SURVEY OF BANGLADESH

THE PEOPLE'S REPUBLIC OF BANGLADESH

NO 1

BASIC DESIGN STUDY REPORT ON THE PROJECT FOR ESTABLISHMENT OF CARTOGRAPHIC CENTER UNDER SURVEY OF BANGLADESH IN THE PEOPLE'S REPUBLIC OF BANGLADESH

JANUARY 1999

JAPAN INTERNATIONAL COOPERATION AGENCY

ASIA AIR SURVEY CO., LTD

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PREFACE

In response to a request from the Government of the People's Republic of Bangladesh, the Government of Japan decided to conduct a basic design study on the Project for Establishment of Cartographic Center under Survey of Bangladesh and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Bangladesh a study team from July 13 to August 12, 1998.

The team held discussions with the officials concerned of the Government of Bangladesh, and conducted a field study at the study area. After the team returned to Japan, further studies were made. Then, a mission was sent to Bangladesh in order to discuss a draft basic design, and as this result, the present report was finalized.

I hope that this report will contribute to the promotion of the Project and to the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of the People's Republic of Bangladesh for their close cooperation extended to the teams.

January, 1999

Kimio Fujita
President
Japan International Cooperation Agency

January, 1999

Letter of Transmittal

We are pleased to submit to you the basic design report on the Project for Establishment of Cartographic Center under Survey of Bangladesh in the People's Republic of Bangladesh.

This study was conducted by Asia Air Survey Co., Ltd., under a contract to JICA, during the period from July 6, 1998 to January 25, 1999. In conducting the study, we have examined the feasibility and rationale of the project with due consideration to the present situation of Bangladesh and formulated the most appropriate basic design for the project under Japan's grant aid scheme.

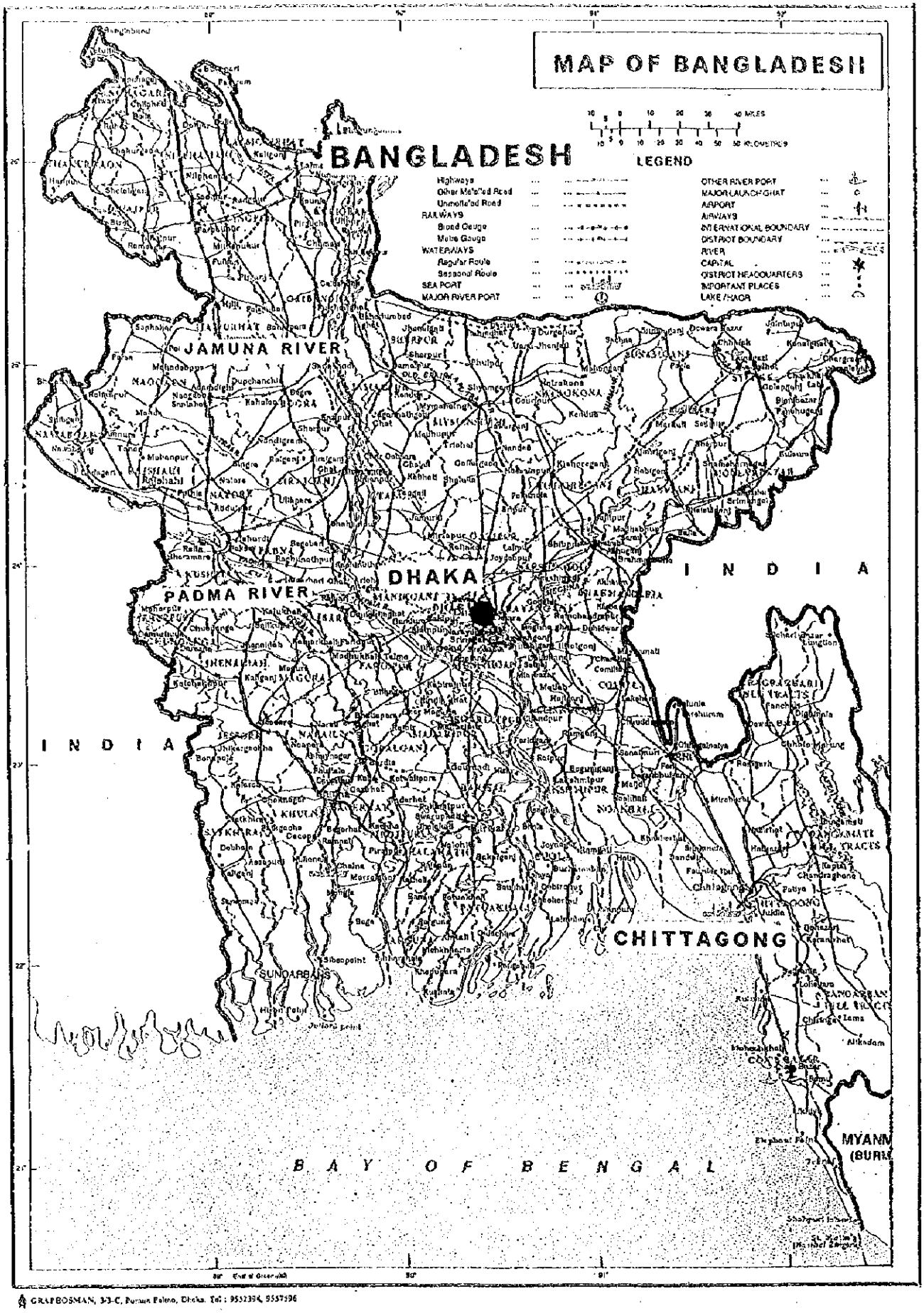
Finally, we hope that this report will contribute to further promotion of the project.

Very truly yours,

Terutisa Niihara
Project manager,
Basic design study team on
the Project for Establishment
of Cartographic Center under
Survey of Bangladesh,
Asia Air Survey Co., Ltd.

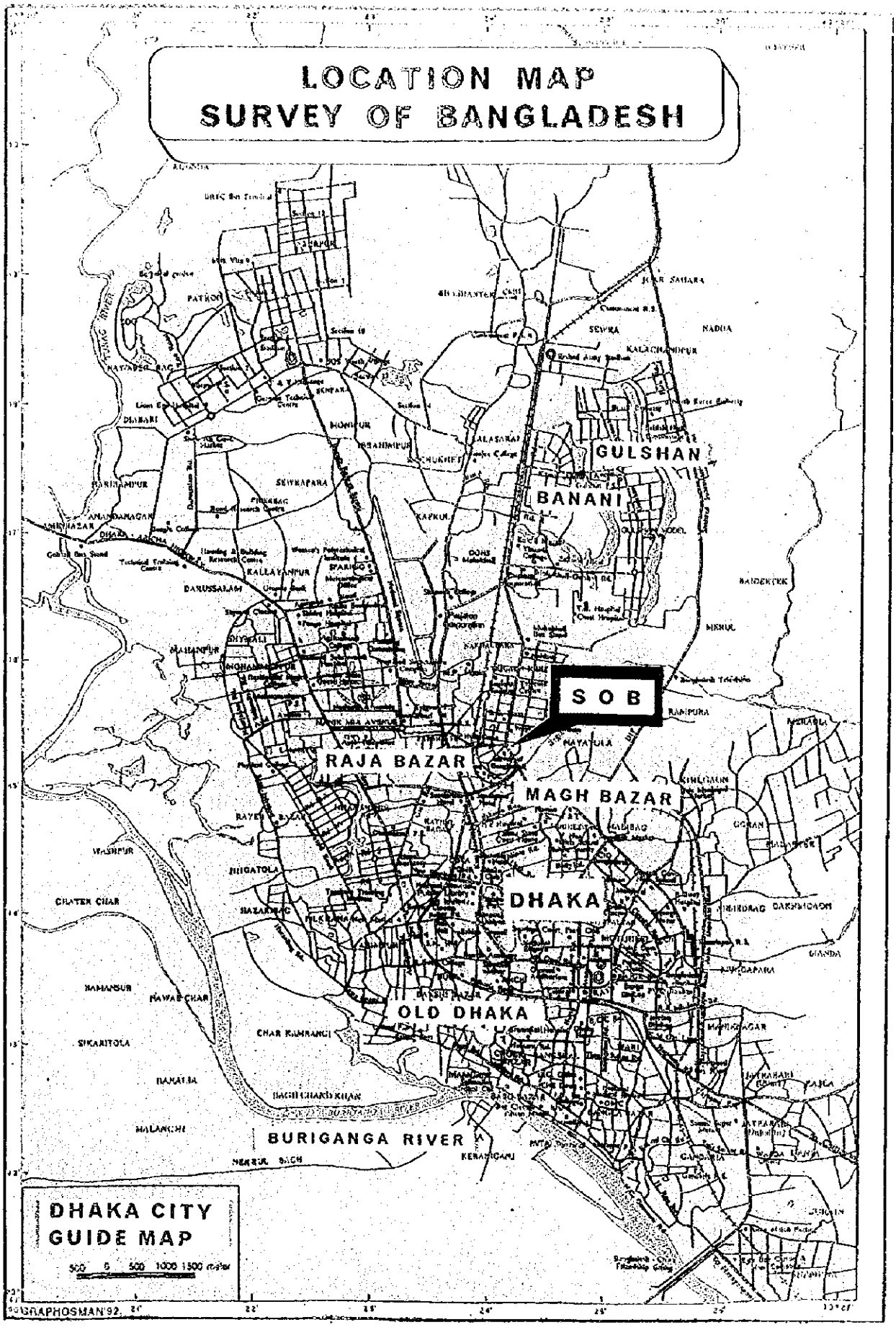
Abbreviation

SOB	: Survey of Bangladesh
GPS	: Global Positioning System
GIS	: Geographic Information System
LPO	: Litho-graphic Printing Office
ADP	: Annual Development Plan
FINNMAP	: FINNMAP Fm·International (financed by the commission of EU)
IGN	: IGN France International, Institute Geographique National
ERD	: Economic Relations Division, Ministry of Finance
IWTA	: Inland Water Transport Authority, Ministry of Transport
CPA	: Chittagong Port Authority, Ministry of Shipping
DLRS	: Directorate of Land Records & Surveys, Ministry of Land
LGED	: Local Government Engineering Department
E/N	: Exchange of Notes
A/P	: Authorization to Pay
B/A	: Banking Arrangement

