

BASIC DESIGN STUDY  
ON  
THE ESTABLISHMENT PROJECT  
OF  
PHARMACEUTICAL FORMULATION CENTRE OF ESSENTIAL DRUGS  
IN  
THE PEOPLE'S REPUBLIC OF BANGLADESH

AUGUST, 1983

Japan International Cooperation Agency



BASIC DESIGN STUDY  
ON  
THE ESTABLISHMENT PROJECT  
OF  
PHARMACEUTICAL FORMULATION CENTRE OF ESSENTIAL DRUGS  
IN  
THE PEOPLE'S REPUBLIC OF BANGLADESH

AUGUST, 1983

Japan International Cooperation Agency

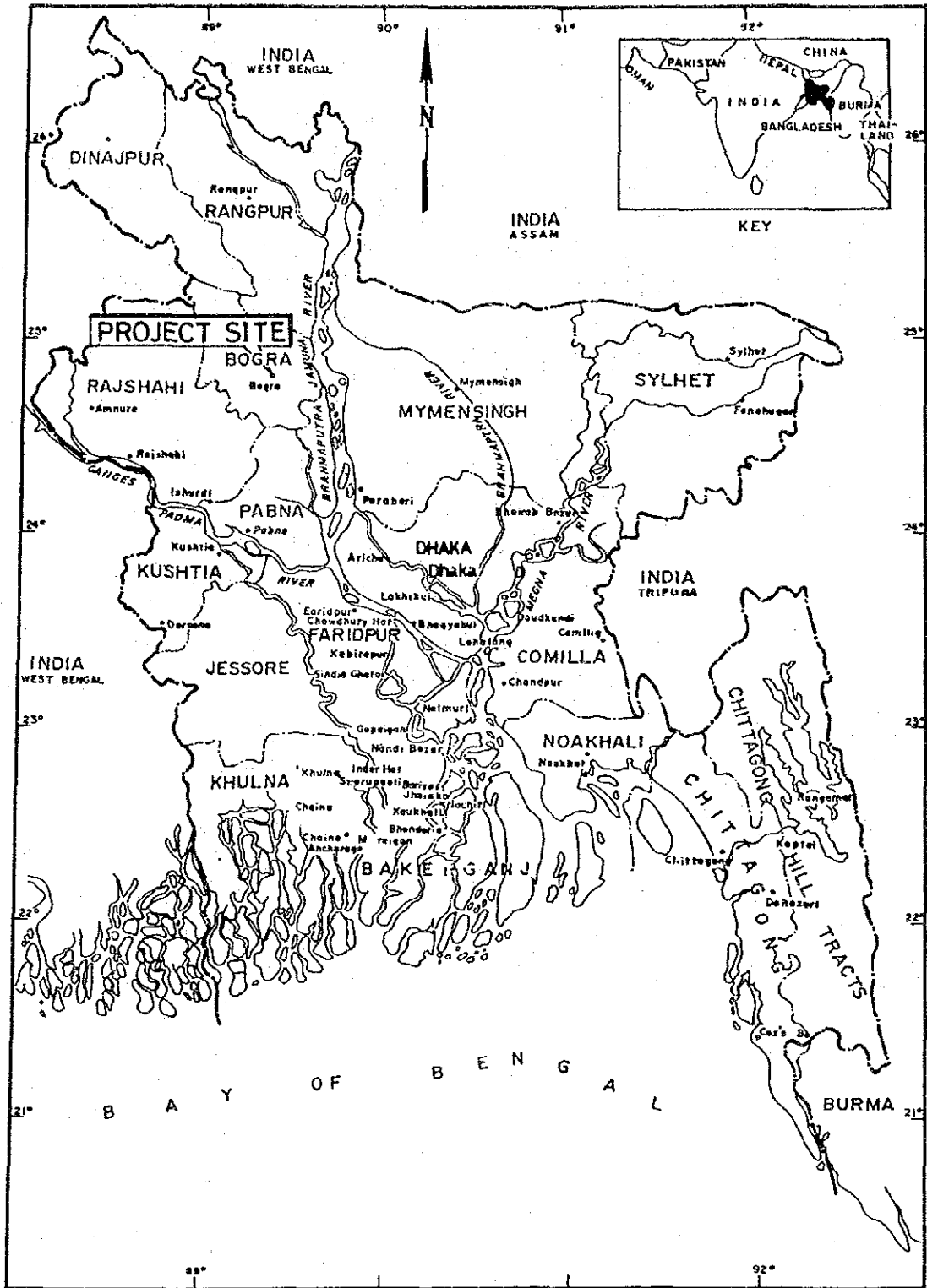
No. 14112

101

99

GRB

国際協力事業団	
受入 月日 58.12.15 84.9.25	101
登録No. 09963	99
	GRB



**BANGLADESH**

10 0 10 20 30 40 50

SCALE IN MILES



## P R E F A C E

In response to the request of the Government of the People's Republic of Bangladesh, the Government of Japan decided to conduct a survey on the Construction Project of the Pharmaceutical Formulation Centre of Essential Drugs and entrusted the survey to the Japan International Cooperation Agency (JICA). The JICA sent to Bangladesh a survey team headed by Mr. Shozo Kamiya, National Institute of Hygienic Sciences, Ministry of Health and Public Welfare from 16th, April to 4th May, 1983.

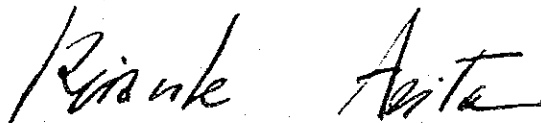
The team had discussion with the officials concerned of the Government of Bangladesh and conducted a field survey in Bogra area.

After the team returned to Japan, further studies were made and the present report has been prepared.

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

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

August, 1983



Keisuke Arita

President

Japan International Cooperation Agency





## SUMMARY

The Bangladesh Government are presenting the highest priority policy of improving backward medical situation and establishing medical services in the rural areas with the target of "Minimum Medical Care to All" and "Health for All by the Year 2000". The Second Five Year Plan (1980-85) has the target to establish, during the period, 356 Thana Health Complex (THC) in the Thana level and 4,500 Family Welfare Centres (FWC) in the Village level, 312 and 1,475 respectively of which have been working as of December of 1982.

In the circumstances, the Bangladesh Government selected 45 items of Essential Drugs required for Primary Health Care being enjoyed in the rural areas and made the plan of construction of two pharmaceutical formulation centres in Bogra (Rajshahi Division) and Jessore (Khulna Division) to realize the increase of supplying essential drugs by the domestic production. For this purpose, the Bangladesh Government requested the Japanese Government to implement, under the Japanese Grant Aid, the establishment of a pharmaceutical formulation centre in Bogra, one of the planned locations.

In response to the request, the Japanese Government executed the preliminary study in December, 1982, through Japan International Cooperation Agency (JICA) to confirm the contents of request and study the possibility and justifiability of implementing the Grant Aid. As a result of study, the Preliminary Study Team recognized the great necessity to execute the project but reported that the project should be executed after the Bangladesh Government would establish the management and administration of project and the circulation system of raw materials and products of drugs.

The Bangladesh Government, afterwards, made a decision to manage the pharmaceutical formulation centre in Bogra by a company registered under the Companies Act whose shares would be subscribed wholly by the Bangladesh Government only. When the management was confirmed as above mentioned, the Japanese Government executed the Basic Design Study in April, 1983, through JICA.

The Basic Design Study Team proposed the basic design in basis of the study by the team and in consideration of the strong request by the Bangladesh Government; "Buildings and facility should be simple and functional as much as possible and not too big and not too sophisticated; and the cost should be minimized as far as possible." The outline of facility is proposed in the Basic Design, as follows:

Buildings	Administration Block	504 m <sup>2</sup>
	Processing & Packing Block	1,215
	Warehouse Block	445
	Others	540
	<hr/>	
	Total	2,704

Production Capacity	Tablet	18,000,000 tabs./month
	Capsule	3,600,000 caps./month
	Powder	270,000 shts./month

The proposed pharmaceutical formulation equipments are designed to produce 45 items of drugs and more within the dosage forms of tablet, capsule and powder. However, the production capacity is designed on the condition of production of following 12 items, out of 45 items of Essential Drugs, which are especially required for Primary Health Care.

- 1) Aspirine tablet (Antifebrile)
- 2) Chloroquine phosphate tablet (Antimalarial)
- 3) Aluminium hydroxide gel tablet (Antacid)
- 4) Piperazine tablet (Vermicide)
- 5) Phenoxy methyl penicillin tablet (Antibacteria)
- 6) Glucose electrolyte powder ORS (Infusion)
- 7) Ampicillin capsule (Antibacteria)
- 8) Ergometrine/methyl ergometrine maleate tablet (Uterotonic)
- 9) Ferrous sulphate tablet (Hematinic)
- 10) Ephedrine tablet (Cough remedy)
- 11) Vitamine A capsule (Vitamine compound)
- 12) Paracetamol tablet (Antifebrile)

The project needs the period of 19 months and the cost of 1,150 million Japanese Yen to construct the proposed pharmaceutical formulation centre.

It is understood that 45 items of essential drugs to be produced in the project were selected through the requirement for Primary Health Care in Bangladesh and that, since the efficacy and safety of 45 items of essential drugs are established in the industrialized countries, they are not dangerous for their use.

The essential drugs to be produced in the project will be provided patients free of cost in the rural areas through Primary Health Care. And it is greatly expected that this project with the important objective to establish the stable supply of essential drugs will be able to play an important role of improvement programme of total medical service in the rural areas, in link with the construction programme of medical facilities.

However, it is seen that various problems are involved in the present medical situation of Bangladesh and therefore that the problems will still be existing in the project, as shown below:

- (1) The Bangladesh Government have the basic policy to manage the new pharmaceutical formulation centre on a self-paying by a company registered under the Companies' Act whose shares will be subscribed wholly by the Bangladesh Government only. However, at present the company is not established yet and the function of company or the management policy by the Government is not decided, either, yet. The Bangladesh Government is suggested to start at the earliest time the preparation for establishing the new company to be an executing body of project.
- (2) Most of locally produced essential drugs are presently produced in two government factories, which, however, do not seem to be efficiently managed. It may be recognized in this condition that the new pharmaceutical formulation centre will need the high managing technique in order to manage the centre financially on a self paying.

- (3) The proposed pharmaceutical formulation centre will need more than 120 persons to operate. In Bogra, it is seen that the new centre will find it difficult to employ the required manpower and especially more than 40 technicians to work on the pharmaceutical processing. Therefore the Government is suggested to start at the earliest time the employment programme of manpower.
- (4) All the raw materials of essential drugs to be used in the project will be imported. And the foreign currency exchange condition is extremely bad in Bangladesh. Therefore, it will be necessary for the Bangladesh Government to allocate the sufficient amount of foreign currency for the import in order efficiently to manage the new centre.
- (5) It will be necessary to establish the circulation system at the earliest time from the procurement of required raw material down to the distribution of produced essential drugs in the Primary Health Care.





BASIC DESIGN STUDY  
ON  
THE ESTABLISHMENT PROJECT  
OF  
PHARMACEUTICAL FORMULATION CENTRE OF ESSENTIAL DRUGS  
IN  
THE PEOPLE'S REPUBLIC OF BANGLADESH

Table of Contents

MAP OF BANGLADESH	
PREFACE	
SUMMARY	
I. INTRODUCTION .....	1
II. BACKGROUND .....	3
1. State of Things and Plan for Improvement of Health Care System .....	3
1-1 State of Things of Health Care System .....	3
1-2 Administrative Organization and Facilities of Health Care System .....	7
1-2-1 Health Care System .....	7
1-2-2 Administrative Organization .....	8
1-2-3 Medical Facilities .....	8
1-3 Plan for Improvement of Health Care System .....	16
1-3-1 Plan for Improvement of Treatment of Diseases .....	16
1-3-2 Plan for Construction of Medical Facilities .....	16
1-3-3 Plan for Development of Medical Care Manpower .....	17
1-3-4 Plan for Reinforcement of THC and FWC .....	17
2. Present State of Things and Plan for Improvement of Supply of Drugs .....	22
2-1 Production and Distribution of Drugs .....	22
2-1-1 Drugs Distribution System .....	22
2-1-2 Central Medical Stores Depot (CMSD) .....	22
2-1-3 District Reserve Stores (DRS) .....	23
2-1-4 Future Plan .....	23

2-2	Present State of Things of Pharmaceutical Industry ..	25
2-2-1	Profitmaking Enterprises .....	25
2-2-2	Nonprofit Organizations (P.P.U. and I.V. Fluid Plant) .....	27
2-2-3	Profitmaking Enterprises (With Participation of Government Capital; Gonoshasthaya Pharmaceuticals Ltd.) .....	31
2-2-4	Items and Volume of Domestic Production of Drugs .....	33
2-2-5	State of Things of Pharmaceutical Manpower ..	33
2-3	Present State of Drugs .....	36
2-3-1	Demand of Drugs .....	36
2-3-2	Actual Case of CMSD .....	36
2-3-3	Present State of Drugs in Medical Facilities	37
2-4	Plan for Improvement of Supply of Drugs .....	45
2-4-1	Recommendation of the World Bank .....	45
2-4-2	Plan Recommended by WHO .....	45
2-4-3	Improvement Plan Proposed by the Bangladesh Government .....	46
III.	THE PROJECT .....	47
1.	Objective and Basic Policy of Design .....	47
1-1	Objective of Project .....	47
1-2	Basic Policy of Design .....	48
2.	Project Site .....	49
2-1	Project Site .....	49
2-1-1	Geographical Situation .....	49
2-1-2	Infrastructure .....	57
2-1-3	Natural Conditions .....	58
2-2	Existing Situation of Project Site .....	61
2-2-1	Possession of Land for Project and Its Utilizing Situation .....	61
2-2-2	Topography and Sub-soil Conditions .....	61
2-2-3	Site Conditions for Construction Work .....	62



3. Architectural Design .....	69
3-1 Buildings .....	69
3-1-1 Site Layout Plan .....	69
3-1-2 Architectural Floor Plan .....	69
3-1-3 Style, Space and Design .....	81
3-1-4 Construction Materials and Finish .....	81
3-2 Structure .....	83
3-2-1 Structural Plan .....	83
3-2-2 Structural Design Condition .....	83
3-3 Sanitary, Plumbing and Fire Extinguishing Equipment .....	85
3-3-1 Water Supply Equipment .....	85
3-3-2 Drainage Equipment .....	85
3-3-3 Fire Extinguishing Equipment .....	85
3-4 Air Conditioning Equipment .....	88
3-5 Electric Equipment .....	90
3-5-1 Power Supply Equipment .....	90
3-5-2 Generating Equipment .....	90
3-5-3 Main Power Feeder Equipment .....	90
3-5-4 Power Control Equipment .....	92
3-5-5 Outlet Equipment .....	92
4. Pharmaceutical Formulation Equipment .....	93
4-1 Pharmaceutical Formulation Equipment .....	93
4-1-1 Items of Drugs .....	93
4-1-2 Production Capacity .....	94
4-1-3 Required Volume of Raw Materials .....	95
4-2 Outline of Pharmaceutical Formulation Equipment .....	96
5. Project Implementation Plan .....	97
5-1 Scope of Project and Items to Be Done by the Bangladesh Government and the Japanese Government .....	97
5-1-1 Scope of Construction Work .....	97
5-1-2 Items to Be Done by the Bangladesh Government .....	97
5-1-3 Items to Be Done by Aid by the Japanese Government .....	99

5-2	Project Implementation Plan .....	101
5-2-1	Consultant and Construction Contractor ...	101
5-2-2	Procurement of Construction Materials, Equipment and Labour .....	101
5-3	Project Schedule .....	104
5-3-1	Schedule of Aid by the Japanese Government	104
5-3-2	Schedule of Items to Be Done by the Bangladesh Government .....	104
6.	Rough Cost Estimate of Items to Be Done by the Bangladesh Government .....	107
7.	Management and Administration Plan .....	108
7-1	Execution Body and Management and Administration of the Project .....	108
7-1-1	Execution Body of the Project .....	108
7-1-2	Management and Administration .....	108
7-1-3	Function of Pharmaceutical Formulation Centre	109
7-2	Manpower Plan .....	110
7-3	Maintenance of Facilities .....	112
7-3-1	Maintenance of Buildings .....	112
7-3-2	Maintenance of Pharmaceutical Formulation Equipment .....	112
7-4	Estimate of Maintenance Expenditure .....	113
7-4-1	Expenditure for Manpower .....	113
7-4-2	Expenditure for Maintenance of Facilities	113
IV.	PROJECT JUSTIFICATION .....	115
V.	CONCLUSION AND RECOMMENDATION .....	121
1.	Conclusion .....	121
2.	Recommendation .....	123

Reference Data

APPENDIX-A	OUTLINE OF SURVEYED MEDICAL TREATMENT AND HEALTH CARE FACILITIES .....	A - 1
APPENDIX-B	EXISTING SITUATION OF PHARMACEUTICAL UNITS ...	A - 15
APPENDIX-C	DEMAND AND SUPPLY OF DRUGS IN THE MEDICAL FACILITIES CONCERNED .....	A - 51
APPENDIX-D	OUTLINE OF "GUIDELINES AND RECOMMENDATIONS FOR THE ESTABLISHMENT OF A LOW COST PHARMACEUTICAL FORMULATION PLANT (LCPFP) IN DEVELOPING COUNTRIES, WHO, 1980" .....	A - 63
APPENDIX-E	METEOROLOGICAL DATA IN BOGRA (TEMPERATURE, HUMIDITY AND RAINFALL) .....	A - 75
APPENDIX-F	OUTLINE OF STUDY .....	A - 81
APPENDIX-G	MINUTES OF DISCUSSION .....	A - 89
APPENDIX-H	ALTERNATIVE DESIGNS PROPOSED BY BASIC DESIGN STUDY TEAM .....	A - 101



## I. INTRODUCTION



## I. INTRODUCTION

In Bangladesh many people suffer from malignant epidemic, or plague, and such other diseases as in skin, eye, ear and by parasites in their chronic malnutrition and bad sanitary environment. However, all people cannot easily have the medical services even in the primary stage.

The Bangladesh Government are concentrating himself on improvement of backward medical situation and on establishment of medical services in rural area with the target of "Minimum Medical Care to All" and "Health for All by The Year 2000". The Second Five Years Plan (1980-85) has the target of providing rural areas with the satisfactory medical services by the establishment of "Primary Health Care" including construction of 356 Thana Health Complexes (THC) and 4,500 Family Welfare Centres (FWC).

Besides the Bangladesh Government selected 45 items of Essential Drugs for Primary Health Care according to the WHO Recommendation, 1977 and 1979, and has planned the domestic production of drugs under the management of Government. In this policy, two pharmaceutical formulation plants have been planned to be constructed in Bogra and Jessore, which are recommended in the World Bank Feasibility Study Report, 1979. For the purpose of realizing the recommendation of the World Bank, the Bangladesh Government requested the Japanese Government to implement the establishment of Pharmaceutical Formulation Centre in Bogra under the Japanese Grant Aid, which is one of the locations.

In response to the request, the Japanese Government dispatched the Preliminary Study Team to Bangladesh from December 11 to December 23, 1982, through the Japan International Cooperation Agency, who in Bangladesh confirmed the contents of request and study the background of project and has studied the justifiability and programme for implementation of project under the Japanese Grant Aid. When the contents of Preliminary Study Report was confirmed by the Japanese Government and the government management of new centre which had not been confirmed at the time of the Preliminary Study was decided by the Bangladesh Government, the Basic Design Study Team was decided to be dispatched to Bangladesh through the Japan International Cooperation Agency from April 16, to May 4, 1983.

The objective of basic design study is as follows:

- (1) To study the background of project and the justifiability of project under the Japanese Grant Aid;
- (2) To survey the expected project site and the existing condition for construction and to study the subject for implementation; and
- (3) To study the contents of project and to propose the plan for project.

To attain the above objective, the Study Team, executed the survey from April 16 to May 4, 1983, in Bangladesh. The formation of the Study Team is shown as follows:

Shozo Kamiya	Team Leader
Norio Shimomura	Project Coordinator
Kiichi Kobayashi	Project Planner, Chief of Works
Tsutomu Shibata	Machinery Engineer
Hiroaki Toba	Architect
Takashi Muraoka	Building Engineer

Between the Bangladesh Government and the Study Team the basic policy for planning was discussed on basis of the result of survey and the conclusion which was mutually confirmed in the Minutes of Discussion (see Appendix-G).

The Report shows the study of existing background of the project, the recommended design of the Centre and the implementation plan, and the justifiability of implementation of the project.



## II. BACKGROUND



## II. BACKGROUND

### 1. State of Things and Plan for Improvement of Health Care System

#### 1-1 State of Things of Health Care System

Bangladesh has a 144,000 square kilometer territory. An outstanding geographical peculiarity of Bangladesh is the fact that the rivers occupy approximately 10 % of its national territory. A huge population, estimated to surpass 100 million, crowds this country. Furthermore, the social conditions of this country are far away from any symptom of improvement, in spite of the efforts of the Government and the huge amounts of aid provided by the industrial countries, in view of adverse factors such as the annual demographic growth rate of 2.7 % and the illiteracy of 75 %.

The period of June to October is the so-called monsoon season, which is the epoch with heaviest rainfall and highest humidity. Furthermore, the topographical peculiarities of Bangladesh, consisting mostly of flatlands with altitude barely exceeding 10 meters above the sea level with exception of some hilly countries, contributes to worsen the situation. During this period most of the national territory of Bangladesh is flooded, and the drainage becomes very poor during a long time.

Consequently, the sanitary environment of the country becomes the worst and most of the epidemics, pestilences and plagues break out during this period, aided by the state of chronic malnutrition of the whole population. Under the circumstances, most of the disease pattern consists of diseases of infecto-contagious nature, such as dysentery, typhoid fever, cholera, malaria, tuberculosis, pneumonia, tetanus, poliomyelitis, etc. Furthermore, other kinds of diseases such as skin diseases, eye diseases, parasites, etc., are also very frequent. (The disease pattern of the patients hospitalized in THC (Thana Health Complex), the disease pattern analyzed from the standpoint of the patients (1,002 persons), and the cases of death analyzed from the standpoint of the age of the patients and the disease pattern in Shibganj THC, located in Bogra District where this project will be implemented, are shown in the Table II-1, Table II-2 and Table II-3, respectively.)

In addition to the aforementioned circumstances, the regrettable situation of the national economy of Bangladesh, contributes to the extremely high mortality of babies, small children and pregnant women. As a consequence, the average life is 46 for male population and 47 for female population.

Under the existing conditions, Bangladesh is scarce of both drugs and medical facilities, and as a matter of fact, people can not so much as receive basic medical care of the most elementary nature.

Table II-1 Disease Pattern in THC  
(Source: Ministry of Health and Population Control)

<u>Group Cause (1976)</u>	<u>Percentage of 1002 patients</u>
(i) Attempted suicide, homicidal injuries, injuries purposely inflicted by others; other accidents, burns, fractures; road transport accidents	20.76
(ii) Anaemias; Protein-Caloric malnutrition, kwashiorkor, marasmus; avitaminosis and other nutritional disorders	12.47
(iii) Dyspepsia, gastritis, epigastric pain, peptic ulcer	11.18
(iv) Intestinal worms; dysentery, enteritis and other diarrhoeal diseases; typhoid, paratyphoid fever	10.48

The above four group-causes constitute about 55% of the 1002 patients.

<u>Leading Group/Single Causes having more or less common causation (1976)</u>	<u>No. of cases 1st &amp; 2nd visits</u>	<u>% of total (1198)</u>
(i) Intestinal worms; diarrhoea, enteritis, dysentery, typhoid and paratyphoid fevers	228	19.03
(ii) Scabies with or without secondary infection	151	12.60
(iii) Diseases of respiratory tract (excluding tuberculosis) i.e. sore throat, tonsillitis, etc. bronchitis, bronchial asthma, etc. pneumonia, other diseases of respiratory tract	149	12.43
(iv) Dyspepsia, gastritis, epg. pains, peptic ulcer	142	11.85
(v) Anaemia, protein-caloric malnutrition, avitaminosis, Goitre, etc.	98	8.18
	768	64.09

Table II-2 Number of Deaths in Age Groups (1974 - 75)

<u>Group and Single Causes</u>	<u>-1</u>	<u>1-4</u>	<u>5-9</u>	<u>10-44</u>	<u>45+</u>	<u>Total</u>	<u>% of 2664</u>
1. Dysentery and diarrhoea	48	189	34	51	208	530	19.89
2. Fever all forms	51	86	14	35	68	254	9.53
3. Tetanus	216	19	3	4	1	243	9.12
4. Measles	14	30	7	0	0	51	1.91
Total above four	329	324	58	90	277	1078	40.47

Table II-3 Types of Diseases for 1982 in Shibganj THC

Sl. No.	Major Disease	Children		Adult		Total	Percentage of Each Disease
		0 - 6	7 - 12	Male	Female		
		1	Cold, Cough, Respiratory, Infection	1,751	1,533		
2	Diarrhoea/Dysentery	640	910	2,863	1,776	6,189	18.90
3	Scabies/Skin Rash	1,536	1,313	1,839	1,426	6,114	18.67
4	Intestinal Worm Infestation	753	1,291	1,862	1,204	5,110	15.60
5	Malnutrition/Anaemia	606	550	1,120	1,049	3,325	10.15
6	Goitre	150	130	170	80	530	1.62
7	Leprosy	180	120	80	60	440	1.34
8	Night Blindness/Xerophthalmia	212	133	63	20	428	1.31
9	Accident	3	52	187	32	274	0.84
10	Measles	251	20	-	-	271	0.83
11	Asthma	15	20	105	55	195	0.60
12	Tonsillitis	1	8	32	15	56	0.17
13	Polio	8	5	-	-	13	0.04
14	T.B.	-	-	7	5	12	0.04
15	Neo-Natal Tetanus	3	-	-	-	3	0
Total		6,109	6,085	11,999	8,558	32,751	-

Source: Ministry of Health and Population Control

## 1-2 Administrative Organization and Facilities of Health Care System

### 1-2-1 Health Care System

The administrative organization and the medical facilities of the health care system of Bangladesh are shown in Fig. II-1. On the other hand, the administrative organization of the health care system of Bangladesh is as follows.

