. General information as to soil type, unusual characteristics, indications of rock, indications of foundation settlement of nearby structures, estimated safe soil bearing capacity, data on soil tests or boring nearby, driller's logs of nearby wells, if available, and any other pertinent data which would be of value in planning future soil tests for foundation design.
 2. Estimated depth of water table.
 3. Description of any building or zoning restriction, height requirement, building set-back requirement, restrictive covenant or ordinance which might affect construction on the property.
 4. "Site Development Questionnaire" shall be fully and completely filled in and attached to the written report.

VI. SITE PHOTOGRAPHS

- A. Engineer will take photographs of each site as follows:
 1. Photographs shall be taken from each corner across the property and sufficient additional views necessary to show the general character of the site and buildings in the vicinity.
 2. Photographs shall be identified on the back by number, property identification, date, etc., and shall carry a brief description of the camera position and view.
 3. A key map shall accompany the photographs and shall show by identifying numbers and arrows the various camera locations, direction and field of view.

SITE DEVELOPMENT QUESTIONNAIRE

Data on local availability of building materials, services etc.

Date _____

Place _____ P.S. _____ District _____

A. Concrete Materials

- | | | | |
|-----------------------------|-------|-----------|-----------|
| 1. Portland Cement | _____ | Tk. _____ | bag/ton |
| 2. Sand (F.M. = 1.8) | _____ | Tk. _____ | cft |
| 3. Coarse Sand (F.M. = 2.5) | _____ | Tk. _____ | cft |
| 4. Coarse aggregate | | | |
| a) Boulder/Shingles | _____ | Tk. _____ | cft |
| b) Picked jhama bricks | _____ | Tk. _____ | 1000 nos. |

B. Brick

- | | | | |
|--------------------------------------|-------|-----------|-----------|
| 1. Common brick(1st class) | _____ | Tk. _____ | 1000 nos. |
| 2. Machine made brick
(1st class) | _____ | Tk. _____ | 1000 nos. |
| 3. Face brick | _____ | Tk. _____ | 1000 nos. |

C. Iron and Steel Products

- | | | | |
|---|-------|-----------|-----|
| 1. Reinforcing bars
(Plain/Deformed) | _____ | Tk. _____ | ton |
| 2. Structural section | _____ | Tk. _____ | ton |
| 3. Plain sheet | _____ | Tk. _____ | ton |

D. Roofing Materials

- | | | | |
|------------------------|-------|-----------|------------|
| 1. Limo | _____ | Tk. _____ | maund/cft. |
| 2. Surki | _____ | Tk. _____ | maund/cft. |
| 3. asphalt or pitch | _____ | Tk. _____ | ton |
| 4. C.I. Sheet (24 BWG) | _____ | Tk. _____ | ton |
| 5. Antibeton sheet | _____ | Tk. _____ | |

E. Floor Covering

1. Marble chips (mosaic) _____ Tk. _____ cwt/pound

F. Lumber & Wood Products

1. Gamar wood (shutters) _____ Tk. _____ cft

2. Telsuk wood (frame) _____ Tk. _____ cft

3. Shilkarai (frame) _____ Tk. _____ cft

4. Plywood _____ Tk. _____ sft

5. Garjan (Dunnage) _____ Tk. _____ cft

6. Jam, Kathal, Karai
(Dunnage) _____ Tk. _____ cft

G. Pipe & Plumbing Supplies^{1/}

1. Concrete pipe (size) _____ Tk. _____ rft

2. Asbestos pipe (size) _____ Tk. _____ rft

3. PVC pipe (size) _____ Tk. _____ rft

4. Cast Iron Pipe (size) _____ Tk. _____ rft

5. Galvanized Iron pipe
(size) _____ Tk. _____ rft

6. Plumbing fixtures &
supplies _____

7. Long Pan _____ Tk. _____ each

8. C.I. Cistern _____ Tk. _____ each

9. Commode _____ Tk. _____ each

10. Lowdown Cistern _____ Tk. _____ each

11. Hand wash basin _____ Tk. _____ each

12. Sanitary fixtures &
supplies _____

^{1/} Use reverse side for additional space for each size pipe under various headings and for description of Items G. 6 to G. 12.