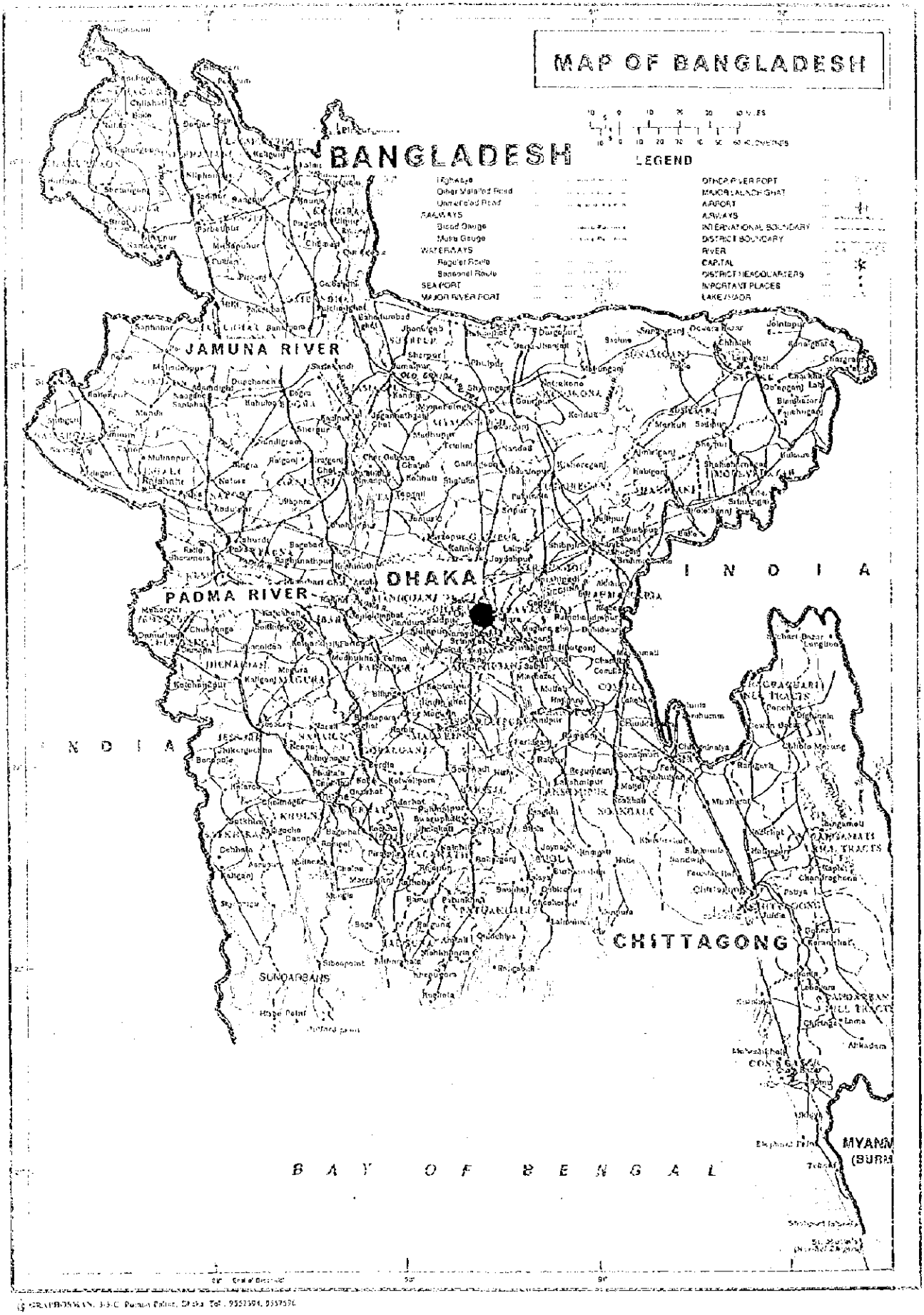


GRAPHOSMAN, 3-3-C, Purana Paltan, Dhaka. Tel : 9552394, 9557596

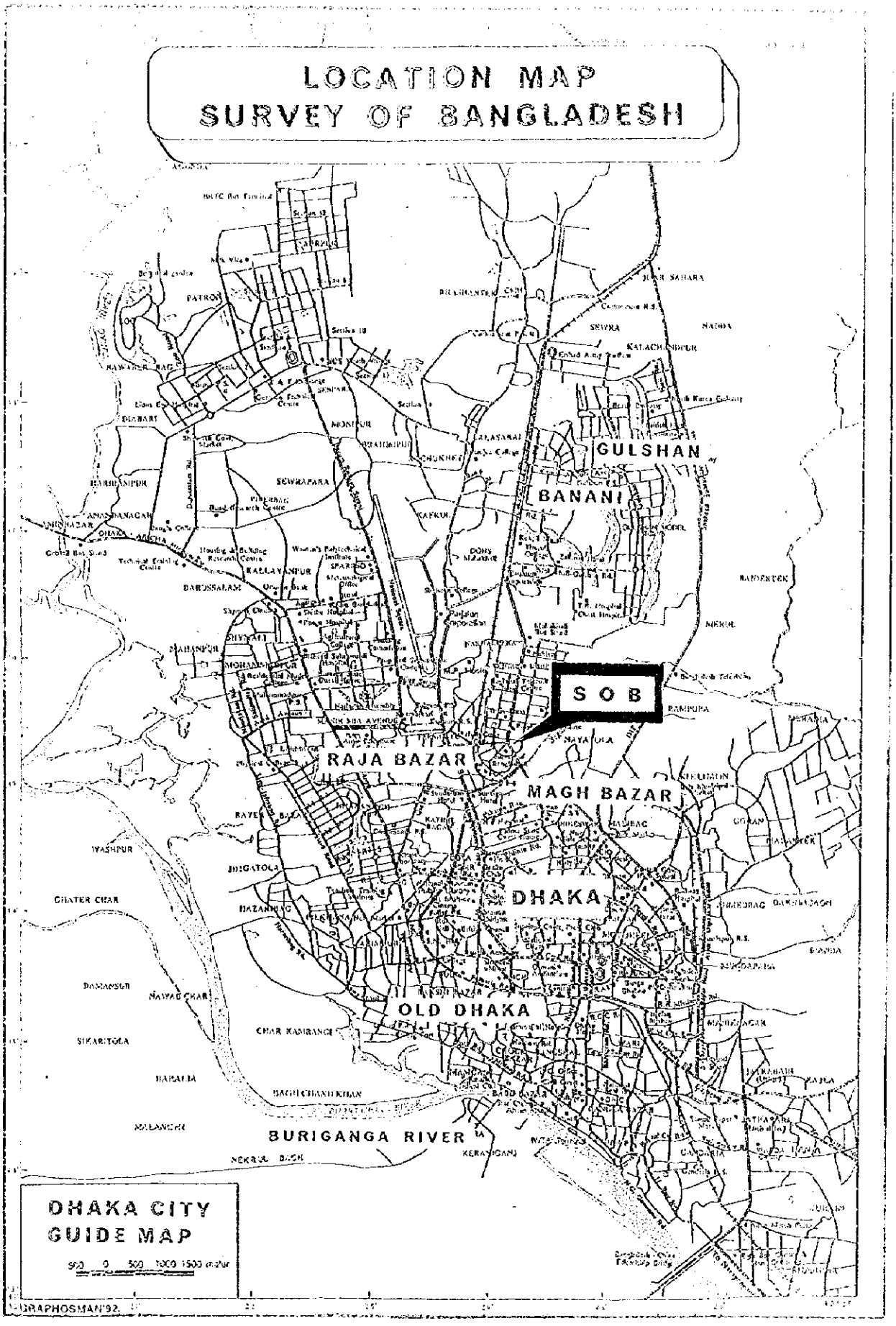
Location Map 1



Location Map 2



Location Map 1



Location Map 2

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Chapter 1

Background of the Project

Chapter 1 Background of the Project

1-1 Details of the request

As a consequence of Bangladesh's becoming an independent state in 1971, Survey of Bangladesh (herein-after referred to as "SOB") also became independent from being a local organization of Survey of Pakistan. Since then, attempts were made to gradually strengthen the organizational structure but improvement has scarcely been made in organizational function to this day because of the delay in introduction of new technologies and insufficient equipment.

Geodetic control points were established by Survey of India at the beginning of 19th century. However, because the control point survey was conducted using triangulation chains, their placement is not uniform and leaves voids especially in the northwest and northeast parts. Voids are also found in the southeast part. The control points have received insufficient maintenance since their establishment, and they have undergone natural and artificial changes. Therefore, some control points and bench marks are lost and many of the existing ones suffer deterioration in precision.

When Bangladesh became independent in 1971, both of its horizontal datum and vertical datum were left inside the state of India. Since then, its geodetic control point network has never had its own datum. This has been a considerable hindrance to the preparation of topographic maps and various engineering works in this country. Thus, the Government of Bangladesh made a request to Japan for technical cooperation in conducting study on a national control point network improvement.

In response to this request, the Government of Japan conducted a development study of "The Study on the Geodetic Survey in Bangladesh" in the period from 1992 to 1995, and made a survey over an area covering the northern two thirds of the territory as follows.

1) Improvement of national geodetic control point network
   - ① Monumentation and observation of control points using GPS (141 points)
   - ② Restoration of horizontal datum (1 unit)
   - ③ Monumentation and observation of bench marks(465 points, 2,386 km)
   - ④ Construction of the vertical datum and a housing facility(1 set, 1suite)
   - ⑤ Construction of tidal stations (1 standard station and 1 auxiliary)

⑥ Tidal observation (determination of mean sea level, 1 set)

2) Technology transfer

Through the conduct of this survey, technology transfer was effected in such fields as control point survey, leveling, tidal observation, determination of mean sea level including the training program in Japan.

Having obtained this technical cooperation, SOB is planning to make an improvement in the remaining area for itself. However, SOB has not been able to conduct this because of its functional inadequacy and the fact is that the results of the development study have not been made efficient use of. The printing and process equipment for preparation of topographic maps also is insufficient and superannuated. In such a situation, it is impossible to accommodate the demand for maps necessary for various development projects.

Under these circumstances, the Government of Bangladesh made a request to Japan in October 1997 for a grant aid with the aim of improving the basic function of SOB and for the procurement of printing and process equipment and GPS survey instruments.

1-2 Outline of the request

(1) Modifications from the initial request

According to the initial request, contents for cartographic center contained three components: printing machine, reproduction equipment and GPS & accessories. At the beginning of the field survey, since there were some ambiguities about the types, specifications and quantities of the requested equipment, inquiries from the Japanese side were made to the SOB for confirmation. And the SOB expressed that the Japanese side would prepare and propose a plan for necessary equipment based on the present conditions of the SOB.

In this Project, large differences will arise according to technology levels at which the mapping processes are set. That is, the process camera requested by SOB lags behind the current global trend, and was replaced about 10 years ago by the scanner method, which processes map information by computer. About 3 years ago, major manufacturers in the world ceased producing this type of cameras. After discussing

this point, SOB claimed:

① Because of their current personnel placement and budget, they cannot take a distinct course in the future.

② Digital mapping equipment and the GIS system using a computer and involving the newest mapping technology was already installed in June of this year by the Institute Geographique National (IGN) of France, and is now currently at technical training.

③ Therefore, for the time being, they want to perform effective mapping using the conventional method centering around an analog camera.

The study team also decided that employment of the latest mapping and printing technology centering around computers would be problematic in maintenance costs, as far as the current status of the SOB is concerned, and decided to examine it according to the initial request.

The study team followed the (2) "Reasons for modifications" below to prepare a modification draft, conferred with SOB, and reached a mutual agreement. The contents of the initial and corresponding modified requests are as follows (excluding added contents in the modified request):

Table 1-1 Comparison of the contents of the initial and modified request

Item	The initial request	The modified request
1) Offset Printing Equipment		
① Offset Press (4-color)	2 units	(2-color) 2 units
② Offset Press (mono-color)	1 unit	0 unit
③ Offset Proof Press	4 units	1 unit
④ Paper Counter	1 unit	0 unit
2) Offset Process Equipment		
① Process Camera	2 units	1 unit
② Film Processor	2 units	1 unit
③ Contact Printer	2 units	1 unit
④ PS-plate Printer	2 units	1 unit
⑤ PS-plate Processor	1 unit	1 unit
⑥ Photo Copier (color)	1 unit	0 unit
⑦ Photo Copier (mono-color)	1 unit	0 unit

3) Survey Equipment		
① GPS Receiver	9 units	6 units
② Micro Computer	6 units	2 units
③ Digital Level	3 units	2 units
④ Total Station	3 units	2 units
⑤ Tidal Gauge	2 units	0 units
⑥ Transceiver	10 units	7 units

(2) Reasons for and details of modifications

Reasons for the modified draft are as follows:

1) A total of three printing presses, two offset (multicolor, specifically 4-color) presses and one (mono-color) offset press, were requested. However:

① Judging from present throughput at the SOB (1000 to 2000 sheets per day) and capability of the 2-color press, the printing capacity will be sufficient even if there is considerable increase in printing demand in the future.

② In the pressroom where the new machines are to be placed, there is a 2-color printing press currently in operation as well as two presses out of order. The room floor is considered to be able to endure a considerable load. However, the 4-color printing press weighs more than 40 tons, and its accommodation seems difficult.

For these reasons, two 2-color offset presses shall be introduced.

2) Four proof presses and one paper counter were requested for printing equipment.

① As stated in ① of 1), two or more proof presses do not seem necessary even if map printing demand at the SOB considerably increases in the future.

② Proof presses are mainly used for printing a small number of copies, but recent throughput has become very high.

③ The number of sheets printed at the SOB will probably not be large enough in the future for a paper counter to be needed.

For these reasons, one proof press shall be introduced.

3) Two units each of a process camera, film processor, contact printer and PS-plate printer and one PS-plate processor unit, were requested. Similar to above, a decision was made from the throughput of recent printing equipment, and one unit

shall be introduced for each of these.

4) One (color) copier and one (mono-color) copier were requested for plate making equipment. However:

① Since large size copiers lack stability in performance, repair and cleaning is necessary several times a month, which is not available in Dhaka.

② The selenium drum and charging wire form the nucleus of a copier but deteriorate remarkably with time. Also problems are expected in high temperatures and humidity.

Because of these reasons, the introduction of such equipment is inappropriate from a maintenance point of view.

5) There is currently no control net for surveying equipment (excluding tidal gauges) in one third of the area. A conference was held with SOB over necessary network preparation time in such regions, with a term of two years established. From this 6 GPS units , 2 personal computer units, 2 digital level units, 2 total station units, and 7 transceiver units were decided to be introduced.

6) The necessity of tidal gauges of the surveying equipment does not agree with this project objective because leveling data, necessary for preparing a control net, has already been prepared by the development survey. Therefore, the introduction of these gauges is inappropriate.

(3) Addition to the request

As the facilities for installing this project equipment need to be repaired, it was decided that this work should be conducted at the expense of Bangladesh side. However, the SOB strongly requested that air conditioning costs be borne by Japan. The study team considered the fact that most equipment in this project has precise construction, important for ensuring mapping precision. Success of this project would be endangered if no air conditioning facilities were installed by the SOB after the project is implemented. Therefore, the study team decided that air conditioning costs be borne by Japan, adding to the request.

(4) Contents of the final request

The final modified request is summarized as follows.

Table 1-2 Contents of the final request

Item	Quantity
1) Offset Printing Equipment	
① Offset Press (2-color)	2 units
② Offset Proof Press	1 unit
2) Offset Process Equipment	
① Process Camera	1 unit
② Film Processor	1 unit
③ Contact Printer	1 unit
④ PS-plate Printer	1 unit
⑤ PS-plate Processor	1 unit
3) Survey Equipment	
① GPS Receiver	6 units
② Micro Computer	2 units
③ Digital Level	2 units
④ Total Station	2 units
⑤ Transceiver	7 units
4) Auxiliary Equipment	
① Air-conditioner for Printing Room	1 set
② Air-conditioner for Instruments Room of Survey Equipment and Materials	1 set

Chapter 2

Contents of the Project

Chapter 2 Contents of the Project

2-1 Objectives of the Project

At present, the fifth five year plan (period 1997/98 -- 2001/02) of the national development plan is underway in Bangladesh. Its development goals include alleviation of poverty, generation of substantial employment opportunity and increase in productivity, improvement in the quality of life of the rural population, attainment of higher food production, human resources development, and development of necessary infrastructure and industries. However, national basic map such as topographical map as the foundation of national development, has not been completed due to insufficiency of capacity of the SOB. Moreover, as for geodetic control point network as the foundation of national basic mapping, the area of two thirds of national land were completed by the development study of Japan's technical cooperation. However, the remaining area has not been completed because of lack of survey equipment at SOB, and national basic map of the area cannot be prepared yet.

Therefore, the objective of the Project is to improve and strengthen the SOB's basic function as the organization with responsibility for mapping and managing maps through supply of printing and survey equipment.

2-2 Basic Concept of the Project

(1) Basic Concept

Evaluating the SOB's operation, maintenance, and management capacity based on the current status of their equipment and the technical standards of engineers, it is important to plan installation of new equipment that is easy to operate and maintain and meets the purposes satisfactory.

The requested equipment can be classified into four major categories, offset printing equipment, offset process equipment, survey equipment, and other equipment (auxiliary equipment). Plans for these categories of equipment will be prepared based on the following basic concept:

1) Offset printing equipment

Efficient and effective equipment must be considered because the SOB's current production efficiency is low due to use of old and obsolete equipment and also because map printing requires special features and functions. Emphasis will be placed on the following points.

① Printing capacity to meet existing and future demand.
② Required high detail of map printing.
③ Function to frequent power stoppage.
④ Technical level of the personnel concerned in the SOB.

Especially, type of printing equipment should be studied as follows based on the above points.

Since major maps are printed in 8 to 10 or more colors, a multi-color offset press is far more efficient than a single-color offset press. It can also prevent "color shear" attributed to shrinkage and elongation of paper over elapse of time. The request of SOB, therefore, was for a 4-color offset press. However, the necessity for a 4-color press is low in view of the SOB's printing volume both at present and in future. It is apprehended that the building cannot bear the weight (40 - 45 tons per press) of a 4-color press. Therefore, 2-color offset press will be introduced.

2) Offset process equipment

As for study of offset process equipment, the following two points should be considered as the basic concept:

①An enormous quantity of data accumulated in Bangladesh can be used for producing high quality diverse maps that will contribute to Bangladesh's development.

②Other maps that are produced with the equipment and system provided under the French IGN project can be incorporated in the printing stage.

Based on the above basic concept, process equipment will be studied as follows.

The recent trend in an offset process is electronic color scanner technology requiring no process camera. However, the camera method will be selected because the SOB is not technologically ready to introduce the electronic scanning method and a process camera is easy to operate, maintain, and manage.

For other offset process equipment, equipment meeting the conditions of easy routine maintenance and inspection and high quality images will be studied.

3) Survey equipment

A country's geodetic control point network should be constructed uniformly and to the same accuracy for the whole of the country's territory.

Survey equipment is used mainly for surveying geodetic control points in the areas that were

not surveyed during the precision geodetic control point survey project implemented with Japan's technical cooperation. Therefore, precision equivalent to the previous survey result must be accomplished. Therefore, equipment meeting two conditions must be studied, namely, the precision is equivalent to the result of the Japanese technical cooperation project and operation, maintenance, and management in Bangladesh are easy.

4) Auxiliary equipment

Bangladesh's meteorological conditions are characterized by high temperature throughout a year and extremely high humidity especially during the rainy season. Since equipment used for printing maps require maintenance of advanced and high precision functions, an air-conditioner is essential.

Survey equipment is used only during the dry season that lasts for about six months. It is stored during the rainy season of high temperature and high humidity. Since all survey equipment units have built-in electronic devices, a storage room with an air-conditioner is necessary to store them. The minimum essential storage room is to be studied.

Bangladesh is responsible for the cost of removing current equipment and remodelling the building needed to install new equipment. The equipment layout is to be planned in such a way as to minimize the remodelling work and raise the efficiency of air-conditioner operation. Printing related equipment has many precision parts and some are quite heavy, ranging from 500 kg to 20 ton. The foundation structure of building should be designed to have sufficient strength to support main equipment weight.

(2) Study of the request

1) Offset printing equipment

① 2-color offset press

A 2-color offset press is key equipment for map production. Maps can never be produced efficiently with cheaper cost using an offset press for the offset process regardless of whether they are produced by printing an enormous volume of existing negative films from partly corrected originals or they are printed using originals produced with the graphic equipment of the IGN project.