#### (1) Primary Health Care

The primary health care exercises jurisdiction over administrative units ranging from Villages to Thanas, and comprises FWC (Family Welfare Center), which cover extremely small dwelling units, THC provided in correspondence to each 200,000 persons, Union Health Centre (UHC), Rural Health Centre (RHC) and the Rural Dispensary (RD).

#### (2) Secondary Health Care

The secondary health care exercises jurisdiction over administrative units ranging from Sub-Divisions to Districts, and comprises District Hospitals, which have a standard capacity of 100 beds and the Sub-Divisional Hospitals, which have a standard capacity of 50 beds.

#### (3) Tertiary Health Care

The tertiary health care exercises jurisdiction over administrative units ranging from Divisions to the whole nation. In addition to the tertiary health care, in Dhaka, the capital city of the country, there is the Special Health Care, which carries out research works related to specific diseases and can also be commissioned by medical colleges and hospitals. In the medical facilities comprised in Primary Health Care, all of the patients receive free medical care. Should the primary medical care be charged, approximately 80% of the patients could not afford to receive it. The essential drugs to be provided by this project will be supplied free of charge, within the scope of the Primary Health Care. In principle, medical care is provided free of charge also in the Secondary Health Care and other types of health care ranked at higher positions within the administrative organization of the health care system. However, in the case of using

special drugs and special medical facilities the health care service is charged.

#### 1-2-2 Administrative Organization

The organization of the Ministry of Health and Population control is shown in the Fig. II-2. The health care service, including the drug administration, is under the control of DGHS (Directorate General of Health Service), and its organogram is shown in the Fig. II-3.

On the other hand, the Ministry of Health and Population Control exerts also direct jurisdiction over the local health care administrative organizations. The administrative organization of the health care system of Bogra District, which is the area where this project will be implemented, is shown in the Fig. II-4. The health care organization set-up at the Thana level are shown in the Fig. II-5. However, the function of the organization is not necessarily perfect, due to vacancies and other problems.

#### 1-2-3 Medical facilities

The medical facilities that compose the health care system of Bangladesh consist principally of hospitals of District and Sub-Division in addition to Thana Health Complexes (THC) and Family Welfare Centres (FWC) of Thana level, Union Health Centres, Rural Health Centres and Rural Dispensaries.

##### (1) Thana Health Complex (THC)

THC is provided in each Thana or in correspondence to each approximately 200,000 inhabitants. Each THC is equipped with 6 beds for family planning, 25 beds for ordinary patients, examination equipment and X-ray equipment, and is operated by a staff which consists of 5 Medical Officers.



(2) Family Welfare Centre (FWC)

FWC is provided in each Union, which is an extremely small dwelling unit, with the purpose of carrying out family planning in addition to prevention and medical treatment of diseases. FWC is operated by a staff which consists of Medical Assistant, Family Welfare Visitor, Pharmacist, etc.

(3) Hospital

There are various kinds of hospitals, i.e., Medical College Hospital, District Hospital, Sub-Divisional Hospital, etc., in correspondence to the various administrative units of the country.

The number of medical facilities of each District is listed in the Table II-4. The outline of the hospitals of Dhaka and Bogra (Institute of Cardiovascular Diseases, Shaheed Suhrawardy Hospital Complex, Dhaka and Mohammad Ali Hospital, Bogra) and THC and FWC of Bogra District (Shibganj Thana Health Complex and Pirob Family Welfare Centre), as examples of medical facility that will be supplied with essential drugs by this project, are shown in Appendix-A. As can be seen from Appendix-A, Shibganj THC and Pirob FWC, examined as examples of THC and FWC which are the leading parts in the Primary Health Care, are very well equipped. Nevertheless, it is necessary to take note of the fact that they are falling short of the most commonly used materials and equipment and personnel for their operation.

Fig. II-1 Government Administration and Health Care System

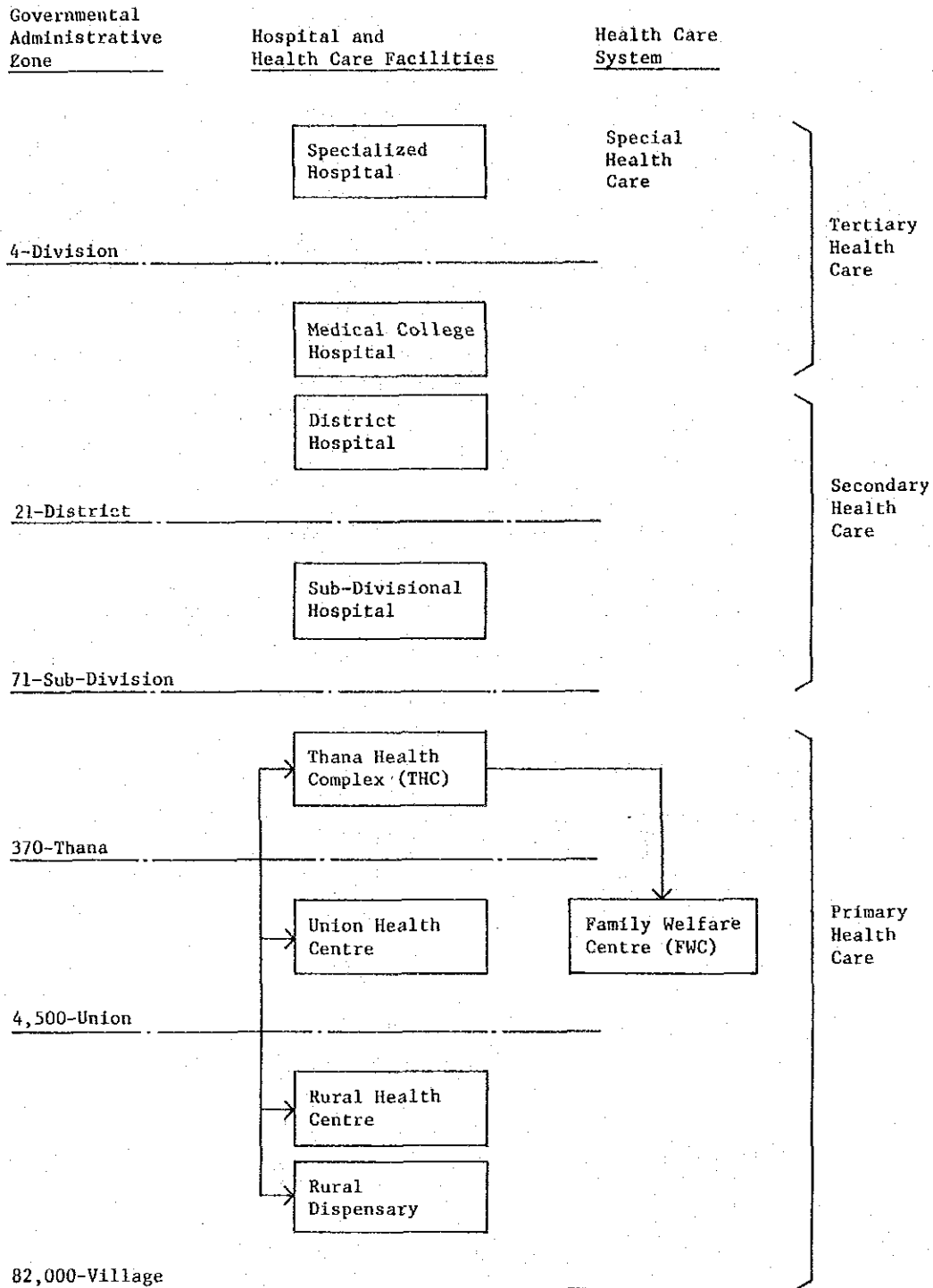


Fig. II-2 Organogram of Health Division, Ministry of Health & Population Control

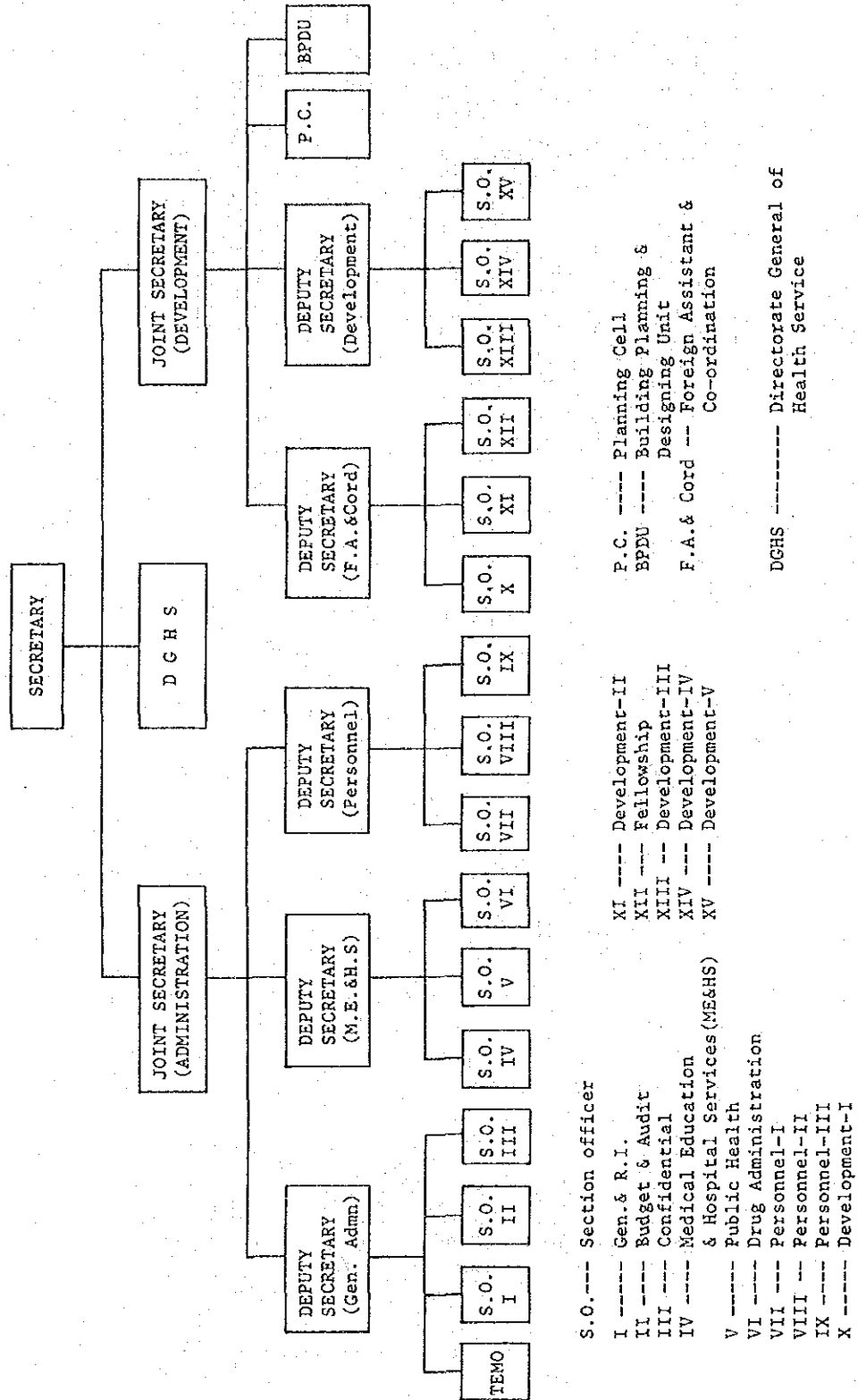


Fig. II-3 Organization Chart of Directorate General Health Service (DGHS)

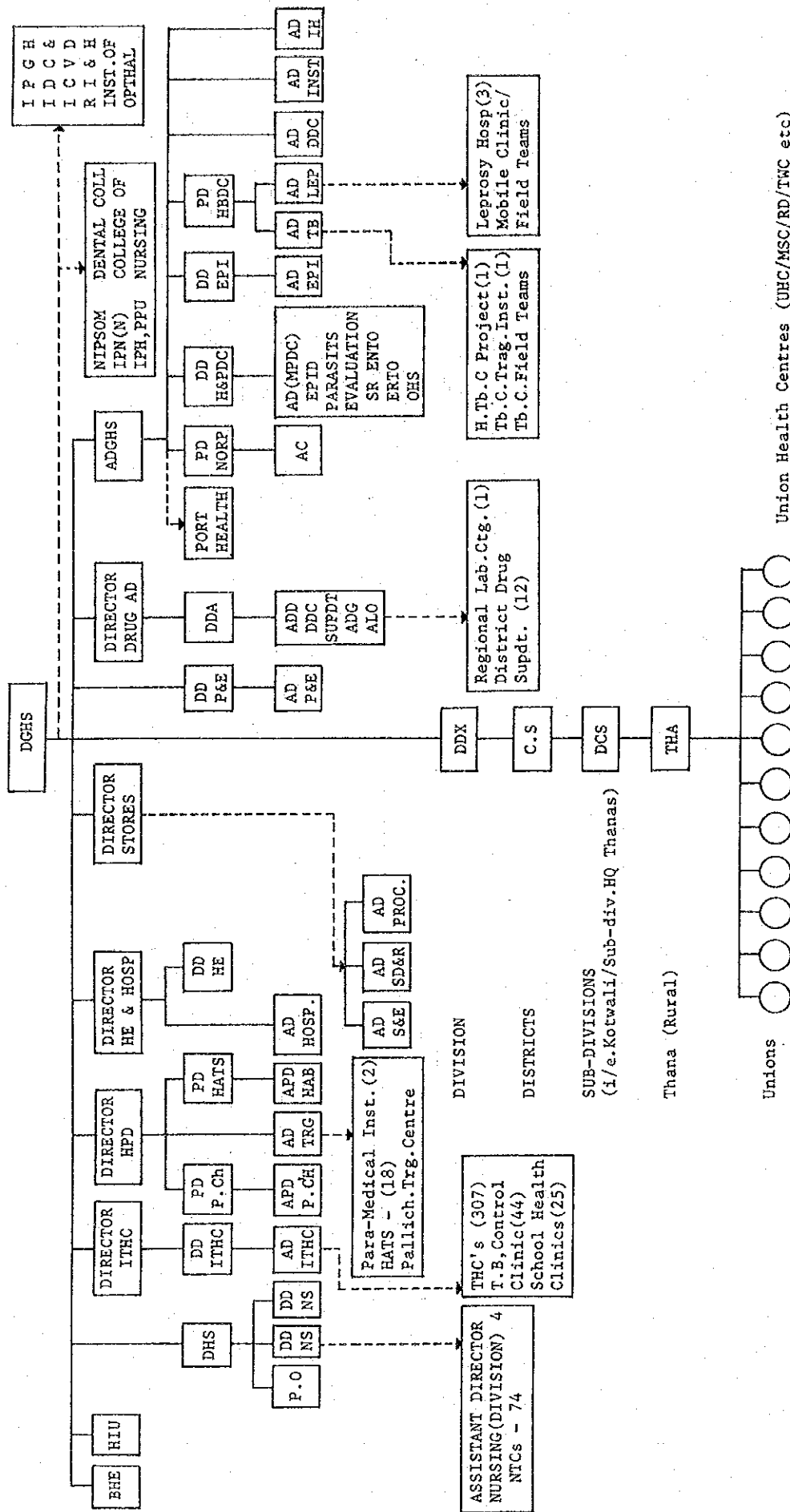


Fig. II-4 Organization Set-up of District Headquarters for Intergrated Thana Health Complex (ITHC) covering Bogra Entire District, Ministry of Health and Population Control

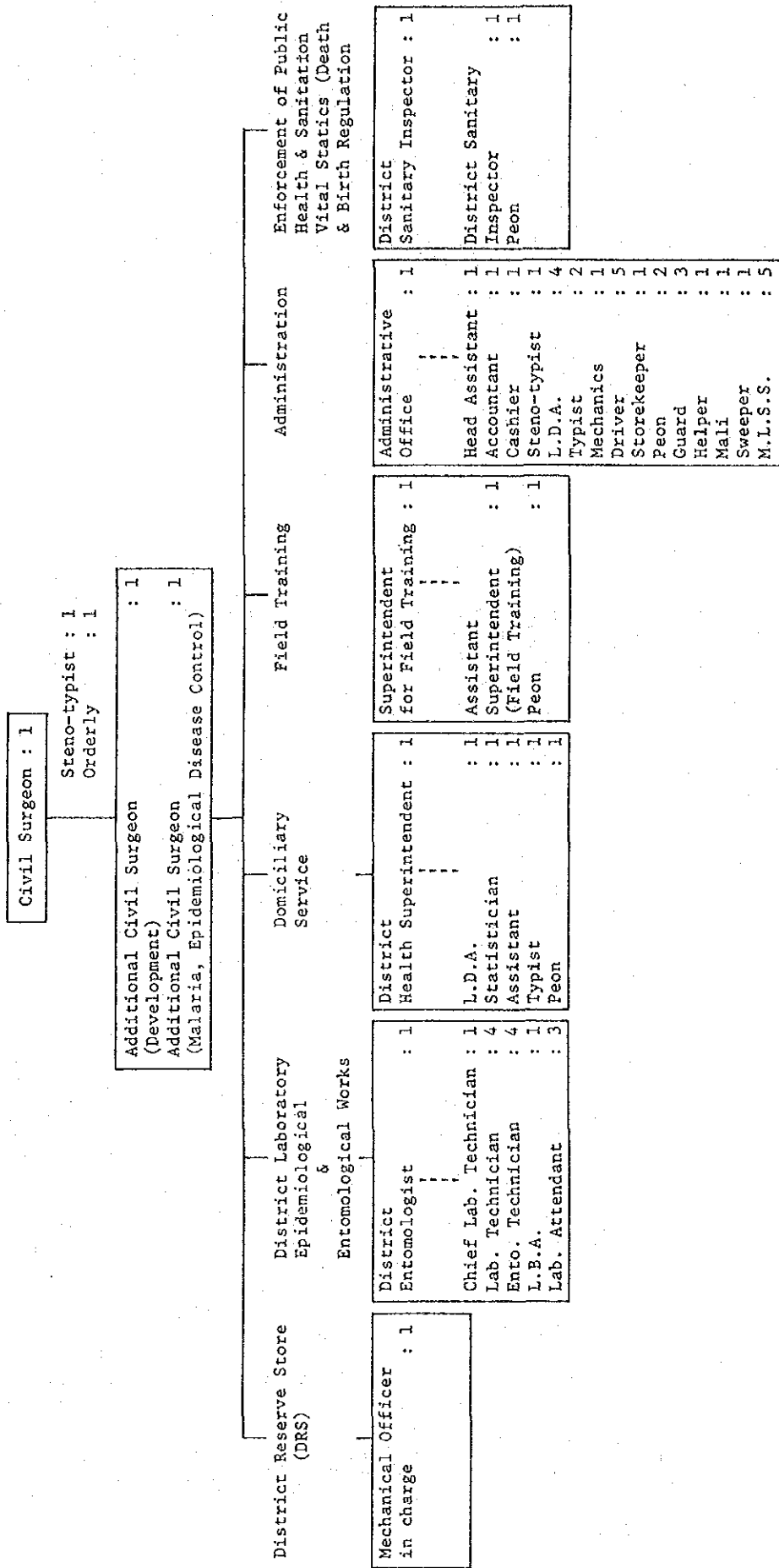
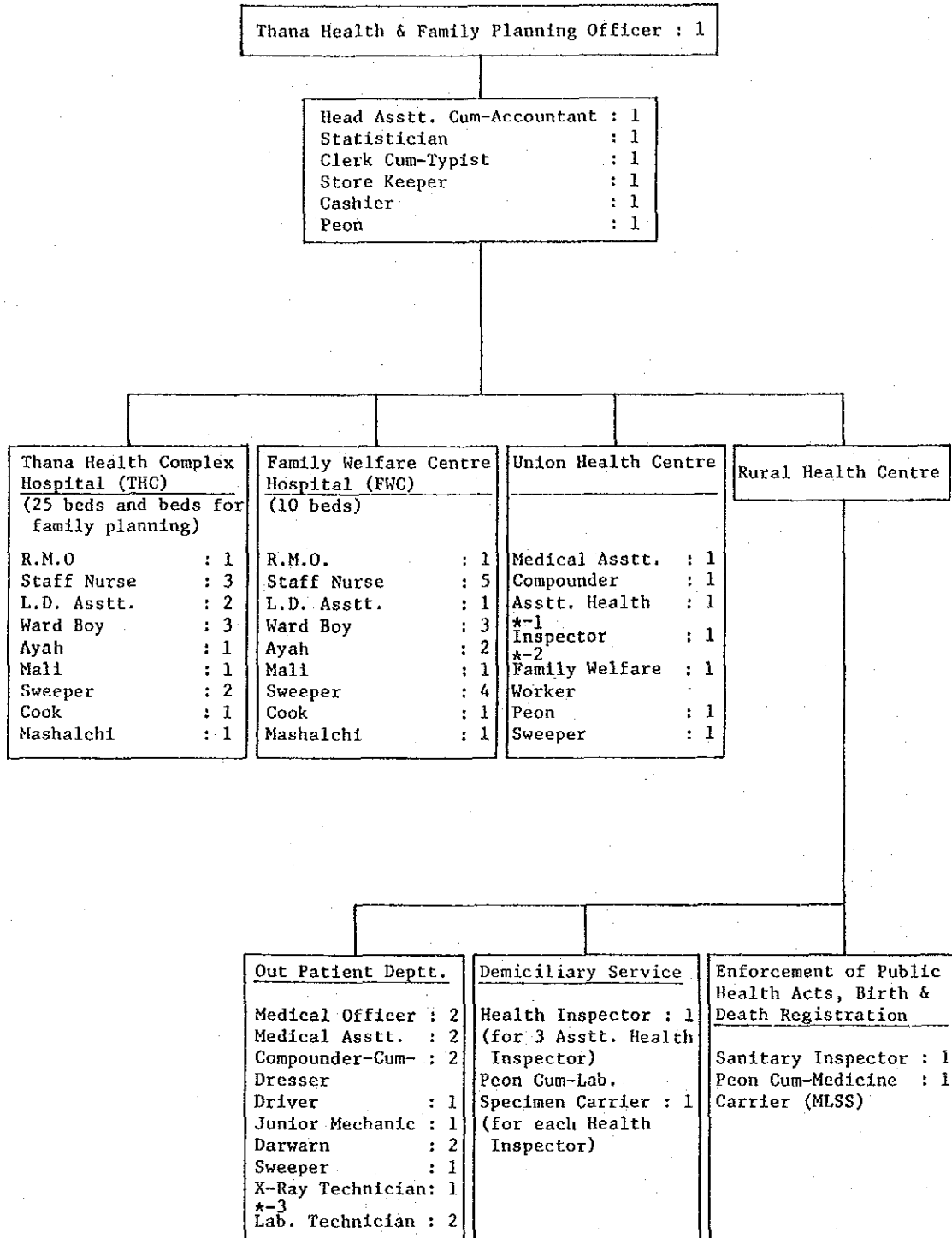


Fig. II-5 Organization Set-up at Thana Level (Non Up-graded)



\*-1 : 1 Inspector for 5-Family Welfare Workers  
 \*-2 : 1 Family Welfare Worker for 4,000 population  
 \*-3 : 1 Lab. Technician for 100,000 population

Table II-4 Hospitals (with Beds) and Dispensaries MOH&PC  
(Health Division) by District

District	Population 1,000	Medical College Hosp.		District Hosp.		Sub-Div. Hosp.		THC Hosp. & Rural Hosp.		Other Hosp.		Total Hosp.		Thana Disp. (TD)	Dispensaries/Clinics			Total Static Health Care Facilities	
		No	Bed	No	Bed	No	Bed	No	Bed	No	Bed	No	Bed		HSC/ UHC/ RD/UC etc.	School Health Center	T.B Cont- rol Center		
1 Dinajpur	3299	-	-	1	100	1	50	12	120	-	-	14	270	8	64	1	2	75	89
2 Rangpur	6698	1	650	-	-	3	150	17	208	3	90	24	1098	10	122	2	3	137	161
3 Bogra	2803	-	-	1	100	-	-	10	131	1	20	12	251	2	51	1	1	55	67
4 Rajshahi	5430	1	650	-	-	3	150	16	124	2	170	22	1094	13	95	1	3	112	134
5 Pabna	3529	-	-	1	100	1	100	11	105	2	420	15	725	5	36	1	2	44	59
6 Kushtia	2346	-	-	1	100	2	100	8	106	-	-	11	306	-	46	1	3	50	61
7 Jessore	4145	-	-	1	100	3	120	14	434	1	20	19	674	3	48	1	2	54	73
8 Khulna	4507	-	-	1	148	2	100	14	170	3	140	20	558	6	42	1	3	52	72
9 Patuakhali	1897	-	-	1	100	1	30	7	101	-	-	9	231	-	16	-	1	17	26
10 Barisal	4815	1	520	-	-	3	130	24	354	1	20	29	1024	2	48	1	3	54	83
11 Faridpur	4917	-	-	1	100	3	150	18	269	1	20	23	539	5	100	1	3	109	132
12 Dhaka	10459	2	1470	-	-	4	275	21	651	8	1499	35	3895	25	118	4	3	150	185
13 Tangail	2520	-	-	1	100	-	-	6	100	-	-	7	200	6	50	1	1	58	65
14 Jamalpur	2522	-	-	1	50	-	-	7	139	-	-	8	189	5	35	-	1	41	49
15 Mymensingh	6749	1	646	-	-	2	100	21	220	-	-	24	966	7	86	1	2	96	120
16 Sylhet	5825	1	500	-	-	3	150	17	506	3	156	24	1312	12	45	1	3	61	85
17 Comilla	7095	-	-	1	110	2	100	19	505	1	20	23	735	10	85	1	3	99	122
18 Noakhali	3932	-	-	1	160	1	50	13	244	1	20	16	474	3	56	2	2	63	79
19 Chittagong	5683	1	854	-	-	1	50	19	212	3	140	24	1246	18	82	3	2	105	129
20 Ctg. H. T.	770	-	-	1	100	2	100	6	165	-	-	9	365	3	20	1	1	25	54
Total	89941	8	5290	13	1368	37	1905	280	4864	30	2735	368	16162	143	1245	25	44	1457	1825

(Source : Ministry of Health & Population Control)

### 1-3 Plan for Improvement of Health Care System

Aiming at improving the present state of things of the health care system of the country, the Bangladesh Government has set the goals of "Minimum Medical Care to All" and "Health for All by The Year 2000", and is planning the construction of hospitals and clinics and the development of medical care manpower such as doctors, medical assistants and nurses in the Second Five Year Plan (1980-85) for realization of these goals.

