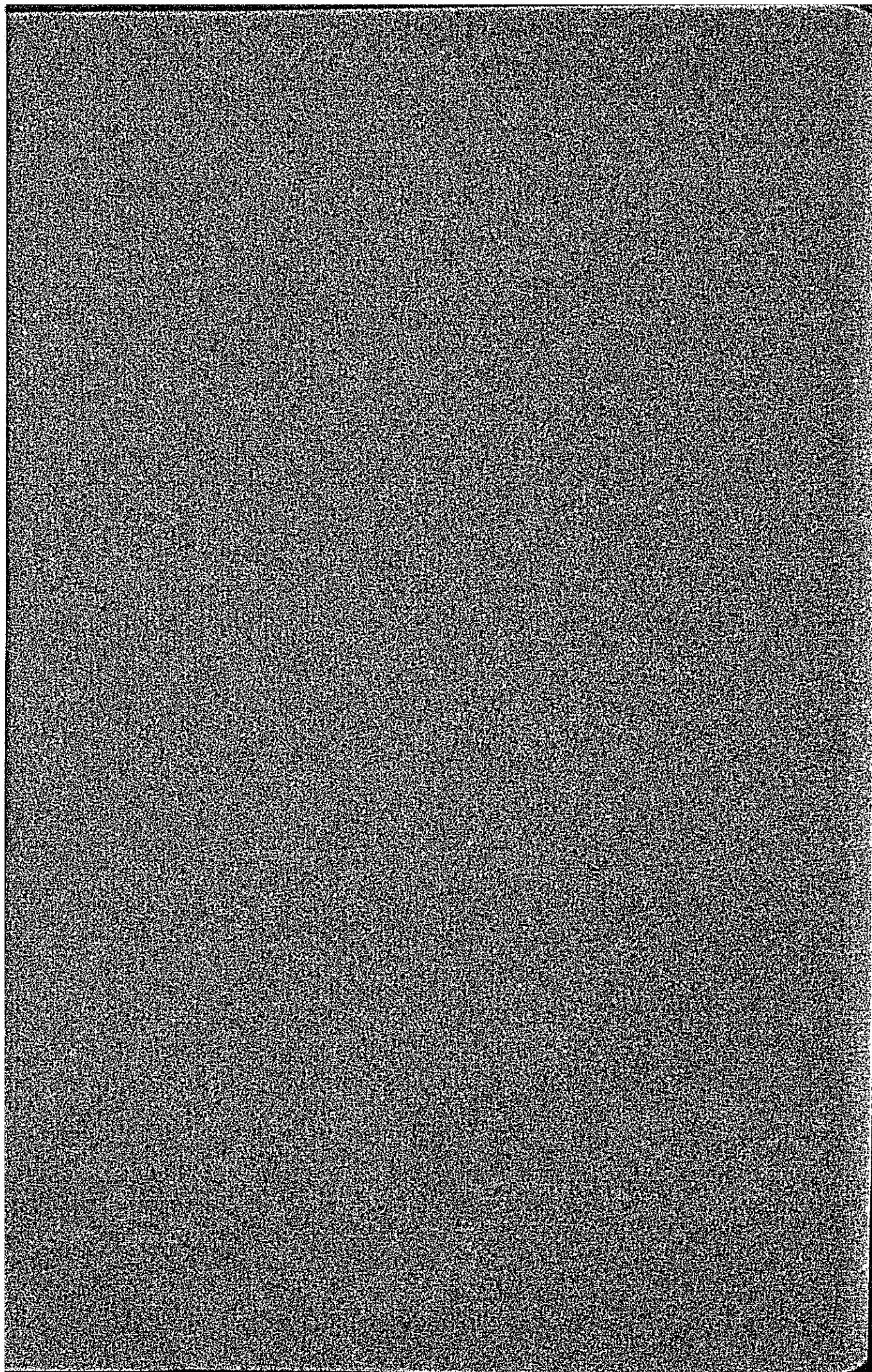


CHAPTER 4
BASIC DESIGN



4-1 DESIGN CONCEPTS

(1) Basic Policy

This basic design was prepared in accordance with the "Pre-survey Report on Reconstruction Plan of Facilities for Bangladesh Agricultural College" prepared in 1979 and 1980 by the Basic Design Survey Team which was dispatched to Bangladesh in February 1981 as the results of discussions and field surveys by the survey team and also examination of proposals and confirmation items on the part of BARI.

The report was compiled by the basic design survey team after returning to Japan.

The design concept of this facilities is based on the following basic policies:

- The Building design should define the functions of the facilities, and also take into consideration the future plan of the college and correlation between farm, and horticultural farm which will be established in future and their associated buildings.
- With full consideration of natural and artificial conditions such as climate, natural features and life style, and also construction conditions in Bangladesh, the plan will be set up in such a matter which suits local architectural forms, materials and techniques, from the layout plan up to selection of materials.
- Concerning building materials, the plan will be made on pre-condition that locally available materials will be used as much as possible if they are suitable in terms of quality, quantity and price, but imported materials will be used instead if locally available materials are unsatisfactory in terms of quality, quantity and price.

(2) Scope of Work

The building facilities which Bangladesh has requested Japan at the time of this basic design survey, are as described below. Described hereunder is an outline of the scope of each construction item.

ITEM	SCOPE OF WORKS
<p>A. BUILDING</p> <p>FUNCTIONAL BLDG.</p> <p>COLLEGE BLDG.</p> <p>ENGINEERING WORKSHOP</p> <p>COMMUNITY FACILITIES</p> <p>HOSTEL BLDG.</p>	<p>(sq.ft)</p> <p>132,900</p> <p>12,000</p> <p>49,500</p> <p>4,100</p> <p>3,300</p> <p>64,000</p> <p>STRUCTURAL WORKS & FINISHING WORKS</p> <p>WATER & GAS SUPPLY</p> <p>LIGHTING FIXTURE & CABLE INSTALLATION</p>
<p>B. EXTERNAL WORKS</p>	<p>INNER ROAD</p> <p>ELEVATED WATER TANK (20 m³)</p> <p>WATER RESERVOIR TANK(100 m³)</p> <p>SUBSTATION</p> <p>FENCE FOR HOSTEL BLDG.</p>
<p>C. PIPING WORKS</p> <p>WATER SUPPLY</p> <p>GAS SUPPLY</p> <p>ELECTRICAL WORKS</p>	<p>WATER & GAS SUPPLY PIPING</p> <p>MAIN CABLE LINE WORKS</p> <p>DEEP WELL (100 m)</p>
<p>D. EQUIPMENT</p> <p>EQUIPMENT</p> <p>FURNITURE</p> <p>VEHICLES</p>	<p>(SEE "LIST OF FURNITURE & EQUIPMENT")</p>

4-2 LAYOUT PLAN

The scope of building facilities can be roughly classified into the following 5 units.

1. Functional BLDG. ---- Auditorium, library, principal office and general offices.
2. College BLDG. ----- Lecture room, experimental laboratory and research laboratory
3. Hostel BLDG. ----- Quarters for male and female students
4. Community Facilities ----- Cafeteria and health center
5. Engineering workshop ----- Workshop, class room.

Under the layout plan, these individual units are arranged in clear and simple layout where the FUNCTIONAL BLDG. and COLLEGE BLDG. and ENGINEERING WORKSHOP are constructed as one group in an area near the entrance. The HOSTEL BLDG. is in the rear of the above area, and the COMMUNITY FACILITIES are positioned between them. This concept is as shown in Fig. 4-1. When the layout plan is to be actually designed, however, attention should be given to the following points.

- The layout plan should be designed, making the best use of the difference in level and the natural environment of the site.
- Individual units should be made and arranged to allow for natural ventilation according to the wind direction. The buildings should be rectangular extending from east to west, as a rule.
- Sufficient space should be provided between individual buildings of each unit to secure a wide open-

area, for the effective adjustment of natural conditions for each building.

- The interrelation between the correlative function and individual function of buildings should be considered when individual units are laid out.
- The layout plan should be capable of satisfactorily coping with future plans.
- Full consideration should be given to reduce the running costs and maintain them at a low level.