The following conclusion was reached as a result of studying the required number of presses:

i) Printing capacity of the 2- color offset printing press

(a) Printing capacity estimation conditions (2-color offset press)

a) Preparatory work (Washing and exchanging ink): 1 hour

- Ink washing: approx. 20 minutes
- Exchange of PS-plate: approx. 20 minutes
- Ink setting, and test operation and printing: approx. 20 minutes

b) Printing: approx. 10 minutes for 1revolution (2 colors)

(Printing speed; in case of 12,000 SPH, Total; 2,000 revolution / 10 min.; 2,000 sheets)

c) Ink drying: approx. 2 hours (in case of air conditioner working)

d) Number of colors: 10 colors (in case of geographical map with a scale of 1/50,000)

e) Working hours: 9:00 – 17:00 (lunch time; 1 hour)

f) Printing operation days per a year:

5 days×52 weeks−14 national holidays−12 days (periodic inspection) = 234 days

h) Operating rate: The rate at the SOB's printing office is estimated to be about 60% in consideration of adjustment required for preventing a shear, and about 1-hour power failure per day on an average, and other troubles (such as paper jamming)

i) Printing efficiency: Considering preparatory work and printing time etc. as mentioned above, one unit of 2-color offset press can print 2 colors in 70 minutes, and also print 12 colors in 420 minutes of working hour a day (420 min.÷70 min.×2 colors = 12 colors). Therefore, it is possible to print 1.2 maps with 12colors a day.

(b) Printing capacity (Number of map)

- 1.2 / a day×234×0.6×2 units=337 originals / a year

ii) Demand for printing

(a) SOB's plan

- Updating map: Mapping every five years.
- For general use: Selling map of 1:50,000 scale removed grid lines.
- New map: Producing and printing new maps such as map of 1:25,000.
- Reprinting: Printing additional copies of maps whose stock runs out

Table 2-2-1 Annual Printing Plan of SOB (unit: number of originals)

Type of Map	Alteration		New	Reprinting	Total
	Updating	Un-gridded			
1:50,000(267 originals)	54	90	15	20	179
1:25,000(1,000 originals)	20		50	20	90
1:250,000(27 originals)	5		2	8	15
Other map	20		5	20	45
Total	99	90	72	68	329

(b) Demand from external organizations

	Number of originals after conversion into 10 color map
a) Request by villages for land record office (mono-color) (Annual plan: 8000 originals)	800 originals
b) Request by Fin Map Project (4 – 6 colors) (Annual plan: 200 originals)	100
c) Request by IWTA (chart) (3 – 4 colors: printing on both sides) (Annual plan: 10 originals×2)	8
d) Request by Meteorological Agency (3 – 4 colors: printing on both sides) (Annual plan: 10 originals×2)	8
e) Request by various projects (average 6 colors) (Annual plan: 50 originals)	30
	Total 946 originals

iii) Relation of printing capacity and demand

Annual demand for printing map within SOB is about 330 originals, and also annual demand by external organizations is about 940 originals after conversion to 10 color map as mentioned in ii). Combining the demands both, the total printing demand is annually about 1,270 originals. The printing capacity for 2 units of 2-color offset press is 337 originals as mentioned in i). Therefore, the printing capacity to meet the total demand is 27 % only in case of 2 units.

As the result of the above study, the required number of 2-color offset press is two units. However, according to the political judgement of Ministry of Foreign affairs, the Project will be planned under the condition that its number is one unit.

② Offset proof press

Since originals used for map production are negative films, printout images cannot be judged without printing them with a proof press. An offset proof press is essential to examining the finish of maps produced from negative films which will account for most of maps produced by the SOB for the immediate future.

The currently installed proof presses will operate for several more years, but all of them are old and obsolete. The efficiency is very low because they are of the manual type. Since the electric proof press has far higher efficiency than the currently installed proof presses, one new proof press will be sufficient in view of the SOB's current volume of work. The demand for printing maps produced using the system provided by the French IGN will increase, but

an offset proof press need not be used for them because proofing is completed in the stage of an original. They can be printed directly on a press. Therefore, the frequency of using the new offset proof press will become lower than now even if the current proof presses become too old to repair in future.

For this reason, it is judged that one offset proof press is sufficient.

2) Offset process equipment

① Process camera

A process camera plays the role of an origin for producing PS-plates used for printing with an offset press. In view of the SOB's technical level and the current staff availability, a process camera will be major equipment for map production by the SOB approximately for the next ten years.

The photographing capacity of a process camera is approximately as follows:

- Setting and vacuum contact of original: approx. 10 minutes
- Setting and taking out film: approx. 3 minutes
- Photograph preparation and photograph: approx. 2 minutes
- Total: approx. 15minutes

In consideration of some loss time, the capability of a process camera is 4 photographs per hour, about 25 photographs per day on an average, or about 5,000 - 6,500 photographs per year. According to the printing plan, the number of form plate that must be produced is about 7,000 per year as shown below. Therefore, one process camera will not be enough.

- For 2-color Offset Press: approx. 330 originals×(mean) 10 sheets = 3,300 sheets
- For existing Press: approx. 60 originals×(mean) sheets = 360 sheets
- For Proof Press: 15 sheets/a day×234 days/a year = 3,510 sheets
- Total: 7,710 sheets

The currently used American camera was introduced in 1966 and has become quite obsolete, but it can be used for 5 - 6 more years. Since SOB plans to continue to use this camera, two cameras (one new and one old) will meet the needs for the immediate future.

It is expected that the quantity of originals produced with the system provided by French IGN will increase considerably when the currently used camera becomes too old to repair. In that stage, one process camera will be sufficient to meet the demand.

② Film processor

Currently, films are developed manually in a dark room. Developing large films such as original plates for maps is said to be difficult even for experienced skilled workers. Therefore, automatic and uniform film development can be realized by combining a film processor with a new process camera. The efficiency of work will considerably be increased.

Since film developing is a part of a series of operations in a dark room, "Photographing - Developing - Contact printing (Reversal printing) - Developing," it cannot be separated from a dark room. The dark room for the currently used process camera has a sturdy and sufficiently large sink for "manual development." "Manual development" requires a very high level of skill especially for large films. The SOB's Litho-graphic Printing Office (LPO) has some skilled workers for this work. Therefore, photographing and developing of relatively small films can be accomplished using the currently used camera and manual development by skilled workers. One processor is necessary for the new process camera to be introduced anew. Since the processing capacity of a film processor is 12 films/hour on an average or about 70 films/day even consideration of time loss for film insertion, one film processor is sufficient for the new process camera.

③ Contact printer

Films that are developed using the above film processor are usually negative films. A contact printer has a function for printing a negative film into a positive film after completely correcting pin holes (opaquing).

Like a film processor, a contact printer is used in a perfect dark room for a camera. One contact printer is always required for one camera. Since the current contact printer was installed in 1992 and can still be used, it will be appropriate to use it for the currently used camera. One contact printer will be sufficient for the new camera.

④ PS-plate printer

A PS-plate printer prints an image of a plate printed with a contact printer on a PS-plate, which is a press plate for offset printing. At present, the SOB has one Japanese-made machine of a new type introduced in 1993 (metal halide lamp - 3 kw) and one manual printing frame using an arc lamp installed more than 40 years ago. Spending a lot of time and labor with a use of the arc lamp printing frame, the SOB's skilled workers currently produce press plates using reproduced aluminum plates. However, the printing frame has become very old and obsolete and its useful life is coming to an end. Therefore, one PS-plate printer is to be introduced to replace the arc lamp printing frame.

According to the SOB's printing plan, they need to print about 7,200 PS-plates per year,

which means about 30 - 31 PS-plates per day. The capacity of one PS-plate printer is about 3 plates per hour, or about 18 - 20 plates per day as shown below.

- Vacuum contact: approx. 15 minutes
- Exposure: approx. 3 minutes
- Replacement of PS-plate: approx. 2 minutes
- Total: approx. 20 minutes

Therefore, two PS-plate printers are required for processing about 30 plates daily. Since the existing PS-plate printer was installed in 1993 and can be used for nearly about ten more years under ordinary conditions, one additional PS-plate printer will be enough for the SOB's current printing demand.

⑤ PS-plate processor

At present, the SOB develops PS-plates by "manual work." A PS-plate processor will greatly contribute to increasing the efficiency of work and the quality of precision for maps requiring high precision printing. Therefore, it is judged that one PS-plate processor is essential. Since a PS-plate processor has extremely high processing capacity, about 20 - 30 plates per hour, one processor will be sufficient even when the number of other equipment is increased in future.

3) Survey equipment

① GPS receiver

A Global Positioning System (GPS) operates by the following principle. After GPS receivers simultaneously receive radio wave from four or more GPS satellites, the base-line vector (distance and direction) between receivers is obtained by base-line analysis calculation. Since GPS surveying has merits such as no visibility requirement between receivers, great tolerance against weather conditions, 24-hour and long-distance surveying performance, shortness of surveying time, of high accuracy result, economic effect etc., it has been adopted in the world from 5,6 years before.

One GPS surveying team consists at least of three receivers. Generally, the efficiency of work becomes higher as the number of receivers increases. For example, a 3-receiver team, a 4-receiver team, and a 5-receiver team can survey one point, two points, and 3 points by one operation, respectively. The configuration must be determined based on cost versus effect and technological competence because the required number of engineers and instruments increases as the number of receivers per team increases.

In Bangladesh, no geodetic control point network has been completed in a southern area

covering about 49,000 km^2. The SOB has a desire to complete a geodetic network in this area as soon as possible. About twenty engineers are required to complete it in one year. SOB's geodetic department currently has thirteen surveyors including seven engineers. Although the engineers have know-how of geodetic control point surveying and experienced GPS surveying during the development study, none of them has attained high skill. GPS surveying requires one engineer per receiver and additional engineers are required for levelling explained later. Therefore, the SOB can organize one GPS team in the current state of personnel availability.

About 80 - 90 geodetic control points must be set to complete a control point network in this area. Since most of the coastal area has elevation ranging from 0 to 5 meters, and includes a jungle zone, outdoor work cannot be performed during the rainy season (April - October). Ferryboats must be used to cross rivers because of poor road conditions (especially bridges).

In view of the above circumstances, it is impossible to complete the network in one year and it will take at least two years. Therefore, it should be planned to complete the geodetic control point network in two years, covering about 40 points per year. The work consists of planning, point selection, mark burying, observation, and data calculation and processing. Observation work must be completed within three months to complete the field work, from point selection to observation, during the 6-month dry season.

One process of one observation team consists of moving, preparations for observation, observation (including observation for bench mark point installation), and clearance. Adding factors such as poor weather conditions and holidays to the above work, it is estimated that SOB need to spend seven days per process on an average. The total number of processes must not exceed 12 (90/7) to complete the observation in 90 days. This requires a team configuration that is capable of observing four points by one process. At least six GPS receivers (observation sets) are required to accomplish this.

Based on the above study, it is concluded that at least six GPS receivers are necessary to implement this plan.

② Micro computer

Staff at a survey site are responsible for calculating base-line vector from data received with GPS receivers and checking observation accuracy. A survey office is responsible for network adjustment of levelling besides 3-dimensional net adjustment to produce survey result tables. Therefore, easy-to-carry notebook type personal computers (hereafter referred to as PC) are desirable.

Since this plan is conducted by one GPS observation team, two PCs, one for the field and one for the office, are required.

③ Digital level

A digital level, which is used for levelling, has a function for automatically observing the division on a bar code levelling rod.

In Bangladesh, the area lacking bench mark points is identical with the area lacking geodetic control points. It is estimated that about 160 new bench mark points of route length of about 800 km must be set to complete a level net. Since the objective of this survey is to determine the altitudes of both bench mark points and GPS control points, levelling must be conducted simultaneously with the GPS survey. A route of 400 km must be covered in one year to complete the level net in two years. At least two digital levels are necessary for completing the observation work in three months.

④ Total station

A total station is a digital surveying equipment with both angle and distance measuring functions.

A total station is used for GPS eccentricity observation during this project. Eccentricity observation is applied to observation points where radio wave cannot be received due to nearby buildings or trees. Therefore, since one total station will be used for three GPS receivers, two units are necessary at the lowest.

⑤ Transceiver

Since GPS observation requires simultaneous observation with all the GPS receivers, transceivers must be used for communications between receivers. In other words, one transceiver is required for each GPS receiver. Reliable communications between receivers can be assured to eliminate work loss by installing one transceiver covering all the survey points at the center of the survey area. Therefore, at least seven transceivers are necessary for this project.

4) Auxiliary equipment

① Air-conditioner for printing room

Most of printing equipment consists of precision devices. In Bangladesh with high temperature and high humidity weather, air-conditioning is essential to protect computers, photographing films, and developers and to prevent elongation of printing paper. Since even

slight elongation or shrinkage of printing paper causes a shear in printing maps requiring high precision, printing paper must be stored in a room with the same temperature and humidity conditions as a printing room even before printing. Therefore, a printing room with an air-conditioner must have enough space to keep fixed quantity of paper.

② Air-conditioner for storage room of survey equipment and materials

Most of survey equipment is used for observation work in the above work schedule table. Sine it is used only during the dry season even after this level net project, it must be stored indoors during the rainy season of about six months.

Since all of the survey equipment consists of precision electronic devices, its storage must have an air-conditioner to assure appropriate maintenance and management.

③ Photocopier

Correction work of topographical maps requires corrections within very small ranges and addition of information. Enlarging an original not only facilitates such work, but also assures high accuracy. Therefore, the enlarging and reducing functions of a photocopier are very useful for correcting topographical maps.

A photocopier for large-size paper, which was initially requested, was excluded because of great maintenance and management problems. If a A3-size photocopier is installed by local procurement, it will greatly contribute to map production work without presenting any maintenance problem because maintenance services are locally available.

2-3 Basic Design

2-3-1. Design Concept

1) Concept of natural conditions

Natural conditions in Bangladesh should be sufficiently considered. Of the natural conditions, especially the meteorological conditions (temperature and humidity) at the project site, Dacca, greatly influence printing and survey equipment which has precision structures. Equipment should be selected in consideration of this factor. And, also it is necessary to equip air-conditioners to rooms for installation and storage of equipment.

2) Concept of social conditions

Social conditions such as power, work site conditions including working hours, customs, and building conditions should be sufficiently considered. Especially, the local state of power

supply in Bangladesh should be considered to select equipment that is suited to the conditions of intentional power stoppage.

3) Concept of the SOB's operation and maintenance capability

The SOB's operation and maintenance capability for this Project should be sufficiently considered. Especially, based on the actual situation of the personnel and technological level, it is important to make sure that the project may be appropriate for the Bangladesh side.

4) Concept of scope and grade of equipment

The scope and grade of equipment must be determined in consideration of the following factors besides the relationship with existing equipment:

①Equipment and models that are suitable for local maintenance will be selected in consideration of the current circumstances in Bangladesh.

②Equipment that can be maintained, inspected, and repaired with locally available equipment and materials will be selected.

③The design should be streamlined and economical in view of the material and equipment availability and labor situations in Bangladesh.

5) Concept of project period

In Bangladesh, the rainy season lasts for seven months, from April until October, on an average. Floods occur in various places nationwide during this season. Since the inland and railway routes between Chittagong and Dhaka, which are inland routes for equipment transportation of this project, are susceptible to floods, smooth and safe transportation cannot be expected. Therefore, the project period should be planned so that inland transportation can be carried out during the dry season starting in November.