#### 1-3-1 Plan for Improvement of Treatment of Diseases

As can be seen from Table II-2, 40.47% of the cases of death in THC are caused by Dysentery, Diarrhea, Fever, Tetanus and Measles. Under the circumstances, in the Second Five Year Plan the Government is considering measures to improve the medical care, aiming at lessening the diseases that are afflicting the country, including Cholera and the aforementioned diseases in THC (see Table II-5).

#### 1-3-2 Plan for Construction of Medical Facilities

As can be seen from Table II-6, the target referring to the construction of medical facilities was set in the First Five Year Plan started in 1973. The relevant medical facilities are being constructed gradually, but only 63% of the target (24,371 beds) was realized in terms of number of beds in the period of 7 years up to 1980. Consequently, it is necessary to construct the remnant 37% in the Second Five Year Plan (1980-85). The targets referring to the improvement of hospitals and clinics in the Second Five Year Plan (1980-85) are shown in the Table II-7.



### 1-3-3 Plan for Development of Medical Care Manpower

The plan for development of medical care manpower is shown in Table II-8.

Barely 7.7% of the target referring to the development of medical care manpower of the Second Five Year Plan (1980-85) has been realized as of 1980. Compared with the population of the country, the scale of the available medical manpower is extremely small.

Therefore, the increase of the number of medical care manpower in the country is a theme requiring urgent solution.

### 1-3-4 Plan for Reinforcement of THC and FWC (See Table II-7)

The construction of 356 THC and 4,500 FWC, which compose the Primary Health Care system, is being planned.

#### (1) Thana Health Complex (THC)

The construction of a total of 356 THC is being planned in the Second Five Year Plan (1980-85). THC are currently being equipped, so that 312 of THC became able to provide the minimum services by December, 1982. Bogra District, where this Pharmaceutical Formulation Center will be constructed, has 97 Thana and the construction of 124 THC is being planned at the present time.

#### (2) Family Welfare Centre (FWC)

There are currently 1,275 Rural Dispensaries operating in Bangladesh, and they will be upgraded to FWC. Furthermore, the construction of 2,775 new FWC is being planned in addition to the aforementioned ones and 1,475 FWC started their operation by December 1982. The construction of approximately 1,100 FWC is being planned in Bogra District alone.

In the field of drugs, measures are being considered with the purpose of upgrading the percentage of self-sustenance of essential drugs used in the Primary Health Care (25% at the present time) to 50%. For that purpose, the Bangladesh Government requested a Grant Aid to the Japanese Government for construction of an Essential Drugs Formulation Centre, aimed at contributing to improve the aforesaid percentage.

Table II-5 Disease Pattern and Target Setting  
(Ref: Country Health Programming, 1977)

Problems	Index	Level 1980	Target, 1980-85
1. Smallpox	Incidence		
2. Cholera	Mortality rate	3.5/1000	Reduction by 50%
3. Diarrhoea/ dysentery	Prevalence rate	16.5/100	Reduction by 15%
4. Tuberculosis	Prevalence rate (10 years age)	7/1000	(a) 100% Immunization (b) Case detection and treatment of 100,000 cases
5. Malaria	Annual Parasite incidence		Reduction to 0.1
6. Measles	Mortality rate Incidence rate		Reduction by 25%, 30% case detection and treatment
7. Worm infestation	Prevalence	80% of children under 15 years.	Deworming of children under 15 years every 6 months.
8. Tetanus	Incidence 1 Mortality 5	271/1000 3.6/1000	
9. Diphtheria	Mortality rate	0.4/1000	
10. Pertusis	Incidence	18.2/1000	
11. Polomyelitis	Prevalence	0.8/1000	
12. Leprosy	Prevalence	2.6/1000	10-40% case treatment
13. Pneumonia	Mortality rate 5 years	5.3/1000	50% reduction
14. Scabies	Prevalence	5.95/1000	Do.

(Source: The Second Five Year Plan 1980-85)

Table II-6 Hospital Beds: Targets and Achievements of the First Five Year Plan and the Two Year Plan

Sl. No.	Category of hospital	Bench mark 1972-73	Plan Target	Achievement (as of June 1978)	Position June 1980 (Expected)	Achievement in percentage
1	Thana Health Complex	900	11036	2400	3800	34
2	Sub-divisional Hospital	1086	3800	1845	2200	58
3	District Hospital	1118	1465	1208	1558	106
4	Teaching Hospital (excluding T.B. Beds)	3670	5000	5015	5200	104
5	Specialised Hospital					
	(a) T.B. & Chest	966	1200	1030	1030	86
	(b) Leprosy	60	120	130	130	108
	(c) Infectious	180	500	180	180	36
	(d) Mental	400	600	430	430	72
	(e) Dental			20	20	
	(f) Cancer		100	40	40	40
	(g) Children		400	250	300	75
	(h) Casualty		150	150	150	100
	(i) Orthopaedic			275	325	
	(j) Cardiovascular				100	
	(k) Eye				30	
Total (1-5)		8380	24371	12973	15483	63

(Source: The Second Five Year Plan 1980-85)

Table II-7 Hospitals and Clinics: Targets for Physical Facilities and Beds by 1985

Category of Hospital	Physical structure		Beds	
	Position by 1980	Position by 1985	Position by 1980	Position by 1985
<b>Hospitals and Clinics:</b>				
1. Teaching hospital	11	18	5200	6700
2. Sadar hospital	13	14	1550	1875
3. Sub-divisional hospital	35	42	2200	2825
4. Specialised hospital				
(a) T.B. Control	5+(8 Segregation)	6+(7 Segregation)	1030	1546
(b) Leprosy	3	3	130	130
(c) Mental	1	1	430	430
(d) Children	2	4	300	500
(e) Cancer		1	40	140
(f) Eye	1	1	30	100
(g) Orthopaedic	1	1	325	325
(h) T.B. Clinics	44	54		
(i) Cardiovascular	1	1	100	100
(j) Infectious diseases	5	5	180	180
(k) Dental	1	4	20	20
(l) Homeopathic system of medicine		4		100
(m) Indigenous system of medicine	1	5		100
(n) Casualty	1	1	150	150
5. Thana Health Complex	290	356	3800	11036
6. Family Welfare Centre	1773	4500		
<b>Total</b>			<b>15485</b>	<b>26257</b>

(Source: The Second Five Year Plan 1980-85)

Table II-8 Manpower Development:  
Targets and Achievements of the First Five Year Plan and  
Two Year Plan Targets set for 1985

Sl. No.	Category	Benchmark 1972-1973	Target 1980	Achievement by June 1978	Expected position in June 1980	Percentage of Col. 6 against 4	Target for 1985
1	Graduate Doctor	7000	11268	9600	11000 (1:8400) Population	98	1700(1:6300) Population
2	Post-Graduate Doctor	259	672	560	631	98	1580(Details in next page)
3	Dental Graduate	310	470	407	457	97	582
4	Basic Nurse	700	3982	1800	1500	38	4184
5	Post-basic Nurse		290	190	280	97	540
6	Junior Nurse						4080
7	Nursing Attendant	1200		1200	1200		1200
8	Medical Assistant		600	192	450	75	5500
9	Medical Technologist (Laboratory)						40
10	Medical Technologist (Equipment)						40
11	Occupational Physiotherapist						40
12	Sanitary Inspector	980	1223	1125	1210	99	1600
13	Health Inspector			1192	1192		No increase is envisaged in view of integration
14	Assistant Health Inspector			3475	3475		
15	Pharmacists/ Compounder	1500	2333	2050	2300	99	6300
16	Laboratory Technicians	270	760	660	740	97	1630
17	Radiographer/X-ray	130	225	160	190	84	555
18	Radiotherapy Technicians	10	260	68	68	26	128
19	Physiotherapy Technicians	20	75	70	45	60	100
20	Blood Bank Technicians	20	67	38	40	60	300
21	Dental Technicians	20	130	58	80	61	500
22	General Health Workers		20300	11000	13500	67	No increase is envisaged in view of proposed integration
23	Paill-Chikiuhox		5000		5000	100	65000

(Source: The Second Five Year Plan 1980-85)

## 2. Present State of Things and Plan for Improvement of Supply of Drugs

### 2-1 Production and Distribution of Drugs

#### 2-1-1 Drugs Distribution System

The flow of pharmaceutical raw materials and products in Bangladesh is shown in Fig. II-6. The supply of all of the raw materials relies on imports. The totality of the raw materials of the P.P.U. (Pharmaceutical Production Unit), which is currently operating as a non-profit enterprise, is supplied through CMSD (Central Medical Stores Depot). As for the raw materials of I.V. Fluid Plant (Intravenous Fluid Plant), they are procured in the form of annual packages through UNICEF. All of the products of P.P.U. and I.V. Fluid Plant are marketed by CMSD, and are supplied to the medical facilities for Primary Health Care (THC, FWC, UHC, RHC, etc.) as shown in Fig. II-6, where the drugs are administered free of charge to the patients.

There is no transfer of money in the aforementioned drug distribution process, which is carried out by Book Adjustment.

On the other hand, the raw materials consumed by the private profit making enterprises are imported mainly by private agents and the manufactured products are sold to CMSD, Corporations, Semi-Government Bodies and to the private market. By the private enterprises, the government license must be required for the import.

#### 2-1-2 Central Medical Stores Depot (CMSD)

CMSD belongs to the DGHS (see Fig. II-2 and Fig. II-3) and has jurisdiction over every aspect related to the distribution of drugs and Medical and Surgical Requisitions (MSR) of the Government. It is in charge of the procurement of raw materials for production of drugs, drugs ready for use, MSR, etc., by importing them from overseas and purchasing them from domestic suppliers. Furthermore, CMSD is also in charge of the supply of raw materials to the pharmaceutical production facilities of the Government and distribution of Drugs and MSR to the 21 District Reserve Stores (DRS), Medical College Hospital and Government Hospitals. CMSD handles all of the 150 items of essential drugs (see Table II-13).

### 2-1-3 District Reserve Stores (DRS)

Each one of 21 Districts of the country is provided with the respective DRS which has the function of distributing drugs and MSR received from CMSD to the Government Hospitals, Medical College Hospitals and THC located in the District.

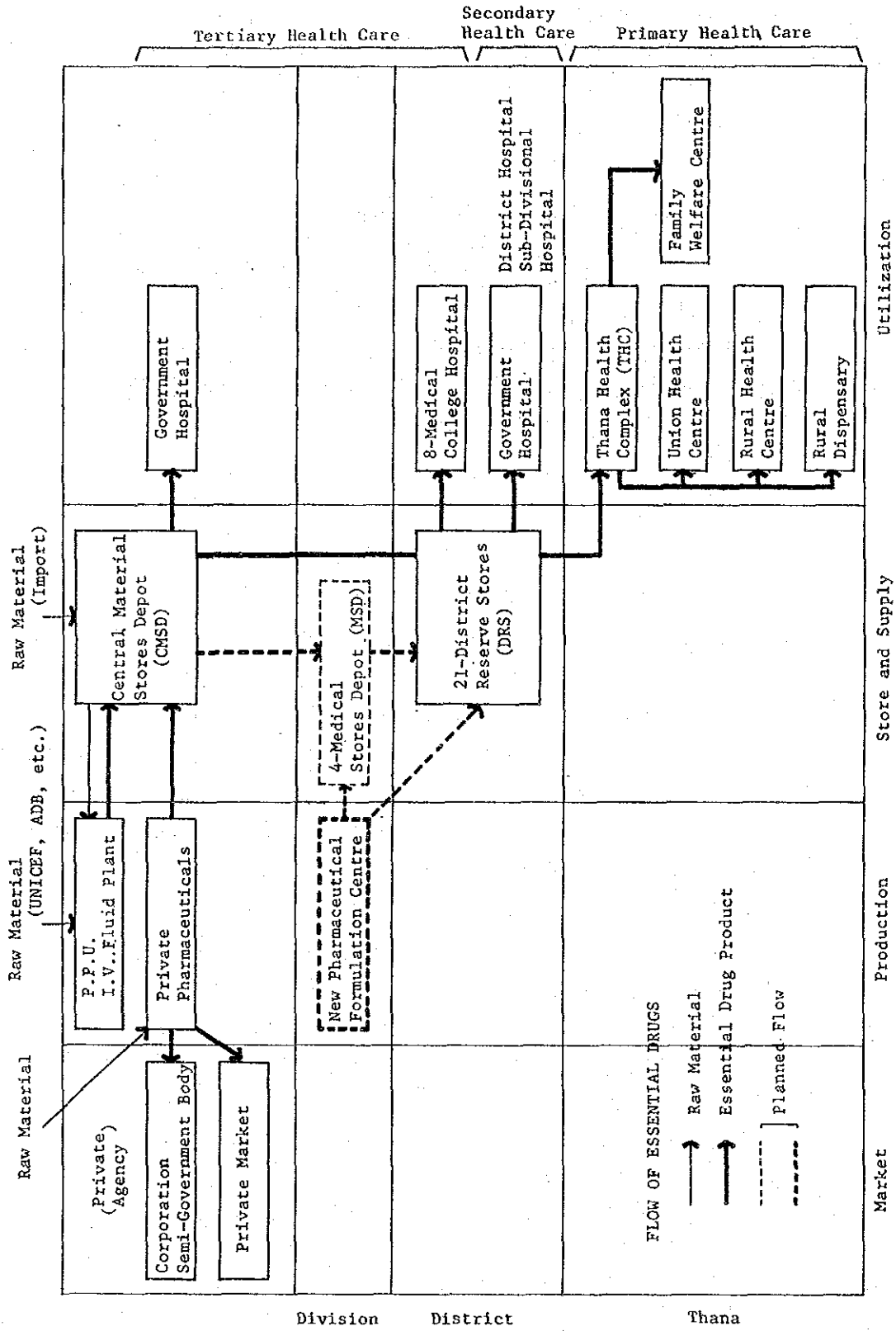
These drugs and MSR are distributed to FWC, Union Health Centres, Rural Health Centres and Rural Dispensaries through THC.

From the organizational standpoint DRS belongs to DGHS and is under Civil Surgeon that has jurisdiction over the District (see Fig. II-4). Therefore, the distribution of drugs and MSR is carried out under the control of Civil Surgeon. The post of the officer of Bogra District, where this project will be implemented, is vacant at the present time and the duty is being carried out by an Officer in charge.

### 2-1-4 Future Plan

The World Bank Feasibility Report (1979) proposes the construction of one plant for formulating essential drugs in each Division of the country (Chittagong, Khulna, Dhaka and Rajshahi), totaling 4 plants, with the purpose of supplying essential drugs to each Division. In addition to the aforementioned plan, the construction of one Medical Stores Depot (MSD) is being planned in each Division, totaling 4 MSD, which will have the function of coordinating the procurement and supply of drugs and MSR in each Division. According to the aforementioned plan, the drugs to be formulated at the new Formulation Centre to be constructed by this project will be distributed through Bogra MSD to DRS throughout the whole Rajshahi Division and will be eventually supplied to the Primary Health Care facilities of the Division.

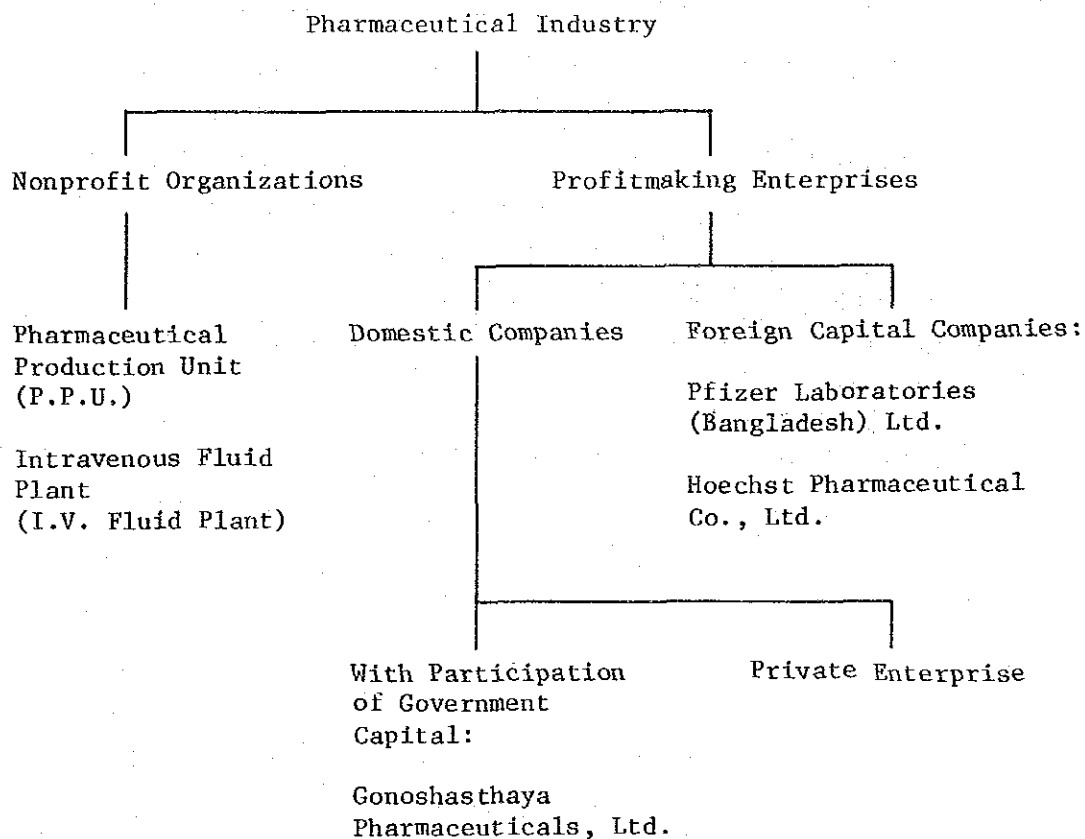
Fig. II-6 Flow of Drugs





## 2-2 Present State of Things of Pharmaceutical Industry

As matters now stand, the pharmaceutical industry of Bangladesh can be classified as follows.



### 2-2-1 Profitmaking Enterprises

#### (1) Domestic Private Companies

Most of the private pharmaceutical companies of Bangladesh are small and medium scale enterprises. The most representative private pharmaceutical companies of Bangladesh are as follows.

- 1) Albert David (Bangladesh) Ltd. (Dhaka)
- 2) Pharmaceutical Laboratories, Ltd. (Dhaka)
- 3) G.A. Company (Dhaka)
- 4) K.D.H. Laboratories, Ltd. (Dhaka)
- 5) Sbuare Pharmaceutical, Ltd. (Pabna)
- 6) Edruc, Ltd. (Pabna)

The aforementioned private pharmaceutical companies of Bangladesh are producing approximately 10% of the total production of drugs of the country, but generally speaking their facilities are not satisfactory.

(2) Foreign Capital Companies

The major pharmaceutical companies of Bangladesh are owned by foreign capital. There are currently only 8 pharmaceutical companies owned by foreign capital operating in Bangladesh, but they are producing approximately 85% of the total volume of drugs turned out in the country, constituting therefore the core of the pharmaceutical industry of Bangladesh. These pharmaceutical companies owned by foreign capital are located in Dhaka and Chittagong.

The above-said 8 pharmaceutical companies

1) Pfizer Laboratories (Bangladesh) Ltd.

Dhaka (Head office: USA, Parent company: Pfizer, Ltd.)

2) Fisons Bangladesh, Ltd.

Dhaka (Head office: Great Britain, Parent company: Fisons, Ltd.)

This company operates with technical license from Beecham of G.B., and is currently importing raw materials from Beecham.

3) Bangladesh Pharmaceutical Industry, Ltd.

Dhaka (Head office: France, Parent company: Rhone Poulenc)  
Established in 1964, approximately 400 workers, high grade factory.

4) Hoechst Pharmaceutical Co., Ltd.

Chittagong (Head office: Federal Republic of Germany, Parent company: Hoechst).

5) Glaxo Bangladesh Ltd.

Chittagong (Head office: Great Britain, Parent company: Glaxo)  
70% of the capital of this company is owned by Glaxo of G.B.  
Established in 1965, production started in 1967.

Factory land of 22 acres, approximately 600 workers. This is the largest pharmaceutical factory of Bangladesh.

- 6) Organon Bangladesh, Ltd.  
Dhaka (Head office: The Netherlands, Parent company: Organon).
- 7) ICI Bangladesh Manufacturers, Ltd.  
Dhaka (Head office: Great Britain, Parent company: ICI).
- 8) Squibb of Bangladesh, Ltd.  
Dhaka (Head office: USA, Parent company: Squibb).

These companies are local branches of worldwide multinationals, and both quality control and production control are carried out also in Bangladesh.

These multinational pharmaceutical companies used to make colossal profits in Bangladesh, but The New Drug Policy - The Drug Control Ordinance 1982 enforced in June 1982, imposing restrictions to the manufacturing, import and marketing of drugs, is expected to exert considerable influence on the future evolution of the business sector of the country.

The present state of things of the pharmaceutical industry of Bangladesh is described in the followings, based on the outline of P.P.U., I.V. Fluid Plant and Gonoshasthaya Pharmaceuticals Ltd. (see Appendix-B).

#### 2-2-2 Nonprofit Organizations (P.P.U. and I.V. Fluid Plant)

P.P.U. is located in Tejgaon and I.V. Fluid Plant is located in Mohakhali, both in Dhaka. Both are non-profit organizations operated by the Ministry of Health and Population Control.

##### (1) Pharmaceutical Production Unit (P.P.U.) (See Appendix B-1)

P.P.U. is the only essential drug formulating factory currently in operation, under direct control of the Ministry of Health and Population Control. The essential drugs formulated by this factory are supplied to the patients free of charge at Primary Health Care facilities through Central Medical Stores Depot (CMSD) and the distribution organizations of the Government (Fig. II-6) located in the various parts of the country.

1) Procurement of Raw Materials and Marketing Route of Products

The procurement of all of the raw materials required by P.P.U. is carried out by CMSD. On the other hand, the drugs formulated by P.P.U. are totally marketed and distributed by CMSD. There is no transfer of money involved in the aforementioned transactions and all of the relevant commodities are handled by Book Adjustment. All of the funds required to procure the raw materials for production of the essential drugs by P.P.U. are financed by loans of ADB.

