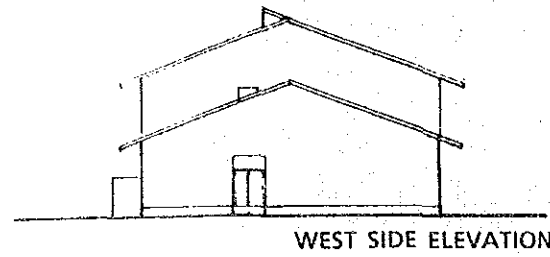
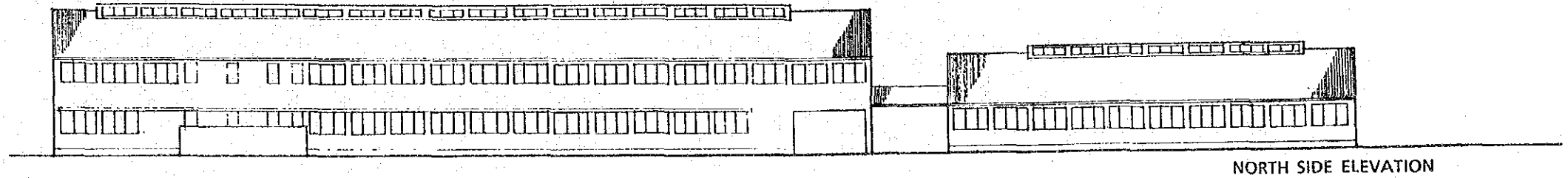


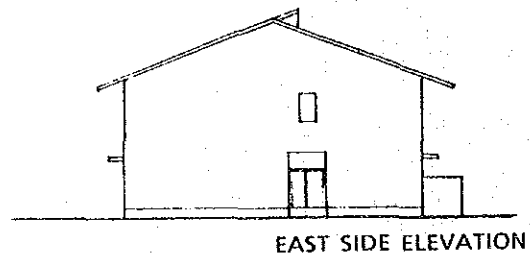
1ST FLOOR PLAN S. 1: 400
ENGINEERING NEW LABORATORY BLDG.