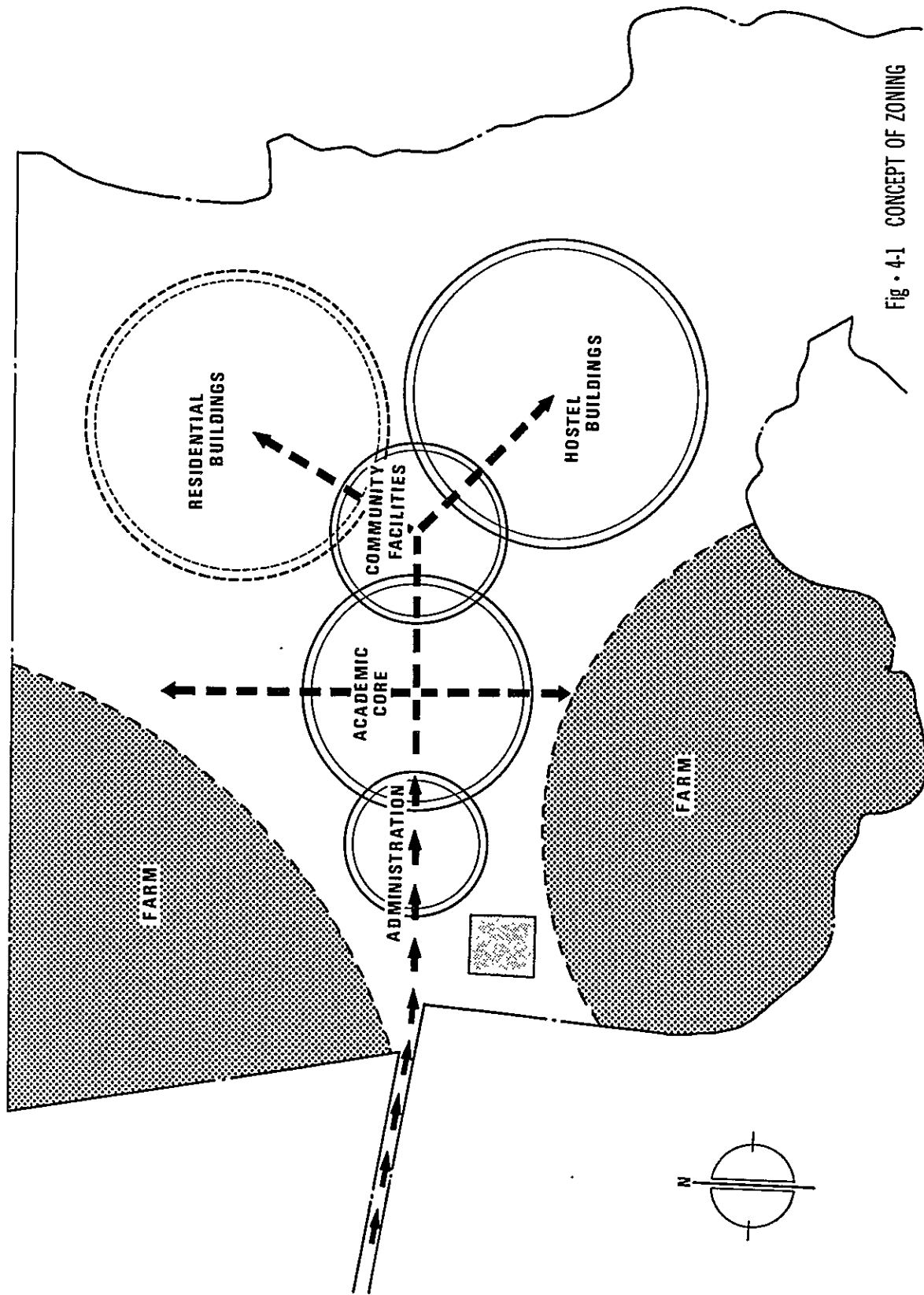


Fig • 4-1 CONCEPT OF ZONING

4-3 ARCHITECTURAL DESIGN

(1) Basic Concept

When buildings are to be designed, the plan should be developed with consideration of the following points from the standpoint of architecture:

◦ Natural conditions

Buildings suited to the local climate and natural features should be designed. Specifically, each buildings should be arranged in east to west direction in consideration of rain and ventilation and connected by external connecting corridors to facilitate passage even when it rains.

◦ Construction technique

Planning of construction materials should be made chiefly based on locally available materials in order to prevent maintenance problems and after construction is completed. In addition, the construction methods to be used should be those which are highly skilled in Bangladesh.

◦ Cost plan

The cost plan of construction materials should be made thoroughly taking into consideration the quality in order to establish an effective and economical building design.

(2) Scope of Facilities

In consideration of various conditions such as the basic concept of the construction plan of "the Bangladesh College of Agricultural Sciences" on the part of Bangladesh and the contents of facilities which Bangladesh requests Japan, the following will be proposed as the optimum scope of the facilities.

BLDG. NAME	AREA	ROOM NAME
1. FUNCTIONAL BLDG.	2 stories 12,000 sq.f	Principal's RM. Accounts RM. Office Academic aeeairs RM. Meeting RM. Administrative RM.
2. COLLEGE BLDG.	2 stories 49,500 sq.f	Professor's RM. (20) Office Associate professor's RM. Assistant professor's RM. Lecture RM. (15) Laboratory (5) Store Toilet
3. ENGINEERING WORKSHOP	1 story 4,100 sq.f	Workshop class RM. (1) Office
4. COMMUNITY FACILITIES	1 story 3,300 sq.f	Cafeteria Kitchen Health center
5. HOSTEL BLDG.S	2 stories 64,000 sq.f	Bed RMS.(300) Dinning RMS. Kitchen Superintendent quarter Office Common RM. Sick RM. Toilet & shower RM. C-Type Bldgs. 1,500 sq.f x 2 660 sq.f x 6

(including corridor, stair case, connecting corridor)

(3) Material Planning

- Structural materials

The structures will be made of reinforced concrete for foundations and superstructures and bricks for walls. Of these materials, locally produced bricks, aggregate and sand, etc. will be used to reduce construction costs.

- External finishing materials

The roofs should be flat and finished by locally available "lime terracing" which is used for both water-proof and insulation. This material is made by binding brick aggregate, cement and sand with plaster.

The exterior walls will be of simple design consisting of concrete columns, beams and decorative bricks.

- Internal finishing materials

The internal finishing materials will be planned according to the purpose of the rooms. Basically, however, the walls and ceilings will be mortar-finished with a trowel and painted, and the floors should be mortar-finished with a trowel and partly terrazzo-finished, as a rule.

- Doors and Windows

The windows facing the outside should be made of aluminium or steel, and the inside doors will be made of wood.

4-4 STRUCTURAL DESIGN

As mentioned before, the horizontal force (seismic force) cannot be neglected completely in Bangladesh.

From this point of view, the structures of buildings will be made of rigid frame reinforced concrete. Concerning the foundations, a spread foundation will be used because all buildings are low (one three-story building and the rest is composed of two-story buildings and one-story buildings).

Accurate values of the bearing capacity of the soil at the site are not clear because subsurface exploration has not been carried out as yet. However, the subsurface exploration report of the site of the Bangladesh Agricultural Research Institute which is approximately 5 km away from the site, was obtained. As the subsurface condition of the soil around Joydebpur is quite the same, the bearing capacity of the soil will be examined for the time being, referring to the aforementioned report. (Ref. ATTACHED DOCUMENT I)

However, the actual survey should be carried out at the planned site before starting the detailed design to ensure accuracy.

The external force and working load on the buildings are set up as described below.

- | | |
|-------------------------------|--|
| (1) Seismic force: | $K = 0.05$ |
| (2) Wind: | 66 m/sec. for cyclones |
| (3) Supporting ground: | 1.5 m or deeper than the present ground level |
| (4) Bearing capacity of soil: | 10 t/m^2 |
| (5) Concrete strength: | (4 week strength)
$F_c = 180 \text{ kg/cm}^2$ |
| (6) Live load: | Act of Japan |

4-5 SERVICE PLANNING

(1) Electrical Works

The electrical works under this plan include the following items:

- (A) 11 kV incoming cable
- (B) Substation
- (C) Main cable (for power distribution system)
- (D) Motor control system
- (E) Lighting and socket-outlets

Outline of installation

(A) 11 kV incoming cable work

The power will be fed in by underground cable from the 11 kV power line installed up to the border of the site, to the substation (outdoor type cubicle).

(The installation of the power line up to the border of the site should be done by Bangladesh.)

(B) Substation work

The transformer incorporated in the outdoor substation reduces the 11 kV power to 440 V for the motor and 220 V for lighting. The proposed specifications are as shown below.

Receiving power 3 phase three-wires 11 kV, 50 Hz

Motor : 3 phase three-wires 440 V, 50 Hz

Lighting: 3 phase four-wires 220 V, 50 Hz

(C) Main cable line work (for power distribution system)

Wiring will be installed from the secondary side terminal of the low voltage power switch board in the substation (outdoor cubicle type) to the motor control board and also to the distribution board provided in each building. Wiring will be mainly underground.

(D) Motor control system work

This work includes piping and wiring from the motor control board to respective motors, and also includes supplying and installing the motor control board.

(E) Lighting and socket-outlet work

This work includes piping and wiring from the branched circuit on the secondary side of each distribution board to individual lighting fixtures and wiring apparatus, and also includes supplying and installing the distribution boards, lighting fixtures and wiring apparatus. The standard luminous intensity in classrooms should be approximately 150 lx to 200 lx, and the lighting fixtures should be mainly composed of fluorescent lamps 40 W x 2 with reflex shade.

(2) Water Supply, Drainage and Sanitary Facilities

(A) Water supply facilities

This plan should be such that a deep tube well is drilled at the high-land part of the site, the well water is pumped up by a submerged-motor pump into an underground water reservoir tank (concrete tank, capacity 100 m³) where the water is sterilized by chlorine, and the sterilized water is pumped up by a pump into an elevated water tank (capacity 20 m³) made of FRP from which the water is supplied by gravity to various water supply points in respective buildings.

Shock-proof hard PVC pipes for supply water application should be used for piping.

(B) Drainage plan

Under this plan, a combined system of sanitary soil and sewage will be used for drainage both indoors and outdoors.

Sanitary soil and sewage discharged from each building is led respectively into 3 septic settling tanks which are planned to be installed on a middle level ground on the site, and the water is infiltrated by multiple-hole pipes into the ground.

In addition, the rain water is discharged through gutters onto the ground.

Hard PVC pipes (VP) will be used for piping both indoors and outdoors.

The extended and elevated vent pipes made of hard PVC (VP) will be used for ventilation.