4. Skilled Labour

- | | |
|----------------------|--------------------|
| 1. Mason _____ | 2. Carpenter _____ |
| 3. Bar Binder _____ | 4. Plumber _____ |
| 5. Electrician _____ | 6. Welder _____ |
| 7. Painter _____ | |

I. Fuels

1. Gas supply _____
2. Distance from nearest line _____

J. Electrical

1. Supply voltage _____
2. Distance from nearest supply source _____
3. Electrical cables/wires _____ Tk. _____
4. Conduit pipes (PVC/Steel) _____ Tk. _____ rft
5. Electrical Items, fixtures etc. _____

K. Sewerage

1. Nearest distance of sewers available _____
2. Nearest distance of Municipal drain _____

L. Water

1. Water source (Agency) _____
2. Nearest distance of supply water _____
3. Depth of tubewell locally used for drinking water _____ ft
4. If saline, nearest source of potable water _____
5. Depth of tubewell in saline zone _____ ft
6. Water pump (Electrical/Mechanical)

Type _____	Made _____
Suction _____	Delivery _____
RPM _____	Lifting head _____
HP _____	Tk. _____ each

N. Meteorological Data

1. Maxm. Recorded Rainfall in 24 hours _____
2. Direction of prevailing breezes _____
3. Direction of hardest wind/cyclone _____
4. Earthquake zone number _____

WAREHOUSE PHASE III
SOIL EXPLORATION AND TESTING

A. PURPOSE

The basic purpose of the soils consulting services will be to work intimately with the designers, during the conceptual and final design phases to assure that the relationship between site development, structural and foundation systems is as good as possible, and that the most appropriate means of building support, pavement design, and railway embankment are integrated with overall design concepts.

The scope of services shall be to provide a report which evaluates the data collected from sub-surface explorations and make recommendations for site development and foundation design. Special recommendations shall include:

- a. Allowable soil-bearing pressure and recommend depth of footings.
- b. Pile capacities, pile-driving criteria and requirements for pile tests, if necessary.
- c. Estimates of settlement.
- d. Requirements for fill, including data required for the preparation of construction specifications and inspection requirements for fill.
- e. Suitability of the material excavated from the site for possible use as compactable backfill.
- f. Recommendations for pavement design.
- g. Highest anticipated ground water level and probable seasonal variations.
- h. Presence of deleterious substances in the soils, including those that will generate gases, their expected effect on foundations and utility lines, and recommend preventive action.
- i. Anticipated construction problems resulting from existing subsurface conditions.
- j. When the contractor locates sources of borrow for each site, these sources will be evaluated and recommendations for their use will be made.

B. PROCEDURE

1. Plan and execute a subsurface investigation program which would provide information necessary for design purposes.
2. A program of borings will be required. One of these borings will be drilled to a depth of the width of the godown to investigate the possibility of potentially deep compressible soils. The top 40' will be 4" diameter and the remainder will be 2 $\frac{1}{2}$ " unless a 60' deep 4" boring is specified. The remainder will each be drilled to a depth of 40 feet or as determined in the field.

3. Test pits will not be used within the proposed building area, because we do not wish to disturb the present soils, in case the structure is founded on spread footings.
4. The exploration program will be designed to investigate the near surface materials to determine the presence of fill or compressible swamp silt or clay layers.
5. After award of construction contracts, test pits will be dug in the sources of borrow proposed by the contractor. Bag samples will be taken to the laboratory and tested. These sources will be evaluated.
6. The parameters necessary for pavement design shall be determined from tests run on samples of compacted potential fill material.
7. The entire field exploration program shall be under continuous supervision by the Foundation Engineer.
8. Appropriate laboratory testing shall be performed on the samples recovered, in order to obtain the compressibility, strength, permeability, or classification properties of the soils as may be required by the design.

C. REPORT AND SCHEDULE

1. Information shall be supplied on an interim basis as it becomes available during the course of the work. The complete results shall be presented in a formal report.
2. The entire program consisting of explorations, tests and report shall be completed in a period of less than 60 calendar days from the date of approval to the boring contractor to proceed with the borings. To expedite the work design analysis shall be performed concurrently with the test boring work.

D. FIELD AND LABORATORY TESTING

Undisturbed samples
Consolidation tests
Atterberg limits
Triaxial shear
Moisture content
Unconfined compressions
Grain size analysis

(Construction Phase)

Moisture-Density relationship tests
Field density tests

E. SOIL INVESTIGATION PROGRAM

1. Soil Investigation

- 1.1 Investigation into the general geological character of the site.
- 1.2 Make exploratory bore holes for specific information regarding the general character and thickness of individual soil strata.
- 1.3 Determine physical properties of the soil by laboratory tests.