2) Present State of Production

The dosage forms that are being formulated by this factory at the present time consist principally of tablets, capsules and sachets. Seven items of essential drugs are being formulated at the present time by P.P.U., as follows;

- a. Phathaly1 sulphetiazol tablet
- b. Sulphadimidine tablet
- c. Aspirin tablet
- d. Anti acid tablet
- e. Piperazine tablet
- f. ORS (Oral rehydration salt)
- g. Chloroquine phosphate tablet

The volume of production (actual production record) of P.P.U. (1979-83) is as follows;

	1980 July/79-June/80	1981 July/80-June/81	1982 July/81-June/82	1983 (9 months) July/82-Mar./83
Tablet	16 million	27 million	30.7 million	43 million
Capsule	—	1.95 million	3.28 million	4.9 million
Distilled water	0.12 million littre	0.1 million littre	—	—
Tr.Iodine	183 Lbs.	2,285 Lbs.	1,488 Lbs.	

3) Drug Formulation Capacity of Machines

The specifications and types of the drug formulation machines that are installed at the present time in P.P.U. are shown in Appendix B-1-3. Formulation capacity of the machines (per annum) is as follows;

Tablet	396,000,000 tabs./year
Capsule	87,600,000 caps./year
ORS Sachet	3,600,000 shts./year
Ample	4,320,000 amps./year

Accordingly, actual production volume (in 1982) is only 7.8% of tablets, 3.7% of capsules, not known of sachets and 0% (not produced) of amples against the formulation capacity.

4) Building

The existing building of the P.P.U. was not designed for drug formulating use and therefore is inappropriate for the use. Therefore, it is being remodeled at the present time, with improvements such as change layout of the rooms, partition, fittings, finishing of walls and floors, air-conditioning, air-cleaning, etc., under way.

Improvement of the existing building and preparation of the future plans are being carried out at the present time, under the supervision of consultants of the WHO. The contents of these plans and improvements are shown in Appendix B-1-5.

5) Quality Control

The ground floor of the building is being used as drug formulating factory and the first floor can be used for quality control. However, the quality control itself is practically inexistent as a matter of fact.

(2) I.V. Fluid Plant (Institute of Public Health) (See Appendix B-2)

I.V. Fluid Plant is the only state-owned factory of Bangladesh producing transfusion consisting principally of intravenous fluids.

1) Procurement of Raw Materials and Marketing Route of Products

The budget for procurement of raw materials is approximately TK24,000,000 (1982-83), but the breakdown of the procured items is unknown. The totality of the funds required for procurement of the raw materials are financed by UNICEF loans and the procurement is carried out through UNICEF. The distribution of the manufactured products is carried out through CMSD, but the transfer of money is not carried out and the manufactured products are handles by means of book adjustment just like P.P.U.

2) Present state of things of Production

I.V. Fluid Plant is turning out 7 items at the present time.

- a. Glucose saline
- b. Glucose aqua
- c. Cholera saline
- d. Normal saline
- e. Peritoneal dialysis
- f. Haemodialysis
- g. Baby saline

3) Present State of Facility

- a. As can be seen from the floor plan (Fig. B-3, Appendix B-2), the factory is divided into 12 types of rooms. However, the lighting conditions of each room are bad, and quite dark even during the day.
- b. The production facilities consists principally of old manufactured machinery such as transfusion filling machine, packing machine, heat sealing machine, etc., and it gives the impression that the production is carried out by means of the human wave tactics. The only automatic equipment in operation is the Swiss made printing machine. All of the other equipment and machinery are simple hand operation type.
- c. The sterilization is carried out with steam only, and the quality control and inspection of the products is practically inexistent.

- d. GMP measures such as change of clothes and air shower, etc., are practically inexistent.

### 2-2-3 Profitmaking Enterprises (With Participation of Government Capital; Gonoshasthaya Pharmaceuticals Ltd.)

This pharmaceutical industry is located in Savar, approximately 40 km north-western of Dhaka and is a complex consisting of the Administration Block, Residential Block and Factory Block (see Appendix B-3). This is a semi-government company and its owner is a private charitable organization (Gono Shestha Kendra Trust).

As for the composition of the capital, both the private charitable organization and the government are even with 50% each, and the board of directors has also 3 members of the Trust and 3 members of the Bangladesh Government, totaling 6 persons in charge of the management of the firm.

#### (1) Procurement of Raw Materials and Marketing Route of Products

The procurement of raw materials relies entirely on imports, and is carried out via local agents, oversea agents or by direct purchase from foreign manufacturers.

On the other hand, the products are sold to CMSD, Semi-Government body and Corporation, etc. Under the circumstances that drugs of high market value can be produced, this company seems to be managed in a very sound financial condition.

#### (2) Present State of Production

##### 1) Items of Products

This factory is turning out 22 items of products at the present time and their prices are listed in the Table B-6, Appendix B-3-2. The dosage forms of products of this factory are as follows;

- a. Tablet
- b. Capsule
- c. Sachet

- d. Liquid
- e. Dry-syrup
- f. Injection (in future)

2) Volume of production

a. Dry-syrup (60g bottle)	1.2 million btl./year
b. Tablet	80 million tabs./year
c. Capsule	60 million caps./year
d. Sachet	2 million shts./year
e. Bottle	1.8 million btl./year

(3) Present State of Facility

Details of the facility of this factory are shown in the Appendix B-3-3. The floor plan of the factory is shown in Fig. B-4, Appendix B-3. This factory has an incomparably more orderly aspect than the aforementioned P.P.U. and I.V. Fluid Plant. The machinery installed in this factory have relatively small capacity, but they are functioning satisfactorily thanks to a good maintenance service. Most of the workers in charge of the production, i.e., approximately 70 to 80% of the total, are young women, and this is a peculiarity similar to the Japanese pharmaceutical industry. Prior to entering in the drug formulating factory, they are obliged to change their clothes and shoes and to wear white hat, and the GMP (Good Manufacturing Practices) measures are adopted as well.

(4) Present State of Building

(See Appendix B-3-4 for details about the building of the factory)

Separate air-conditioning system is provided for each section of the factory, and the capsule, dry antibiotic syrup, oral-saline and table compression sections are controlled at a temperature of 20-24°C and humidity of 40-45%.

(5) Quality Control

The first floor of the factory building accommodate the quality control section and the laboratory for development of new products. Measuring apparatus of various types such as microscope, biscosmeter, photometer, etc., are provided, and the quality control system seems to be satisfactory (see Appendix B-3-3, (2)).



#### 2-2-4 Items and Volume of Domestic Production of Drugs

The items of essential drugs produced in Bangladesh, including the production of P.P.U. in 1981, and their production volumes are shown in Table II-9.

#### 2-2-5 State of Things of Pharmaceutical Manpower

It is reported that a considerable number of engineers graduated from the universities and colleges of Bangladesh are drained to Middle East countries, where they find wages 10 times better than home. In particular, the state-owned laboratories and drug formulating plants are unable to recruit technical personnel of good ability, because the wage levels of government employees are quite low.

Of 73 employees of P.P.U., which is the state-owned drug formulating factory, there are only 4 pharmacists and 2 electrical engineers. Such being the case, it is indispensable to recruit technical personnel of high grade for these factories to function satisfactorily.

Table II-9 Figure of Domestic Production of Items included in List of Essential Drugs for Primary Health Care (1981)

Sl.No.	Name of the item	Quantity manufactured during
1	Aspirin Tablet	44,000,000 Tabs.
2	Chloroquine Tablet	60,000,000 "
	Chloroquine Syrup	182,000 Phials.
3	Aluminium Hydroxide Gel Tab.	Single ingredient product is not manufactured
	Aluminium Hydroxide Gel Susp.	- do -
4	Piperazine Elixir	3,130,000 Phials.
	Piperazine Tab.	5,402,000 Tabs.
5	Glucose Electrolyte Powder	Production in the private factories started in 1982 and manufactured by Government also
6	Phenoxy Methyl Penicillin Tab.	24,709,088 Tabs.
	Phenoxy Methyl Penicillin Dry Syrup	727,920 Phials.
7	Ampicilin Cap.	32,366,200 Caps.
	Ampicillin Dry Syrup	959,260 Phials.
8	Ergometrine/Methyl Ergometrin Maleate Tab.	Not manufactured
9	Ferrous Sulphate Tab.	86,241,300 Tabs.
10	Ephedrine Tab.	4,432,000 "
	Ephedrine Liquid	Not manufactured
11	Vit A Caps.	Not manufactured
12	Chloramphenicol Eye/Ear Oint	Not manufactured
13	Pethidin HCl Inj.	1,013,740 Amps.
14	Sulphadoxin with pyrimethamin Tab.	Not manufactured
15	Levamisole Tab.	9,388,000 Tabs.
	Levamisole Elixir	482,810 Phials.
16	Chlorpheniramine Tab.	52,265,400 Tabs.
	Chlorpheniramine Elixir	109,500 Phials.
	Chlorpheniramine Inj.	29,800 Amps.
17	Lidocaine	Not manufactured
18	Isoniazid with Thiacetazone Tab.	12,566,000 Tabs.
19	Streptomycin Sulphate Inj.	3,391,650 Vials.
20	Metronidazole Tab.	31,036,100 Tabs.
	Metronidazole Susp.	529,400 Phials.
	Metronidazole Inj.	Not manufactured
21	Atropine Sulphate Inj.	52,600 Amps.
22	Hyoscine-N-Butyl Bromide Tab.	Not manufactured
23	Chlorohexidine/Chloroxylenol Solution	1,447,640 Phials 12 ml
	Chlorohexidine/Chloroxylenol	
24	Procain & Penicillin Inj.	19,028,534 Vials.
25	Tetracycline/Oxytetracycline Caps.	74,000,000 Caps.
	Tetracycline/Oxytetracycline Inj.	1,175,860 Amps.
	Tetracycline/Oxytetracycline Oint.	84,240 Tubes.
26	Phenobarbitone Tab.	4,590,000 Tabs.
	Phenobarbitone Inj.	31,000 Amps.(1 1)
27	Diazepam Tab.	16,623,000 Tabs.
	Diazepam Inj.	Not manufactured
28	Chlorpromazine Tab.	8,273,250 Tabs.
	Chlorpromazine Inj.	Not manufactured
	Chlorpromazine Syrup	31,423 Phials.

Sl. No.	Name of the item	Quantity manufactured during
29	I.V. Saline	Manufactured
30	Dextrose in Water	- do -
31	Redistilled Water	3,000,000 Amps.
32	Cholera Fluid	Manufactured by I.C.D.D.E.
33	Oxytocin Inj.	Not manufactured
34	Furosemide Tab.	3,896,600 Tabs.
	Furosemide Inj.	479,800 Amps.
35	Prednisolene Tab.	2,269,000 Tabs.
36	Propranolol Tab.	Not manufactured
	Propranolol Inj.	Not manufactured
37	Aminophylline Tab.	Figure not available
	Aminophylline Inj.	Not manufactured
38	Co-Trimexazole Tab.	14,885,000 Tabs.
	Co-Trimexazole Susp.	385,746 Phials.
39	Homatropine Drop.	Not manufactured
40	DT/SPT/POLIO/Vaccin	- do -
41	Ergometrine Inj.	- do -
42	Vit.-B-Complex Tab.	3,809,000 Tabs.
43	Multi, Vitamine Drops	333,730 Phials.
	Vit. A Inj.	Not manufactured
44	Whitfield oint.	The item has recently been included in many licences
45	Benzyl Benzoate Emulsion	55,375 Phials. The items has recently been included in many licenses
46	Paracetamol Tab.	50,000,000 Tabs.

## 2-3 Present State of Drugs

### 2-3-1 Demand of Drugs

#### (1) Forecast of Demand by the World Bank

It is very difficult to make an accurate forecast of the demand of drugs not only in Bangladesh but also in any other country, because it is hard to cope with the multiplicity of types of drugs and the changes brought about the progresses in the scientific and technological fields.

The projection of the demand of drugs expected to take place in the Primary Health Care of Bangladesh in 1985 according to the feasibility study of the World Bank is shown in the Table II-10.

#### (2) Forecast of the Demand by the Bangladesh Government

The projection of the demand of drugs expected to take place in the Primary Health Care of Bangladesh (1981) according to the forecast of the Bangladesh Government is shown in the Table II-11.

### 2-3-2 Actual Case of CMSD

#### (1) Volume of Drugs Supplied by CMSD (Central Medical Stores Depot)

The volume of drugs supplied by CMSD to DRS (District Reserve Stores) of each District of the country (1982-83) is shown in the Table II-12.

The volume of drugs supplied to the DRS corresponds to TK99,731,000 in terms of budget and TK55,243,418 in terms of actually supplied drugs (July 1982 - March 1983).

#### (2) Essential Drugs Handled by CMSD

150 items of drugs are selected as essential drugs by the Bangladesh Government. Of the aforesaid total, 12 items are selected at the Village level and 45 items at the Thana level as necessities for Primary Health Care. The 150 items of essential drugs selected by the Bangladesh Government are listed in Table II-13.

2-3-3 Present State of Drugs in Medical Facilities  
(See Appendix-C)

(1) Demand and Supply of Drugs in ICVD (Institute of Cardiovascular Diseases), Dhaka

The demand of drugs in the Institute of Cardiovascular Diseases (Shaheed Suhrawardy Hospital Complex) (1983-84) is shown in Appendix C-1. The demand of the preceeding year was 20% less.

The drugs consumed in this hospital are supplied by CMSD. The supply covers approximately 70-80% of the required volume of drugs, which are administered free of charge to the patients. The particular drugs except the about are borne by the patients.

(2) Demand and Supply of Drugs in Mohammed Ali Hospital, Bogra

CMSD supplies drugs to this hospital through DRS. The demand and supply of drugs of this hospital are shown in Appendix C-2. As can be seen from the aforementioned Appendix, the supplied volume covers only 1/4-1/5 of the demand, and is far from fulfilling the minimum requirements. As a matter of fact, the patients are forced to bear the purchase of special drugs that are not available in the DRS.

(3) Demand and Supply of Drugs in Shibganj THC

The annual demand of drugs in Shibganj THC, located in Bogra District, are shown in Appendix C-3.

The requested amount is approximately 250,000TK/year, but the actually supplied sum is 125,000TK/year. As can be seen from the aforementioned data, there is shortage of approximately 50% of the requirement of drugs.

Table II-10 Total Demand of Dosage Forms for Primary Health Care  
by 1985 Estimated by World Bank

Dosage Form	Quantity
Tablets	3,174 million
Hard capsules	460 million
Soft Capsules	45 million
Liquid (non sterile)	480,000 litres
Ointments (skin) 20g tubes	9 million
Ointments (eye) 3.5g tubes	9 million
Sachets oralite	9 million
Sachets anthelmintic	9 million
Vials (antibiotics)	55 million
Ampoules	74 million
I.V. fluids, 1 litre packs	4 million

Table II-11 Annual Requirements of the 45 Essential Drugs for Primary Health Care in Bangladesh (1981)

Sl. No.	Name of the item	Quantity
1	Aspirin Tablet	180 million
2	Chloroquine Phosphate Tablet	360 "
	Chloroquine Phosphate Syrup	36 "
3	Aluminium Hydroxide Gel Tab.	120 "
	Aluminium Hydroxide Gel Suspension	12 "
4	Piperazine Tab.	240 "
	Piperazine Elixir	24 "
5	Glucose Electrolyte Powder ORS	18 "
6	Phenoxy Methyl Penicillin (Penicillin V) Tab.	45 "
	Phenoxy Methyl Penicillin (Penicillin V) Dry suspension	4.5 "
7	Ampicillin Cap.	72 "
	Ampicillin Syrup	10 "
	Ampicillin Injection	1 "
8	Ergometrine/Methyl Ergometrine Maleate Tab.	30 "
	Ergometrine/Methyl Ergometrine Maleate Inj.	0.5 "
9	Ferrous Sulphate Tab.	360 "
	Ferrous Sulphate Syrup	36 "
10	Ephedrine Tab.	90 "
11	Vitamin A Cap.	45 "
12	Chloramphenicol Eye/Car Oint.	10 "
	Chloramphenicol Eye/Car drop	1 "
13	Paracetamol Tab.	180 "
	Paracetamol Elixir	18 "
14	Pethidine hydrochloride Inj.	1.0 "
15	Sulphadoxin with Primethamine	90 "
16	Levamisole Tab.	90 "
	Levamisole Elixir	9 "
17	Chlorpheniramine Tab.	90 "
	Chlorpheniramine Elixir	9 "
	Chlorpheniramine Inj.	1 "
18	Lidocaine 1%	1 "
19	Isoniazid with Thioacetazone Tab.	90 "
20	Streptomycin Sulphate Inj.	30 "
21	Metronidazole Tab.	180 "
	Metronidazole Elixir	18 "
	Metronidazole Inj.	2 "
22	Atropine Sulphate Inj.	3 "
23	Hyoscine-n-butyl Bromide Tab.	3 "
	Hyoscine-n-butyl Bromide Inj.	0.3 "
24	Chlorohexidine/Chloroxylenol Soln.	1 million litre
25	Procaine Penicillin Inj.	60 million
26	Tetracycline/Oxytetracycline Cap.	260 "
	Tetracycline/Oxytetracycline Inj.	36 "
	Tetracycline/Oxytetracycline Oint.	10 "
27	Phenobarbitone Tablet	45 "
	Phenobarbitone Inj.	4 "
28	Diazepam Tab.	60 "
	Diazepam Inj.	6 "

Sl. No.	Name of the Items	Quantity
29	Chlorpromazine Tab.	10 million
	Chlorpromazine Syrup	1 "
	Chlorpromazine Inj.	0.1 "
30	I.V. Saline of Various Strength (0.9%) (25%, 0.18%) with 4% Dextrose/0.9% Saline without dextrose	2 "
31	Dextrose in Waster 5%	2 "
32	Redistilled Waster(Pyrogen free) Amps.	72 "
33	Cholera Fluid	0.5 "
34	Oxytocin	2 "
35	Furosemide Tab.	2 "
	Furosemide Inj.	2 "
36	Prednisolone Tab.	1 "
37	Propranolol Tab.	2 "
	Propranolol Inj.	0.2 "
38	Aminophylline Inj.	0.5 "
	Aminophylline Tab.	5 "
39	Co-trimexazole Tab.	80 "
	Cotrimexazole Suspension	8 "
40	Homatropine	0.25 million
41	ET/SPT/POLIO/Tetanol	
42	Diphtheria Anti-toxin	
43	Tab. Vit. B-Complex	90 "
	Multi Vit. Drops 15 ml.	5 "
44	Ung. Salicylic Acid and Bezoic Acid 6% + 3%	2.5 million X 30
45	Benzyl Benzoate Saponated	0.5 million litre



Table II-12 Cost of MSR Supplied to Different DRS (Financial Year 1982 - 83) from CMS

(Unit: TK)

Sl. No.	Name of the DRS	Total Budget in 1982-83	Decentralization of money	Total cost of MSR supplied from CMSD upto 27 March '83		Total	Balance	Remarks
1	DRS Dhaka	7,810,000	640,000	4,564,458	499,062	5,703,520	2,106,480	
2	" Mymensingh	7,101,000	480,000	5,728,039	746,235	6,954,274	146,726	
3	" Tangail	2,330,000	160,000	2,182,741	251,424	2,594,165	-----	204,165 excess supply
4	" Jamalpur	2,510,000	160,000	1,341,182	427,550	1,928,732	581,268	
5	" Faridpur	6,620,000	576,000	1,358,573	563,478	2,498,051	4,121,949	
6	" Chittagong	4,565,000	340,000	1,628,004	223,916	2,191,920	2,373,080	
7	" Ctg. Hill Tract	2,400,000	280,000	946,654	358,430	1,585,084	814,916	
8	" Bandarban	3,200,000	260,000	1,082,030	60,199	1,402,229	1,797,771	
9	" Noakhali	4,965,000	356,000	2,439,818	369,578	3,165,396	1,799,604	
10	" Comilla	5,705,000	476,000	2,660,085	520,901	3,656,986	2,048,014	
11	" Sylhet	6,350,000	600,000	4,896,755	724,767	6,221,522	128,478	
12	" Rajshahi	6,875,000	500,000	4,032,333	351,611	4,883,944	1,991,056	
13	" Rangpur	6,800,000	636,000	5,342,191	832,894	6,811,085		excess supply TK 11,085
14	" Dinajpur	4,910,000	360,000	1,466,123	397,122	2,223,245	2,686,755	
15	" Bogra	4,140,000	256,000	2,564,030	727,531	3,547,561	592,439	
16	" Pabna	2,710,000	356,000	1,857,677	508,590	2,722,267		Excess supply TK 12,267
17	" Khulna	5,805,000	508,000	3,033,852	703,355	4,245,207	1,559,793	
18	" Jessore	4,445,000	416,000	2,855,916	236,254	3,508,170	936,830	
19	" Kushtia	3,405,000	260,000	1,612,737	409,623	2,282,360	1,122,640	
20	" Barisal	4,755,000	536,000	2,420,991	326,691	3,283,682	1,471,318	
21	" Patuakhali	2,330,000	240,000	1,229,229	776,886	2,246,115	83,885	
	Total	99,731,000	8,396,000	55,243,418	10,016,097	73,655,515	26,075,485	

Source: Ministry of Health & Population Control

MSR: Medical and Surgical Requisite

DRS: District Reserve Store

CMDS: Central Medical Stores Depot

Table II-13 List of 150 Essential Drugs Supplied  
by Central Medical Stores Depot

Sl. No.	Item
(I)	List of 12 Essential Drugs for Use by the Village Level Health Workers
1	Aspirin Tab./Paracetamol Tab.
2	Chloroquinophosphate Tab./Syrup
3	Aluminium Hydroxide Gel Tab./Suspension
4	Piperazine Tab./Elixir
5	Glucose Electrolyte Powder ORS
6	Phenoxy Methyl Penicillin (Penicillin V) Tab./Dry Suspension
7	Ampicillin Cap./Syrup/Inj.
8	Ergometrine/Methylethergometrine Maleate Tab./Inj.
9	Ferrous Sulphate Tab./Syrup
10	Ephedrin Tab./Elixir
11	Vitamin A 200,000 Units Cap.
12	Chloramphenicol Eye/Ear/Oint./Drop
(II)	List of additional 33 Essential Drugs for Primary Health Care up to Thana Health Complex Level
13	Paracetamol Tab./Elixir
14	Pethidine Hydrochloride Inj.
15	Sulphadoxin with Pyrimethamine Tab.
16	Levamisole Tab./Elixir
17	Chlorphenamine Tab./Elixir/Inj.
18	Lidocaine 1%, 2% with or without Adrenaline
19	Isoniazid with Thiacetazone Tab.
20	Streptomycin Sulphate Inj.
21	Metronidazole Tab./Elixir/Inj.
22	Atropine Sulphate Inj.
23	Hyoscine-n-butyl Bromide Tab./Inj.
24	Chlorhexidine/Chlorxylenol Solution/Cream
25	Procaine Penicillin Inj.
26	Tetracycline/Oxytetracycline Cap./Inj./Ointment
27	Phenobarbitone Tab./Inj.
28	Diazepam Tab./Inj.
29	Chlorpromazine Tab./Inj./Syrup
30	I.V. Saline of Various Strengths (0.9%, 0.25%, 0.18%) with 4% Dextrose/0.9% Saline without Dextrose
31	Dextrose in Water (5%, 25%, 50%)
32	Redistilled Water (Pyrogen free) Amps.
33	Cholera Fluid
34	Oxytocin Inj.
35	Furosemide Tab./Inj.
36	Prednisolone Tab.
37	Propranolol Tab./Inj.
38	Aminophylline Inj./Tab.
39	Co-Trimoxazole Tab./Suspension
40	Homatropine Drops
41	DT/SPT/POLIO/Tetanol/Diphtheria Antitoxin
42	Atropine Sulph Inj.
43	Tab. Vitamin B. Complex/Multi Vitamin Drops (15 ml)/Vitamin A Inj.
44	Ung. Salicylic Acid and Benzoic Acid
45	Benzyl Benzoate Saponated

Sl. No.	Item
(III)	List of Additional 105 Essential Drugs for Use up to Tertiary Level
46	Indometacin Cap./Tab.
47	Morphine Sulphate Inj.
48	Allopurinol Tab.
49	Quinine Tab./Powder/Inj.
50	Corticosteroid Eye Drop/Oint.
51	Diethylcarbamazine Tab./Suspension
52	Chloramphenocol Skin Ointment
53	Mebendazole Tab.
54	Promethazine Tab./Inj. Syrup
55	Ether Anaesthetic
56	Procaine Hydrochloride
57	Suxamethonium Inj.
58	Thiopental Sodium (Powder for injection)
59	Gallaminetriethiedide
60	Tubocurarine Inj.
61	Halothane
62	Isoniazid Tab.
63	Ethambutol Tab.
64	Rifampicin Cap.
65	Dapsone Tab.
66	Glibenclamide
67	Insulin Preparations
68	Pilocarpine Drop 1%, 2%, 4%
69	Emetine Hydrochloride Inj.
70	Naloxone Hydrochloride Inj.
71	Sodium Thiosulphate Inj.
72	Trifluoperazine
73	Pralidoxime Tab./Inj.
74	Sodium Antimony Gluconate Inj.
75	Tincture Iodine
76	Lysol/Cresol/Soap Solution (Surgical)
77	Benzyl Penicillin Inj.
78	Benzathine Penicillin Inj.
79	Erythromycin Tab./Suspension
80	Centamycin Syrup/Drops/Ointment
81	Cloxacillin Syrup/Cap./Inj.
82	Ethosuximide Cap.
83	Phenytoin Tab./Cap./Elixir
84	Amitriptylin/Mortrityline Tab.
85	Haloperidol Tab./Cap.
86	Prochlorperazine Tab./Inj.
87	Potassium Chloride Inj./Tab./Syrup
88	Mannitol Solution
89	Dialysis Fluid
90	Plasma Substitute
91	Sodi-bi-carb Infusion 7.5% or 8.4%
92	Bendrofluazide
93	Acetazolamide Tab.
94	Spirolactone
95	Barium Sulphate (X-Ray Grade)
96	Iodipamide 30% & 50%
97	Iopanoic Acid /Iobenzamic Acid Tab.
98	Acetrizoic Acid /Iodized Oil Inj.