(C) Sanitation fixtures installation plan

The sanitation fixtures will be installed in toilets or the like of each building according to the building plan. The sanitation fixtures will be selected taking into consideration of local living environment and habits.

(D) City gas facilities planning

Under this plan, city gas will be taken from the main city gas pipeline which is laid up to the border line of the site, to supply city gas to various points.

Galvanized steel pipes will be used for piping.

(E) Ventilation facilities plan

Under this plan, the ceiling fans and ventilation fans will be provided at various necessary points.

4-6 LIST OF FURNITURES AND EQUIPMENTS

FURNITURE	ITEM		QUTY.
FUNCTIONAL BLDG	Chair	A-Type	120
		B-Type	5
		C-Type	1
		D-Type	14
		E-Type	22
		F-Type	50
	Lecture Desk		1
	Side Desk		2
	Office Desk	A-Type	1
		B-Type	6
		C-Type	14
	Conference Desk		24
	Steel Locker		14
	Reception Furniture Set	A-Type	1
		B-Type	1
	Bulletin Board		2
	Blackboard		3
	Card Case		3
	Bookshelf	A-Type	4
		B-Type	10
Steel Shelf		38	
Bench		3	
Filling Cabinet		4	
COLLEGE BLDG	Chair	D-Type	52
		E-Type	16
	Desk	B-Type	40
		C-Type	12
	Chair for Classroom		600
	Desk for Classroom		600
	Cabinet		46
	Locker		4
	Bench		11
	Table		5
	Teacher's desk	A-Type	4
B-Type		16	

FURNITURE	ITEM	QUTY.	
COLLEGE BLDG	Laboratory Desk	24	
	Observation Stand	8	
	Shelf for fixtures	32	
	Blackboard	16	
HOSTEL BLDG	Bed	304	
	Chair	D-Type	4
		E-Type	110
		F-Type	300
	Desk	C-Type	4
		D-Type	300
	Table		19
	Locker		1
	Bench		32
	Table for common room		16
	File Cabinet		2
	Screen		2
	Cupboard		1
HEALTH CENTER	Bed	2	
	Examination & treatment table	2	
	Screen	2	
	Table for medical appliance	2	
	Medical appliance case	2	
	Cabinet	1	
CAFETERIA	Chair	F-Type	120
	Table		20
	Cupboard		1
WORKSHOP	Chair for classroom		40
	Desk for classroom		40
	Teacher's Table	B-Type	1
	Blackboard		
	Office Desk	C-Type	5
	Chair	E-Type	1
		D-Type	5

FURNITURE	ITEM	QUTY.
WORKSHOP	Steel Locker	2
	File Cabinet	1
	Shelf	1

EQUIPMENT	ITEM	QTY.
OFFICE EQUIPMENT	Typewriter (electric)	4
	Typewriter (Manual)	6
	Calculating machine	10
	Copying Machine	2
	Small-size Copying Machine	4
	Paper for Copying Machine	1 set
	Printing Machine	2
	Plate Making Machine	2
	Paper for Plate Making Machine	1 set
	Bulletin board	7
	MEDICAL EQUIPMENT	Spirometer
Optometer		1
Tomometer		1
Height Scale		1
Weighing Scale		1
Sitting Height Scale		1
Audiometer		1
Dynamometer		1
Medical Appliances (stethoscope, etc.)		1
Washbasin		2
Pillow		2
Towel Bar		2
Clothes Basket		2
Refrigerator		2
Medichines		1 set
Sterilizer		4 sets
First-aid kit		2 sets
LABORATORY EQUIP- MENT		Chemical Balance A-Type
	B-Type	6 sets
	Dial Platform Scale	2 sets
	Dial Scale	2 sets
	Flow Meter	4
	Pitot Tube	4

EQUIPMENT	ITEM	QTY.
LABORATORY EQUIP- MENT	Max./Min. Thermometer	36
	Wet & Dry Bulb Hygrometer	36
	Automatic-Recording Pluviometer	1
	Pluviometer	2
	Evaporimeter	2
	Automatic-Recording Pyrheliometer	1
	Jordan Heliograph	2
	Instrument screen	2 sets
	PH Meter	2 sets
	Hydrogen Ion Concentration colorimeter	2 sets
	Soil Acidity Meter	2 sets
	Water-quality Tester	2 sets
	Microtome	1 set
	Microscope (biological)	10
	distiller	1
	Humidifier	2
	Mixer	2
	Constant-temperature Dryer	2
	Nematode Selector	1 set
	Unit Type Steam Sterilizer	1
	Sterilizer box	1
	Pot	20
	Juicer	2
	Universal Mixer	2
	Deionizer	1
	Centrifugal Separator	1
	Vacuum Pump	2
	Constant Temperature Water Bath	1
	Crucible Furnace	1
	Soil hardness Tester	1
	CO2 Meter	1
Sieve for Soil Analysis	2	
Sieve for Analysis	30	
Anemometer	1	

EQUIPMENT	ITEM	QTY.
LABORATORY EQUIP- MENT	Viscosimeter	1
	Soil Checking Stick	2
	Soil Collecting Clinder	20
	Soil Selection Analyzer	1 set
	Cylinder for Measurement of Soil Volume & Gravity	2
	Cylinder for Measurement of Water Content of Soil	2
	Measuring Instrument of Soil Capillarity	2
	Measuring Instrument of soil Percolation	2
	Tension Meter	2
	Leaf Puncher	2
	Fruit Hardness Tester	2
	Ultrared Moisture Meter	2
	Small Moisture Meter	2
	Gas Burner	30
	Heat Indicator	2
	Tracsparency Indicator	2
	Ion Meter	1
	Ion Electrode	1
	Dissolved Oxygen Measuring Instru- ment	1
	Volumetric Flask	200
	Volumetric Mess-pipet	200
	Flow Meter	200
	Test Tube	400
	Flask	400
	Beaker	400
	Poise Pipet	400
	Ultra-micro Pit	100
	Test tube stand	28
	Pygrimeter	4
	Specific Gravity Battle	100
Pygrimeter for Soil	50	

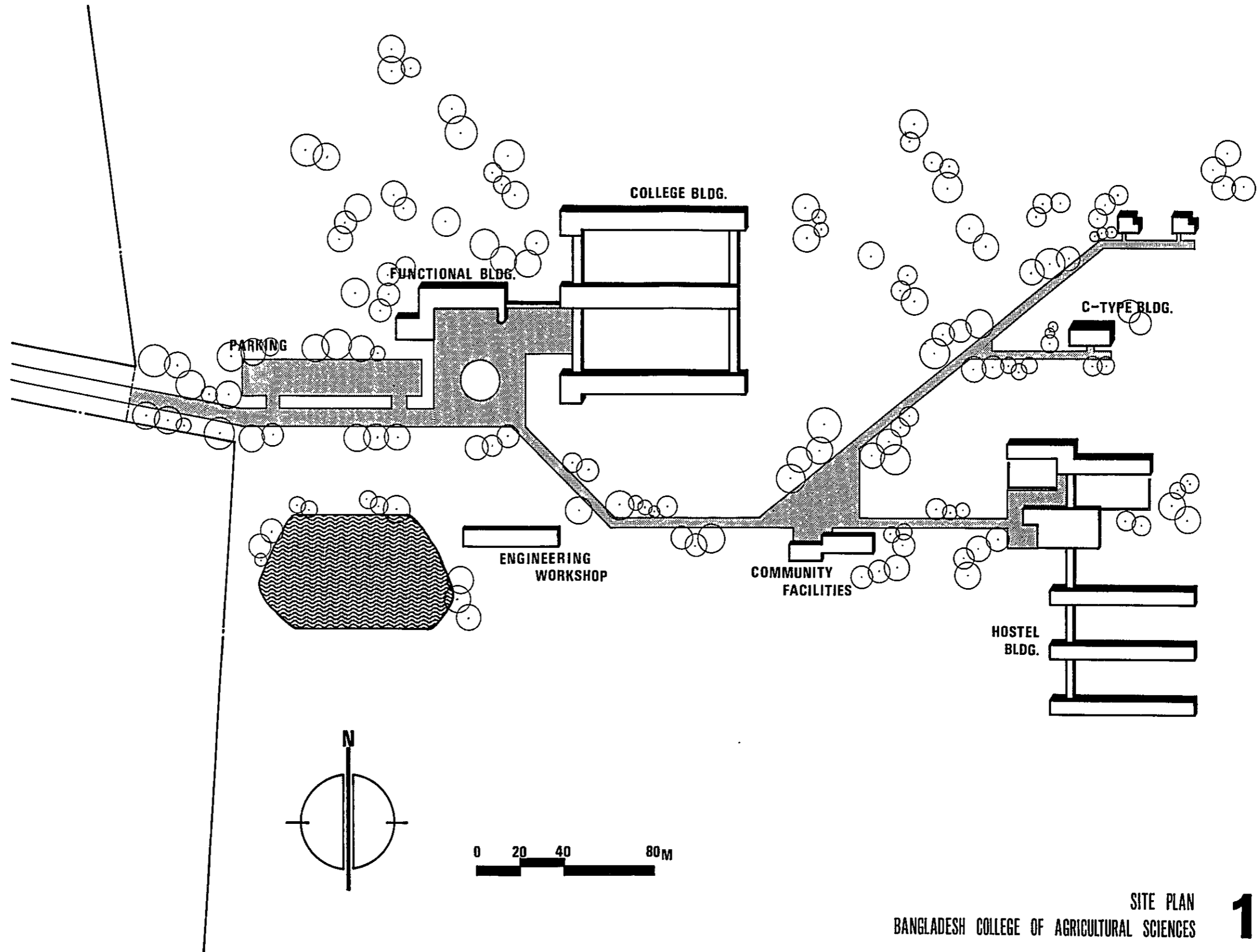
EQUIPMENT	ITEM	QTY.
LABORATORY EQUIPMENT	Ostwald gravity bottle	50
	Bar mercury thermometer	50
	Desiccator	4
	Chromatography Equipment	1
	Alcohol lamp	50
	Water Sampling Bottle	2
	Test Tube Holder	100
	Flask Holder	50
	Evaporating Dish	50
	Test Tube Basket	4
	Sand Dish	50
	Funnel Dish	20
	Tripod	50
	Buret Stand	50
	Pincette	50
	Brush	100
	Enameled Beaker	20
	Enameled Tank	20
	Enameled Pad	20
	Polyethylene Washing Bottle	50
	Polyethylene Narrow-mouthed Bottle	50
	Polyethylene Wide-mouthed Bottle	50
	Polyethylene Beaker	50
	Polyethylene Funnel	20
	Polyethylene Measuring Cup	20
	Porcelain Gooch's Crucible	20
	Narrow-mouthed Reagent Bottle	100
	Wide-Mouthed Reagent Bottle	100
	Evaporating Bottle	50
	Oil Bottle	50
	Common Fitting Bottle	50
	Air Collecting Bottle	50
	Filtering Bottle	10
Specimen Bottle	10	