2. Boring at each Site

- 2.1 Collection of soil samples by 4" and 2 $\frac{1}{2}$ " inside diameter cased borings as specified.
 - 2.1.1 Depth of boring - 1 @ building width and others @ 40' or as determined in field.
- 2.2 Collection of samples by auger holes.
- 2.3 Test pits will be dug during the construction phase to evaluate the sources of borrow found by the contractor.
- 2.4 Locations of borings.
 - 2.4.1 Borings to be located as shown on the boring site plan.
- 2.5 The log of these borings are to be analysed immediately by the Consultant's Foundation Engineer to ascertain whether additional depth and number of borings are required to adequately describe the soil condition at the site.

3. Sampling

3.1 Undisturbed Samples

- 3.1.1 Undisturbed samples shall be collected from cohesive soil layers, one per 4" boring, as directed by the Consultant's Foundation Engineer.
- 3.1.2 After recovery, undisturbed samples shall be carefully sealed and marked for laboratory tests. Before sealing, a small quantity of soil from the bottom part of the sample shall be put in a glass jar or plastic bag for visual classification purposes. The sample container shall be marked as noted in 3.6.
- 3.1.3 The material for sealing the ends of the undisturbed sample tube shall be composed of 1 part paraffin wax to 1 part petroleum jelly or other approved compound.

3.2 Disturbed Samples

Split spoon samples from borings and samples from auger holes shall be taken at a depth of three (3), five (5), seven (7) and ten (10) feet and at every five (5) foot interval thereafter. Additional samples shall be taken at every change of stratum.

3.3 Standard Penetration Test

Blow count (N) per ft. of penetration shall be recorded for every split spoon sample taken. Each blow shall be made with a 140 lb hammer freely dropping 30".

At a depth where disturbed samples cannot be extracted because of the availability of only cohesionless soil layers, record of N-blows may be considered sufficient for the determination of bearing capacity of soil.

3.4 In-Situ Vane Shear Test

When SPT blow count, N, is less than 4 blows per foot and a good undisturbed sample cannot be obtained, make in-situ vane shear test.

3.5 Borrow Pit Samples

3.5.1 A 25 lb. sample of borrow pit material shall be taken for compaction test from each borrow pit found by the contractor during the construction phase.

3.5.2 An additional small sample shall be put in a sealed container for water content analysis.

3.6 Marking Samples

All samples shall list the Boring Auger Hole, or borrow pit number, the depth of the sample, and the blows (N) on the sampling spoon when applicable.

4. Laboratory Tests

4.1 Undisturbed Soil Samples

Laboratory tests shall be conducted for the following:

4.1.1 Unconfined compression test on all undisturbed cohesive soil samples.

4.1.2 Consolidation tests on each undisturbed cohesive soil sample.

4.1.3 Natural moisture content test.

4.1.4 Triaxial compression test (consolidated undrained). One per site.

4.2 Disturbed Samples

Laboratory test to be performed on representative disturbed soil samples as follows:

- 4.2.1 Atterberg limit test. 2 per boring.
- 4.2.2 Grain size analysis. 2 per boring and one compaction test.
- 4.2.3 Visual identification of the soil.
- 4.2.4 Preparation of complete boring logs, auger hole logs and test pit logs and soil profiles by using Unified Soil Classification system in addition to a soil description.

F. WASH BORINGS PROCEDURE

- Use of modified bits with upward water jets and to use clean-out augers in advance of making Standard Penetration or vane shear tests, and in advance of undisturbed sampling.
- A minimum clear distance of 6 inches should be maintained between the bottom of the preceding undisturbed sample or in-place test and the start of the succeeding in-place test or undisturbed sample.
- Corroded, scaled and pitted, or bent sampling tubes should not be used in undisturbed sampling. To reduce corrosion and to facilitate extrusion of undisturbed samples, clean sample tubes immediately after the samples are extruded and then coat with paraffin for re-use.
- Strength tests should be made only under saturated conditions to avoid errors on the unsafe side.
- Triaxial shear tests on $2\frac{1}{8}$ inch diameter specimens.
- Report to include stress-strain curves; Mohr failure envelopes; natural moisture content; in-place density; and, consolidated density and moisture content at test.
- Consolidation Tests

To be representative of the foundation settlement conditions to be analyzed, the test load increments must be chosen so as to include and represent the initial and final geostatic stresses or effective stress changes that will prevail in the field. The initial test load applied should be not more than 500 lb/sq.ft.