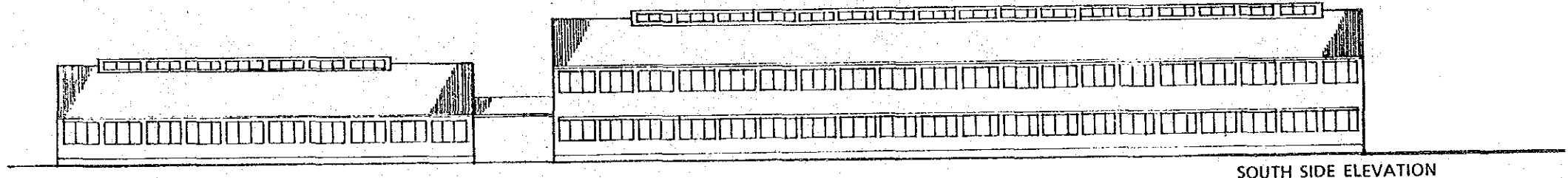
WEST SIDE ELEVATION



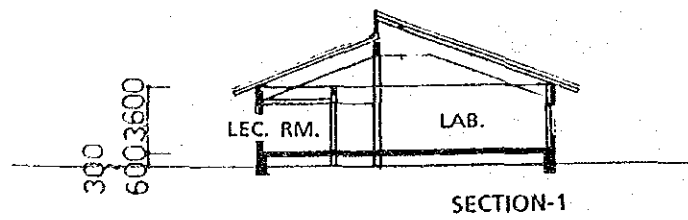
NORTH SIDE ELEVATION



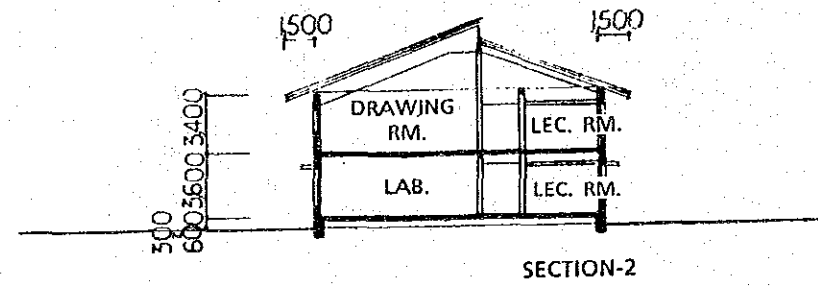
EAST SIDE ELEVATION



SOUTH SIDE ELEVATION

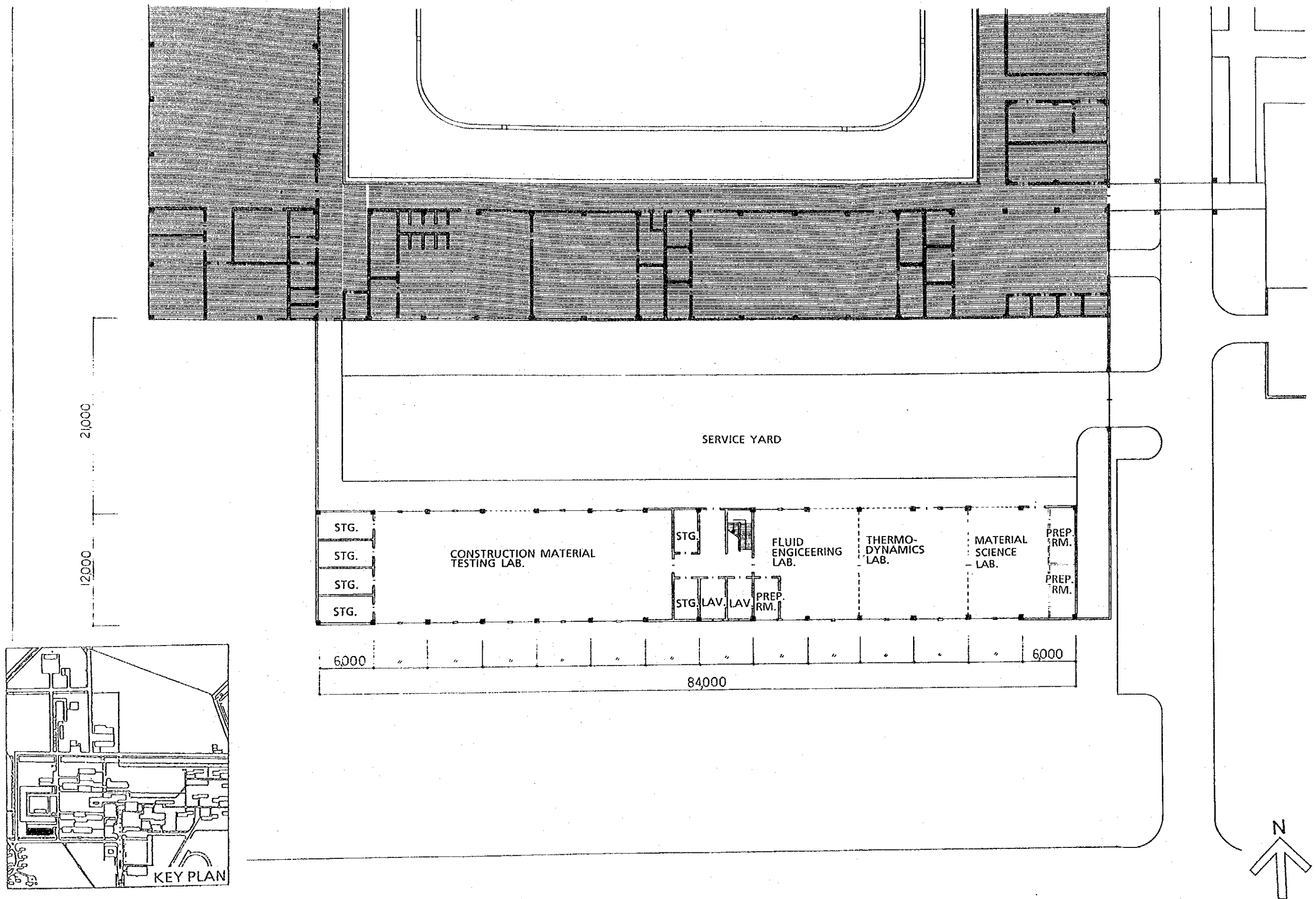


SECTION-1

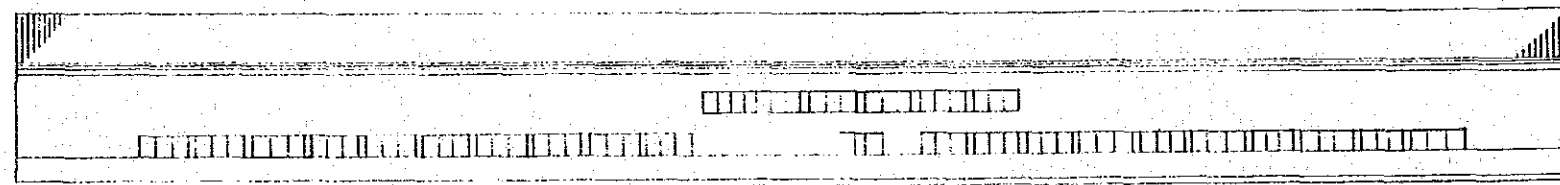