EQUIPMENT	ITEM	QUTY.
LABORATORY EQUIPMENT	Square Specimen Bottle	10
	Funnel	50
	Square Threaded Oil Bottle	100
WORKSHOP EQUIPMENT	Carpenter's Tools	2 sets
	Metal Utensil	1 set
	Welding Machine	1
	Captyre Cord	1 set
	Douser	1 set
	Holder	1 set
	Gloves (leather)	1 set
	Welding Electron	20 kg
	Drilling Machine	1
	Cutting Machine	1
	Cutting Tools	1 set
	Wrench & Spanner Tools	1 set
	Grinder	1 set
	Sander	1
	Electric Drill	1
	Vise	2
	Work Bench	1
	Tool Storing Shelf	1
	Furnace	1
	Metal Seat	1
	Hammer	1 set
	Tongs	1 set
	Chain Block	1
	Jack	3
	Work Tool	1 set
	Shovel	1
Hoe	1	
Pick	1	
Megger	1	
Driver Bench	1 set	
Tester	1	

EQUIPMENT	ITEM	QUTY.
WORKSHOP EQUIPMENT	Earth Tester	1
	Phase Rotation Meter	1
	Safety Belt	2
	Safety Cap	2
	Safety Shoes	2
	Safety Gloves	2
VEHICLE	Light truck	2
	Micro-Bus	2
	Car	2
	4-wheel driven station wagon	2

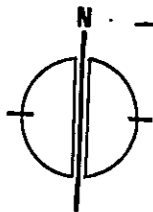
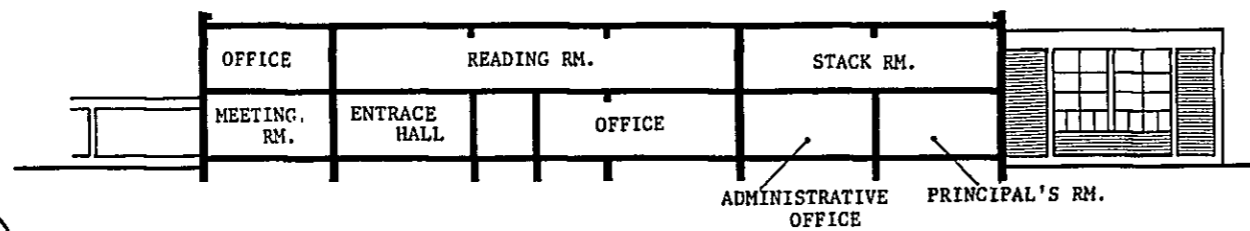
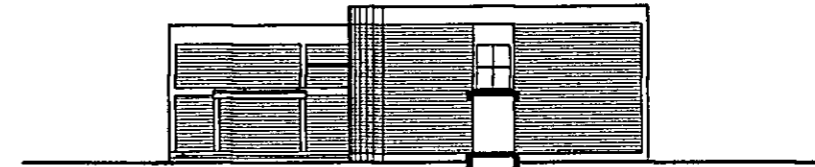
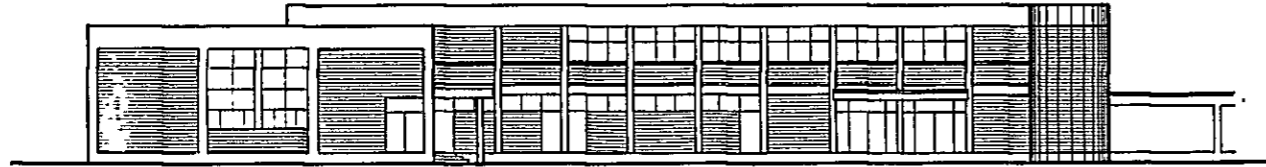
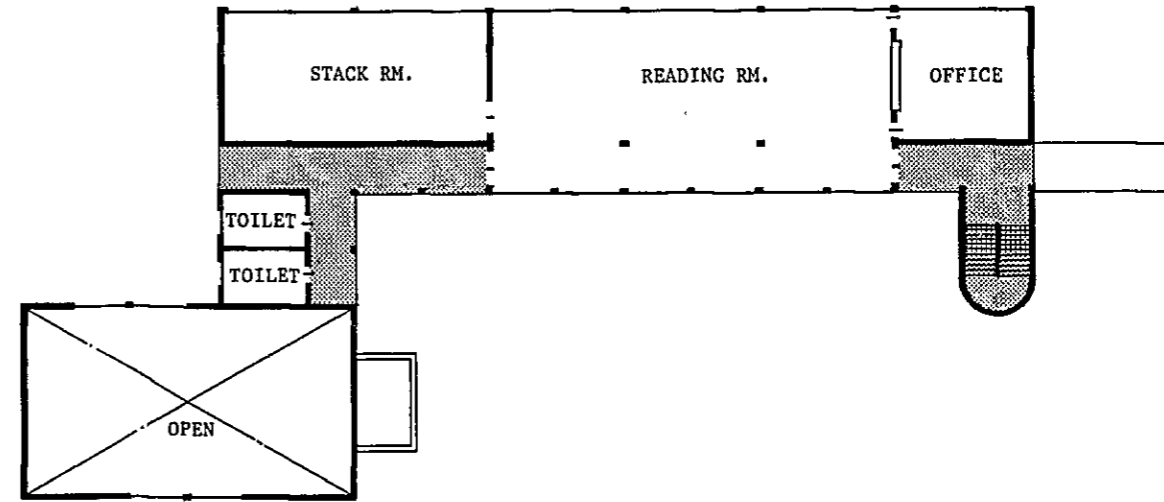
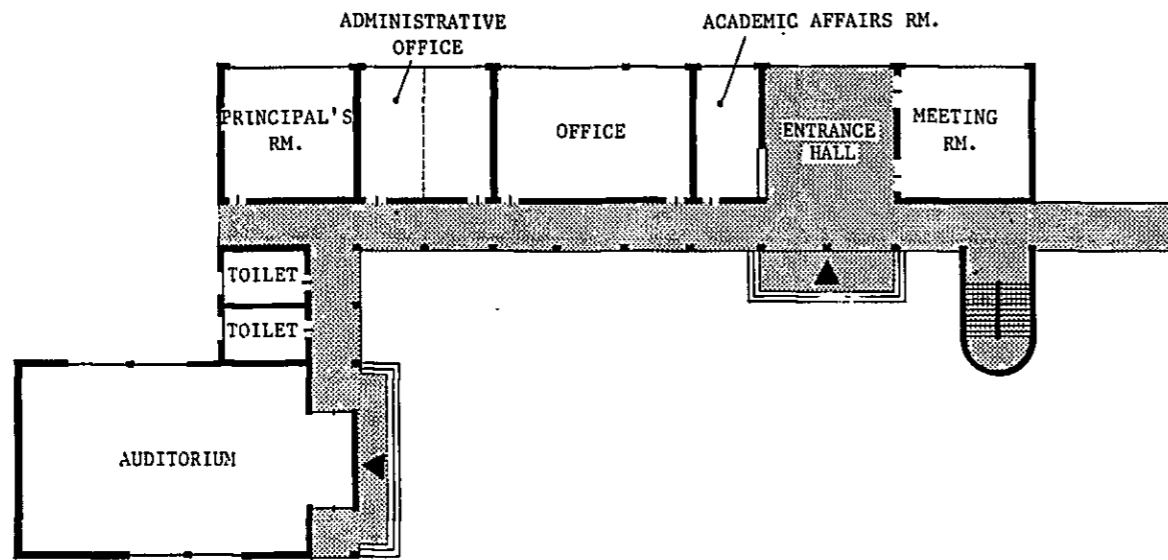
4-7 BASIC DRAWINGS

1. SITE PLAN.
2. FUNCTIONAL BLDG.
3. COLLEGE BLDG. GROUND FLOOR PLAN.
4. COLLEGE BLDG. 1ST FLOOR PLAN.
5. COLLEGE BLDG. ELEVATION & SECTION.
6. COMMUNITY FACILITIES.
7. HOSTEL BLDG. GROUND FLOOR PLAN.
8. HOSTEL BLDG. 1ST FLOOR PLAN.
9. HOSTEL BLDG. ELEVATION & SECTION.