Sample disturbance and disturbance or partial remolding of the specimen while setting up for the test are a serious source of erroneous consolidation test results. Careful continuing attention will be necessary to see that samples or specimens suspected of having been disturbed or partially remolded will be excluded from consolidation testing and excluded from consideration in foundation design analysis.

To be complete, the report on consolidation tests should clearly state initial specimen moisture and density, and final specimen moisture after test, and should include both consolidation-time curves and consolidation-pressure curves for all tests.

MEMORANDUM OF UNDERSTANDING

MADE and entered into this the 14th day of the month of October of One thousand Nine hundred eighty two of the Christian Era.

B-E-T-W-E-E-N

Bangladesh Agricultural Development Corporation, Dhaka, being represented by its Secretary, hereinafter called BADC, which expression shall, where the context so admits, mean and include its successors-in-interest, assigns, duly authorized agents and representatives of the ONE PART.

.... FIRST PARTY

A-N-D

Bangladesh Railway, being represented by its Project Director, Fertilizer Transport Project, hereinafter called BR, which expression shall, where the context so admits, mean and include its successors-in-interest, assigns and duly authorized agents and representatives of the OTHER PART.

.... SECOND PARTY

WHEREAS for the construction of Railway sidings at several locations in Bangladesh, where Fertilizer godowns will be constructed under USAID financed Fertilizer Warehouse Project, Phase II and III, both Bangladesh Agricultural Development Corporation (BADC) and Bangladesh Railway (BR) are required to sign a Memorandum of understanding,

AND WHEREAS both the BADC and the BR, after elaborate discussion, meetings and decisions have reached certain agreed procedures which are required to be recorded in writing.

NOW, THEREFORE, it is hereby agreed, understood and undertaken that :-

1. That for the work of construction of Railway sidings at Mohendranagar, Rangpur, Shibganj, Muladuli, Amnura, Rohonpur, Metrokone, Atrai, Molanda Bazar, Panchgar, Santahar, Jangalia, Bogra, Charkhai and other sites to be mutually agreed upon, detailed siding plans/drawings will have to be developed by BADC. The cost estimates for construction of railway sidings, of Bridges and culverts, railway tracks etc. and of related works will have to be prepared. The plans/drawings, costs estimates, time limit for any work at each site etc. will have to be approved by both the BADC and the BR and without any such approval, no work at any site for each such category will be taken up and this approval will hereinafter be called

Contd. P/2

Best Available Document

APPENDIX 3.11

as "pre-approved" or "agreed".

2. That earth work including grading and compaction of the embankment required in connection with the construction of sidings will be the responsibility of BADC who will do this work at each site in accordance with the pre-approved plan/drawing and technical specification.
3. That the earth work for the embankment will be done by BADC with materials carried from off-site and no earth work will be done with earth taken from on-site borrow pits.
4. That from the take-off points of the siding to entrance gates of the enclosed land leased out to BADC, no rent will be charged by BR.
5. That construction of any bridge, culverts, if required, will be assigned to and executed by BR based on pre-approved estimates and soil investigation reports furnished by BADC.
6. That the laying of railway track, points and crossings etc. will be assigned to and executed by BR based on a site-wise estimate pre-approved by BADC.
7. That the technical specification of siding materials to be purchased and imported by BADC will be prepared by BADC based on BR standard specifications and before floatation of procurement tender, BADC will obtain clearance of the specifications of the materials proposed for purchase from BR. It is further agreed that pre-shipment inspection of the materials at source points will be carried out as per procedure of BR and the cost of such inspection will be borne by BADC.
8. That BR will render necessary assistance to BADC for obtaining clearance from the Government to import track materials based on pre-approved specifications.
9. That whenever BADC will supply the imported and /or locally procured materials to BR at each site as per agreed time-schedule, such materials will remain under the custody of BADC till delivery is made BR will use the same materials for the purpose of siding tracks only.
10. That the quantity of sand, bricks and stone ballast etc. required for laying the track or its proper maintenance for each site will be assessed and the Cost estimates therefor will be made by BR; BADC procure them locally and supply them to BR; or BADC

Contd....P/3

may also assign the responsibility of such procurement to BR, who will procure the same on pre-approved estimate and will furnish the actual procurement cost site-wise basis including storage and other direct labour cost/charges to BADC for reimbursement from USAID.