2-3-2 Basic Design

(1) Equipment plan

1) Offset printing equipment

① 2-color Offset Press (1 units)

The latest 2-color offset press (720 mm × 1030 mm) has very high printing speed. There are such presses as being able to print 15,000 sheets per hour at the maximum speed. However, it is desirable to select about 80% of the maximum speed from the viewpoint of paper quality and need for high-precision printing. A model of the highest level of automation is unsuitable due to frequent power failures and workers' skill level. Therefore, neither a full automatic ink supply system, nor automatic rinsing equipment for ink rollers and blankets,

currently used in Japan, will be adopted. Since the press is used for printing maps, it must be possible to adjust the printable range from small maps to the SOB's current map standards or higher.

In view of the above factors, an offset press model with at least the following functions and standards will be selected.

- Number of color: 2 colors
- Printing speed: (Max.) 10,000 SPH or more
- Sheet size: (Max.) 720×1,020mm or more
- Printing area: (Max.) 700×1,020mm
- Machine weight: under 20,000kg

As mentioned in (2) Study of the request under 1-2, the required number of 2-color offset press is two units, however the Project will be planned under the condition that its number is one unit according to the political judgement of Ministry of Foreign affairs.

② Offset Proof Press

An electric offset proof press planned for this project can attain very high efficiency. Other than the original object of an offset proof press, it can efficiently finish final products without using an offset press when the number of copies is extremely small for producing maps. In view of this usage, an offset proof press must be equivalent to the offset press model in both printable range and printing paper standards.

In view of the above usages, a model with at least the following functions will be selected.

- Printing size: (Max.) 1,030×730mm
- Paper size: (Max.) 1,060×760mm
- Plate size: (Max) 1,060× 770mm

2) Offset process equipment

① Process Camera (1 unit)

The camera method, not the scanner method, will be adopted for the offset process in view of SOB's current circumstances, the special nature (negative films are mostly used) of an offset process for map printing, and ease of operation, maintenance, and management after equipment installation, as described in the basic concept.

Since a camera has a problem of slight distortion in the peripheral parts due to the nature of a lens, the photographing size should be the A0 size, larger than original maps to be photographed.

- Photographing size: A0
- Lens: f = 610mm
  f = 1,210mm
- Size of originals: Reflection originals = 1,000×1,300mm
  Transparent originals = 900×1,200mm

② Film Processor (1 unit)

Films photographed with a process camera and films reversed with a contact printer must be developed.

Since a film processor and a camera are used in a pair, the former must have performance for processing large and small films photographed with the latter. For this reason, a model with at least the following functions is selected.

- Film size: (Width) 102—966mm
  (Length.) 125—30,500mm
- Developing time: 15 – 50 sec.
- Productivity: 60 sheets/ hour

③ Contact Printer (1 unit)

A contact printer is used in combination with a process camera and a film processor. Its dimensions and light source must be appropriate for films photographed with the camera. Moreover, it also requires low printing speed for diazo film. A model with at least the following functions is selected to meet these requirements.

- Effective printing size: 1,100×2,000mm
- Light source: Litho film = Tangsten lamp 100W×10
  Diazo film = Idlefin lamp 6kw×1
- Printing speed: 0 - 4 m/min.

④ PS-plate Printer (1 unit)

A PS-plate printer prints an image of a plate printed with a contact printer on a PS-plate. Its effective printing dimensions should be large enough to prevent nonuniformity in peripheral parts. It must have a vacuum contact function to prevent space formation between a PS-plate and the printing glass. Its exposure time must be variable to print maps varying in the number of color and line thinness. A model with at least the following functions is selected to meet these requirements.

- Effective printing size: 1,430×1,145mm
- Vacuum system: Vacuum pump with glass cover
- Vacuum pump: Piston type or Rotary type

- Exposure time: 0 - 999 sec.

⑤ PS-plate Processor (1 unit)

A PS-plate processor processes PS-plates that are printed with a PS-plate printer. Since a PS-plate processor and a PS-plate printer are used in a pair, the two must be functionally equivalent. A model with at least the following functions is selected because of the need to process PS-plates of the largest size and the need for efficient functions.

- Plate type: Positive PS-plate or Negative PS-plate
- Plate size: approx. Width = 254 - 850mm,
  Length = 311 - 1,130mm
  Thickness = 0.15 – 0.40mm
- Processing speed: 0.5 - 1.5m/min. variable
- Productivity: 70 sheets/hour at standard processing time

3) Survey equipment

① GPS Receiver (6 units)

Since the accuracy of GPS depends highly on ionosphere according to base-line, GPS receivers of 1-frequency model and 2-frequency model are available. Since a receiver of the 1-frequency model has no ionosphere compensation function, it is used when the base-line intervals are 10 km or less. Since a receiver of the 2-frequency model has an ionosphere compensation function, it is applied to base-line intervals over 10 km. Since the GPS receivers will be used for a 30 km network, the 2-frequency model must be selected.

A model with at least the following functions will be selected.

- Frequency: dual frequency
- Measurement accuracy:
  Static = 5mm + 1ppm× D (horizontal)
  10mm + 1ppm ×D (vertical)
- Receiver channels: L1band; 9 channels or more
  L2band; 9 channels or more
- Software: In English language and Windows 95 compatible
  Network adjustment
  Data downloading and transfer
  Survey data processing
- Antenna: L1/L2 Antenna

② Micro Computer (PC) (2 units)

Since PCs are used for processing GPS observation data, they are used mainly at the survey sites and the field survey offices. Therefore, easy-to-carry notebook type PCs are desirable. PCs of the following principal specifications will be selected in consideration of the usage.

- A4 size Notebook-type

- Memory: 32MB or more
- Hard disk: 3.2 GB or more
- Windows 95 (English version) or equivalent or better
- Printer: Compact Inkjet-printer (A4 size), 2 units
  Laser printer (A3 size), 1 unit

③ Digital Level (2 units)

Two models, one for precision levelling and the other for ordinary levelling, are available. Since the major usage is precision levelling for installing a national primary level net, a model with at least the following functions will be selected.

- Accuracy: 0.6mm/ km
- Staff: Bar coded invar staff of 3m length, 2 sets
  Bar coded fibre Glass staff of 4m length, 2 sets
- Data collector (English)
- Software: Data downloading and level network adjustment software in English
  Windows 95(English version) compatible

④ Total Station (2 units)

Total station is a digital surveying equipment with both angle and distance measuring functions. It is necessary for all kinds of survey, such as GPS eccentricity observation, small-scale control point survey, topographical survey, engineering survey though it is not used for levelling.

Since a total station is used for GPS eccentricity observation during this project, a model with at least the following functions will be selected.

- Angle measurement accuracy: 1 sec(horizontal and vertical) or less
- Distance measurement accuracy: (5mm + 5ppm × D) or better
- Software: Data down loading and traverse calculations
  English version
- Mirrors: 3 prisms 2 sets
  1 prism with pole 1 set

⑤ Transceiver (7 units)

Transceivers are used for communications during GPS observation. Since the average survey point interval of GPS observation is 30 km, transceivers operating in the frequency range permitted in Bangladesh and with transmission performance of at least 30 km must be selected. In view of these requirements, a model with at least the following functions will be selected.

- Communication mode: Simplex type
- Frequency band: 400 - 512MHz

- Power output: 30w and 5w
- Reach distance: over 30 km
- Antenna cable (30m)

4) Auxiliary equipment

① Air-conditioner for printing room (1 set)

Of the equipment to be installed in printing room [1] studied in "(1) Equipment layout plan", the offset presses (including the existing offset press) and printing paper require air-conditioning. Therefore, the room for them will be partitioned to the following dimensions and an air-conditioner will be planned.

All of the equipment and materials to be installed in printing room [2] require air-conditioning. Since this room is partitioned into three, an offset room, a dark room, and a bright room, air-conditioners will be installed in all of the three. The three rooms will have the following dimensions. (Refer to Figures 2-3-3 and 2-3-4.)

·Printing room [1]

Press room : 185m^2 (h=3.5m)

·Printing room [2]

PS-plate room: 45m^2 (h=3.5m)

Dark room : 53m^2 (h=3.5m)

Light room : 65m^2 (h=3.5m)

Automatic de-humidity and temperature control function

Wall mounted type

② Air-conditioner for instrument room of survey equipment and materials (1 set)

Since all of the survey equipment consists of precision electronic devices, its storage must have an air-conditioner. The instrument room may be small because the total quantity is not large. Therefore, one room of the following dimensions located on the second floor of the SOB's main building was selected out of all the existing small rooms to keep survey equipment and materials.

·Instrument room: 27m2 (h=3.5m)

Automatic de-humidity and temperature control function

Wall mounted type

Local procurement is planned for the air-conditioners of ① and ② because marketing, installation, maintenance, inspection, and repair services for air-conditioners are available in Bangladesh.

③ Photocopier

Local procurement is planned for an A3-size photocopier used for map correction work because marketing, maintenance, inspection, and repair services are available in Bangladesh.

- Monocolor
- Paper size: (Max.) A3
- Enlargement and reduction function: 50 - 200%

The specifications of equipment studied above are summarized in Table 2-3-1 - Table 2-3-4.

Table 2-3-1 Printing equipment

Item	Specification	Quantity
①2-color Offset Press	Type: Sheet fed Number of color: 2 colors Printing speed: (Max.) 10,000 SPH or more Sheet size: (Max.) 720×1,020mm or more Printing area: (Max.) 700×1,020mm Machine weight: under 20,000kg	1 unit
②Offset Proof Press	Type: Mono color Printing size: (Max.) 1,030×730mm Paper size: (Max.) 1,060×760mm Plate size: (Max.) 1,060×770mm	1 unit

Table 2-3-2 Offset process equipment

Item	Specification	Quantity
①Process Camera	Type: Overhead Type Photographing size: A0 Lens: f = 610mm f = 1,210mm Size of originals: Reflection originals = 1,000×1,300mm Transparent originals = 900×1,200mm	1 unit
②Film Processor	Type: Table top rapid access materials processor Film size: (Width) 102- 966mm (Length) 125-30,50mm Developing time: 15 -- 50 sec. Productivity: 60 sheets / hr	1 unit

③ Contact Printer	Type: Vacuum film printer for printing of High Sensitive (Litho film) or Low Sensitive(Diazo film) Effective printing size: 1,100×2,000mm Light source: Litho film = Tangsten lamp 100W×10 Diazo film = Idlefin lamp 6kw×1 Printing speed: 0 - 4 m/min.	1 unit
④PS-plate Printer	Type: Horizontal Type, Vacuum contact printer Effective printing size: 1,430×1,145mm Vacuum system: Vacuum pump with glass cover Vacuum pump: Piston type or Rotary type Exposure time: 0 – 999 sec.	1 unit
⑤PS-plate Processor	Type: Flood standing roller transport automatic processor Plate type: Positive or Negative PS-plate Plate size: Width = 254 –850mm, Length = 311 – 1,130mm Thickness = 0.15 – 0.40mm Processing speed: 0.5 – 1.5m/min. variable Productivity: 70 sheets /hr. at standard processing time	1 unit

Table 2-3-3 Survey equipment

Item	Specification	Quantity
①GPS Receiver	Frequency : dual frequency Measurment Accuracy: Static = 5mm + 1ppm× D(Horizontal) 10mm+ 1ppm× D (Vertical) Receiver channel: L1band 9 channels or more L2band 9 channels or more Soft ware: English language and Windows95 compatible Survey planning Data downloading and transfer Survey data processing Network adjustment Antenna: L1/L2 Antenna	6 units 1 set 6 sets
②Micro Computer	A4 size Notebook-type Memory: 32MB or more Hard disk:3.2 GB or more Windows 95 (English version) or equivalent or better Printer: Compact Inkjet-printer (A4 size) Laser printer (A3 size)	2 units 2 units 1 unit

③Digital Level	Accuracy: 0.6mm / km Staff: Bar coded invar staff of 3.0 m length Bar coded fibre glass staff of 4.0 m length Data collector (English) Software: Data downloading and level network adjustment software in English Windows 95 compatible	2 units 2 sets 2 sets 1 unit 1 set
①Total Station	Measurement accuracy: Angle = 1 sec.(horizontal and vertical) or less Distance = (5mm + 5ppm× D) or better Software: For data downloading and traversing calculations English version Mirror: 3 prisms 1 prism with pole	2 units 1 set 2 sets 1 set
⑤Transceiver	Communication mode: Simplex type Frequency band: 400 - 512MHz Power output: 30w and 5w Reach distance: over 30 km Antenna Pole: 7m length aluminium made pole Antenna cable: 30m	7 units 1 set 7 sets

Table 2-3-4 Auxiliary equipment

Item	Specification	Quantity
① Air-conditioner for Printing room - Printing room[1] - Printing room[2]	Capacity:920 – 1040 Btu/ hr for each unit Press Room : 185m² (h=3.5m) PS-plate Room: 45m² (h=3.5m) Dark room: 53m² (h=3.5m) Light room: 65m² (h=3.5m) Automatic de-humidity and temperature function Wall mounted type	1 set
② Air-conditioner for instruments room of survey equipment and materials	Capacity: 920 – 1040 Btu/hr Room:27m² (h=3.5m) Automatic de-humidity and temperature function Wall mounted type	1 set
③ Photocopier	Mono-color Paper size: (Max) A3 Enlargement and reduction function: 50 – 200%	1 unit

(2) Equipment layout plan

Two rooms in the LPO building on the west side of the SOB's main building will be the installation and storage place for printing equipment and materials. One room on the third

floor of the main building will be the installation and storage place for survey equipment and materials. (Refer to Figures 2-3-1 and 2-3-2.)

The equipment layout plan of printing related equipment (offset printing and offset process equipment) and materials including existing equipment is as shown below.