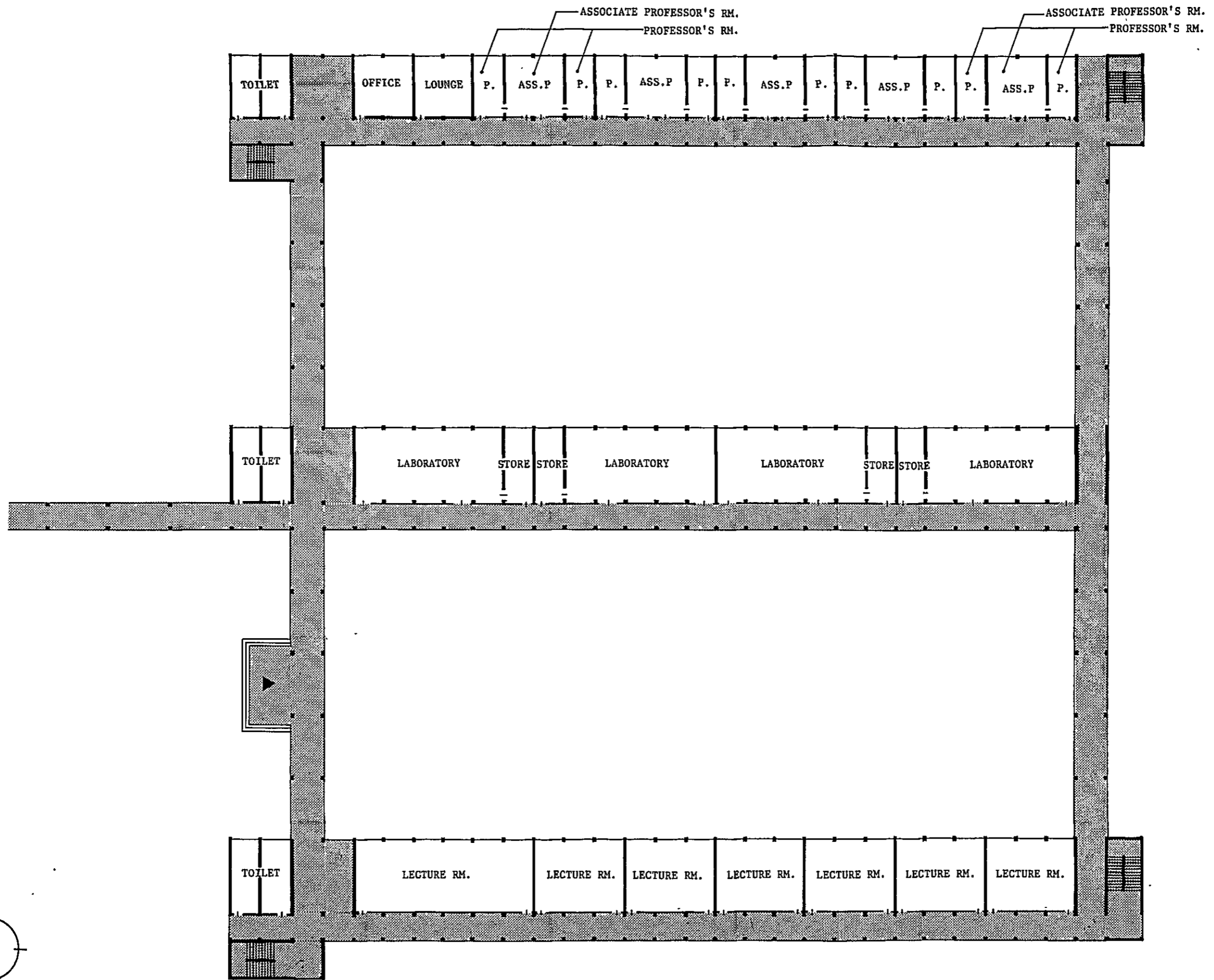
SITE PLAN
 BANGLADESH COLLEGE OF AGRICULTURAL SCIENCES

1



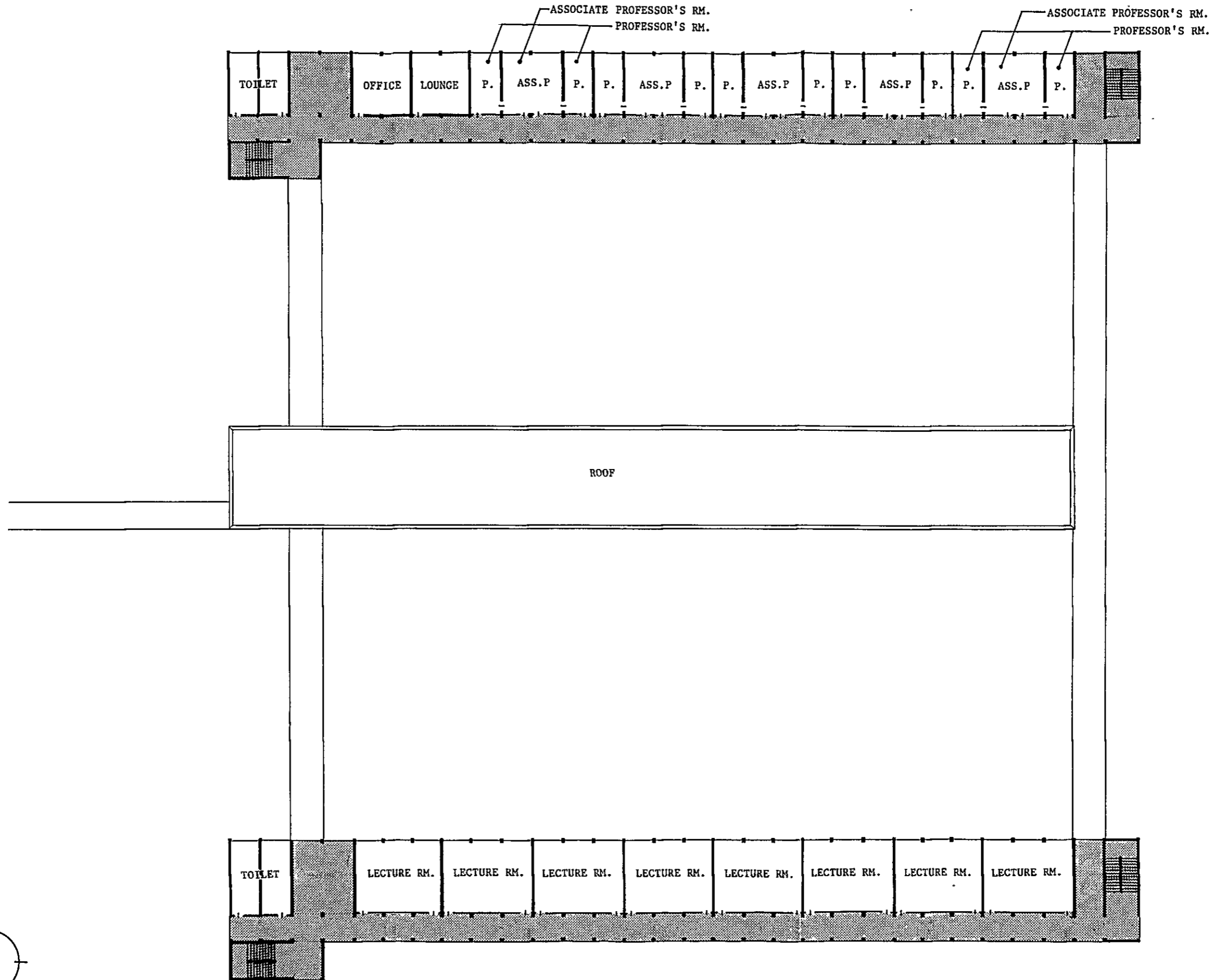
FUNCTIONAL BLDG.
BANGLADESH COLLEGE OF AGRICULTURAL SCIENCES

2



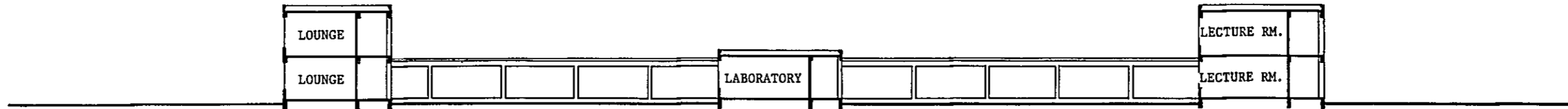
COLLEGE BLDG. GROUND FLOOR PLAN
 BANGLADESH COLLEGE OF AGRICULTURAL SCIENCES

3



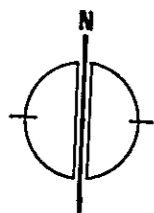
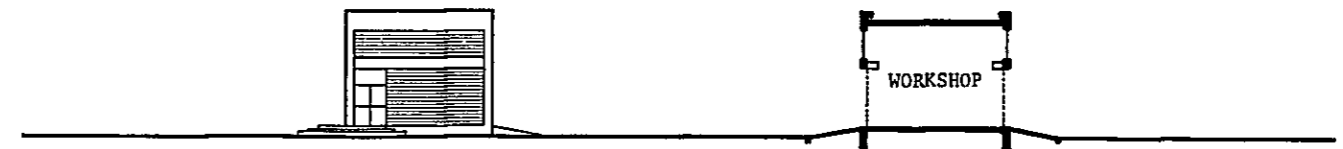
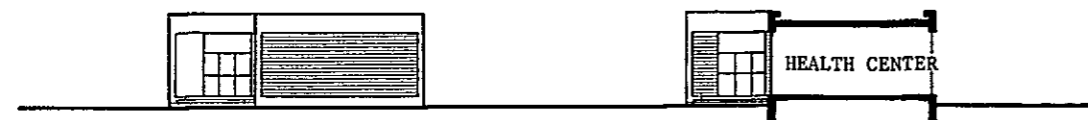
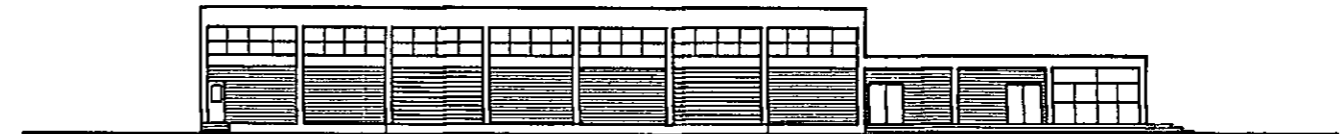
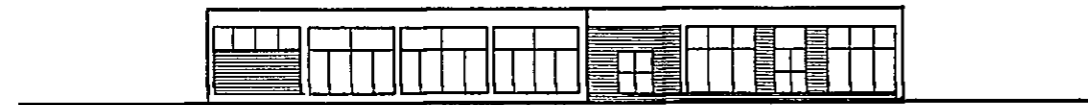
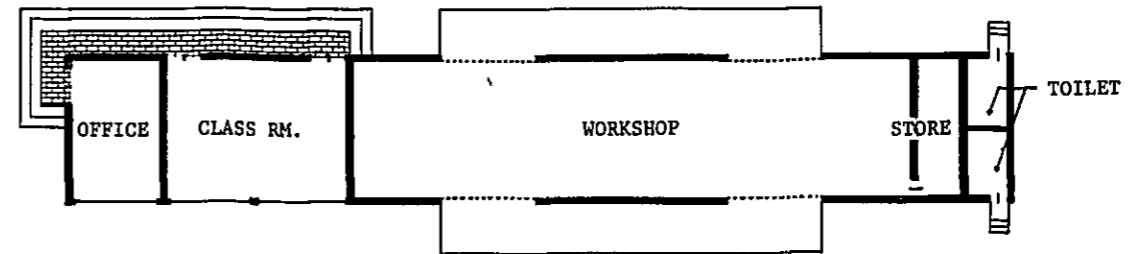
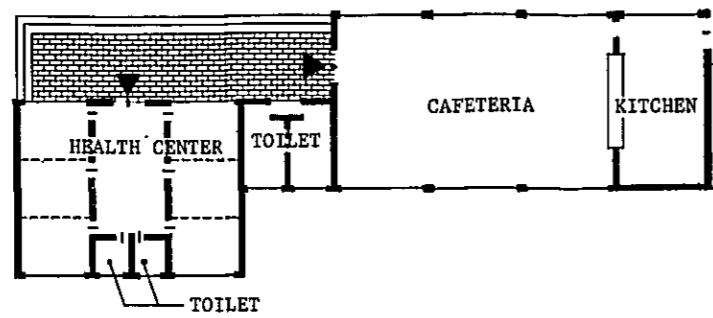
COLLEGE BLDG. 1ST. FLOOR PLAN
 BANGLADESH COLLEGE OF AGRICULTURAL SCIENCES