11. That the construction of level crossing, dismantling and construction of signal, dismantling and construction of quarters will be assigned to and executed by BR based on estimate pre-approved by BADC. BR will furnish statement of expenditure to BADC for reimbursement from USAID.

12. That for the works which will be assigned to and executed by BR, they will develop detailed cost estimate on site-wise basis and the work will be started according to pre-approved estimate & time schedule.

13. That BR will allow sites for railway sidings serving the proposed warehouse and the sidings will be developed as per previously agreed siding plan with pre-approved materials and agreed time schedule. It is further agreed that work-component to be assigned to and executed by BR and cleared by BADC will be clearly identified on site-wise basis by subsequent site references based on stipulation contained in this Memorandum of understanding. It will not charge the usual 12% and other charges for materials to be procured for laying tracks for the Railway siding.

14. That BR will clear and endorse the siding drawings, plans and material specifications to be prepared by BADC within pre-approved time schedule.

15. That it is agreed that BR will not claim any fees and service charges for works to be assigned to and executed by BR based on pre-approved estimates and BADC will pay only the direct cost for such works, including the cost of checking plans, drawings estimates, etc.

16. That for ~~the works to be assigned to and executed by BR~~, BADC will re-inburse either on PAR (fixed amount reimbursement) basis based on pre-approved estimates or on actual cost basis supported by pre-approved estimates and supporting papers.

17. That if there is any cost escalation beyond the original approved estimate or there is any change, BR will furnish full justification and obtain prior written approval of BADC before taking up any such works & in-curring any expenditure therefor.

Contd....P/4

18. That BR will furnish completion reports to BADC for the works assigned to & executed by BR on site-wise basis along with site-wise statements of cost.
19. That BR and BADC will jointly develop and agree to a time schedule for construction of sidings at each site in such a way that the component of the work to be undertaken both by BR and BADC are completed on agreed time schedule for operation of the warehouses and Unit-Train.
20. That BR will give free access to the site to BADC Officers/ agents or contractor's labour and staff during the construction period and as a measure of security, identification cards may be issued for the on-site personnel.
21. That BADC will place an amount of Tk. 50,00,000.00 (Taka Fifty lacs) only as advance to form a Revolving Fund in the name of FA & CAO, Bangladesh Railway or any other officer as agreed upon between the parties, to meet the expenditure for the works to be assigned to and executed by BR based on pre-approved estimates; when the works as above will be done, BR will adjust, the amounts so taken against regular bills duly supported by related papers for such works.
22. That when the amount of the aforesaid revolving fund will come down to Tk. 15,00,000.00 (Fifteen lacs) only, BADC will replenish the amount in full to reach Taka, 50,00,000.00 (Taka Fifty lacs) only within 7 days on receipt of written notice from the BR.
23. That BADC will arrange to complete the certification process of the completed work independent of Railway involvement by Make the cost of work eligible for funding and re-imbursible from USAID.
24. That in order to facilitate early re-imburement of money BR will provide BADC complete expenditure statements based on pre-approved estimates.
25. That BR will provide BADC monthly progress reports on site-wise basis in terms of Physical and financial aspect at the end of each month.
26. That BR will maintain proper accounts of expenditure on site-wise basis under the project as per Railway accounting procedure,

Contd.....P/5

27. That BADC will supply the materials as per agreed time schedule.
28. That if there is any any dispute between BADC and BR, the same will be amicably settled or it will be settled or it will be settled through Inter-Ministerial meetings and the decisions of the Inter-Ministerial meetings will be final and bindings on both the parties.
29. That this Memorandum of Understanding may be emended by the Ministry of Agriculture & Forest and the Ministry of Communications, Railway Division at the option of BADC or BR with due notice.

IN WITNESS WHEREOF the parties hereto have set their hands and affixed their seals to this Memorandum of Understanding on the date, month and year first above written.

WITNESS:-

1.


(MAFIZUL ISLAM)
SECRETARY,
BANGLADESH AGRICULTURAL
DEVELOPMENT CORPORATION.
(FIRST PARTY)

2.


(SHAMSUDDIN AHMED)
PROJECT DIRECTOR,
FERTILIZER TRANSPORT PROJECT,
BANGLADESH RAILWAY,
(SECOND PARTY).