Sl. No.	Item
99	Sodium Diatrizoate
100	Iron-Dextran Complex Inj.
101	Folic Acid Tab.
102	Hydrocortisone Inj./Ointment/Cream
103	Dexamethasone Inj./Tab.
104	Stilboestrol/Diochylsilboestrol
105	Levo-thyroxin Tab.
106	Progesterone Preparations
107	Neomarcazole
108	Digoxin Tab./Inj.
109	Diazoxide Inj.
110	Methyl-Dopa Tab.
111	Glyceryl Trinitrate Tab. (Sublingual)
112	Procainamide Inj./Cap.
113	Heparin Inj.
114	Warfarin Sodium Tab.
115	Tetracaine /Novosine
116	Metaraminol Inj.
117	Senna Tab.
118	Glycerin Suppository
119	Sulphadimidin Tab.
120	Ibuprofen Tab.
121	Sulphanilamide Powder
122	Sulphadizine Inj.
123	Adrenaline /Epinephrine Inj.
124	Neostigmine Tab./Inj.
125	Sulbutamol Tab./Elixir/Inhaler/Inj.
126	ACD Blood Pack (Double/Triple bag)
127	TABC
128	Anti-rabies Vaccine
129	Polyvalent Anti-Venin
130	Tetanus Anti-toxin (minimum 10,000 unit dose)
131	Ampicillin Inj.
132	Vitamin B <sub>1</sub> Inj./Tab.
133	Vitamin C Tab.
134	Vitamin B <sub>12</sub> Inj.
135	Vitamin K Tab./Inj. Vitamin K <sub>1</sub> Inj.
136	Cyclophosphamide Tab./Inj.
137	5-Fluoro-Unacil Inj./Cap./Ointment
138	Methotrexate Tab./Inj.
139	Busulphan Tab.
140	Vincristine Inj.
141	Nitrogen Mustard Inj.
142	Doxorubicin Inj.
143	Chlorambucil
144	Fluorescein Eye Drop 1%
145	Clofazimine Tab.
146	Calciferol
147	Griseofulvin Tab.
148	Pyrazinamide
149	Plaster of Paris
150	Zinc Oxide Adhesive Bandage

Source: Ministry of Health and Population Control

## 2-4 Plan for Improvement of Supply of Drugs

### 2-4-1 Recommendation of the World Bank

According to the feasibility study carried out by the World Bank, the demand of 45 items of essential drugs is expected to surpass 600 million Taka in terms of market price in 1985.

Under the circumstances, curtailments of the order of 20-55% of the production cost are expected to become possible, should the unified procurement of the raw materials, production control and distribution control of drugs be carried out by a no-profit and no-loss organization.

The feasibility study of the World Bank mentions the cases of Mission Pharma (Denmark), ECHO (G.B.), International Dispensary Association (The Netherlands), Malaysia, etc., as successful examples of the aforementioned system.

Should an organization of this kind be created in Bangladesh, it is expected to make substantial contributions not only to the direct benefit represented by the cheap and stable supply of essential drugs, but also to accessory benefits such as considerable hard currency saving, increase of jobs in the country, increase of the self sustenance in drugs, etc.

### 2-4-2 Plan Recommended by WHO (Guideline and Recommendation for Establishment of a Low Cost Pharmaceutical Formulation Plant (LCPFP) in Developing Countries)

In 1977 and in 1979 WHO recommended the production of approximately 200 items of essential drugs in developing countries.

It recommended furthermore the construction of low-cost formulation plants for domestic production of 20-30 items of essential drugs for Primary Health Care in developing countries (see Appendix-D).

On the other hand, the Bangladesh Government designated 45 items of essential drugs required for Primary Health Care of the country, based on the recommendation of WHO. Furthermore, the Bangladesh Government planned the construction of formulation plants for production of these 45 items of essential drugs in the Second Five Year Plan (1980-85).

### 2-4-3 Improvement Plan Proposed by the Bangladesh Government

The essential drugs required for Primary Health Care are supplied by foreign aid organizations, domestic private companies and state-owned drug formulation factories (e.g. P.P.U. and I.V. Fluid Plant), but as described in II, 2-3 of this report, the supply is not able to fulfil the demand. (As a matter of fact, the percentage of self-sustenance is reported to be of the order of 25%). The Second Five Year Plan (1980-85) intends to raise the self-sustenance to at least 50%.

In principle, all of the medical care and drugs of the Primary Health Care are provided free of charge to the patients. Therefore, the raising of the self-sustenance rate of drugs is particularly significant in this country. The Bangladesh Government has designated 45 items of essential drugs and is planning the construction of plants for their production, in compliance with the recommendation of WHO.

According to the report presented by the World Bank in 1979, the report proposes to establish four drug formulation plants in each Division of Khulna, Chittagong, Dhaka and Rajshahi with the purpose of realizing the expected objectives, by taking into consideration the poor state of the transportation network of the country.

According to the aforesaid proposal, the Bangladesh Government is planning to construct the drug formulation centers in Bogra and Jessore of the above Divisions in order to distribute the essential drugs through the distribution network shown in the Figure II-6 with the purpose of attaining the most effective results. There are also plans for expansion of P.P.U. currently in operation. Details of the said plan are described in the Appendix B-1-5.

### III. THE PROJECT





### III. THE PROJECT

#### 1. Objective and Basic Policy of Design

##### 1-1 Objective of Project

In the Second Five Year Plan (1980-85), the Bangladesh Government is preferentially promoting the establishment of Primary Health Care Service, medical and welfare services in rural areas, with constructing THC (Thana Health Complex) and FWC (Family Welfare Centre), etc. All the necessary drugs for these facilities are procured from domestic private pharmaceutical factories, government factories such as I.V. Fluid Plant (Institute of Public Health) and P.P.U. (Pharmaceutical Production Unit) and under the aid by UNICEF, etc. and are supplied through CMSD (Central Medical Stores Depot) to the medical and welfare services in rural areas. However, the supply of drugs does not meet the present demand. The Bangladesh Government has the plan to improve the self-sustenance of drugs in Bangladesh, from present 25% to at least 50%, by the end of Second Five Years Plan. For this purpose, the project has been schemed.

Primary Health Care Service, as well as drugs, are free of charge, provided people and the drugs to be formulated in the Project will, also free of charge, be provided patients through THC and FWC, etc. Most of Pharmaceutical factories are, at present, located only in or around Dhaka and Chittagong, and the transportation and communication system is not satisfactorily established, in spite of being establishing drug distribution system, which causes the present difficult situation to deliver the drugs to rural areas. The Project has the objective, to solve this problem, that the drugs will be produced in the local factories and will be supplied to the respective local area, and will establish a pharmaceutical formulation centre in Bogra, with following the recommendation in the World Bank Feasibility Study Report (1979) (see II, 2-4-3).

Besides, the Project has another objective that the new pharmaceutical formulation centres will improve the self-production of drugs in Bangladesh and will stably produce the essential drugs in low cost under the government management which do not have high market value or do not make good profit and, accordingly, cannot be expected to be produced in private pharmaceutical factories.

## 1-2 Basic Policy of Design

The Bangladesh Government strongly desires the following policies when the project is planned:

- 1) Building(s) and facilities necessary for the project will be as simple and functional as possible;
- 2) The project will be not too big and not too sophisticated; and
- 3) The construction cost of project will be minimum as far as possible.

The design will realize the above policies, and will be drawn up in consideration of the recommendation of "A Low Cost Pharmaceutical Formulation Plant in developing countries" by WHO (1980).

On the above consideration, the basic policies for the design can be presented as follows:

- 1) With understanding the natural, social and physical condition in Bangladesh as well as Bogra, the project will use usual plan of facilities, usual construction method and usual material in the locality, as much as possible.
- 2) In consideration of GMP (Good Manufacturing Practices) measures corresponding with the actual Bangladesh condition, the buildings and the pharmaceutical formulation machinery will be concisely planned with satisfactorily meeting the function of facilities.
- 3) The facilities will be designed in consideration of easy management and operation and future expansion.
- 4) Buildings and machineries will be designed in the smallest size and the lowest and most simple specification to realize a low cost project.

## 2. Project Site

### 2-1 Project Site

#### 2-1-1 Geographical Situation

Bogra is located in the mid-east of Rajshahi Division of the north-western part of Bangladesh (see Title-page Map), where the population amounts to approximately 50,000. Bogra has been socially and economically playing the main role as, in the history, a leading city of the northwestern part of Bangladesh. And now it is being developed as a central city for industries in Rajshahi Division.

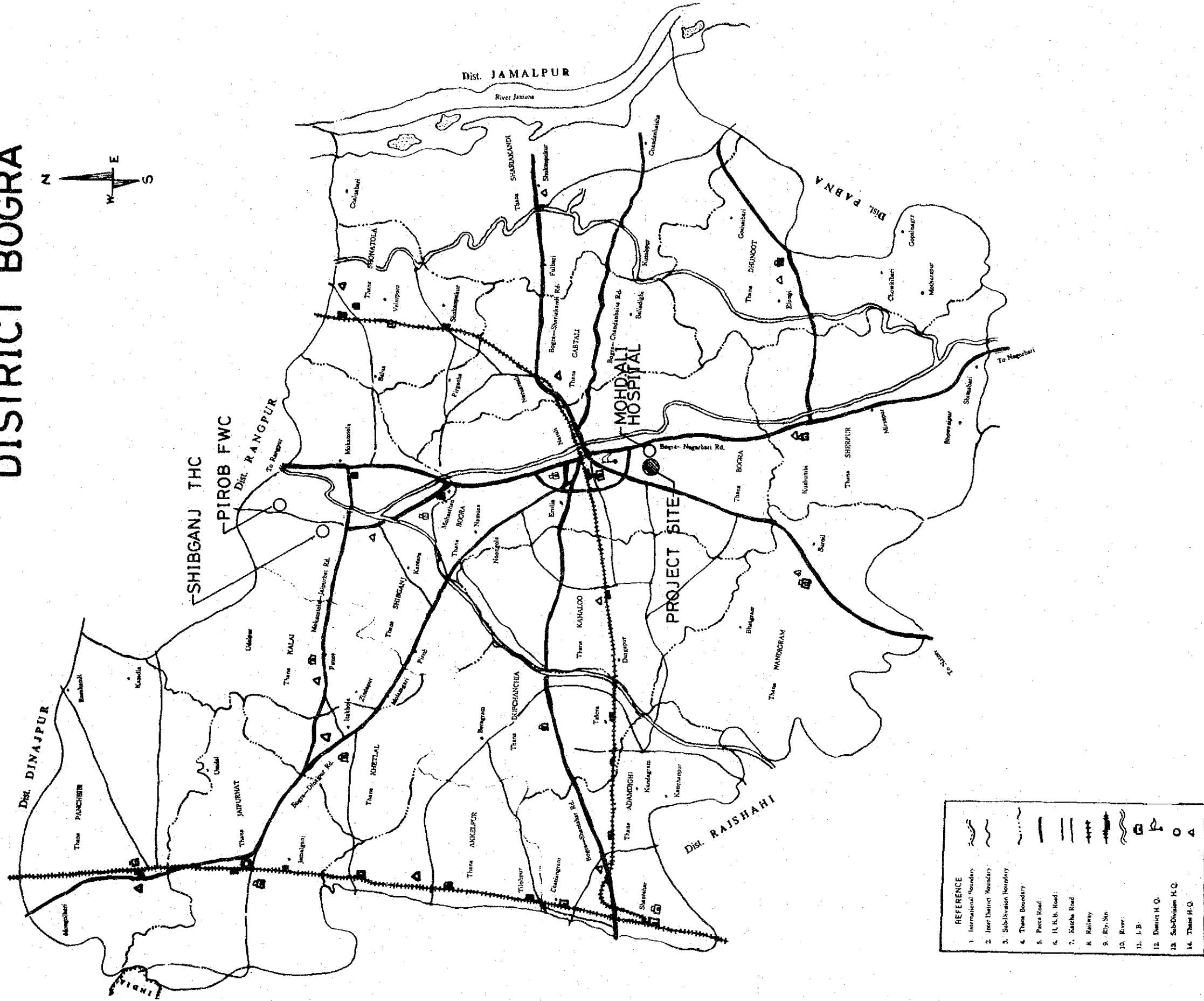
The project site is located in Bogra city and its location is shown in Fig. III-1.

The transportation routes to Bogra such as railways, roads and waterways are shown in Fig. III-2-4. In Rajshahi Division, there are railways and roads which connect a main city in a District with the other main cities in the other District. Since both the broad gauge and the metre gauge are used together in the railway system in the Division, that makes the railway transportation of material inconvenient. Therefore the roads are usually utilized to transport freights instead of railways. The traffic between Dhaka and Bogra depends on roads or railways with partial use of ferryboats, or airways with use of roads. As above seen, the transportation between two cities is extremely inconvenient and makes the big amount of freight difficult.

The railway can be used between Khulna, one of two international ports, and Bogra, but it is necessary to transfer freights to the other gauge of train or to the road transportation in Santahar because of the broad gauge between Khulna and Santahar and the metre gauge between Santahar and Bogra. As a result the roads are usually used as a means of the transportation of freights between Santahar and Bogra.

As for the transportation of imported construction materials for this project, the above materials will be unloaded in Khulna and will be transported to Santahar by railway and Santahar to Bogra the road will be utilized to transport the imported materials.

Fig III-1  
**DISTRICT BOGRA**





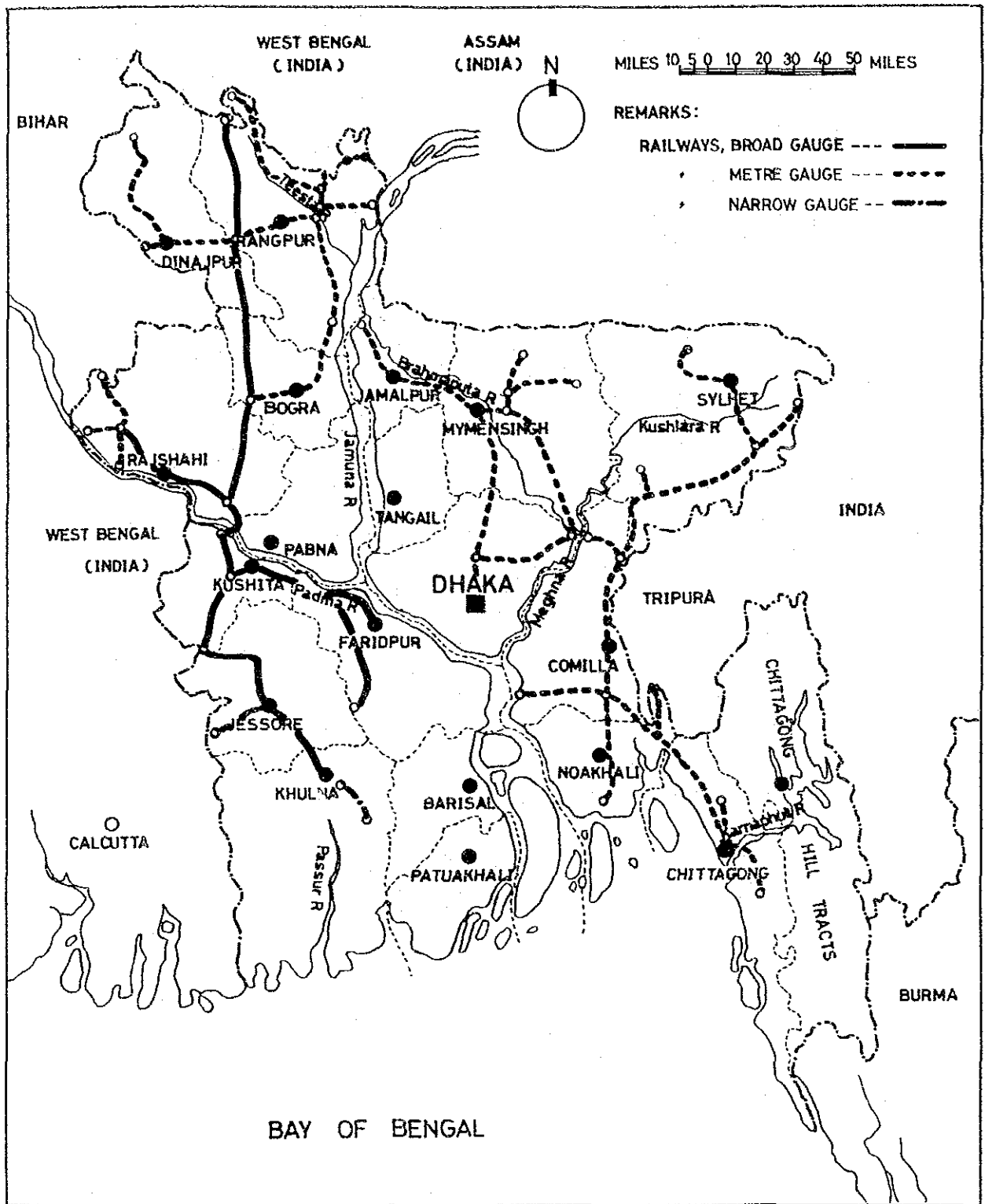


Fig.III-2 RAILWAY NETWORK

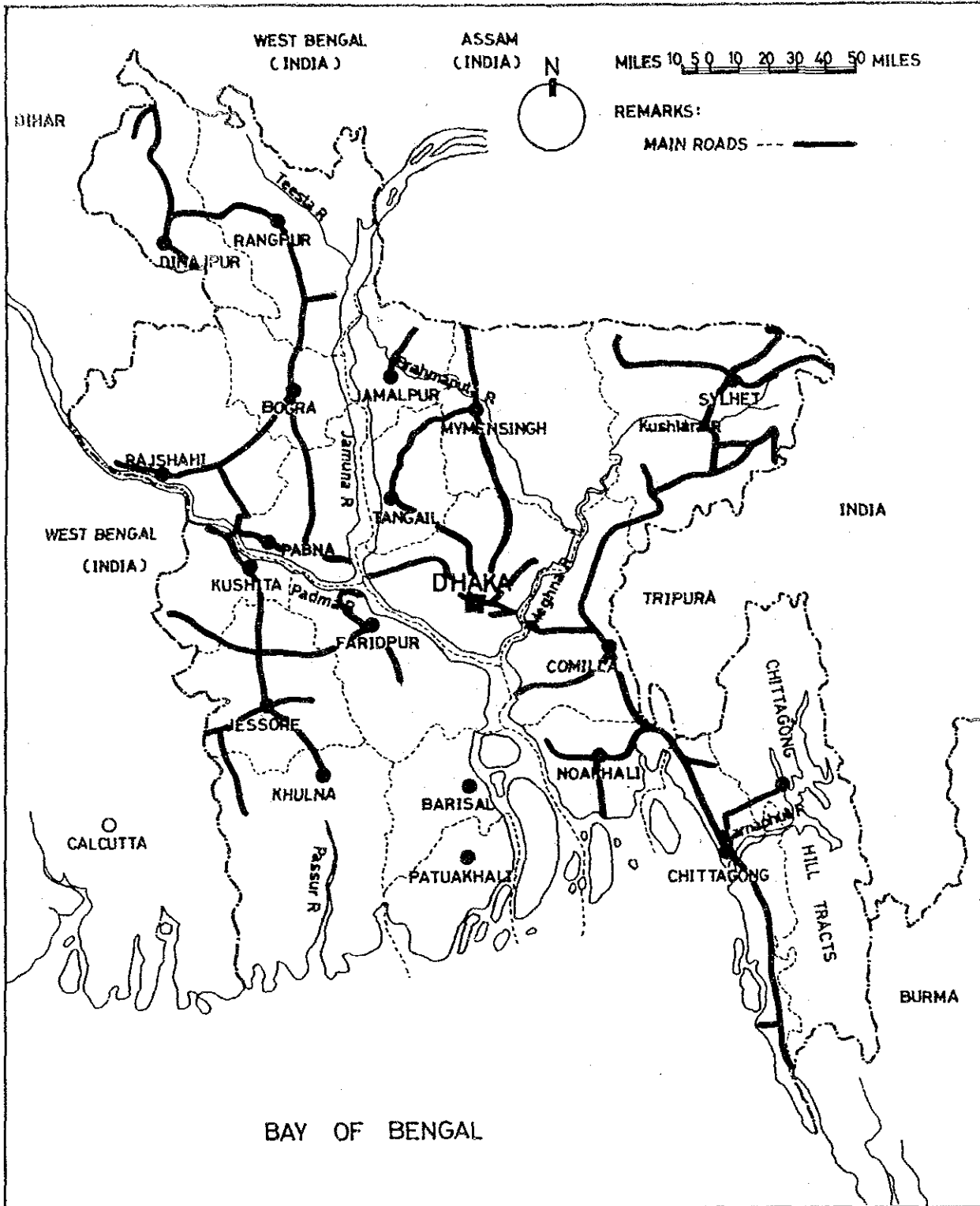


Fig.III-3 ROAD NETWORK

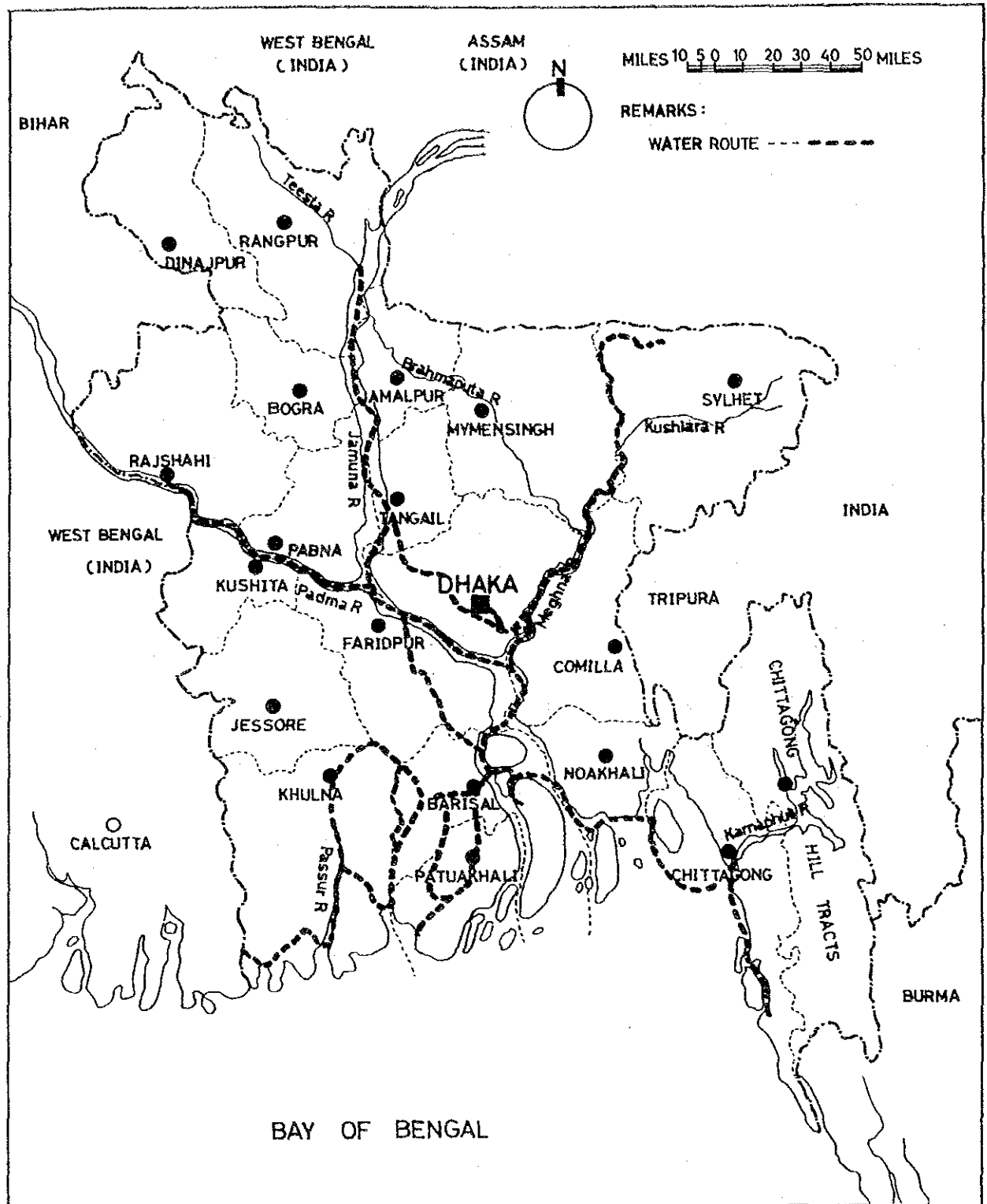


Fig.III-4 WATERWAYS





## 2-1-2 Infrastructure

### (1) Electricity

Now the electricity (11KV-50Hz) is supplied to the area around the project site and the power lines are wired along the Bogra-Sherpur Road. To general consumers the electricity (400V/230V) is supplied. The electric power capacity is existingly 132KV/10MVA. Since the capacity is short, it will be increased up to 20MVA within six months (as of April, 1983) and further, up to 80MVA by 1985/86. At the time of completion, the sufficient capacity of electricity will be supplied. It is reported in the local office of PWD that, due to the unstable electric supply, the installation of a generator will be necessary. Electric power of 11KV and 400V-50Hz will be supplied to the project site. In case the electric power of exceeding 50KVA will be supplied, a transformer will have to be installed by the expense of the project.