1) Printing room [1] (Offset Printing Equipment) (See Figure 2-3-3)

① 2-color offset press	1 unit
② Offset proof press	1 unit
③ 2-color offset press (existing)	1 unit
④ Guillotine (existing)	1 unit

2) Printing room [2] (Offset Process Equipment) (See Fig. 2-3-4)

① Process camera	1 unit
② Film processor	1 unit
③ Contact printer	1 unit
④ PS-plate printer	1 unit
⑤ PS-plate processor	1 unit
⑥ PS-plate printer (existing)	1 unit

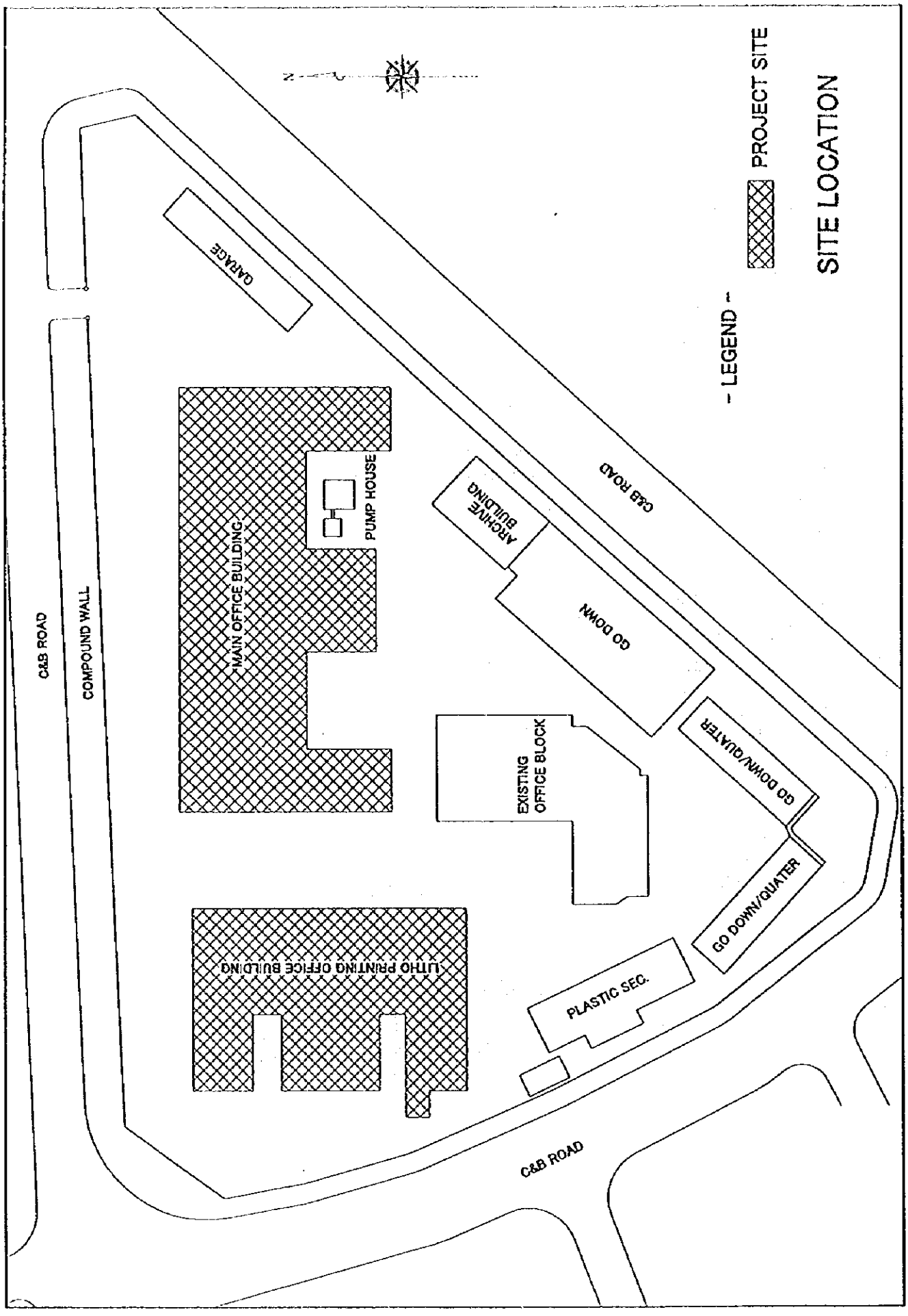

SITE LOCATION
PROJECT SITE
- LEGEND -
C&B ROAD
ARCHIVE BUILDING
PUMP HOUSE
MAIN OFFICE BUILDING
GO DOWN
GO DOWN/QUATER
EXISTING OFFICE BLOCK
GO DOWN/QUATER
PLASTIC SEC.
LITHO PRINTING OFFICE BUILDING
C&B ROAD
COMPOUND WALL
C&B ROAD
GARAGE

Fig. 2-3-1

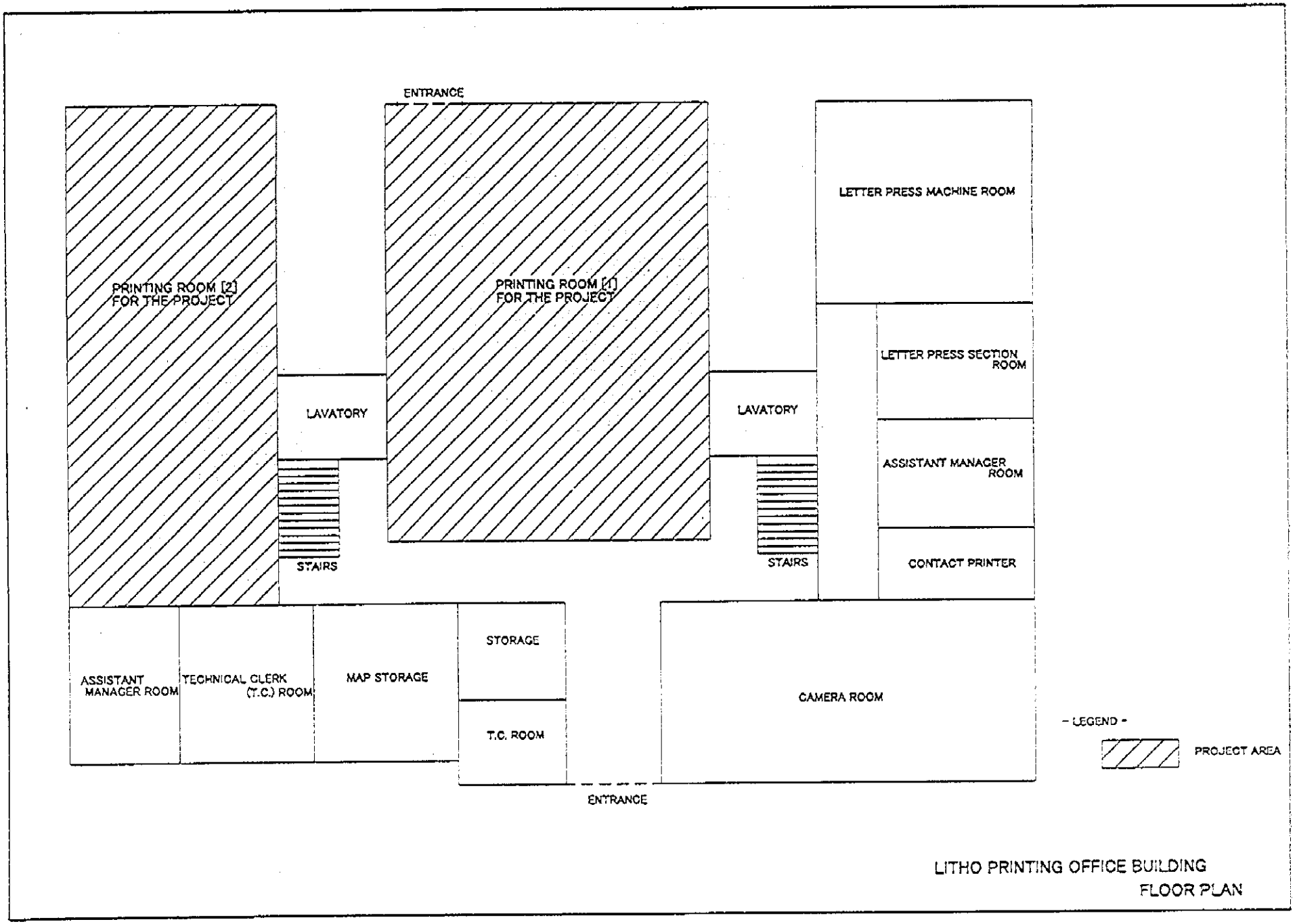
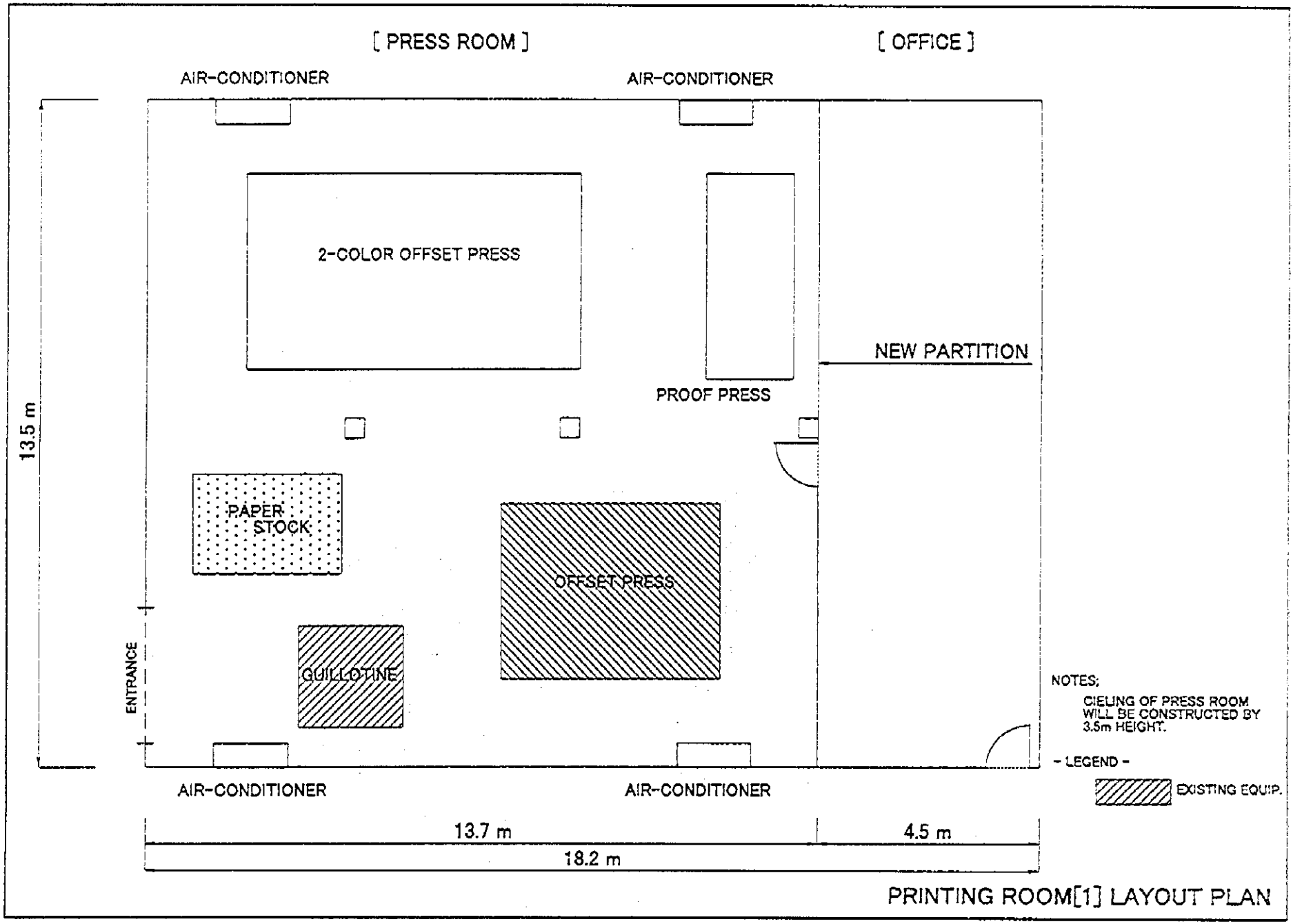

ENTRANCE
PRINTING ROOM [2] FOR THE PROJECT
PRINTING ROOM [1] FOR THE PROJECT
LETTER PRESS MACHINE ROOM
LETTER PRESS SECTION ROOM
ASSISTANT MANAGER ROOM
CONTACT PRINTER
LAVATORY
LAVATORY
STAIRS
STAIRS
ASSISTANT MANAGER ROOM
TECHNICAL CLERK (T.C.) ROOM
MAP STORAGE
STORAGE
T.C. ROOM
CAMERA ROOM
ENTRANCE
- LEGEND -
PROJECT AREA
LITHO PRINTING OFFICE BUILDING
FLOOR PLAN

Fig. 2-3-2

Fig 2-3-3


[PRESS ROOM]
[OFFICE]
AIR-CONDITIONER
AIR-CONDITIONER
2-COLOR OFFSET PRESS
PROOF PRESS
NEW PARTITION
13.5 m
PAPER STOCK
OFFSET PRESS
GUILLOTINE
ENTRANCE
AIR-CONDITIONER
AIR-CONDITIONER
13.7 m
4.5 m
18.2 m
NOTES;
CIELING OF PRESS ROOM WILL BE CONSTRUCTED BY 3.5m HEIGHT.
- LEGEND -
EXISTING EQUIP.
PRINTING ROOM[1] LAYOUT PLAN

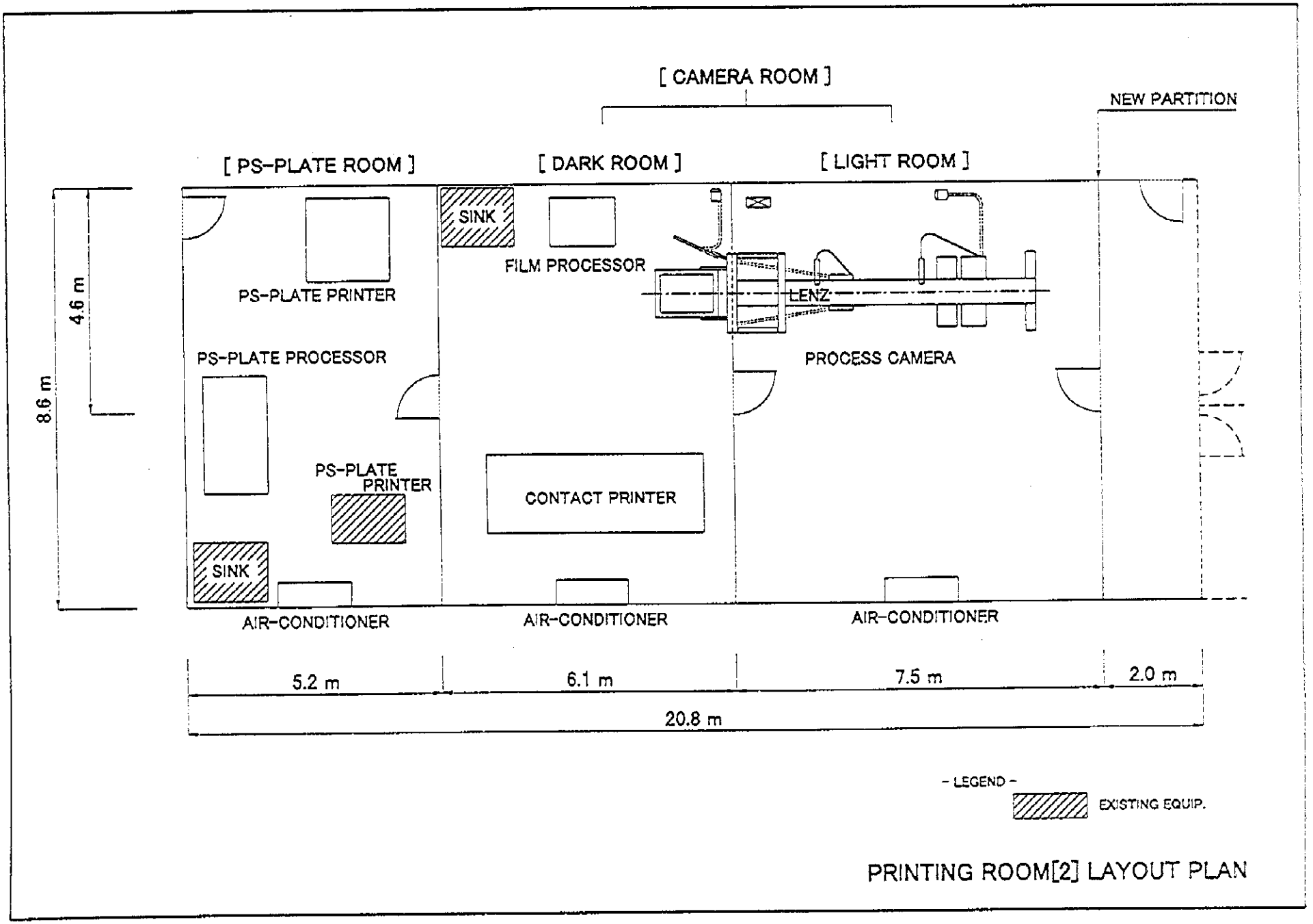

[CAMERA ROOM]
NEW PARTITION
[PS-PLATE ROOM]
[DARK ROOM]
[LIGHT ROOM]
SINK
FILM PROCESSOR
PS-PLATE PRINTER
LENZ
PS-PLATE PROCESSOR
PROCESS CAMERA
4.6 m
8.6 m
PS-PLATE PRINTER
CONTACT PRINTER
SINK
AIR-CONDITIONER
AIR-CONDITIONER
AIR-CONDITIONER
5.2 m
6.1 m
7.5 m
2.0 m
20.8 m
- LEGEND -
EXISTING EQUIP.
PRINTING ROOM[2] LAYOUT PLAN

Fig. 2-3-4

Chapter 3

Implementation Plan

Chapter 3 Implementation Plan

3-1 Implementation Plan

3-1-1 Implementation Concept

This Project will be implemented under Japanese grant aid program. After an exchange of notes (E/N) by both governments, the Government of Bangladesh will conclude a contract for detailed design and supervision with a Japanese consulting company. After the completion of detailed design based on this contract, the Government of Bangladesh will ask dealers to submit bids. Then, the equipment for the Project will be procured, and carried into storage locations and installed at installation locations.