2. House/

SCOPE OF WORKS

General

The Consultant shall have sole responsibility for supervising, monitoring, inspecting and approving construction works under the project on behalf of BADC. The Consultant shall ensure required quality and standard in the performance and discharge of its obligation under this contract. Inspecting and review of Consultant's and Contractor's performance shall be provided by the Chief Engineer (Const), BADC. Related BADC engineering staff may be used by the Chief Engineer (Const) for the purpose of reviewing, checking, and supervising Consultant's and Contractor's performance and monitoring and reporting the progress, quality, standard and volume of the works. Suggestion for modification including improvements if any shall be communicated in writing to the Consultant through the Chief Engineer (Const).

Any construction contract amendment, change order, or other action, especially those which would result in variation of more than US \$ 2,000 in initial estimated/contracted construction quantities or cost at any one warehouse site will require the full signatory approval of the Chief Engineer (Const) and USAID.

Acceptance of Work and Payment to the Contractor

The Consultant is hereby delegated the authority for and on behalf of BADC for accepting works completed for purpose of progress payment and final payment to the construction contractor. In this regard the Consultant shall certify works completed, provide certification for payments to the contractor, and forward invoices to USAID for payment. The detailed mechanism of payment and accounting procedures will be developed with USAID, BADC and the Consultant and will be incorporated as applicable in the conditions of contract with the contractor.

SCOPE OF WORK

A. Specific Services

1. For each site proposed for construction by BADC, assist MSS Division of BADC to determine lands to be acquired/purchased for construction of required buildings and for access (by road, rail and water as applicable) to this site. Prepare final site drawings, land plan and railway siding plan to assist BADC in such purchase/acquisition. (Note : Preliminary site drawings have already been prepared for several of the proposed project sites).
2. Review BADC purchase/acquisition or other right of use documents against the current site drawings to assure that the land available is adequate for the required construction and access. Provide BADC and USAID with copies of this review.
3. In collaboration with BADC District Managers and with BADC technical personnel, inspect sites which are proposed and/or made available by BADC for the construction of warehouse under the project and advise BADC as to the technical suitability of such sites in a site review study to include cost factors, accessibility, flood levels, utilization, site preparation, construction difficulties, traffic flow, allowances for future expansion and other appropriate factors and recommend if the warehouse selected for the site should be modified either in size or structural elements. If the site is not suitable, suggest alternate sites within the vicinity which appear technically suitable for construction. The work in this item should be done before BADC acquires the site to the extent possible.
 - 3.1 For the acquired/purchase land assist BADC in boundary demarcation and monumentation for obtaining and retaining possession.
 - 3.2 The site survey shall include existing structures, installations, overhead and underground supply and service lines, local utilities, irrigation and drainage systems, graveyards, etc.
 - 3.3 Prior to construction, the Consultant shall prepare a site contour map showing existing ground elevation at 10 ft. interval grid and indicating a permanent bench mark, high flood level, finish ground level and proposed plinth level.
4. For each size and type of warehouse, meet and discuss with BADC Supply and Engineering personnel and develop preliminary building (i.e. warehouse and ancillary) sketches to conform with these plans prior to proceeding with design or design revision as required.
5. Carry out soil investigation at each site prior to final selection, and modify the foundation design and other designs as may be considered necessary. Perform all required site surveys and site drawings. These site drawings should indicate by dotted lines possible locations for future warehouses or other buildings (if any). Before they are submitted for AID approval, these site drawings should be signed by the Consultant and the Manager (Storage), BADC or his representative and countersigned for final BADC approval by the Chief Engineer (Const).