### (2) Water Supply

As for the water supply by citywater service, the main pipe (D=8") is buried along Bogra-Sherpur Road. According to the local office of PWD, the existing capacity of water supply is not sufficient so that the water supply from a well will be necessary. It is obvious that existing supply capacity of city water service is short and actually, in Bogra city, a deep tube well is under drilling to meet the demand of water supply. In the project site, the small-scaled irrigation are carried out utilizing the underground water pumped up from a shallow tube well. It proves that there are sufficient capacity of water under the ground. The depth of deep tube well in this District is usually 100-120ft.

The examination of the underground water sampled in the project site and the water by city water service (public water) was conducted. The result of microbiological test is shown in the following:

	<u>Coliform per 100ml</u>	
Public Water	460	Unsatisfactory
Ground Water	4	Satisfactory

(Tested by Institute of Public Health)

And the result of chemical experiment test is shown in Table III-1.

(3) Drainage

Drainage system is seen only in ditches on both sides of road even in Bogra city and sewage is not made yet. There is no regulation or standards on drainage.

(4) Telephone

Bogra T & T (Telephone and telegram) Office holds 1,700-lines of telephone, out of which 1,400-lines are now utilizing. Accordingly there is no difficulty of new supply since it has large capacity to supply.

(5) Gas

In Bogra District, even Rajshahi Division no gas is supplied or, in the future, there is no plan to supply gas. Accordingly, electricity and petroleum come to be the main energy source in Bogra.

## 2-1-3 Natural Conditions

(1) Climate

Bangladesh is said to be in the typical Monsoon climate. From the climatic features, one year is divided into three seasons such as Nor' Western season (summer season: Mar.-May), Monsoon season (rainy season: Jun.-Oct.) and Dry season (Nov.-Feb.). The temperature generally goes up highest in April and goes down lowest in January. According to the record of the Bogra station, the highest of the average temperature is 35.6°C in April and the lowest is 11.6°C in January. Approximately 80% of yearly rainfall has been recorded in the rainy season. There are much rainfall in the eastern part of Bangladesh and less rainfall in the western part of Bangladesh. According to the record of the Bogra station, the highest of the average rainfall is 13.8 inches in August and the lowest is 0.08 inches in December. The humidity generally goes up in the rainy season and goes down in the dry season. According to

the record of the Bogra station, the highest of the average humidity is 87% in August and the lowest is 37% in March. The climate of Bogra is that temperature is quite up to the average as compared with those of the other districts but the temperature range is very wide. The rainfall is smaller and the humidity is lower as compared with the other districts. Accordingly, in Bangladesh, it is said that Bogra is more or less in the inland-type climate (see Appendix-E for the above-mentioned climatic data).

(2) Damages from Storms and Floods

Cyclones before the rainy season damage houses, trees, agricultural products and river floods also damage agricultural products, roads, bridges in the rainy season, which yearly repeats as usual. As for cyclone, the velocity of wind reaches more than 70m/sec. But Bogra was not damaged much in flood because the land of Bogra is comparatively higher in the altitude and is located at inland.

(3) Earthquake

There are no record on earthquakes in Bangladesh. Although body sensed earthquakes have been reported, damages of buildings have not been reported. However, according to the recent research of physical geography, there are much possibilities that a big earthquake will occur in future. So that Bangladesh is divided into 3 zones in order of the volume of foreseeable damages and Bogra belongs to the second zone of seismic force.

Table III-1 Test Results of Water Sampled in Project Site

Sl.No.	Description	Public Water	Ground Water
1	pH	7.45	7.39
2	Conductivity	220.00 $\mu\text{m/cm}$	300.00 $\mu\text{m/cm}$
3	Turbidity	2.20 NTU*	3.10 NTU*
4	Colour	7.00 UNIT**	6.00 UNIT**
5	Total Hardness as $\text{CaCO}_3$	75.00 mg/l	116.00 mg/l
6	Ca-Hardness as $\text{CaCO}_3$	23.00 mg/l	28.00 mg/l
7	Mg-Hardness as $\text{CaCO}_3$	52.00 mg/l	88.00 mg/l
8	C.O.D. as $\text{KMnO}_4$	0.70 mg/l	1.80 mg/l
9	Iron as Fe	0.02 mg/l	0.03 mg/l
10	Manganese as Mn	0.20 mg/l	0.75 mg/l
11	Silica as $\text{SiO}_2$	102.00 mg/l	104.00 mg/l
12	Sulfate as $\text{SO}_4^{++}$	1.00 mg/l	2.00 mg/l
13	Chlorine as $\text{Cl}^-$	0.50 mg/l	0.40 mg/l
14	Bicarbonate as $\text{HCO}_3^-$	72.44 mg/l	88.45 mg/l
15	Acid demand at pH 4.8 as $\text{CaCO}_3$	95.00 mg/l	116.00 mg/l
16	Phenol	absent	absent
17	Nitrogen, Ammonia as $\text{N-NH}_3$	0.15 mg/l	0.08 mg/l
18	Nitrogen, Nitrate as $\text{N-NO}_3$	1.10 mg/l	1.00 mg/l
19	Nitrogen, Nitrite as $\text{N-NO}_2$	0.002 mg/l	0.002 mg/l

\* Nephelometric Turbidity Unit  
 \*\* APHA Platinum-Cobalt Standard

Tested by: Dhaka University  
 of Technology

## 2-2 Existing Situation of Project Site

### 2-2-1 Possession of Land for Project and Its Utilizing Situation (See Fig. III-5 and 6)

The land for the project is located just behind the Mohammed Ali Hospital and the Medical Assistants & Nurses Training School in view from the main road, the Bogra-Sherpur Road and approximately 120 meters away from the main road through approximately 3.5 meter wide road.

The Government of Bangladesh has possessed the land of 11.95 acres as the project site for the Construction of Pharmaceucital Formulation Centre. The possession right has been transferred to the Bangladesh Government. However, this land is now actually possessed by Public Works Department (PWD), in connection with the pre-scheme for the Construction of Medical College using for this land. Therefore before the commencement of the construction work, the procedures for transferring the possession right of the necessary land from PWD to Ministry of Health & Population Control will have to be needed.

The western part of approximately 3/5 of the land are now utilizing as paddy field, which is approximately 4 ft. lower than the eastern part. The part of approximately 2/5 facing the road on the east side of the land are uneven, which is approximately 2-5ft. higher than the paddy land. At this part, several deserted houses made of mud brick remain. And at the hollow in this part, ditches are seen for being utilized for the drainage from the Mohammed Ali Hospital. The corner land in the north-eastern part has been decided as the proposed site for the construction of Nurses Training School.

### 2-2-2 Topography and Sub-soil Conditions

The project site has a landscape as shown in Fig. III-7. The shape of the project site is almost a square, which is 640ft. x 760ft. (see Fig. III-5). The outline of the project site following the levelling survey map is as shown in Fig. III-6. The eastern part of 3/5 the land site is approximately 2-5ft. higher than the other western part. According to the plan of PWD, the designed ground level has been set up at 98ft., assuming that 100 ft. is the west side plinth level of the Male Student

Hostel in the Medical Assistants & Nurses Training School. Accordingly, the surplus earth of the higher land than 98ft. will be cut off and it will be necessary for the low land to be filled up.

According to the survey conducted with a portable cone penetrometer, the soil bearing capacity shows 6-10t/m<sup>2</sup>. This means the typical sub-soil conditions in Bangladesh. For the structural design, the peculiar consideration is not necessary. The survey points (2 places) are shown in Fig. III-5.

### 2-2-3 Site Conditions for Construction Work

The access road to the project site is approximately 3.5m wide from the Bogra-Sherpur Road, and therefore is difficult for big vehicles to go to and from the project site. Accordingly, it is necessary to extend the road upto 6m in width before commencement of the construction work. The width of the Kutcha Road facing the project site is approximately 4m so that it is also necessary to extend the road upto 6m into the project site.

The existing situation of the project site is as described in III, 2-2-1. In this project site, there are two houses where the residents are living and five deserted houses and are some holes among those houses. Providing those houses and obstacles are demolished before the commencement of the construction work, there will be no difficulty for construction. Also it is necessary to complete the land development of the project site, adjusting to the designed ground level. As described in III, 2-2-2, it is necessary to cut off the higher level more than 98ft. and to fill-up with earth in low land. On the filling-up in the paddy field, existing surface subsoil is so soft as to give the sufficient compaction.

There is an engine pump working in the middle of the project site for irrigation of the paddy field. For the construction work this tube well will be able to be used. However, since the pump is on private belongings, another pump will be necessary to be prepared.





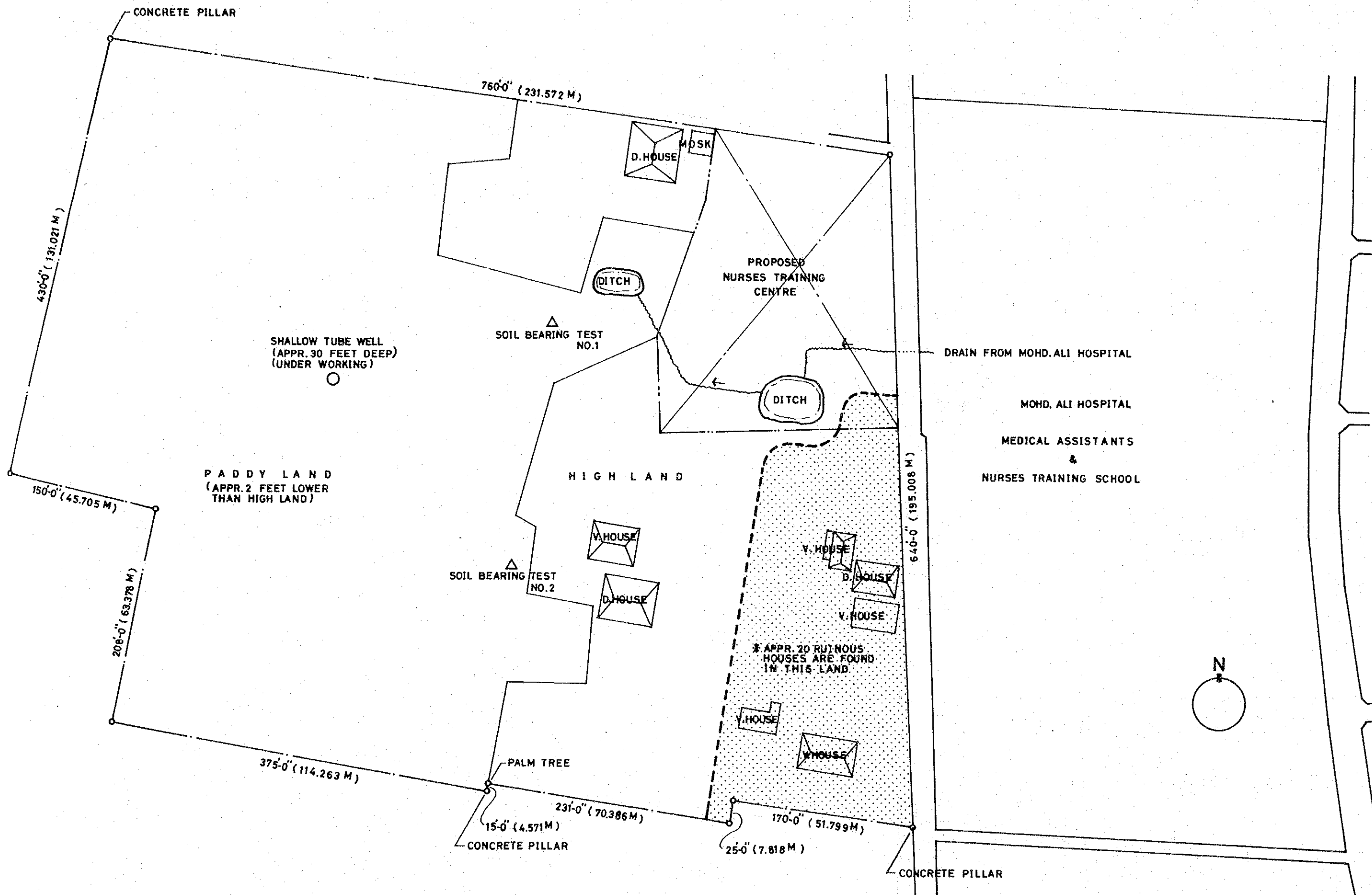
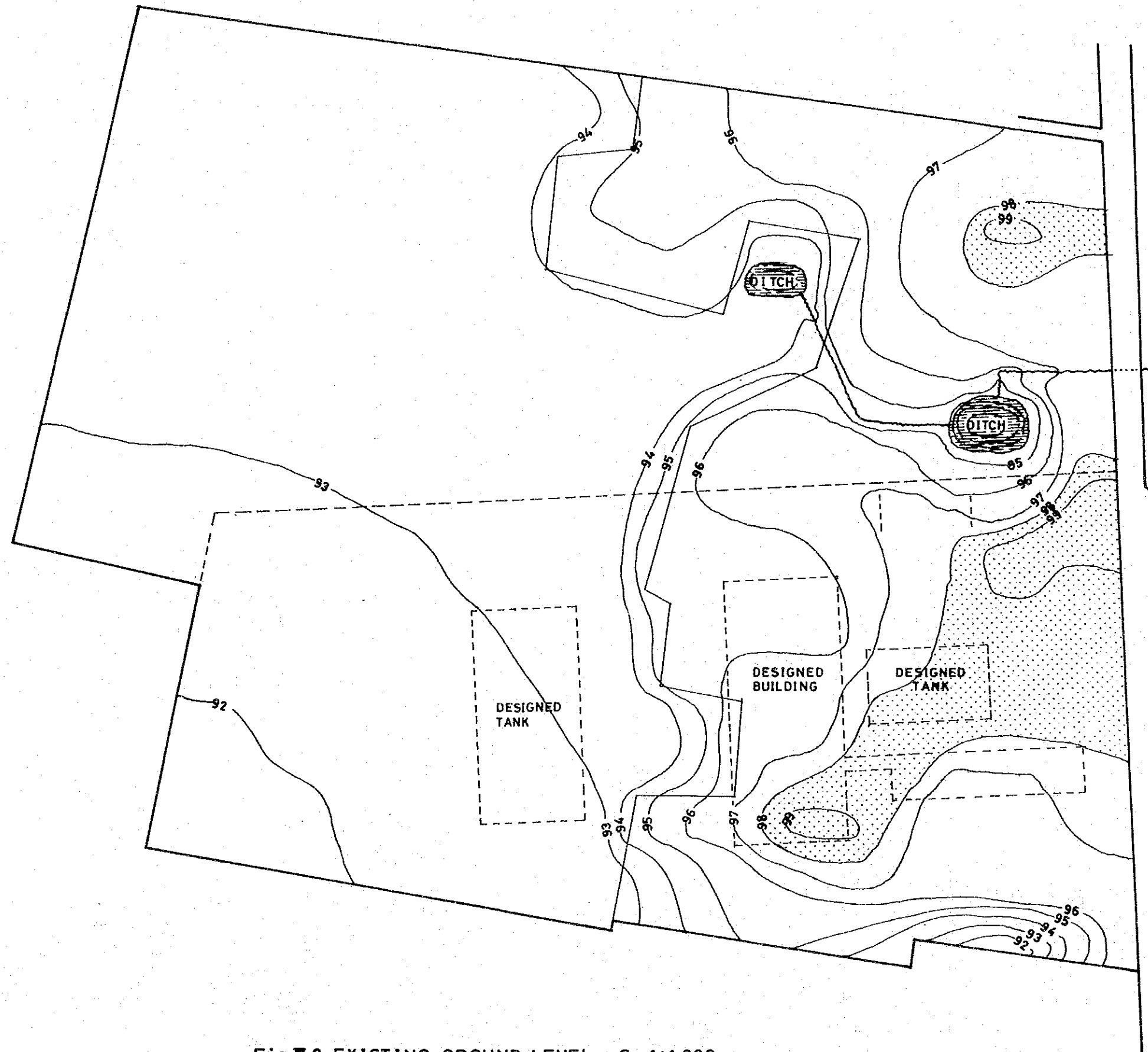


Fig. II-5 PROJECT SITE MAP S=1:1,000

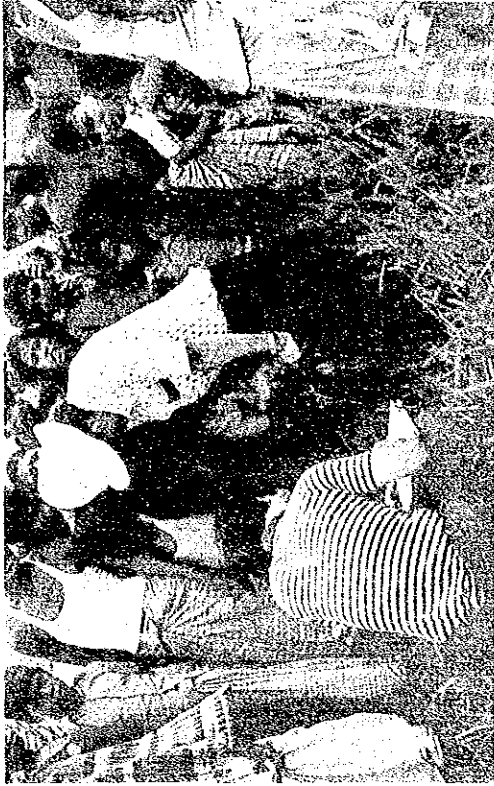
D. HOUSE : DWELLING HOUSE  
 V. HOUSE : VACANT HOUSE



REF.  
 1. ASSUMED G.L. 100'-00" AT THE WEST  
 SIDE PLINTH OF MALE STUDENT  
 HOSTEL ATTACHED TO TRAINING  
 SCHOOL FOR MEDICAL ASST...  
 BOGRA.  
 2. DESIGNED G.L. IS 98'-00" AS SHOWN  
 IN  IN EXISTING GROUND LEVEL.

Fig. II-6 EXISTING GROUND LEVEL S=1:1,000





SOIL BEARING TEST



WATER FROM SHALLOW TUBE WELL IN THE SITE



Fig. III-7 PHOTO OF PROJECT SITE



### 3. Architectural Design

#### 3-1 Buildings

##### 3-1-1 Site Layout Plan (See Fig. III-8)

Each facilities is independently laid out in order from the eastern road side, Administration Block, Processing & Packing Block and Warehouse Block in the project site. Considering the future extension of Processing & Packing Block and Warehouse Block, the spare land is secured. A tank for drainage is designed. A 6-meter wide road is designed to circulate in the site. In the north area of the site, sub-station, Water Supply Tower, etc. are laid out. Besides, in the west side of the site, the land to construct residential Block is planned. Administration Block faces south to get in the natural draft of window.

##### 3-1-2 Architectural Floor Plan (See Fig. III-9 - III-12)

#### (1) Functional Design

##### 1) Administration Block

This block is laid out at the nearest part from the entrance because it has the largest number of workers, managing staff and visitors, including the administration section and the locker room for workers. Accommodation of visitors and managing staff is zoned separately from workers and the entrances are separately designed respectively. Particularly workers always have to enter the Processing and Packing Block through the locker room and the air-lock to keep inside clean.

##### 2) Processing & Packing Block

The flows of raw materials and workers make the Processing and Packing Block clean by way of the air-locks from the Warehouse Block and Administration Block respectively. Raw materials will be flowed according to the pharmaceutical formulation process and will be distributed in each form of drugs by way of the warehouse. The corridor in the middle of this Block is designed to be the trunk of flow and to make visitors show the inside of rooms without their entering.

### 3) Warehouse Block

Since it is the busiest place on transportation of material and products, this block is laid out in the shortest distance from the gate. Warehouse Block is connected with the Processing & Packing Block through the air lock. The entrance is located in the middle of Warehouse Block to meet two functions of bringing in and out the raw materials and products respectively and storing on both sides of Warehouse Block products and raw materials separately.