1) Basic matters

The basic matters in implementing the Project under Japan's grant aid program are as follows.

① When procuring equipment, draw up an implementation schedule without causing difficulties in the manufacture and transport of the equipment so that the provision of the equipment will be completed within the period specified.
② Make proper arrangements through the SOB beforehand to clear the equipment through the customs smoothly.
③ In order to allow the equipment to be installed immediately upon arrival, prepare the storage and installation locations of the equipment, which are to be taken care of by Bangladesh.

In implementing this collaborative project associated with the grant aid, take into consideration the following as well.

2) Dispatch of engineers

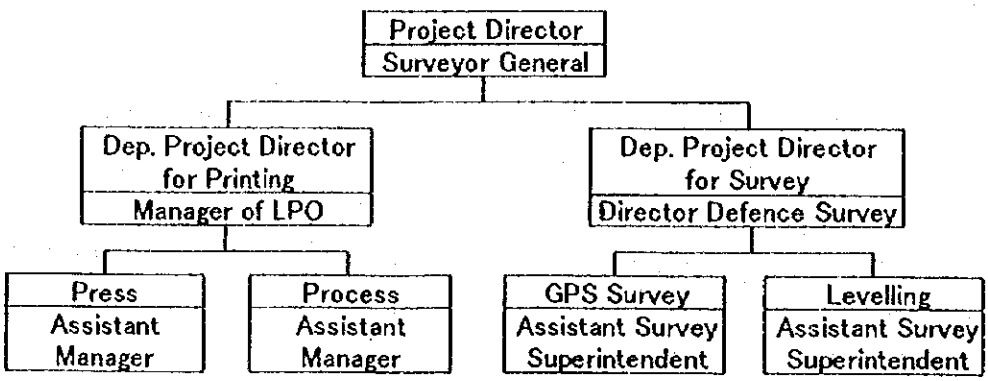
Of the equipment provided in this project, the equipment related to printing, in particular, is sophisticated precision machines. To operate them without trouble for a long period of time, their "proper installation" and "proper operation" are said to be extremely important. Therefore, expert engineers should be sent for guidance in the installation, assembly, and operation of the equipment.

3) Organizational setup on the Bangladesh side

The responsible organization for the Project is the SOB. SOB plans to set up the Project

organization of which the Surveyor General should be the Project director and the manager of LPO in printing the director of defense survey in survey should be the deputy Project directors respectively as given in below figure.

Project Organization Chart



As long as the Project is implemented under Japan's grant aid program, it must comply with applicable Japanese systems. Every office must accomplish its duties without delay in each phase of implementation. The scope of responsibility on the Bangladesh side is shown below.

① Conclude a contract with a Japanese consulting company, based on an E/N (exchange of notes).

② Conclude a contract with a Japanese corporate contractor, based on an E/N.

③ Open an account with a Japanese bank immediately upon conclusion of a contract to pay the contract money to the above-mentioned contractor.

④ Pay the commission to the above-mentioned Japanese bank according to the banking arrangement (B/A).

⑤ Issue entry permits and permits for a long-term stay to the Japanese consultants and contractors who enter Bangladesh for execution of their duties.

⑥ Go quickly through the acceptance procedures for the equipment and materials imported from Japan as well as pay the customs duties and clearance fees for them.

⑦ Conduct an attendance inspection of equipment and materials when necessary and issue an inspection certificate.

⑧ Assign personnel and utilize the equipment after its acceptance.

⑨ Arrangement of the budget for implementation of the Project.

3-1-2 Implementation Conditions

On the road between the port of discharge Chittagong and the SOB's seat Dhaka, there are many poorly-paved sections. Since the land transport in Bangladesh will mainly handle equipment that incorporates precision printing and measuring devices, it is necessary to consider the adoption of rail transport that will involve less traffic accidents than truck

transport.

Of the offset printing equipment, the offset press, in particular, has a minimum handling unit of 12 to 14 ton, requiring a large crane truck with a hoisting load of approximately 20 ton. Although the printing building of the SOB has a passage large enough to pass this much heavy equipment, it is necessary to rehearse carrying-in and check for obstacles and the like in order to bring in the equipment smoothly without any accident.

3-1-3 Scope of Works

The scope of works in accordance with the responsibilities of both Japanese and Bangladesh side for the implementation of the Project is summarized as follows.

1) Responsibilities of the Japanese side

① Procurement of the equipment.

② Transportation of the equipment (packing, domestic transportation, shipment, sea transportation, local harbors, local land transportation, and transportation insurance).

③ Installation of the equipment.

④ Guidance of installation, assembly and operation of the equipment.

⑤ Supervision of the implementation of the Project.

2) Responsibilities of the Bangladesh side

① Arrangement of facilities for custody and installation foundation of the equipment.

② Payment of B/A commission, custom clearance and taxes etc.

3-1-4 Consultant Supervision

The following supervisory tasks should be carried out properly and systematically for smooth procurement of the equipment.

1) Examination and approval of the drawings of the equipment to be manufactured
2) Verification of the shipment of the equipment
3) Confirmation of the progress of the works under the responsibilities of the Bangladesh side
4) Report on the progress of the implementation plan to the authorities concerned of the both Governments
5) Observation and confirmation of the installation of the equipment
6) Observation and confirmation of the guidance for installation, assembling and operation of the equipment

7) Confirmation of the inspection and delivery of the equipment

3-1-5 Procurement Plan

(1) Procurement sources

The equipment for this Project should be procured locally whenever possible with consideration for the ease of future maintenance. Therefore, auxiliary equipment and the like are planned to be procured from local dealers. However, the major equipment - offset printing equipment, offset process equipment, and survey equipment (excluding micro computers) - that cannot be procured in Bangladesh are planned to be procured from The Third Countries or Japan.

The sources of procurement and reasons for their selection are shown in Table 3-1-1.

Table 3-1-1 Procurement sources of the equipment

Items	Procurement sources	Remarks
1) Offset printing equipment		
① 2-color offset press	The Third Countries or Japan	- Not produced in Bangladesh or adjacent countries. - Planned to be procured from OECD in consideration of the initial operation, training, and the like after installation.
② Offset proof press	Japan	- Not produced in Bangladesh or adjacent countries. - Planned to be procured from Japan in consideration of the initial operation, training, and the like after installation.
2) Offset process equipment		
① Process camera	Japan	- Most makers in the world has discontinued production. Available only in Japan.
② Film processor	Japan	- The same as offset printing equipment in 1).
③ Contact printer	Japan	- The same as above
④ PS-plate printer	Japan	- The same as above
⑤ PS-plate processor	Japan	- The same as above
3) Survey equipment		
① GPS-receiver	Japan	- May be maintained and repaired by local dealers, which, however, have poor sales performance. Japan was selected

		because of the reliability of procurement.
② Micro computer (PC)	Bangladesh	- Available from local dealers. - Easy to inspect, maintain, and manage after provision. - No significant difference in price compared with procurement from Japan.
③ Digital level	Japan	- The same as GPS receivers in (1).
④ Total station	Japan	- The same as above
⑤ Transceiver	Japan	- The same as above
4) Auxiliary Equipment		
① Air-conditioner for printing room	Bangladesh	- Available from local dealers. - Easy to inspect, maintain, and manage after provision. - Less expensive compared with procurement from Japan.
② Air-conditioner for instrument room of survey equipment and materials	Bangladesh	The same as above
③ Photocopier	Bangladesh	The same as above

(2) Procurement routes

Of the equipment associated with this project, the equipment procured locally should be delivered to the site while the equipment procured from Japan should be discharged at Chittagong port, processed through customs in Dhaka (ICD: Inland Container Deposit), and delivered to the site. Between Chittagong and Dhaka, the equipment should be transported basically by railroad, as described in Section 2-1-2. However, packaged equipment exceeding the regulatory load limit of 15 ton should be transported by truck from Chittagong port. The delivery route is shown below.

- The equipment over 15 tons:

  Japan ⇒ Chittagong (customs clearance) ⇒ (truck transportation) ⇒Dhaka ⇒ the Project site

- Other equipment:

  Japan ⇒ Chittagong ⇒ (rail transportation) ⇒ Dhaka(customs clearance) ⇒ the Project site

3-1-6 Implementation Schedule

The matters to be undertaken by the Japanese side should be carried out in accordance with the detailed design and procurement-specific implementation schedule. The implementation

schedule is shown in Table 3-1-1.

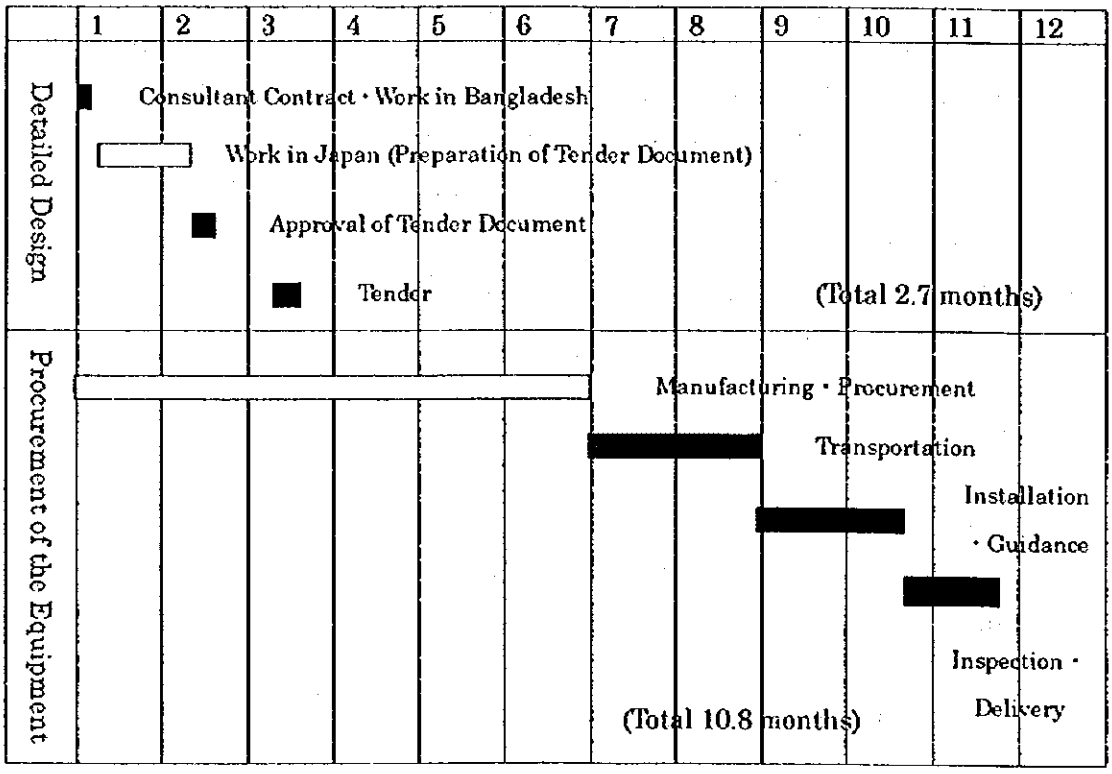
1) Detailed design

Detailed design should be started after obtaining certification from the Government of Japanese upon conclusion of a contract for consulting. A bidding document should be created, based on the basic design. It should be approved by the Bangladesh side after consultation with the SOB staff. Then bids should be invited in Dhaka. 2.7 months should be allowed for the detailed design.

2) Equipment procurement

The procurement of equipment should be started after obtaining approval from the Japanese government upon conclusion of contracts with suppliers. The equipment should be delivered to Bangladesh after the construction of the installation and storage locations, which are to be arranged for by the Bangladesh side. A total of 10.8 months should be allowed for the delivery of the equipment: 6.0 months for the process from ordering to production and procurement, 2.0 months for marine and inland transport of equipment procured from Japan, 1.8 months for installation and guidance, and 1.0 month for inspection and delivery.

Table 3-1-2 Implementation Schedule



3-1-7 Obligations of Recipient Country

Necessary measures to be taken by the Government of Bangladesh in case Japan's Grant Aid is executed are as follows.

1) To secure the site for the Project.
2) To remove the existing equipment replaced by the Project.
3) To improve the building and facilities necessary for the Project.
4) To provide facilities for distribution of electricity, water supply, telephone, drainage, sewage and other incidental facilities to the Project site.
5) To bear commissions to Japanese bank for the banking services based upon Banking Arrangement.
6) To pay taxes and to take necessary measures for customs clearance of the materials and equipment brought for the Project at the port of disembarkation.
7) To accord Japanese Nationals whose services may be required in connection with the supply of products and the services under the verified contract such facilities as may be necessary for their entry into Bangladesh and stay therein for the performance of their work.
8) To maintain and use properly and effectively the facilities constructed and equipment purchased under the Grant.
9) To bear all expenses other than those to be borne by the Grant necessary for the execution of the Project.

3-2 Operation and Maintenance Plan

(1) Basic concept of operation and maintenance

The operation and maintenance plan should be worked out based on the following basic concept and should be put into practice in a proper and effective manner.

1) All the equipment introduced into Bangladesh according to the grant aid belongs to Bangladesh (SOB). The SOB is responsible for the general control and direction of the plan for establishment of geodetic control points as well as the plan for printing and supply of maps, not to mention the maintenance and management of the equipment and facilities including daily maintenance. The SOB should establish and strengthen its organizational setting for supporting proper management of this Project.

2) The equipment introduced into Bangladesh in this Project is intended to be used for development of geodetic networks in the areas where they are undeveloped. The SOB should control it closely so that it will not be used for other projects in preference to this purpose.

3) The equipment, materials, and spare parts for repair that are provided in this project are intended to be used for the maintenance of the equipment introduced into Bangladesh according to this project. The SOB must control them so that they will not be diverted for other equipment.