6. Provide all necessary modifications to existing designs wherever applicable and perform all required new designs of warehouses and ancillary buildings to be constructed under Phase III in consultation with Chief Engineer (Const) and AID.
7. Prepare the bill of quantities for construction at each site and the cost estimates for each site for BADC approval. The cost estimates shall be analyzed and based on the market price of materials, labor and standard of work specified.
8. Conduct a prequalification process and recommend to BADC and USAID a list of Bangladesh, U.S. construction firms and Code 941 countries construction firms prequalified to bid on work at one or more construction sites. This will include, in addition to adequate technical and financial capability, a physical investigation of each firm's office, equipment and previous projects.
9. Provide the construction bid documents and contract documents, signed and dated, for BADC and USAID approval. It is anticipated that bids will be invited on three or more construction packages.
10. Assist and advise BADC in bid analyses and contract awards and performance supervision of the construction contractors working under the project to ensure that construction is carried out in compliance with the drawings, specifications, and costs as approved. The supervision and inspection by the Consultant at each site shall be continuous during construction and shall be in accordance with Supervision of Construction, attached hereto.
11. Inspect and certify whether construction at each site under the project has been completed in accordance with the approved contract documents.
12. Procure and arrange for shipping, in accordance with AID source and origin requirements, motor vehicles with spares, motorcycles with spares, transceivers - spares, and other equipment and materials as needed to assist in performance of the services under this Agreement. Assist BADC in receipt of the above in Bangladesh and in port and customs clearance, inspection and transport to sites of work under the project and assist BADC in the processing of any claims in connection therewith. BADC shall obtain from Chief Controller of Imports and Exports prior permission to import the items. All items procured shall be retained and used by the Consultant in the performance of the work until the completion of the project. The Consultant shall be reimbursed for all allowable costs incurred for procurement, arrangement and assistance upon submission of proper invoices. Upon completion of the project all non-expendable equipment shall be turned over to BADC in good working order, less normal wear and tear, for use in future AID funded projects.

13. Within seven months of the effective date of the contract, complete preliminary site drawings, site specific designs, and site specific cost estimates for the first IFB package. Within nine months complete preliminary site drawing, site specific designs, and site specific cost estimates, insofar as is possible (considering the status of land acquisition), sufficient to make a firm, revised cost estimate for all the planned bagged warehouse and related construction under the project, and provide this estimate to BADC and USAID. All of these tasks must be completed at a sufficiently early date to ensure completion of all construction by 31 December 1984.
14. Advise the Trading Corporation of Bangladesh (TCB) of the material requirements of the Project and of each Contractor and work with BADC and TCB to assure availability of these materials.
15. Monitor availability and projected availability of construction materials nationwide and report on same in the monthly reports.
16. The Consultant shall prepare all contract drawings, designs, and contract documents taking into consideration use of indigenous materials, methods of construction, and local practices.
17. The Consultant will make his best effort to maintain the implementation schedule of the project as per the Activity Bar Chart shown in Appendix E of the contract.

B. Reports

1. Inception Report

This report will fully update the Consultant's proposed program of work and schedule as was originally contained in the technical proposal. It should state the methodology proposed for preparing the required designs and the date on which the designs will be complete. It will also indicate the kind of data available that is relevant to the contract, the requirement for additional data and the arrangements proposed for data collection. Thirty-six copies of the Inception Report shall be submitted to the BADC and six copies to USAID within sixty-five (65) calendar days after the effective date of the contract.

2. Monthly Reports

The Consultant shall prepare a monthly progress report containing a brief history and description of the project, contract milestones reached during the reporting period, problems, actual or anticipated, with recommended solutions, the financial status of the project, staffing levels, results of test performed, and other items that may have an effect on the contract. The monthly report shall not be used as an instrument to obtain answers to specific questions or problems; this should be obtained by other direct communications. Fifteen (15) copies of the Monthly Report shall be submitted to the BADC and six (6) copies to USAID. The report

shall be submitted within ten (10) days after the end of the reporting period.

3. Thirty days after completion of construction at each site under the project, a certification in accordance with paragraph A.11 above will be prepared with respect to compliance with approved specifications.
4. The Consultant shall submit other reports as required by BADC.
5. Upon completion of construction and during the schedule close-out period a Final Completion Report is twenty copies of which ten copies will be provided to USAID, certifying completion of services and including information and data with respect to the carrying out of the project including costs of construction, evaluation of contractors, and such other information and data as BADC may reasonably request.

C. Coordination Meeting

The Consultant shall participate in periodic coordination and other project meetings as will be convened by BADC with reasonable prior information to the Consultant.

D. Preliminary List of Construction Sites

BADC has acquired the following planned sites for locations for construction. The Consultant shall review and submit to BADC a positive recommendation for engineering feasibility of the sites acquired.

<u>NPSP Ref.</u>	<u>Name of Sites</u>	<u>Capacity M.T.</u>
B1	Kishoreganj	5,000
O3	Jamalpur	5,000
F1	Dohazari	2,000
F3	Cox's Bazar	2,000
H2	Chowmahani	3,000
H3	Lakshimpur	1,000
I4	Chandpur	6,000
L4	Domar	2,000
L6	Gaibandha	3,000
O5T	Farbatipur	4,000
		<u>35,000 M.T.</u>

Tentative preliminary site plans have been prepared for proposed sites at most of the above locations and should be reviewed, if available, by the Consultant.