## (2) Scope of building work

The designed items and the scale of construction are as follows:

### 1) Buildings

a. Administration Block	504,000 m <sup>2</sup>
b. Processing & Packing Block	1,215,000 m <sup>2</sup>
c. Warehouse Block	445,500 m <sup>2</sup>
<hr/>	
Sub-Total ; a + b + c	2,164,500 m <sup>2</sup>
d. Sub-station	168,000 m <sup>2</sup>
e. (Check Gate) (to be borne by G.O.B.)	(24,000 m <sup>2</sup> )
f. (Canteen) (to be borne by G.O.B.)	(180,000 m <sup>2</sup> )
g. (Garage) (to be borne by G.O.B.)	(168,000 m <sup>2</sup> )
<hr/>	
Sub-Total ; d only	168,000 m <sup>2</sup>
d + e + f + g	(540,000 m <sup>2</sup> )
<hr/>	
Total ; a + b + c + d	2,332.500 m <sup>2</sup>
a + b + c + d + e + f + g	(2,704.500 m <sup>2</sup> )

### 2) External Work

- External road within the site
- Raw water reservoir
- Elevated water supply tank
- Drainage ditch

Note: G.O.B.; the Government of Bangladesh

## (3) Required Rooms and Area

Room No.	Designation	Floor Area
(1)	Administration Block	504.000 m <sup>2</sup>
101	Office Room	126.000 m <sup>2</sup>
102	Entrance	63.000
103	Quality Control Room	45.000
104	Toilet (M)	13.000
105	Toilet (F)	13.000
106	Kettle Room	9.000
107	Toilet/Shower Room (F)	18.000
108	Locker Room (F)	27.000
109	Toilet/Shower Room (M)	18.000
110	Locker Room (M)	27.000
111	Air Lock	31.000
	Others	112.500
(2)	Processing & Packing Block	1,215.000 m <sup>2</sup>
201	Weighing Room	27.000 m <sup>2</sup>
202	Sifting Room	20.000
203	Milling Room	20.000
204	Processing Office	13.000
205	Tool Room	13.000
206	Weighing Material Storage	101.250
207	Dry Mixing Room	82.500
208	Wet Mixing Room	82.500
209	Middle Staging Storage	60.750
210	Tableting Room (1)	20.250
211	Tableting Room (2)	20.250
212	Tableting Room (3)	20.250
213	Liquid Preparation Room	28.875
214	Weighing Room	28.875
215	Capsule Filling Room (1)	18.000
216	Capsule Filling Room (2)	18.000
217	Middle Staging Storage	47.250
218	Packing Room	189.000
219	Packing Preparation Room	63.000
220	Machine Room	94.500
221	Raw Material Drum Storage	22.000
222	Processing Office	11.250
	Others	212.500
(3)	Warehouse Block	445.500 m <sup>2</sup>
301	Warehouse	335.500 m <sup>2</sup>
302	Material Storage (1)	13.500
303	Material Storage (2)	18.000
304	Air Lock	18.000
305	Office Room	13.500
306	Inspection Room	18.000
	Others	9.000
(4)	Sub-station	168.000 m <sup>2</sup>
(5)	(Check Gate) (to be borne by G.O.B.)	(24.000 m <sup>2</sup> )
(6)	(Canteen) ( - do - )	(180.000 m <sup>2</sup> )
(7)	(Garage) ( - do - )	(168.000 m <sup>2</sup> )
Total (( ) is not included)		2,332.500 m <sup>2</sup>

Note: G.O.B.; the Government of Bangladesh



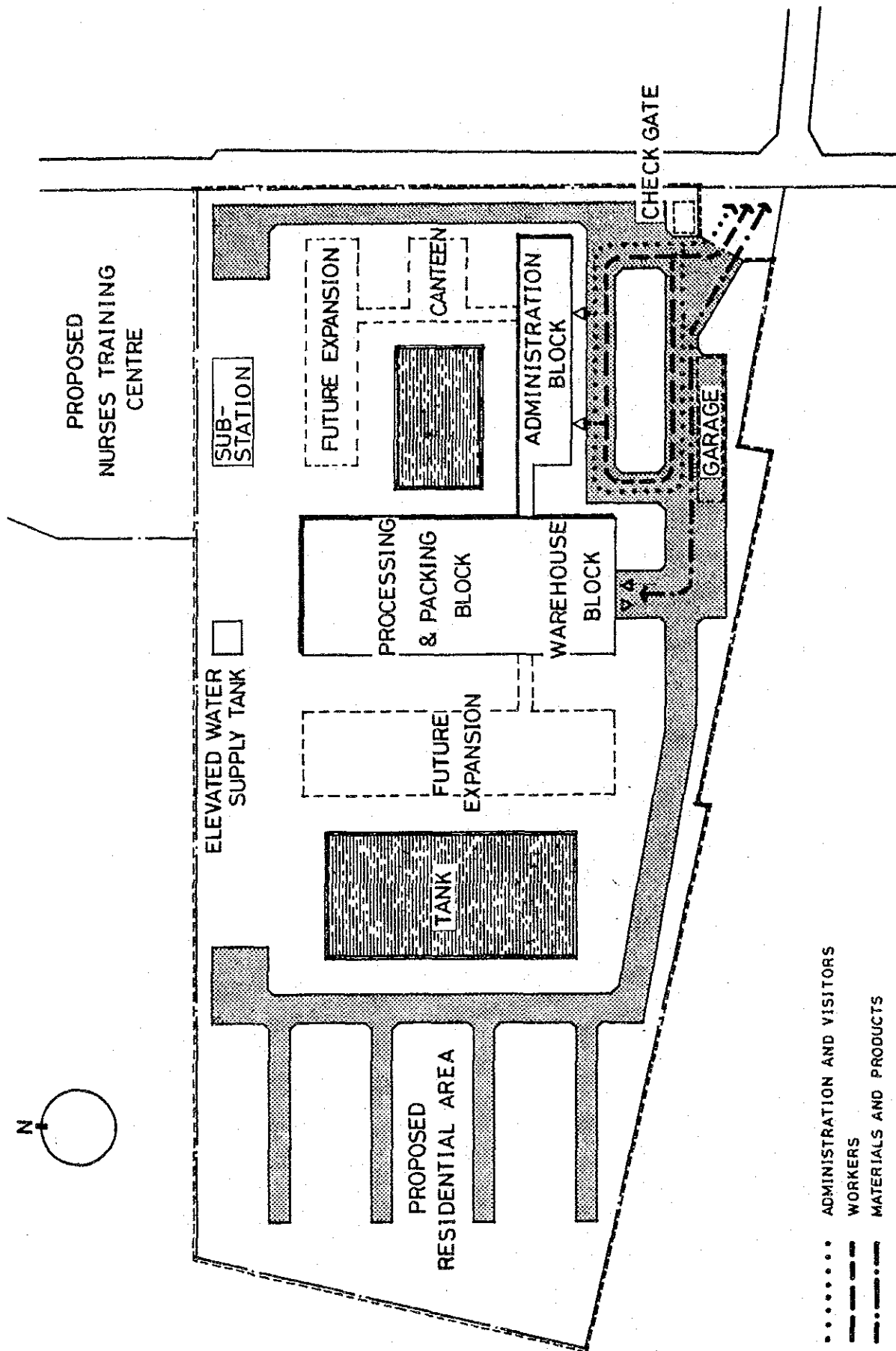
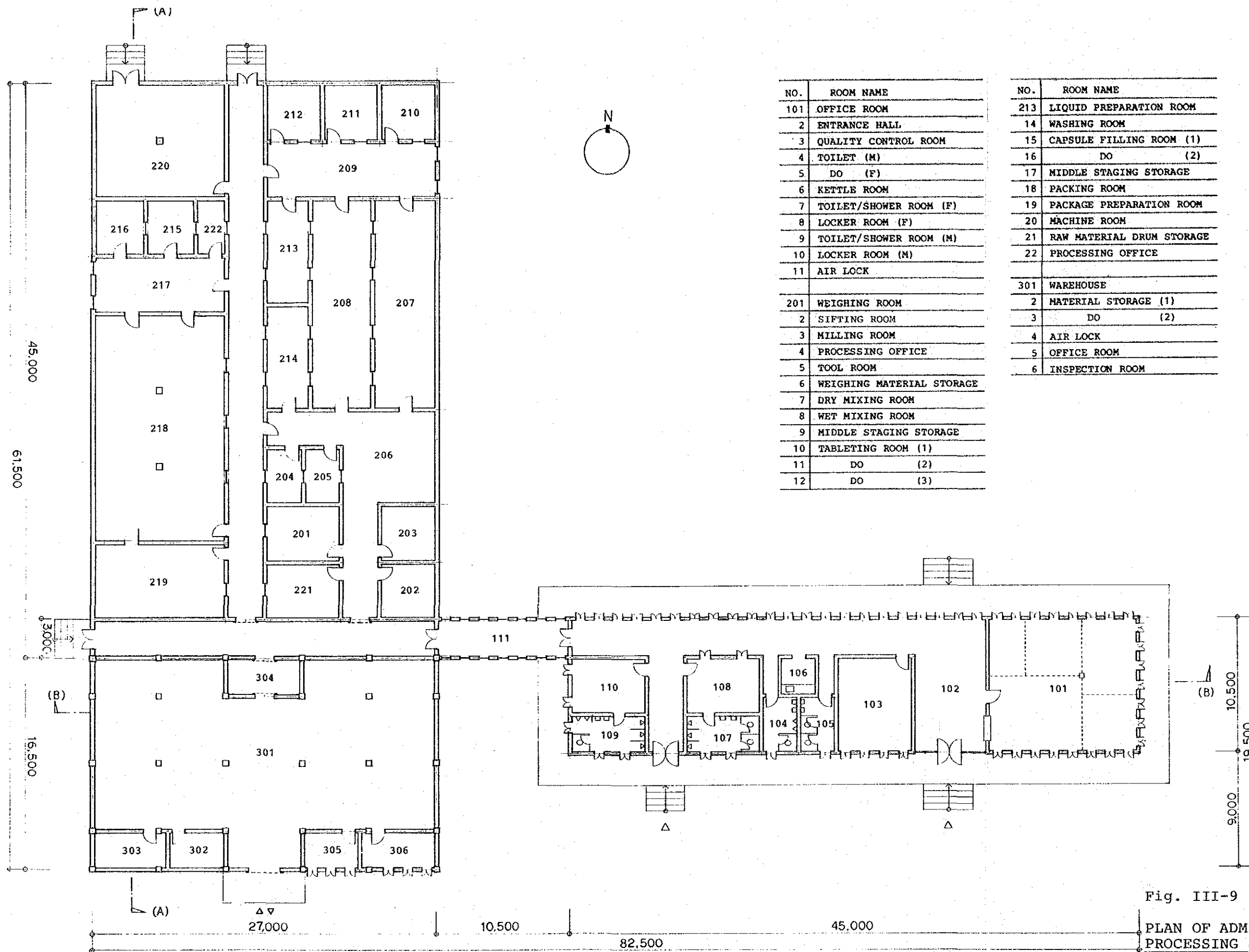


Fig. I-8 DIAGRAM OF CIRCURATION IN LAND

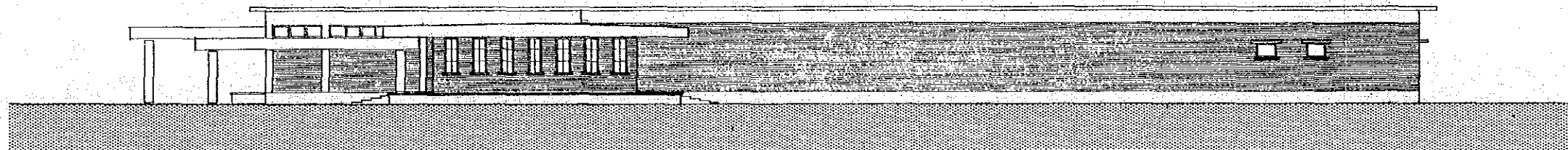




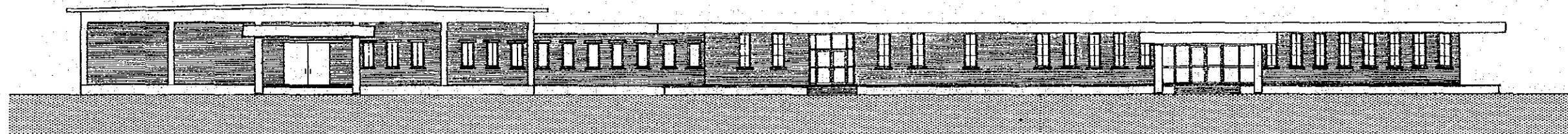
NO.	ROOM NAME
101	OFFICE ROOM
2	ENTRANCE HALL
3	QUALITY CONTROL ROOM
4	TOILET (M)
5	DO (F)
6	KETTLE ROOM
7	TOILET/SHOWER ROOM (F)
8	LOCKER ROOM (F)
9	TOILET/SHOWER ROOM (M)
10	LOCKER ROOM (M)
11	AIR LOCK
201	WEIGHING ROOM
2	SIFTING ROOM
3	MILLING ROOM
4	PROCESSING OFFICE
5	TOOL ROOM
6	WEIGHING MATERIAL STORAGE
7	DRY MIXING ROOM
8	WET MIXING ROOM
9	MIDDLE STAGING STORAGE
10	TABLETING ROOM (1)
11	DO (2)
12	DO (3)

NO.	ROOM NAME
213	LIQUID PREPARATION ROOM
14	WASHING ROOM
15	CAPSULE FILLING ROOM (1)
16	DO (2)
17	MIDDLE STAGING STORAGE
18	PACKING ROOM
19	PACKAGE PREPARATION ROOM
20	MACHINE ROOM
21	RAW MATERIAL DRUM STORAGE
22	PROCESSING OFFICE
301	WAREHOUSE
2	MATERIAL STORAGE (1)
3	DO (2)
4	AIR LOCK
5	OFFICE ROOM
6	INSPECTION ROOM

Fig. III-9  
 PLAN OF ADMINISTRATION BLOCK,  
 PROCESSING & PACKING BLOCK



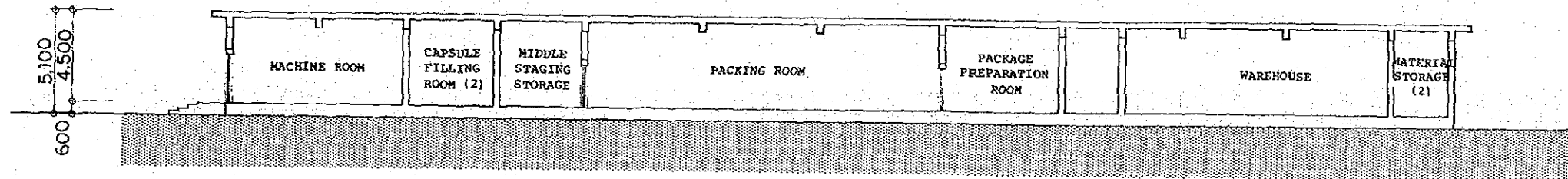
EAST ELEVATION



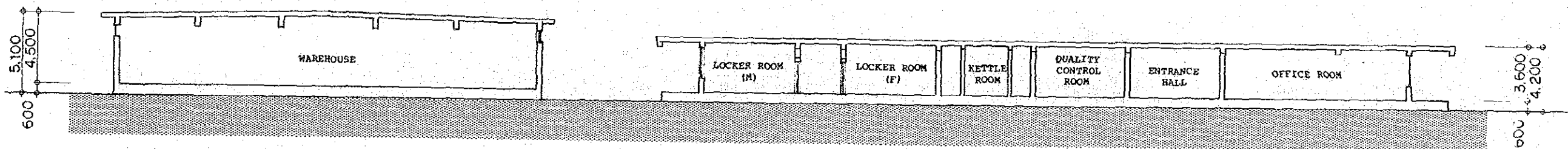
SOUTH ELEVATION

Fig. III-10

ELEVATION OF ADMINISTRATION BLOCK,  
PROCESSING & PACKING BLOCK



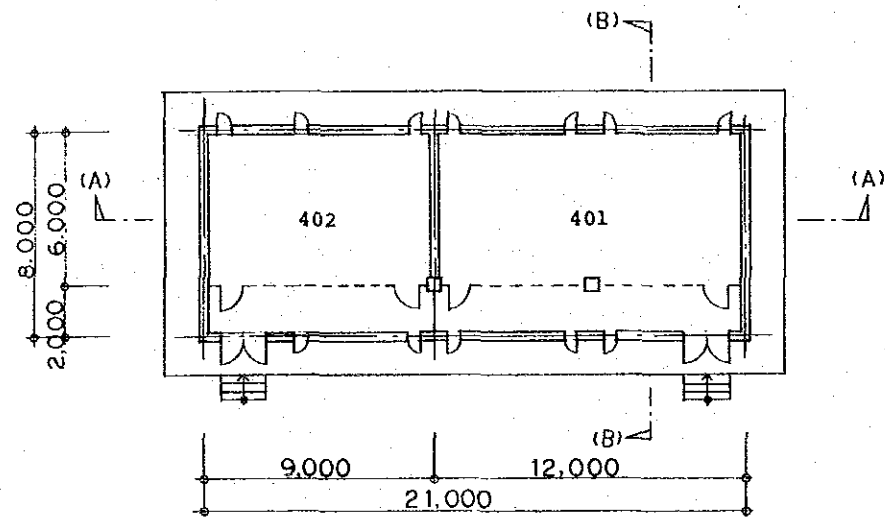
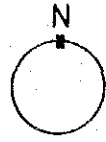
SECTION (A)



SECTION (B)

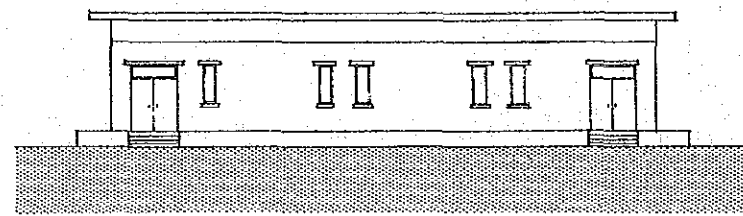
Fig. III-11

SECTION OF ADMINISTRATION BLOCK,  
PROCESSING & PACKING BLOCK

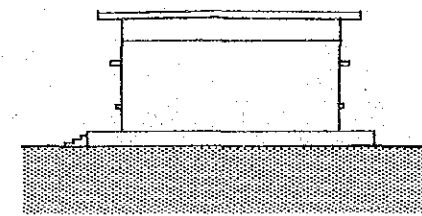


NO.	ROOM NAME
401	SUB-STATION
2	ENGINE GENERATOR ROOM

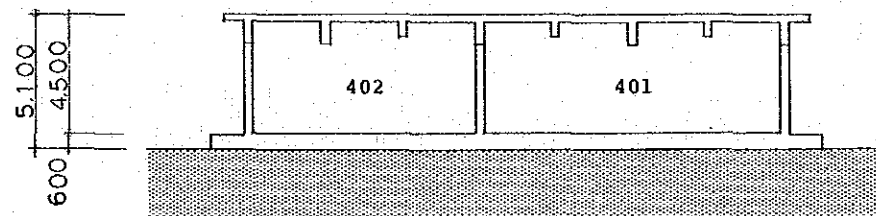
PLAN



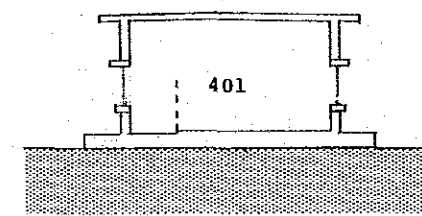
SOUTH ELEVATION



EAST ELEVATION



SECTION (A)



SECTION (B)

Fig. III-12

PLAN · ELEVATION · SECTION OF  
SUB-STATION



### 3-1-3 Style, Space and Design

The architecture style will follow the brick masonry which is the most popular in Bangladesh. This is because the masonry is most economical and suitable in Bangladesh.

As for the design, simple and functional should be taken in account. In Administration Block, the opening will be expanded as large as possible in brick masonry to take in the natural draft. The Processing & Packing Block will be a windowless building, in principle, in view of its function. The Warehouse Block will be a building which has large areas of wall and high windows to take in the natural draft. Administration Block, Processing & Packing Block and Warehouse Block are designed as independent blocks to have the particular ceiling height.

Except for part of Processing & Packing Block and Warehouse Block, the wall layout is designed in a 1.5 m unit as a rule, considering the particularity of bricks masonry structure. Grills will be provided in window to ensure safety.

### 3-1-4 Construction Materials and Finish

Brick which is the most popular construction material in Bangladesh is adopted for both the structural walls and the non structural walls. Reinforced concrete will be used for all parts of columns, beams and roof-slabs. On external walls, exposed bricks may make the look fine and the internal walls will be finished with water-proof coating on trowelled mortar. Terrazzo is one of the most popular construction materials. As for doors and windows, doors facing outside will be of steel and inside doors will be of wood, and windows will be of aluminium since the air tightness is necessary to fulfill the functions of the Pharmaceutical Formulation Centre.

The finish is shown as follows:



#### External

External wall	:	Brick (exposed)
Column	:	Fair faced concrete
Beam	:	- do -
Roof	:	Lime terracing on reinforced concrete slab
Baseboard	:	Trowelled mortar concrete

#### Interior

Floor	:	Terrazzo block
Baseboard, Wainscot	:	Terrazzo cast in place
Wall	:	Waterproof finish coat on trowelled mortar
Ceiling	:	- do -

### 3-2 Structure

One of main policies is low cost so that the main structure of all the buildings will be brick masonry and reinforced concrete will be used for required parts. The story will be single.

#### 3-2-1 Structural Plan

##### 1) Frame

The main structure will be brick masonry and the walls will be laid out in consideration of a 1.5m-unit as far as possible to support the vertical load. Roof slabs and beams will be reinforced concrete against the horizontal force.

##### 2) Floor

Floors will not be concrete floor on the ground but reinforced concrete slab. It is because in Bangladesh there are not much suitable soil and sand for back-filling and therefore the reinforced concrete slab can prevent floors from being uneven. However, for equipments which make heavy vibration or which has a special specification, independent foundations will be designed.

##### 3) Foundation

The foundations will be designed as a direct foundation (continuous footing and independent footing) on the supporting ground of silt or clay stratum (Soil bearing capacity; 6-10 t/m<sup>2</sup>).

#### 3-2-2 Structural Design Condition

##### 1) Design Policy

There is no regulation and standards in Bangladesh. Accordingly, it is much better to design the structure according to Japanese standards in consideration of the Bangladesh condition.

## 2) External force

Brick masonry structure, to be used in the design, cannot bear the horizontal force. In this structure the whole structure of brick wall and reinforced concrete frame of slab, beam, column and footing, is to have resisting force against the horizontal force. The horizontal force are seismic force ( $K=0.1$ ) and wind force (66m/sec).

## 3) Structural material

a. Reinforcing bars : JIS SD30 and M/S bars or more than equal

b. Concrete to use normal Portland cement

- Standard strength

Foundation FC = 180 kg/cm<sup>2</sup>

Superstructure FC = 180 kg/cm<sup>2</sup>

### 3-3 Sanitary, Plumbing and Fire Extinguishing Equipment

#### 3-3-1 Water Supply Equipment (See Fig. III-13)

Due to the shortage and the unsatisfaction of city water for producing drugs for the project site (see III,2-1-2,(2)), water will be pumped up from the deep tube well (depth: approximately 100-120ft.) to the raw water reservoir and again pumped up to the elevated water tank. Then the water will be supplied to each place by the gravity water supply system. Incidentally, the pure water which is made by the demineralizing equipment will be also supplied to the Processing & Packing Block.

#### 3-3-2 Drainage Equipment (See Fig. III-14)

The drainage equipment is divided into four systems such as the waste water, the rain water, the chemical water and the soil water system. The waste water and the rain water will be discharged to the tank through the pipe and the drainage ditch. The chemical water shall be led to the treatment tank and discharged to the tank after dilution. The soil water will be led to the septic tank and discharged to the tank after treatment. The drainage system in the site as shown in Fig. III-15. These system is designed to ensure that wastes do not pose any health hazard.

#### 3-3-3 Fire Extinguishing Equipment

One fire extinguisher at intervals of 30m will be provided at the places needed in buildings.