The SOB should operate and maintain this Project based on the above-mentioned basic concept.

(2) Organizational framework for operation and maintenance

After the map printing facilities are completed under the Japanese grant aid, the SOB plans to operate them as follows.

1) Matters related to printing
The present LPO of the SOB should operate and maintain the matters related to printing. The Surveyor General of the SOB should be the Project director, and the manager of the LPO should be the deputy Project director.

Regarding daily inspection and repair, the SOB has neither a workshop for printing nor repair technician. Currently, therefore, if a printer gets out of order, the SOB has it repaired by a private company. In Bangladesh, there are two agencies of offset press companies (one Japanese and one German), only one of which provides daily inspection, maintenance, and repair services. For other offset presses, expert engineers are invited from Singapore or the countries where they were made. However, the latest first rate offset presses are extremely stable. Their failure rate is said to be generally as low as that of refrigerators. Therefore, the possibility of an offset press causing some trouble within one year is almost zero, provided it is installed and operated properly. For about five years, no special maintenance is necessary except for replacement of consumables such as blankets. Regarding the offset presses, therefore, it is desirable to send expert engineers: after one year to raise the level of operation and after five years to check important parts and to supply consumables. As a precondition, however, it is important to provide sufficient training in "proper installation" and "proper operation."

The useful lives of offset process equipment and printing equipment are shown in the table below. Except for the film processor, PS-plate processor, and the like, the equipment provided as part of the Japanese grant aid is very durable and is expected to prove fairly effective during its useful life. Besides, replacement parts are not very expensive: they are judged to be

within the financial reach of Bangladesh, considering their life cycle and costs.

Table 3-2-4 Life of the Printing and Process Equipment

Item	Life of the equipment(year)		Price of parts (Exchange after 5 years) (yen)
	Legal life of Japan	Actual life	
2-color offset press	13	25	(per 1) 300,000
Offset proof press	13	25	50,000
Process camera	13	25	30,000
Film processor	4	8	200,000
Contact printer	8	15	100,000
PS-plate printer	8	15	200,000
PS-plate processor	4	8	200,000

It is indispensable to inspect and maintain photocopiers approximately once a month. A3-size photocopiers can be procured and maintained in Bangladesh. Maintenance and inspection costs (12 services a year) in Dhaka are 6,000 to 6,500 takas a year. It is considered that this much costs can be paid out of the SOB budget.

2) Matters related to survey

The Defense Survey Directorate should operate and maintain the matters related to survey. The Surveyor General of the SOB should be the Project director and the director of the Defense Survey Department should be the deputy Project director.

The SOB has a small workshop for survey equipment and a few skilled technicians. However, although they can repair conventional equipment, they cannot repair new electronic equipment. Although the electronic equipment to be introduced this time is relatively free of trouble, organizational arrangements for supporting repair work are needed to provide against contingencies such as sudden shocks or spilled water. Since most manufacturers of such electronic equipment have agencies with a workshop in Dhaka, the SOB should rely on them for repairs and develop personnel who can perform daily maintenance and inspection.

The legally designated useful lives of major items of survey equipment in Japan are shown below. Considering the hot and humid climate of Bangladesh, these lives are estimated to be slightly shortened. It is expected, however, that the development of the geodetic network planned by the SOB will be completed within these useful lives and that the equipment will contribute satisfactorily to the second geodetic network development plan.

- GPS Receiver: 7 years
- Digital Level: 6 years

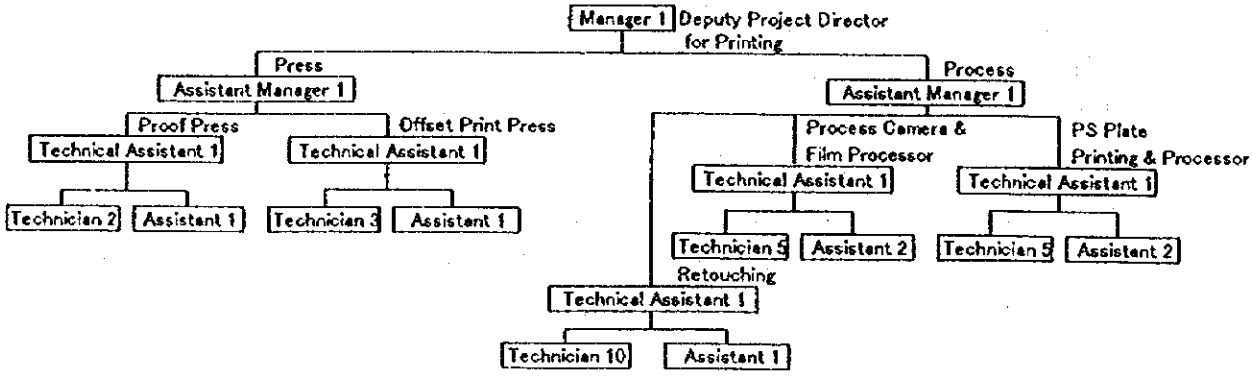
- Total Station: 7 years Items omitted

(3) Personnel plan

1) Matters related to printing

The LPO of the SOB has a staff of 159, among whom there are quite a few technicians skilled in conventional process and printing. Since the SOB has old versions of the equipment to be introduced this time except for the film processor and SP-plate processor, only a short time will be required for training in handling and operation. Regarding the film processor and SP-plate processor to be introduced for the first time, their operation will not require much skill since they are automated. The SOB plans to assign 10 personnel to press and 29 personnel to process under the conduct of the deputy project director. (see the following chart).

"Organization chart for the implementation of the printing sector of the Project"



① For printing equipment

For the operation of the printing equipment to be introduced by the Project, the SOB plans the following personnel assignments.

- Assistant Manager: 1 person
- Technical Assistant: 2 persons (1 person for the press, 1 person for the proof press)
- Technician: 5 persons (3 persons for the press, 2 persons for the proof press)
- Assistant: 2 persons (1 person for the press, 1 person for the proof press)
- Total: 10 persons

② For process equipment

About 10 personnel for film-making, about 15 personnel for plate-making and about 10 personnel for film-retouching are engaged in the process section of the LPO presently. It is supposed that following composition and their personnel will be required for the process section when the equipment will be introduced by the Project.

- Assistant Mnager: 1 person

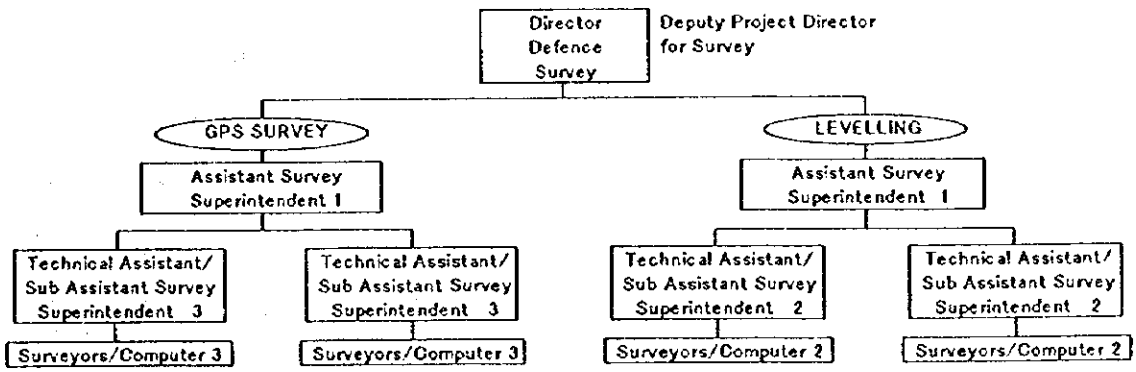
- For film-making: 8 persons
  (For new process camera / new contact printer / new film processor)
- For plate-making: 8 persons
  (For existing and new PS plate printer / new PS plate processor)
- For film-retouching: 12 persons (For film opaque work / scribing etc.)
- Total: 29 persons

2) Matters related to survey

The SOB has 13 surveyors who belong to Geodetic Detachment of the Defense Survey Department. Seven of them are engineers. Therefore, the survey equipment to be introduced will be used by these surveyors for the time being. However, since this equipment will be the center of all the equipment to be introduced in the future, the SOB is planning to provide training to familiarize all the local surveyors with this equipment.

The SOB plans to complete the development of the undeveloped geodetic network by the use of this equipment in two years. For that, The SOB plans to assign the personnel for each equipment as below (see the following chart).

"Organization chart for the implementation of the survey sector of the Project"



- Director: 1 person (Assistant project director)
- GPS survey
  Assistant survey Superintendent: 1person
  Technical Assistant / Sub-assistant Superintendent: 6 persons
  Surveyor / Computer: 6 persons
  Sub-total: 13 persons
- Leveling survey
  Assistant survey Superintendent: 1person
  Technical Assistant / Sub-assistant Superintendent: 4 persons
  Surveyor / Computer: 4 persons

Sub-total: 9 persons

- Total: 23 persons

There is a growing need in Bangladesh for a denser geodetic network. In view of this need, the SOB plans to embark on the development of a secondary geodetic network across the country upon completion of the present development plan. The current number of surveyors in the Survey Department is not sufficient for that. Therefore, the SOB intends to put effort into development of surveyors along with the development of the geodetic networks.

(4) Operation and maintenance costs

In order to implement the Project Government of Bangladesh will allot extra budget from development fund, SOB and ministry of Defense will take necessary measure to allot the budget for implementation of the Project corresponding to execution of this scheme.

The budget required for the operation and maintenance of the equipment in relation to this Project are, as shown in the Table 3-2-5, divided into personnel expenses, materials cost, and electricity and heating expenses in the area of printing; and into personnel expenses, field survey expenses, labor expenses and materials cost in the area of survey. The amounts are about 9,100,000 takas in the area of printing and about 6,150,000 takas in the area of survey. The estimation bases are listed at the end of this section.

Table 3-2-5 Estimation of annual operation and maintenance costs

Items	Budget (taka)
(Printing Sector)	
- Personnel expenses	2,202,000
- power and water	306,018
-materials	6,583,350
Sub total	9,091,368
(excluding personnel expenses)	(6,889,368)
(Survey Sector)	
- Personnel expenses	822,000
- Expenses for field survey	2,136,000
- Labors	804,000
- Materials etc.	2,390,000
sub total	6,152,000
(excluding personnel expenses)	(5,330,000)
Total	15,243,368
(excluding personnel expenses)	(12,219,368)

Of these costs, the personnel expenses are part of the ordinary operation cost of the SOB and not special expenses incurred in this project. Therefore, the actual yearly operation and

maintenance costs are estimated to be about 12,220,000 takas in total: about 6,890,000 takas for printing and about 5,330,000 takas for survey.
Moreover, of the costs involved in print-related matters, about 3,400,000 takas a year is required anyway for conventional printing, as shown below. The operation and maintenance costs required specifically for this project is estimated to be annually around 9,000,000 takas.

* Expenses for printing of past 2 years (95/96, 96/97) (1 year average)

Materials for printing	: 3,289,490 takas
· Printing paper	: 1,604,500 takas
· Ink for offset	: 869,050 takas
· Processing film	: 176,930 takas
· PS-plate	: 190,010 takas
· Other chemicals	: 450,000 takas
Water and power charge	: 110,000 takas
Total	: 3,400,000 takas

The fiscal 97/98 budget of the SOB is 54,456,000 takas, which means that the operation and maintenance costs described above makes up 22% of the SOB's fiscal 97/98 budget. However, the SOB's fiscal 93/94 budget five years ago 65,762,000 takas or 121% of the fiscal 97/98 budget. Since this actual results and this reduction in the budget was a direct result of reduction in the SOB's workload, it is considered that the SOB will be able to secure the above mentioned costs in its expenses after this Project is put into practice.

As for the expenses except for personnel expenses, the SOB plans to secure it as development budget in order to implement the project for the time being. This project period means two years for survey works to complete geodetic control point network in the remaining areas, and five years for printing works because of the following reasons. As mentioned in (2), printing and process equipment should be maintained and checked by experts after one and five years of introduction. Therefore, during first five years, there is almost no need to check or change important parts of machinery, and it also will be a period for training of the personnel concerned.

During operation of the project, SOB people will become skilled in operating the equipment at their own. To operate the equipment after successful implementation of the project, expenditure will be met from the fiscal budget of SOB.

There is a rule that all the income from the sales of the printed maps and the like go to the National Treasury. It appears that the income and expenditure of the SOB is not treated independently. The printing costs of the maps are generally much higher than their sales prices and the SOB is filing an application with the government for permission to double the

price of the map (which costs 25 takas per sheet) to 50 takas.

Estimation bases of the operation and maintenance costs for the Project]

1) Matters related to printing

①Personnel expenses Tk. 2,202,000

Item	Number of personnel					Total	Month	Unit Salary (Tk.)	Total Amount (Tk.)
	Printing		Process						
	Press	Proof	Retouch	Camera	PS plate				
Manager	1					1	12	7,500	90,000
Assistant Manager	1		1			2	12	6,000	144,000
Technical Assistant	1	1	1	1	1	5	12	5,000	300,000
Technician	3	2	10	5	5	25	12	4,000	1,200,000
Assistant	1	1	1	2	2	7	12	3,000	252,000
Others	Store keeper 1, Technical clerk 2, Assistant 1					4	12	4,500	216,000
Total						44			2,202,000

②Water and power charge Tk. 306,018

- Water charge: $20m^3 \times 234$ days $= 4,680m^3 \times$ Tk.12.75 = Tk. 59,670.
- Power charge: 79,467kw× Tk.3.1 = Tk246,348 (see the following table.)

Item	Power capacity(kw)	Hours /day	Days /year	Number	Annual quantity used (kw)
Offset press	33.1	6	234	1	46,473
Offset proof press	4.4	6	234	1	6,178
Process camera	6.5	6	234	1	9,126
Film processor	8.4	3	234	1	5,897
Contact printer	0.9	2	234	1	421
PS-plate printer	4.8	5	234	1	5,616
PS-plate processor	8.2	3	234		5,756
total					79,467

③Materials for printing Tk. 6,583,350

Item	Remarks	Number	Unit	Unit price (taka)	Amount (taka.)
Printing paper	640×940mm,90g/m^2	500	pack	6,700	3,350,000
Ink for offset	black, yellow, magenta, cyanide	580	kg	1,200	696,000
Ink for offset	other 20 colors	290	kg	1,400	406,000
Processing film	61.0×76.2mm,50s	40	box	19,300	772,200
PS-plate	1030×800mm,30s	70	pack	15,300	1,071,000

Developing solution	30l	30	pack	2,540	76,200
Fixing solution	20l	45	pack	1,140	51,300
PS-plate -developing sol.	10l	15	pack	2,200	33,000
Gum solution	1l	15	bottle	250	3,750
Erasing solution	100ml	15	bottle	180	2,700
Fountain water	1l	60	bottle	440	26,400
Cleaning oil	20l	30	pack	2,500	75,000
Other chemicals	lubricating oil etc.	1	set	20,000	20,000
Total					6,583,350

2) matters related to Survey

① Personnel expenses Tk. 822,000

Item	Number of personnel			Month	Unit Salary (Tk.)	Total Amount (Tk.)
	GPS survey	Leveling	Total			
Director	1		1	6	12,000	72,000
Assistant survey Superintendent	1	1	2	6	10,000	120,000
Technical Assistant / Sub-assistant Survey	6	4	10	6	6,000	360,000
Surveyor / Computer	6	4	10	6	4,500	270,000
Total	13.5	9.5	23			822,000

② Expenses for field survey Tk. 2,136,000

- Accommodation and transportation: 23 p. × 6 month=Tk.12,000 × 23 × 6= Tk.1,656,000
- Car maintenance costs: Tk.15,000 × 8 cars × 1 year = Tk.120,000
- Hire motorboat / ferryboat / speedboat:

  Tk.40,000 × 3months × 3 boats = Tk.360,000

③ Expenses for labors: Tk.804,000

- Skilled labors: 26 persons × 6 × Tk.4,000/month = Tk.624,000
- Porters: 10 persons × 6 × Tk.3,000 = Tk.180,000

④ Expenses for materials etc. Tk. 2,390,000

- Fuel: 8 cars × 900 l/month × 6 months × Tk.25 =Tk.1,080,000
- Stationary: Tk.10,000× 6 months = Tk.60,000
- Construction of monuments: Tk.10,000 ×125 spots = Tk.1,250,000

Chapter 4

Project Evaluation and Recommendation

Chapter 4 Project Evaluation and Recommendation

4-1 Project Effect

The objective of the Project is to prepare national base maps and other various maps serving as the basic material necessary for fulfilling alleviation of poverty, generation of substantial employment opportunity and increase in productivity, improvement in the quality of life of the rural population, attainment of higher food production, human resources development, development of necessary infrastructure and industries and other national important objectives set up in the national development plan (5th 5-year plan for the period from 1997 to 2002). In this sense, it can be said that the Project effects will extend over the whole territory and whole nation both directly and indirectly in Bangladesh.