E. Designs

The Engineering Consultants for the AID-financed Phase I and Phase II Fertiliser Storage Construction Projects (Ammann & Whitney and the International Engineering Co.) have developed designs under these projects for 500, 1,000, 2,000, 3,000, 4,000, 5,000, 6,000, 7,000, 8,000, 10,000 and 12,000 ton capacity warehouses. These designs are the property of the Bangladesh Government and are available for use in this project. The Consultant will review these designs and other designs proposed by BADC and USAID, evaluate the performance of BADC's existing godowns, and provide BADC and USAID with recommended designs for Phase III warehouses and related structures within 120 days of the effective date of the contract. Designs specific to sites will also be the responsibility of the Consultant and will be completed in a timely manner, as per the terms of A.13. above.

F. Supervision of Construction

1. General

The Consultant will inspect the work of the construction contractors for compliance with the plans and specifications; interpret contract drawings; develop any necessary clarifying details required during construction; execute measurements and certify work completed for the purpose of interim payments; provide certification for payments to the contractors; and provide day to day site supervision, guidance, and inspection of the work in the field described hereinafter, all within the limits of personnel and time provided in the contract.

2. Design Services During Construction Period

Services under this heading include:

- a. Preparation and development of any additional clarifying details to the official contract plans and specifications required for the completion of the work.
- b. Study, development of, and recommendation of changes required by BADC or changes suggested by the Consultant or the contractors, all due to unforeseen conditions and/or convenience of work at the sites, and preparation of change orders to authorize agreed changes, including cost estimate and construction time. If major changes (not caused by unforeseen site conditions and/or convenience of work) requiring design due to changes in design concept are proposed by the contractors or BADC, then study, development and recommendations on such changes shall be performed by the Consultant and shall be reimbursed under the provision of this contract.
- c. Interpreting drawings and specifications.

3. Site Inspection

Services under this heading will include furnishing qualified personnel, in accordance with schedule of personnel (or as modified) to accomplish the following :

- a. Conduct on-site observation of the work in progress as a basis for determining that the project is proceeding in accordance with the contract documents.
- b. Issue necessary instructions to the contractors for and on behalf of BADC, to assure orderly progress of the work. This includes approval of work schedules.
- c. Perform measurements in connection with the preparation of provisional and final payment certificates. It is necessary that a joint survey by the Consultant and contractor be made to clarify actual measurements and certify work completed for progress payment. The detailed measurement of works shall be submitted to BADC and USAID along with certificate for final payment to the contractor.
- d. Prepare payment documents, audit and Consultant's certification on behalf of BADC of such documents in accordance with accepted standards and requirements.
- e. Report to BADC upon acceptability of the work at provisional and at final acceptance stages. Deliver to BADC Maintenance Certificate(s) signed by the Consultant stating that the works have been completed and have or have not been maintained to the Consultant's satisfaction.
- f. Prepare drawings necessary for the acquisition of land and buildings on planned sites.
- g. Check and approve samples, schedules, reports of materials, and other data which the contractors are required to submit for compliance with the information given by the contract documents.
- h. The Consultant will provide as reimbursable cost items basic soils and materials testing equipment for use by the Consultant in accomplishing the necessary field tests.
- i. The Consultant will conduct laboratory tests as required. If the tests cannot be performed in the field, the Consultant will arrange for testing elsewhere for which the Consultant will be reimbursed under this contract.
- j. Approve the quantity and quality of equipment and materials delivered by the contractors to the sites.
- k. Inspect and accept or reject work in place and require replacement of defective work or materials by the contractors.
- l. The Consultant shall have the right to object to the contractors techniques and methods of construction, sequence of construction, size and composition of work force, and rate of progress, to the extent that those affect compliance with the drawings and specifications, or the quality, completion or cost of the work.

m. In measuring, valuing or certifying, the Consultant is intended to act not as arbitrator but as an engineer acts, by his skill and from his knowledge of the facts. The Consultant shall at all times be considered to be aware of all facts necessary for him to form his own opinions, make his measurements or valuations, give his decisions and orders, make his requisitions, or give or refuse his certificate.

BANGLADESH AGRICULTURAL DEVELOPMENT CORPORATION
 CONSTRUCTION OF BAGGED PRODUCT FERTILIZER WAREHOUSES PHASE-III
ORGANIZATION CHART