4



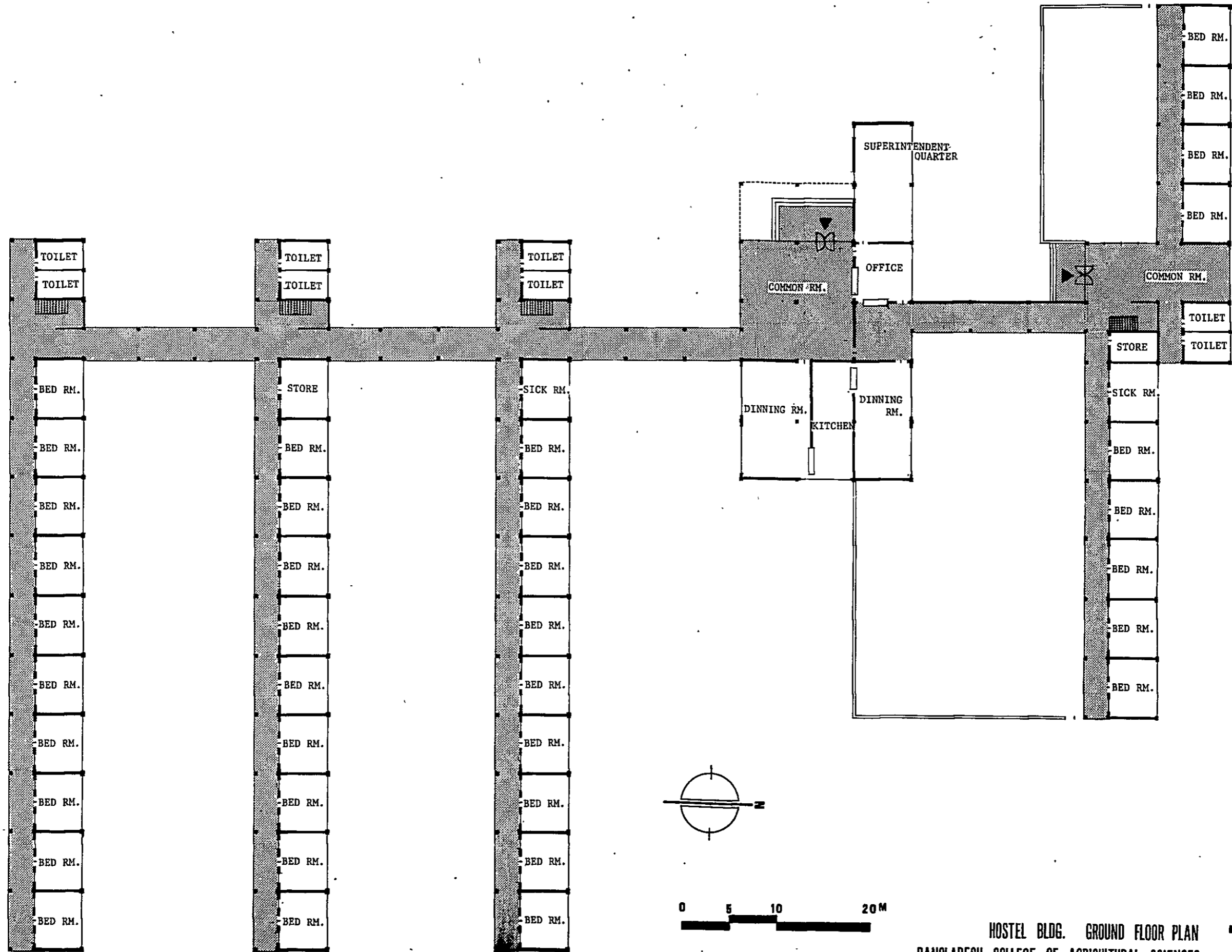
COLLEGE BLDG. ELEVATION & SECTION
BANGLADESH COLLEGE OF AGRICULTURAL SCIENCES

5



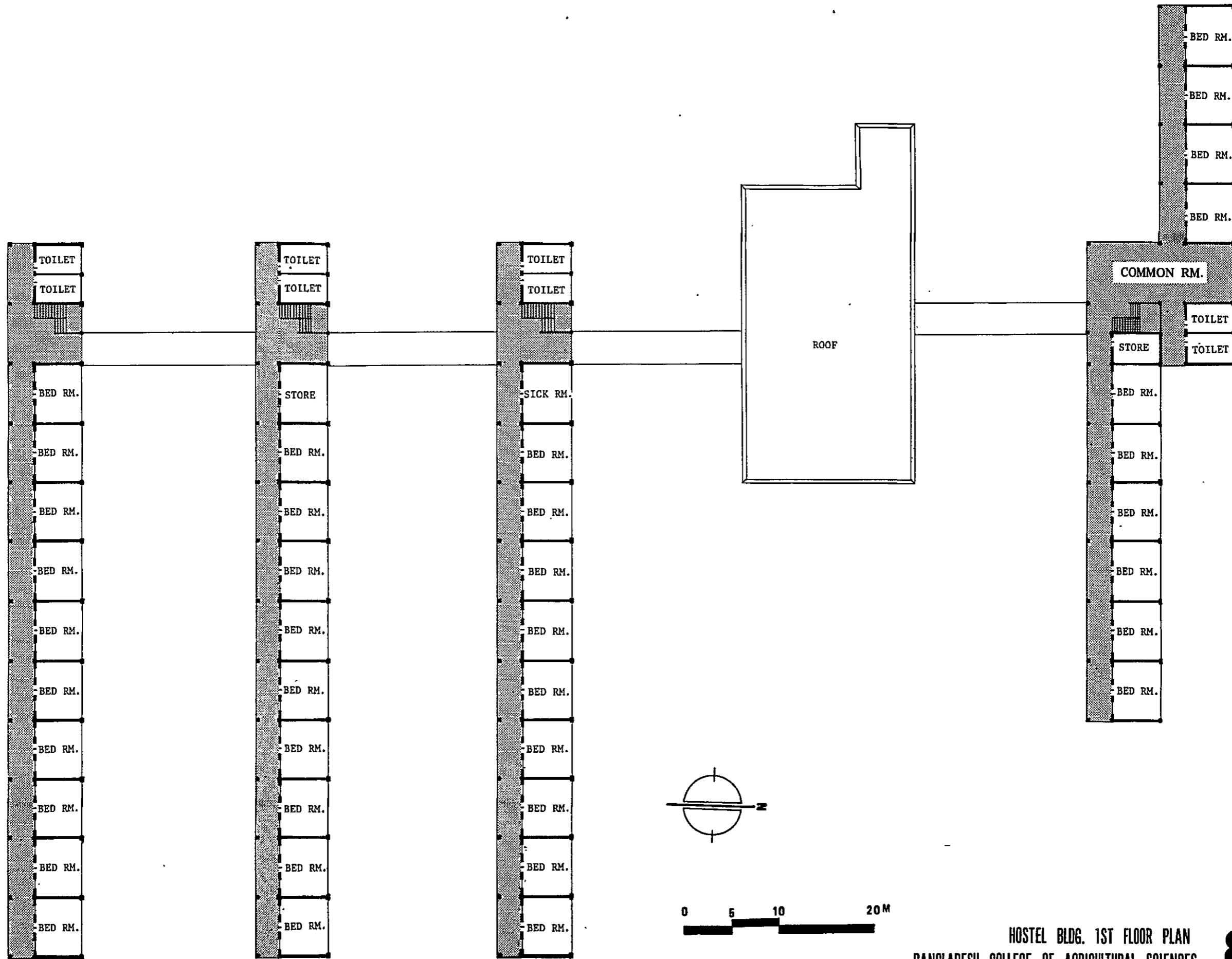
COMMUNITY FACILITIES
BANGLADESH COLLEGE OF AGRICULTURAL SCIENCES

6



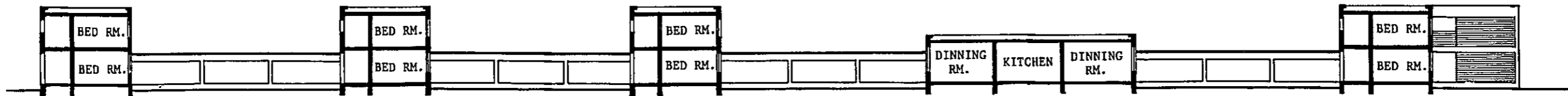
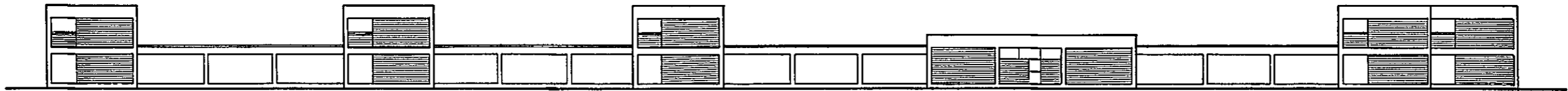
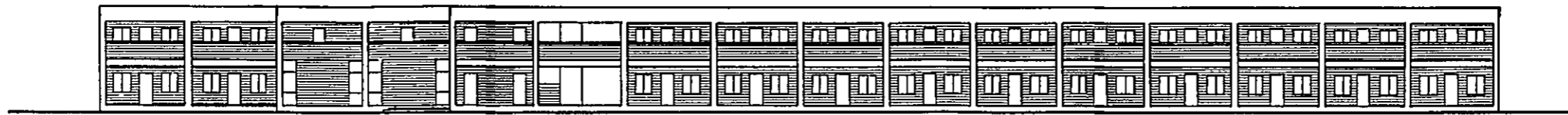
HOSTEL BLDG. GROUND FLOOR PLAN
 BANGLADESH COLLEGE OF AGRICULTURAL SCIENCES

7



HOSTEL BLDG. 1ST FLOOR PLAN
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HOSTEL BLDG. T.E:EVATION & SECTION
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4-8 CONSTRUCTION SCHEDULE

After the official notes is concluded between the Japanese Government and the Bangladesh Government regarding grant-in-aid for construction of the facilities, the