The degree of the effect from the Project is shown in Table 4-1.

Table 4-1 Project Effect

Current Situation and Problems	Project Countermeasures	Project Effect
1) Printing Equipment Most existing equipment is superannuated and breakdowns occur frequently. Because some of the equipment is out of order and inoperative, mapping precision and productivity are very low. 2) Survey Equipment There is no instrument for preparing a geodetic control net which forms the foundation of mapping. Therefore, the national land geodetic control net does not cover the whole territory (about one third is not covered). At about 70 control nets and along leveling lines 1200 km long	1) Printing Equipment The conventional method was used, based on the personnel and technical level and the operating and maintenance structure of SOB. A large process camera was placed in the center of the plate making process and two full-size 2-color printing presses in the center of the printing process. This way, it is possible to prepare high utility valued maps, not only from new original drawings but also from the large amount of original drawings in storage. 2) Survey Equipment Required instruments will be supplied to extend the national land geodetic control net over regions	1)In addition to the diversity of large national scale maps and others, it is possible for SOB to accommodate itself to demands from other agencies which was almost impossible in the past. A new increase in various demands is anticipated 2)A geodetic control net which forms the foundation for mapping, makes it possible to create documents for disaster prevention plans for floods, cyclones, etc., along with a national land development plan covering the entire territory of

in regions not covered, a survey cannot be carried out.	that are not covered yet, in two years, by GPS surveying and leveling.	Bangladesh.

This Project aims at reinforcing the mapping capability of SOB. It is possible to prepare various thematic maps such as land use maps, geologic maps, soil maps, vegetation maps and road maps and national park maps etc., for departments other than SOB along with national base maps and other basic maps necessary for national land planning and disaster-prevention planning.

4-2 Recommendation

The following suggestions will be presented to expedite a more smooth and effective implementation of the Project.

(1) Smooth fulfillment of the obligations of Bangladesh side

The works to be undertaken by the Bangladesh side such as the preparation of printing rooms and instruments room for survey equipment shall be executed in accordance with the implementation schedule of the procurement of the equipment by the Japanese side. In particular, for equipment requiring initial instructions on its installation, assembly and operation, it is important that the installation area for the equipment has been completely prepared before the delivery of the equipment. Therefore, it is necessary for the Bangladesh side to proceed smoothly securing and executing of the budget while keeping contact with the Japan side so that the preparation is conducted in accordance with the procurement of equipment and is completed before the delivery of equipment.

(2) Establishment of operation and maintenance system

For a steady and smooth development of activities for this project, a responsibility system must be established for operation and maintenance including personnel and budgetary considerations. SOB is planning to establish a system for the execution of this project with the Surveyor General of SOB as the project director, consisting of a printing group 44 strong with the Director of LPO as a deputy project director and a survey group 23 strong with the Director Defense Survey as a deputy project director. It is planned that the expenses excluding the personnel expenses are appropriated in

the development budget and procured as budgetary allocations for the time being. Therefore, it is necessary to secure this system and appropriation and make efforts to effect appropriate operation and maintenance of equipment and improvements in the technical level of the personnel.

(3) Improvement of environment

A great increase is expected in the quality of maps and working efficiency as a result of the introduction of excellent process machines and presses by this project. However, for new and powerful presses to exhibit its intrinsic ability, meticulous care is always required to prevent dust from being deposited on the paper rack and feeder as well as the ink rollers and blankets. An environmental situation of the press room inadequately put in order can not only bring about a reduction in quality and efficiency but also cause accidents. Therefore, it is considered that an environmental enlightenment to the personnel is also important.

[Appendices]

Appendix-1 Member List of the Survey Team

(1) Basic Design Study Team

1) Team Leader : Yuichi SUGANO
First Project Study Division, Grant Aid Project Study Department, JICA

2) Technical Adviser : Kosei OTOI
Deputy Head of Third Geographical Division, Geographic Department,
Geographical Survey Institute, Ministry of Construction

3) Chief Consultant / Operation & Maintenance Planner : Teruhisa NIHIARA
Asia Air Survey Co., Ltd.

4) Equipment Planner (Printing) : Yukio KITANI
Asia Air Survey Co., Ltd.

5) Equipment Planner (GPS) : Megumi SHIMIZU
Asia Air Survey Co., Ltd.

6) Procurement Planner / Cost Estimation : Hitoshi KATO
Asia Air Survey Co., Ltd.

(2) Draft Basic Design Explanation Team

1) Leader : Junji YOKOYAMA
Senior Assistant to Managing Director, Grant Aid Project Study Department, JICA

2) Technical Adviser : Kosei OTOI
Deputy Head of Third Geographical Division, Geographic Department,
Geographical Survey Institute, Ministry of Construction

2) Chief Consultant / Operation & Maintenance Planner : Teruhisa NIHIARA
Asia Air Survey Co., Ltd.

3) Equipment Planner (Printing) : Yukio KITANI
Asia Air Survey Co., Ltd.

Appendix-2 Survey Schedule

(1) Basic Design Study Team

No.	Date	Day	Activities		Accommodation
			Officials	Consultants	
1	7/13	Mon	Tokyo → Bangkok 11:00 → JL717 → 15:15		Bangkok
2	7/14	Tue	Bangkok → Dhaka 11:25 → TG321 → 12:50 Courtesy call on Embassy of Japan Courtesy call on JICA Bangladesh Office		Dhaka
3	7/15	Wed	Courtesy call on Ministry of Finance Courtesy call on SOB, Explanation and Discussion on IC / R		Dhaka
4	7/16	Thu	Discussion and Site Survey of SOB		Dhaka
5	7/17	Fri	Internal Meeting and Collection of Information		Dhaka
6	7/18	Sat	As above		Dhaka
7	7/19	Sun	Discussion on M/D Site Survey of SOB		Dhaka
8	7/20	Mon	Discussion on M/D Signing of M/D		Dhaka
9	7/21	Tue	Site Survey of SOB		Dhaka
10	7/22	Wed	Report to Embassy of Japan Report to JICA Bangladesh Office		Dhaka
11	7/23	Thu	Dhaka → Bangkok 14:00 → TG322 → 17:00 Bangkok → 22:30 → JL718 →	Cont. Survey	Officials: Bangkok Consultants: Chittagong
12	7/24	Fri	→ Tokyo → JL718 → 06:20	Cont. Survey	Officials: Japan Consultants: Chittagong
13 ↓ 28	7/25 ↓ 8/9	Sat ↓ Sun		Cont. Survey	Dhaka
29	8/10	Mon		Report to Embassy of Japan Report to JICA Bangladesh Office	Dhaka
30	8/11	Tue		Dhaka → Bangkok 14:00 → TG322 → 17:00 Bangkok → 22:30 → JL718 →	B angkok
31	8/12	Wed		→ Tokyo → JL718 → 06:20	Japan

(2) Draft Basic Design Explanation Team

No.	Date	Day	Activities			Accommodation
			Officials		Consultants	
			Mr. YOKOKURA	Mr. OTOI		
1	10/24	Sat			Tokyo → Bangkok 11:00→JL717→15:15	Bangkok
2	10/25	Sun			Bangkok → Dhaka 11:25→TG321→12:50 Courtesy call on Embassy of Japan Courtesy call on JICA Bangladesh Office	Dhaka
3 ↓ 6	10/26 ↓ 10/29	Mon ↓ Thu			Meeting with Counterparts	Dhaka
7	10/30	Fri	Tokyo → Bangkok 11:00→JL717→15:15			Officials: Bangkok, Consultants: Dhaka
8	10/31	Sat	Bangkok → Dhaka 11:25→TG321→12:50			Dhaka
9	11/1	Sun	Courtesy call on Embassy of Japan Courtesy call on JICA Bangladesh Office Courtesy call on Ministry of Finance Courtesy call on SOB, Explanation and Discussion on DF/R			Dhaka
10	11/2	Mon	Discussion on M/D			Dhaka
11	11/3	Tue	Signing of M/D			Dhaka
12	11/4	Wed	Meeting with Counterparts Report to Embassy of Japan Report to JICA Bangladesh Office			Dhaka
13	11/5	Thu	Site Survey	Dhaka → Bangkok 14:00 → TG322 → 17:00 Bangkok → 22:30 → JL718 →		Official (YOKOKURA): Dhaka, Official(OTOI) & Consultants: Bangkok
14	11/6	Fri	Site Survey	→ Tokyo → JL718 → 06:20		Official (YOKOKURA): Dhaka, Official(OTOI) & Consultants: Japan
15	11/7	Sat	Dhaka → Bangkok 14:00→TG322→17:00 Bangkok → 22:30→JL718→			Bangkok
16	11/8	Sun	→ Tokyo →JL718 →06:20			Japan

Appendix-3 List of Parties Concerned in the Recipient Country

(1) Basic Design Study Team

1.	Ministry of Finance	
	Mr. Abdul Aziz Sarkar	Deputy Secretary, Economic Relations Division (ERD)
	Mr. Probtas Chandra Roy	Research Officer, Planning Commission
	Mr. Aspia Hkran	Research Officer, Planning Commission
	Mr. Shin'ichiro Omote	JICA Expert, Economic Cooperation Coordinator, Economic Division
2.	Survey of Bangladesh	
	Mr. Shahedul Islam Mondal	Surveyor General, Survey of Bangladesh (SOB)
	Mr. Noor Muhammad Mian	Director, Development Survey, SOB
	Mr. Kazi Shafayetul Haque	Director, Defense Survey, SOB
	Mr. Ismail Mia	Manager, Litho-graphic Printing Office (LPO), SOB
	Mr. Ayub Hossain	Assistant Manager, LPO, SOB
	Mr. Anisor Rahaman	Assistant Survey Super, Surveyor General Office, SOB
	Mr. Nayon Chandra Sarker	Technical Assistant, Geodetic Department, SOB
	Mr. AKM Musa	Assistant Survey Super, Surveyor General Office, SOB
	Mr. Ganesh Chandra Roy	Technical Assistant, Geodetic Department, SOB
	Mr. Porves Anmed Khan	Survey Super, Photogrammetric Office, SOB
	Mr. Patric Geiger	Manager, IGN France International Project, SOB
	Mr. Alain Devloze	Expert, IGN France International Project, SOB
3.	Ministry of Shipping	
	Mr. Habibur Rahman Khan	Chief Hydrographer, Chittagong Port Authority (CPA)
	Mr. Aminul Haque	Hydrographer, CPA
	Mr. Hashibar Rahman	Hydrographer, CPA
4.	Ministry of Land	
	Mr. Shafi Islam	Director General, Directorate of Land Records & Surveys (DLRS)
	Mr. Rezaul Karim	Charge Officer, DLRS

5.	Ministry of Works	
	Mr. Mu Fukkharul Haider	Sub-divisional Engineer, Public Works Department
6.	Ministry of Local Government	
	Mr. Quamurul Islam Siddique	Chief Engineer, Local Government Engineering Department (LGED)
	Mr. A.N.M. Wahiduddin	Laboratory Consultant, LGED
	Mr. Zahurul Islam	GIS Unit, Institutional Support Project, LGED
	Mr. Matiar Rahman	Executive Engineer, Rural Development Project, LGED
7.	National Board of Revenue	
	Mr. Saiful Islam	Second Secretary (Custom)
8.	Bangladesh Bank	
	Ms. Noor Unnhar	Officer
9.	FINNMAP	
	Mr. Heikki Perenius	Manager, FINNMAP Project
10.	Embassy of Japan	
	Mr. Yoshikazu Kaneko	Ambassador of Japn
	Mr. Shigeharu Maruyama	Minister
	Mr. Yoichi Yamaguchi	Second Secretary, Economic Cooperation Section
11.	JICA Bangladesh Office	
	Mr. Yuji Okazaki	Resident Representative
	Mr. Sen'ichi Kimura	Additional Resident Representative
	Mr. Masaaki Matsushima	Deputy Resident Representative In Charge of Japanese Grant Aid Assistance

(2) Draft Basic Design Explanation Team

1.	Ministry of Finance	
	Mr. Kamrul Hasan	Deputy Secretary, ERD
	Mr. Nurul Hogue Mazumder	Senior Assistant Chief, ERD
	Ms. Aspia Aktar	Assistant Chief, ERD
	Mr. Shin'ichiro Omote	JICA Expert, Economic Cooperation Coordinator, Economic Division
2.	Survey of Bangladesh	
	Mr. Shahedul Islam Mondal	Surveyor General, SOB
	Mr. Noor Muhammad Mian	Director, Development Survey, SOB
	Mr. Kazi Shafayetul Haque	Director, Defense Survey, SOB
	Mr. Ismail Mia	Manager, LPO, SOB
	Mr. Ayub Hossain	Assistant Manager, LPO, SOB
	Mr. Anisor Rahaman	Assistant Survey Super, Surveyor General Office, SOB
	Mr. Nayon Chandra Sarker	Technical Assistant, Geodetic Department, SOB
	Mr. Porves Anmed Khan	Survey Super, Photogrammetric Office, SOB
	Mr. Mohamnad Morutuza Reza	Assistant Surveyor General, SOB
	Mr. Minhaz Ali	Assistant Manager, LPO., SOB
	Mr. Nurul Amin Chowdhung	Project Director, SOB
3.	National Board of Revenue	
	Mr. Saiful Islam	Second Secretary(Custom)
4.	Embassy of Japan	
	Mr. Yoichi Yamaguchi	Second Secretary, Economic Cooperation Section
5.	JICA Bangladesh Office	
	Mr. Yuji Okazaki	Resident Representative
	Mr. Sen'ichi Kimura	Additional Resident Representative
	Mr. Masaaki Matsushima	Deputy Resident Representative In Charge of Japanese Grant Aid Assistance
	Mr. Kozo Ito	Deputy Resident Representative In Charge of Japanese Grant Aid Assistance