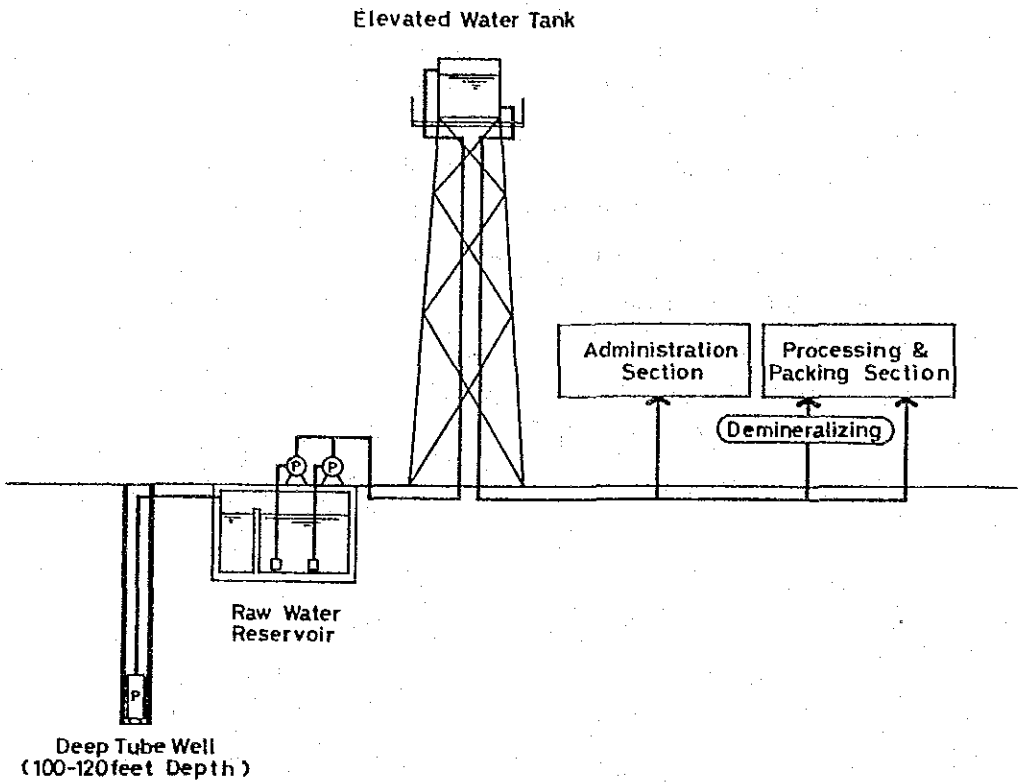


Fig. III-13 Water Supply System

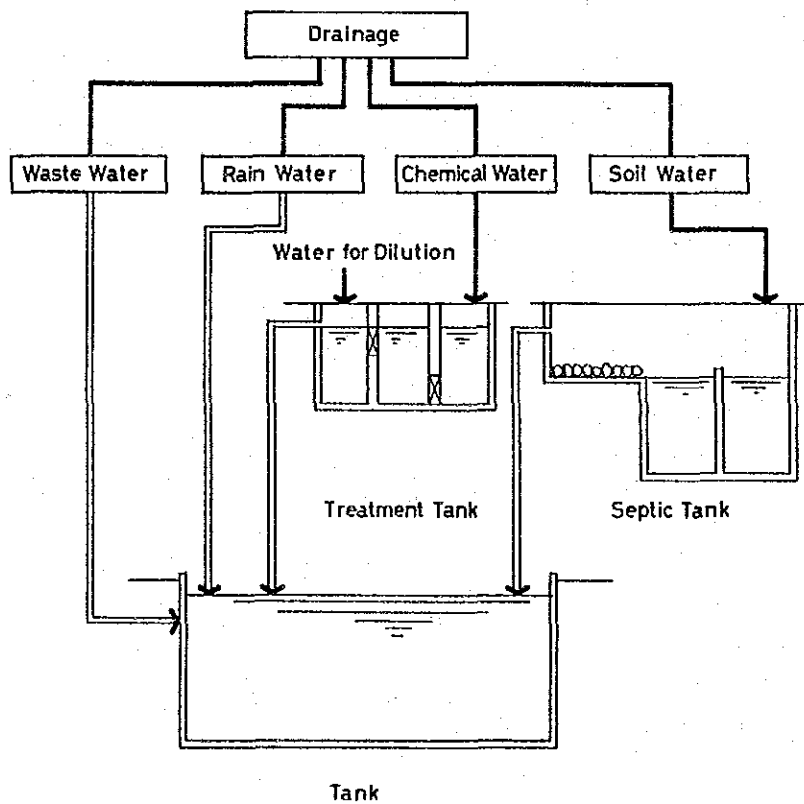


Fig. III-14 Drainage System

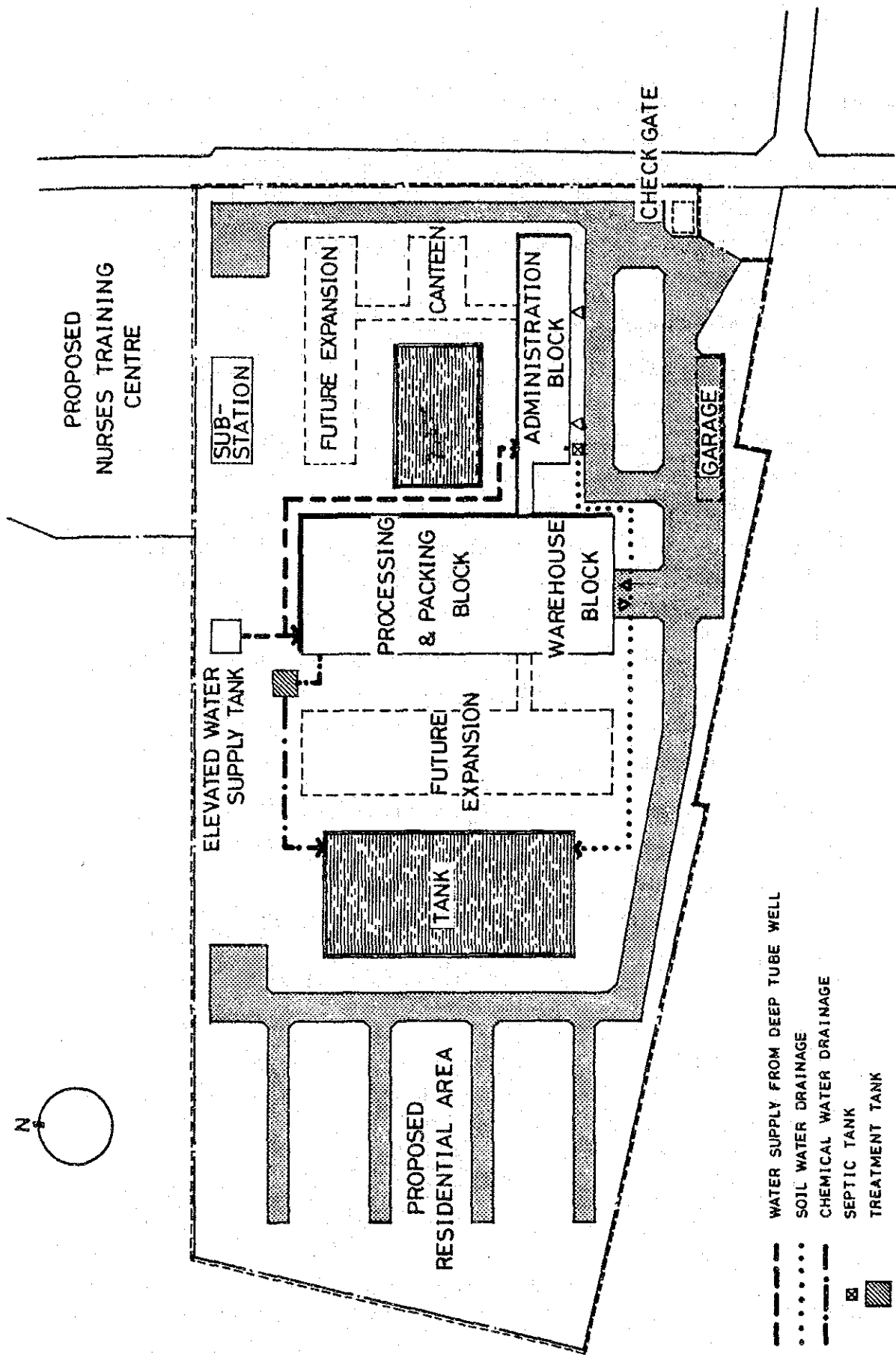


Fig. 1-15 DIAGRAM OF WATER SUPPLY AND DRAINAGE

### 3-4 Air Conditioning Equipment

#### (1) Design Policy

The air conditioning system is designed with the aim of not giving a harmful influence to the quality of products in the Processing & Packing Block.

#### (2) Outline of Air-conditioning and Ventilation

- 1) It may essentially be necessary to install the air-conditioning system of temperature and humidity control with air-cleaning system in the Processing & Packing Block for maintenance of quality of raw material and product. However, in this design, in consideration of easy maintenance and operation, a package-type air conditioning will be installed in the required room of Processing and Packing Block. Air cleaning filter of medium fine filtering will be set out in the machine.

It may also essentially be necessary to prepare dust collector in the required rooms. However, with understanding the difficulty to maintain and operate it, dust collector will not be prepared in this design.

- 2) Living conditions will principally be improved in the other working rooms by ceiling fans and by natural draft.
- 3) It may essentially be necessary to install air-conditioning in Quality Control Room and a cold store (5°C) in Warehouse Block.

## (3) Outline of Air-conditioning and Ventilation

(1) Administration Block		
101	Office Room	C
102	Entrance Hall	X
103	Quality Control Room	P
104	Toilet (M)	X
105	Toilet (F)	X
106	Kettle Room	X
107	Toilet/Shower Room (F)	X
108	Locker Room (F)	C
109	Toilet/Shower Room (M)	X
110	Locker Room (M)	C
111	Air Lock	X
(2) Processing & Packing Block		
201	Weighing Room	P
202	Sifting Room	P
203	Milling Room	P
204	Processing Office	P
205	Tool Room	X
206	Weighing Material Storage	P
207	Dry Mixing Room	P
208	Wet Mixing Room	P
209	Middle Staging Storage	P
210	Tableting Room (1)	P
211	Tableting Room (2)	P
212	Tableting Room (3)	P
213	Liquid Preparation Room	X
214	Washing Room	X
215	Capsule Filling Room (1)	P
216	Capsule Filling Room (2)	P
217	Middle Staging Storage	P
218	Packing Room	P
219	Package Preparation Room	P
220	Machine Room	X
221	Raw Material Drum Storage	P
222	Processing Office	P
(3) Warehouse Block		
301	Warehouse	X
302	Material Storage (1)	C.S.
303	Material Storage (2)	X
304	Air Lock	X
305	Office Room	C
306	Inspection Room	C
Notes		
	C: Ceiling Fan	
	P: Package-Type	
	C.S.: Cold Storage	
	X: Not installed	



### 3-5 Electric Equipment

#### 3-5-1 Power Supply Equipment (See Fig. III-16)

The receiving point will be laid at the northeast corner of the site and electric power will be supplied to the sub-station in the underground pipe from there.

Incoming voltage	3 $\phi$ - 3W	11KV	50Hz
Distribution voltage	3 $\phi$ - 4W	400V/230V	50Hz

Sub-station equipment will include power factor improvement plant with two-part energy metres.

#### 3-5-2 Generating Equipment

It may essentially be necessary that one generator will be provided as an emergency power supply at the time of power failure. The emergency power will be supplied to the following equipment.

- a. Mixing, tablet, sachet and packing equipment
- b. Power source of air conditioning equipment and lighting equipment

At least one-hour operation will have to be provided in the most important process of pharmaceutical production.

#### 3-5-3 Main Power Feeder Equipment (See Fig. III-17)

Electric power will be supplied from the switch board to each distribution board, power control board and power board. The distribution voltages are as follows;

Distribution board	3 $\phi$ - 4W	400V/230V	50Hz
Power control board	3 $\phi$ - 3W	400V	50Hz

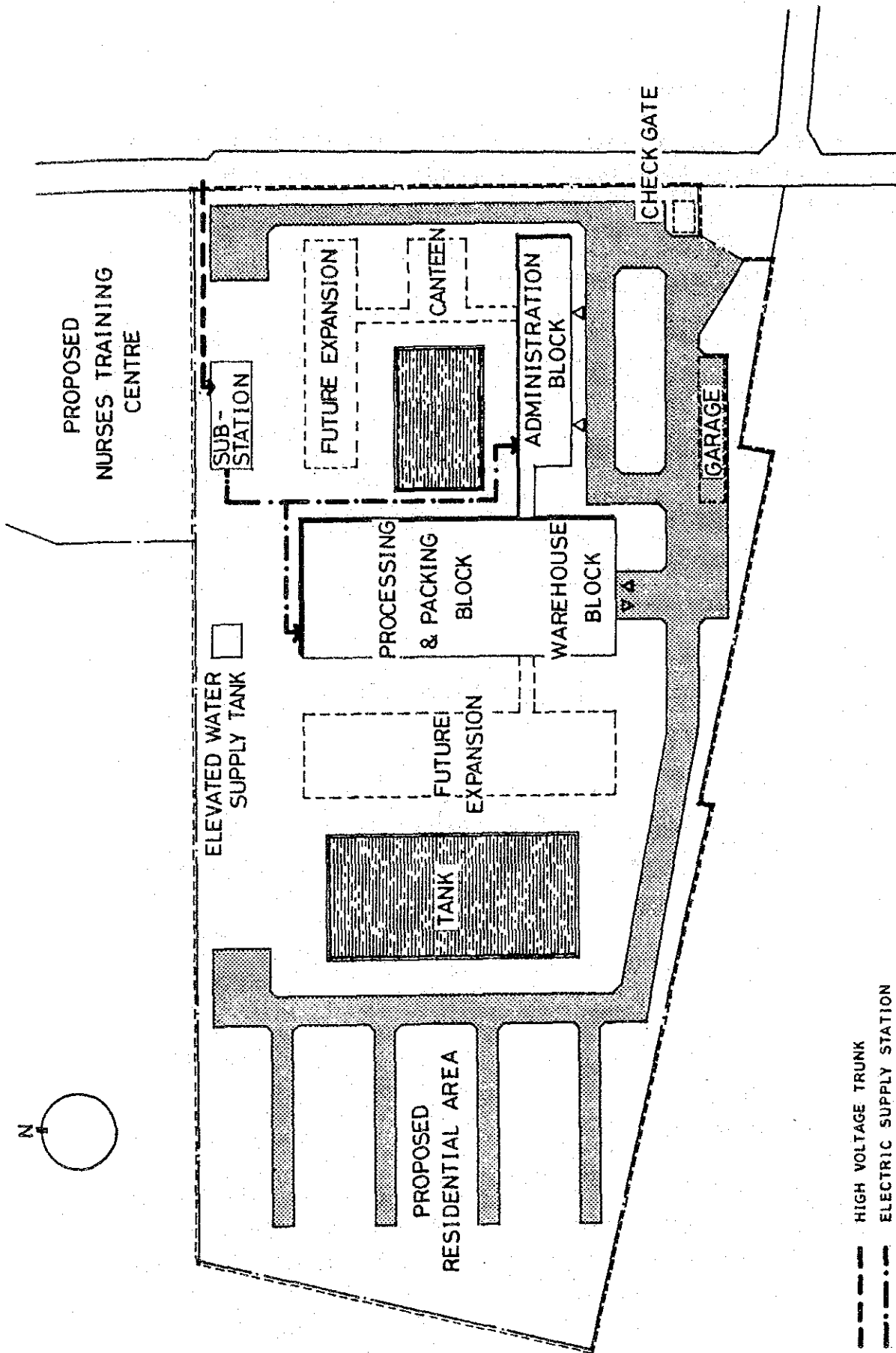


Fig. II-16 DIAGRAM OF ELECTRICITY

3-5-4 Power Control Equipment (See Fig. III-17)

Piping and wiring will be made to supply the electric power from power control board to air conditioning, ventilating, water supplying, and pharmaceutical equipment. The distribution voltages are as follows;

Air conditioning, ventilating, and water supplying equipment:  $3\phi - 3W$  400V 50Hz

Pharmaceutical equipment:  $3\phi - 3W$  400V 50Hz

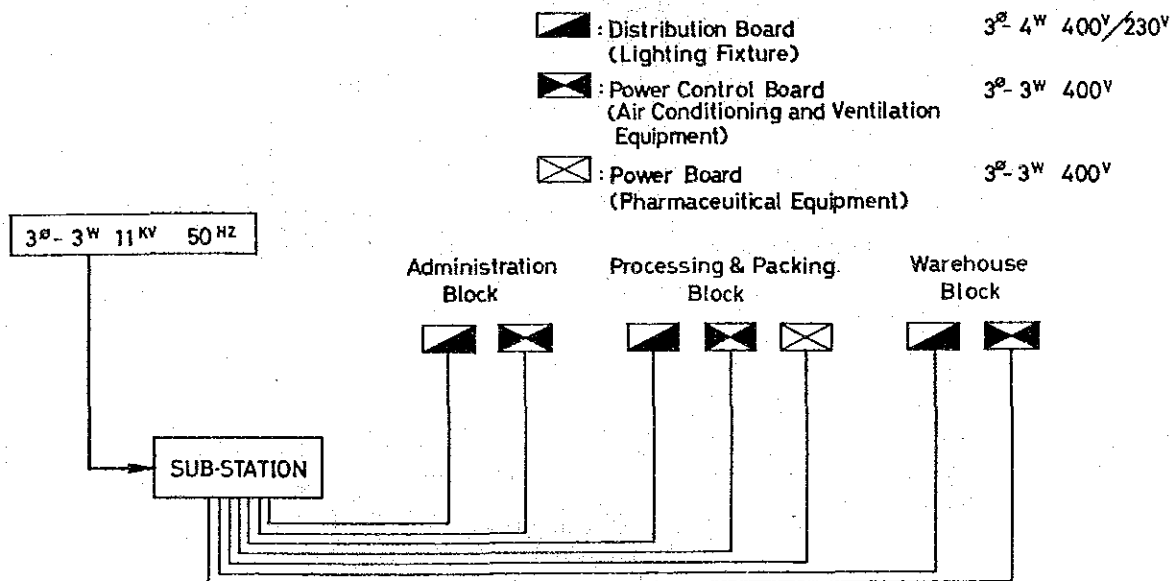


Fig. III-17 Diagram of Main Power Feeder System

3-5-5 Outlet Equipment

Necessary lighting and outlets will be provided. As for lighting, fluorescent fixtures will be mainly used and incandescent fixture will be supplementary used. Distribution voltage is  $1\phi - 2W$ , 230V, 50Hz for lighting fixture and outlet.

#### 4. Pharmaceutical Formulation Equipment

Judging from the existing situation of Bogra and the conditions of infrastructure, etc., it might be justifiable to produce three kinds of such dosage forms as tablets, capsules and sachets of essential drugs for the Pharmaceutical Formulation Centre. In the future, when the gas supply is available, the production of infusion and ointments will be considered.

Accordingly, the contents of equipment have been decided in principle considering the capacity of each equipment in connection with the standard production system of drugs, the Good Manufacturing Practices (GMP) and the scale which is requested by the Bangladesh Government. For details, since there remains the factors to be committed to the Detailed Design Report it seems to be necessary to study and discuss further details. At present the equipment, however, is considered well enough to produce 12 items out of essential drugs with as wide range as possible in Bangladesh.

As a result, the standard production system of tablets, capsules and sachets as mentioned above, and the facilities of Pharmaceutical Formulation Centre in which Good Manufacturing Practices (GMP) is sufficiently considered would be recommendable. Any drugs especially for children (paediatric drugs) will not be included in this project, and may be considered in the future phase.

#### 4-1 Pharmaceutical Formulation Equipment

##### 4-1-1 Items of Drugs

Following items of drugs will be able to be produced in this Pharmaceutical Formulation Centre according to the discussion with the Bangladesh Government (see Appendix-C, I).

- |                                   |              |
|-----------------------------------|--------------|
| 1) Aspirin tablet                 | Antifebrile  |
| 2) Chloroquine phosphate tablet   | Antimalarial |
| 3) Aluminium hydroxide gel tablet | Antacid      |
| 4) Piperazine tablet              | Vermicide    |

5) Phenoxy methyl penicillin tablet	Antibacterial
6) Glucose electrolyte powder ORS	Infusion
7) Ampicillin capsule	Antibacterial
8) Ergometrine/methyl ergometrine maleate tablet	Uterotonic
9) Ferrous sulphate tablet	Hematinic
10) Ephedrine tablet	Cough Remedy
11) Vitamin A capsule	Vitamin Compound
12) Paracetamol tablet	Antifebrite

The production capacity of machines will be too big, if 12 items production per month is planned on the design condition of actual operating hour and day as mentioned in III, 4-1-2. Therefore, it is designed that 12 items will be able to be produced in a longer rotation than a month under the proper administrative control.

#### 4-1-2 Production Capacity

The production capacity is designed on the following conditions and the pharmaceutical formulation equipments to produce the above capacity are selected.

##### (1) Pre-conditions for Designing Production Volume

- 1) Working day per month : 24 days/month
- 2) Actual operating day per month : 20 days/month  
(4 days for maintenance and adjustment of equipment)
- 3) Working hour per day : 7 hrs/day
- 4) Actual operating hour per day : 5 hrs/day
- 5) Rate of operating efficiency : 70%

##### (2) Production Capacity by Tableting Machine

- 1) Capacity : 100,000 tabs./hr x 1 No.  
50,000 tabs./hr x 2 Nos.
- 2) Actual operating hours : 5 hrs/day (20 days per month)
- 3) Rate of good quality product : 90%
- 4) Average weight of tablet : 300 mg
- 5) Production volume : 18,000,000 tabs./month  
(216,000,000 tabs./year)

(3) Production Capacity by Capsule Filling Machine

- 1) Capacity : 20,000 caps./hr x 2 Nos.
- 2) Actual operating hours : 5 hrs/day (20 days/month)
- 3) Rate of good quality product : 90%
- 4) Average weight of capsule : 300 mg
- 5) Production volume : 3,600,000 caps./month  
(43,200,000 caps./year)

(4) Production Capacity by Sachet Sealing Machine

- 1) Capacity : 3,000 shts./hr
- 2) Actual operating hours : 5 hrs/day (20 days/month)
- 3) Rate of good quality product : 90%
- 4) Average weight of sachet : 1 g
- 5) Production volume : 270,000 shts./month  
(3,240,000 shts./year)

4-1-3 Required Volume of Raw Materials

(1) Monthly Production Volume of Tablets, Capsules and Sachets

- 1) Tablets : 18,000,000 tabs./month (5,400 kg/month)
  - 2) Capsules : 3,600,000 caps./month (1,080 kg/month)
  - 3) Sachets : 270,000 shts./month (270 kg/month)
- 
- (6,750 kg/month)

(2) Raw Materials (Main materials and sub-materials)

- 1) Total volume of production : 6.8 ton/month
- 2) Total volume of raw materials : 9.4 ton/month

The rate of good quality product is assumed to be 90% and the usable rate of raw materials 80%.

4-2 Outline of Pharmaceutical Formulation Equipment

Room	Equipment	Qty.	
(1) Weighing Room	Scale	3	
(2) Sifting Room	Sifter	1	
(3) Milling Room	Milling	1	
(4) Dry/Wet Mixing Room	Fluidizing Bed Granulating Dryer	1	
	Grinding	2	
	Sifter	2	
	Blender	2	
	Scale	4	
	Kneader	1	
	Granulator	1	
(5) Tableting Room	Tableting	100,000 tabs./hr	1
		50,000 tabs./hr	2
(6) Liquid Preparation Room	Tank with Stage	2	
(7) Washing Room	Dryer	2	
(8) Capsule Filling Room	Capsule Filling (20,000 caps./hr)	2	
(9) Packing Room	Packing	4	
	Powder Filling	1	
	Heat Sealer	1	
	Conveyer	5	
(10) Package Preparation Room	Label Printing	1	
	Printing	3	
(11) Machine Room	Demineralizer	1	
	Steam Generator	1	
	Dust Collector	0	
(12) Warehouse	Forklift	2	
(13) Quality Control Room	Quality Control Apparatus	1 set	
(14) Others	Hand Palletter, Palette, etc.	1 set	

Remarks: A lathe machine and a welding machine will not be provided.

## 5. Project Implementation Plan

### 5-1 Scope of Project and Items to Be Done by the Bangladesh Government and the Japanese Government

#### 5-1-1 Scope of Construction Work

The scope of the construction work planned in this Basic Design is as follows:

- 1) Security of the project site
- 2) Land development of the project site
- 3) Construction of the boundary wall and gate, etc.
- 4) Construction of the road required
- 5) Construction of the buildings (including attached facilities)
- 6) Supply and installation of the pharmaceutical formulation equipment
- 7) Exterior work in the site
- 8) Installation of the facilities for power supply, water supply, drainage, telephone, etc.
- 9) Supply of furniture and facility accessories

#### 5-1-2 Items to Be Done by the Bangladesh Government

The items to be done by the Bangladesh Government are confirmed in the Minutes of Discussion between the Bangladesh Government and the Basic Study Team (see Appendix-G).

##### (1) Works to Be Done by the Bangladesh Government

Works to be done by the Bangladesh Government are set up in this Basic Design as follows:

- 1) Security of the project site  
To transfer the possession right of at least the land necessary for this project out of the whole land possessed by PWD to the Ministry of Health and Population Control.
- 2) Land development of the project site  
Before the commencement of the construction work, to complete the demolition of existing old houses and obstacles, to clear



the land for existing irrigation and its facilities, and to complete filling and levelling of the site according to the design.

3) Construction of the boundary wall and gate, etc.

To complete the boundary wall and gate, etc. for safeguarding at least the land necessary for the project, before the commencement of the construction work.

4) Construction of the access road

To expand all or a part of the road on the southern side of the Medical Assistants and Nurses Training School, before the commencement of the construction work.

5) Construction of the buildings and the attached facility except the items to be done by the Japanese Government.

6) Supply and installation of the pharmaceutical formulation equipment except the items to be done by the Japanese Government.

7) External work in the site except the items to be done by the Japanese Government.

8) Installation of external telephone facilities, and installation of power supply facilities, water supply and drainage facilities up to the boundary wall. To complete the power supply facilities and the water supply and drainage facilities by the proper time in course of the construction work.

9) Supply of furniture and facility accessories.

(2) Other Items to Be Done by the Bangladesh Government regarding the Construction Work

The other items, than the works mentioned in the above (1), to be done by the Bangladesh Government regarding the construction work planned in this Basic Design are as follows:

1) Bank expenses for the payment regarding the construction work (Advising Commission of A/P, Payment Commission, etc.)

2) Unloading and customs clearances of imported construction materials and equipment in Bangladesh and its expenses.

- 3) Duties imposed on construction materials and equipments and all other taxes in Bangladesh.
- 4) Exemption of any taxes, duties, fees, levies and other impositions imposed on the Japanese nationals engaged in this project in Bangladesh.
- 5) Provision of entry and exit visas, residence permits and other necessary permission, rights, etc. for the Japanese nationals engaged in the project.
- 6) Provision for information, documents, drawings map and such other materials as may be necessary for the project.
- 7) Procedures and adjustment necessary for the project implementation.
- 8) Proper and effective utilization, maintenance and management of the facilities constructed under the Japanese aid.
- 9) Expenses which is not undertaken under the aid by the Japanese Government and which is necessary to implement the construction work.

#### 5-1-3 Items to Be Done by Aid by Japanese Government

The items to be done by the aid by the Japanese Government which are set up in this Basic Design are as follows:

- (1) Scope of the Construction Work
  - 1) Construction of a required part of the road in the site
  - 2) Construction of the buildings (including attached facilities for water supply, drainage, power supply, etc.)
    - Administration Block
    - Processing & Packing Block
    - Warehouse Block
    - Sub-station
  - 3) Supply and installation of the pharmaceutical formulation equipment

- 4) Construction of a required part of the parking lot in the site
- 5) Construction of a required part of the facilities for water supply, power supply and drainage.

(2) Implementation Work for the Construction Work

- 1) Procurement of the construction materials and equipment necessary for the construction work
- 2) Procurement of labour necessary for the construction work
- 3) Preparation of the implementation plan and the operation and management of the construction work.
- 4) Marine transportation of imported materials and equipment upto the port of disembarkation in Bangladesh and the inland transportation from the above port to the site.

(3) Consultant Services

- 1) Preparation of detailed design drawings and specifications
- 2) Preparation of tender documents and assistance in floating tender
- 3) Supervision of the construction work
- 4) Inspection on the procured construction materials and equipment
- 5) Assistance in adjustment among the related organization
- 6) Promotion of the project