design work will be started. During the designing, various design drawings and documents and specifications necessary for constructions, and also drawings and documents necessary for tender and contract of construction will be prepared. After the contents of the design drawings and documents are approved by the Bangladesh Government, contractors will be consulted for a tender.

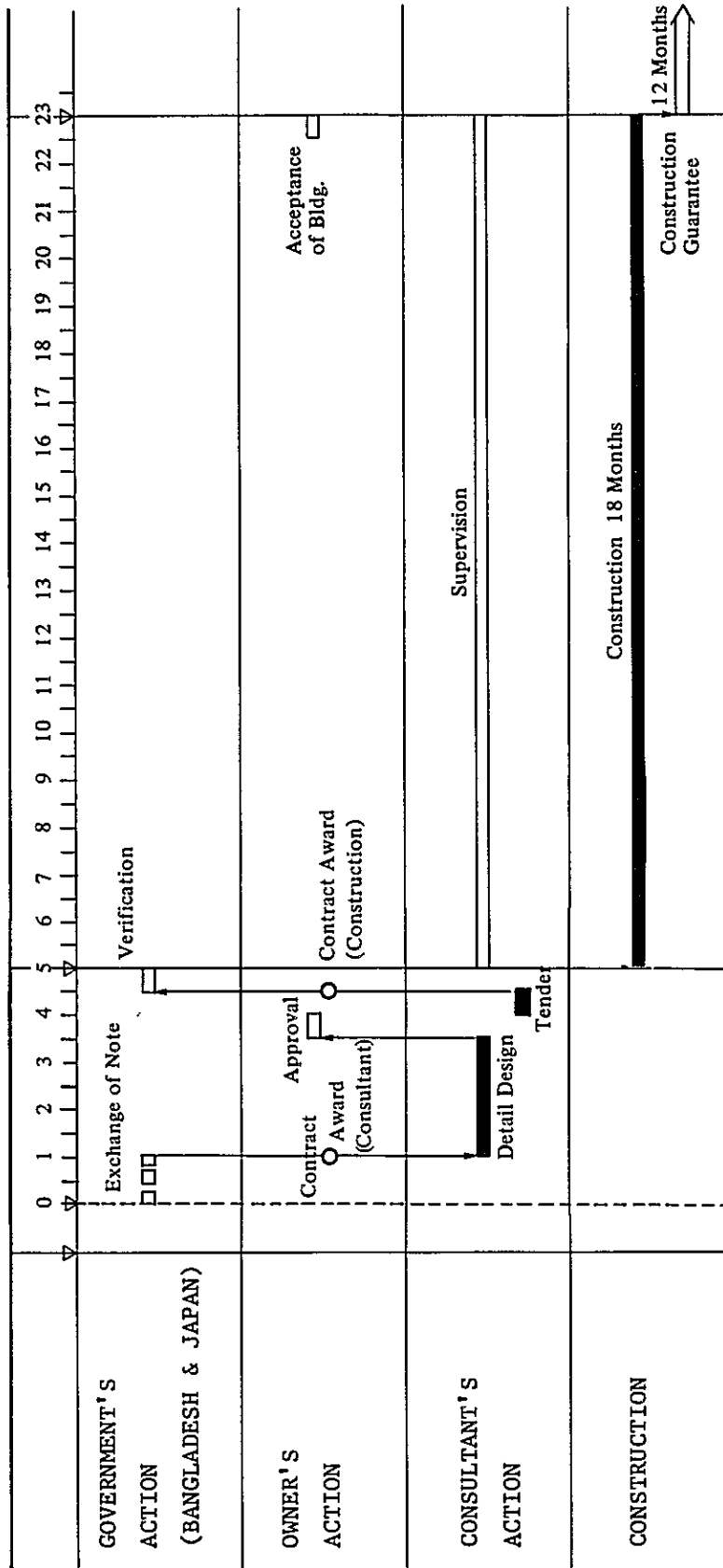
After an agreement is concluded between the Bangladesh Government and the successful contractor, certification of Japanese Government will be obtained to commence the construction.

The period required for construction is estimated to be approximately 18 months, judging from scale, structure and scope of the facilities, provided that two dry seasons occur during the period.

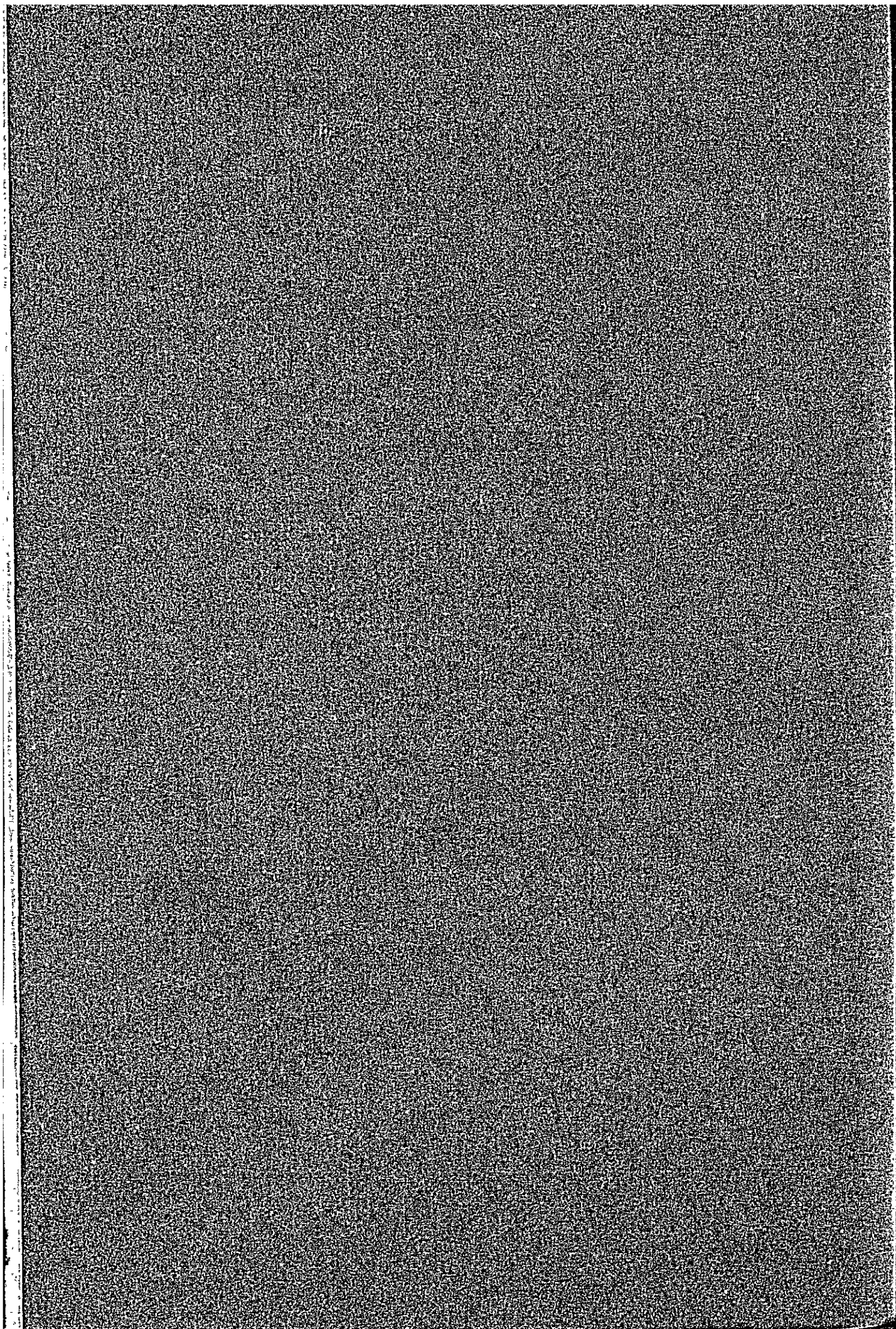
The construction guarantee period will be one year after transfer of the building to the Bangladesh Government.

For a tentative construction schedule, refer to the table on the next page.

Table 4-1 TENTATIVE CONSTRUCTION SCHEDULE



ATTACHED DOCUMENT



BANGLADESH AGRICULTURAL RESEARCH INSTITUTE

REPORT ON SOIL INVESTIGATION AND TESTS
OF AGRICULTURAL RESEARCH INSTITUTE SITE,
AT JOYDEBPUR, DACCA.

DECEMBER - 1977

DEVELOPMENT DESIGN CONSULTANTS
"HUQ MANSION"
13/2, TOYENBEE CIRCULAR ROAD,
MOTIJHEEL COMMERCIAL AREA,
DACCA-2.

CALCULATION OF BEARING CAPACITY FROM FIELD DATA:

The bearing capacity of sub-soil strata may be evaluate by using Standard Penetration Number as recorded in the field.

As the soils of the BARI Site are predominantly silty clay upto a depth of 30 feet, Unconfined Compressive Strength of the soil strata can be evaluated by correlating with Field SPT Values as suggested by Terzaghi & Peck. The Correlation Table is given below:

CONSISTENCY	VERY SOFT	SOFT	MEDIUM	STIFF	VERY STIFF	HARD
No. of Blows - N	0-2	2-4	4-8	8-15	15-30	30
qu Ton/ft ²	0.25	.25-.50	.50-1.0	1-2	2-4	4

From the above table, the unconfined compressive strength and Cohesion (C), at 5 & 10 feet depth of different bore holes of BARI, Joydebpur site may be evaluate and given in the following table.

Unconfined Compressive Strength (qu)
and Cohesion (C) at different depth

Bore hole No.	BH-1		BH-2		BH-3		BH-4		BH-5	
	5	10	5	10	5	10	5	10	5	10
Depth in feet	5	10	5	10	5	10	5	10	5	10
Field SPT Value (Min. be ween (15'-20')	9	8	11	10	11	10	10	10	8	8
qu TSF	1.15	1.00	1.25	1.25	1.25	1.25	1.25	1.25	1.00	1.00
$C = \frac{qu}{2}$	0.57	0.50	0.62	0.62	0.62	0.62	0.62	0.62	0.50	0.50

As the soils of BARI, Joydebpur site at a depth of 5 & 10 feet are clayey, we can use the following Terzaghi's equation for calculating bearing capacity.

$$q_f = C N_C$$

Where, q_f = Ultimate bearing capacity

C = Cohesion, T.S.F.

N_C = Terzaghi's bearing capacity factor = 5.7

From the above equation the ultimate bearing capacity of soil layers at 5 & 10 feet depth of different boring location will be as follows:

1. a) At 5 feet depth of boring location 1

$$\begin{aligned} q_f &= C N_C \\ &= 0.57 \times 5.7 \\ &= 3.249 \text{ TSF.} = 34.8 \text{ TSM} \end{aligned}$$

With a factor of safety 3; the allowable bearing capacity will be:-

$$q_a = 1.08 \text{ TSF.} = 11.6 \text{ TSM}$$

b) At 10 feet depth of boring location 1

$$\begin{aligned} q_f &= C N_C \\ &= .50 \times 5.7 \\ &= 2.85 \text{ TSF.} = 30.6 \text{ TSM} \end{aligned}$$

With a factor of safety 3; the allowable bearing capacity will be:-

$$q_f = 0.95 \text{ TSF.} = 1.02 \text{ TSM}$$

CALCULATION OF BEARING CAPACITY FROM LABORATORY TEST:

From the unconfined test on a representative soil sample collected from BH-2 at a depth of 8'-8", we have obtained the value of q_u as 14.1 Psi (1.01 TSF). Thus the value of C will be,

$$C = \frac{q_u}{2} = 0.505 \text{ TSF} = 5.43 \text{ TSM}$$

Now the bearing capacity of the sub-soil layer will be:

$$\begin{aligned} q_f &= CN_c \\ &= 0.505 \times 5.7 \\ &= 2.878 \text{ TSF} = 30.98 \text{ TSM} \end{aligned}$$

with a factor of safety 3; the allowable bearing capacity will be:

$$q_a = .96 \text{ TSF} = 10.3 \text{ TSM}$$

CONCLUSION AND RECOMMENDATION:

In the light of foregoing findings and discussion, we may conclude and suggest as follows:

As the recommended allowable bearing capacity of the sub-soil (with a factory of safety 3) at different boring point (BH-1 to BH-5) at a depth of 5 and 10 feet are between 0.95 and 1.17 TSF. Shallow footing foundation may be considered most suitable & safe against shear failure. However, the type and magnitude of foundation will be subjected to the magnitude of superimposed load of proposed structure. As the soils are homogenous within the area, the possibility of differential settlements are not there. The magnitude of immediate and ultimate settlement will however depend on the magnitude of superimposed load. Raft foundation may be provided if the settlement remains within permissible limit.

B. H. No. BH-1

G.W.T. 4'-9"

DATE	DEPTH	THICK- NESS	STRATA ENCOUNTERED	LOG	NO. OF BLOW FT.	S.P.T. BLOWS/FT					SOIL SAMPLES		SKIN FRICTION P.S.T.
						10	20	30	40	50	60	DIST	
	0			X									
	5			X									
	10			X									
	15	33'	BROWNISH SILTY CLAY	X									
	20			X									
	25			X									
	30			X									
	35	8'	GRAY BROWN SILTY FINE SAND WITH TRACE CLAY	X									
	40			X									
	45			X									
	50			X									
	55			X									

AT 5 FEET INTERVAL

B. H. No. BH-2

G.W.T. 6'-9"

DATE	DEPTH	THICK- NESS	STRATA ENCOUNTERED	LOG	NO. OF BLOW FT.	S.P.T. BLOWS/FT					SOIL SAMPLES		SKIN FRICTION P.S.F.	
						10	20	30	40	50	60	DIST		UNDIST
	0			X										
	5		BROWNISH SILTY CLAY	X	11									
	10			X	10									
	15			X	10									
	20	36'		X	10									
	25			X	11									
	30			X	11									
	35			X	10									
	36'			X	10									
	37'			X	11									
	38'			X	11									
	39'		X	10										
	40'	5'	GRAY BROWN SILTY FINE SAND TRACE CLAY	X	12									
	45													
	50													
	55													

AT 5 FEET INTERVAL

JICA