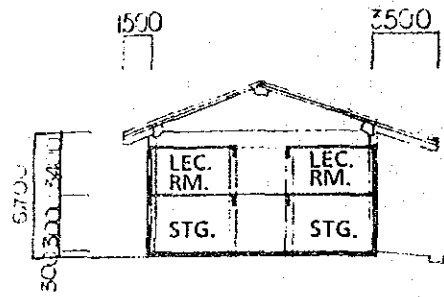
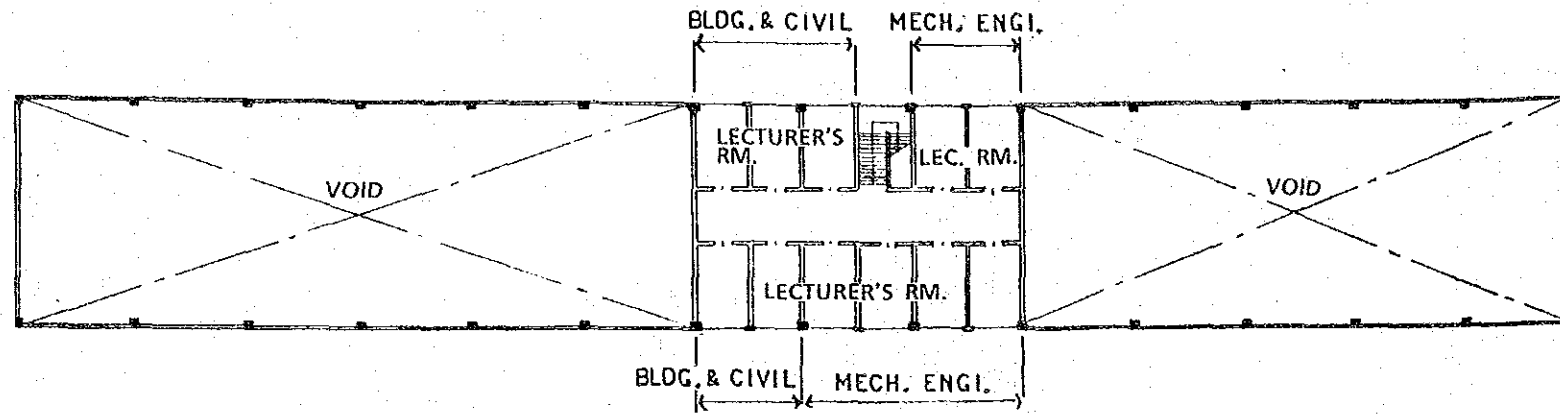


SECTION-2

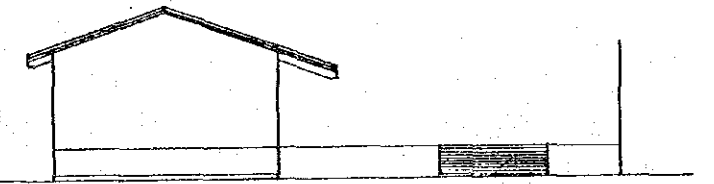
**ELEVATION & SECTION S. 1: 400
ENGINEERING NEW LABORATORY BLDG.**



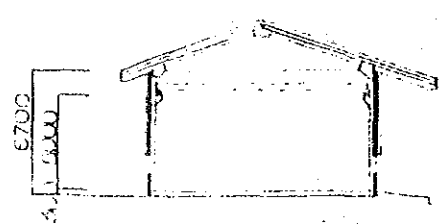
GROUND FLOOR PLAN S. 1:400
CIVIL & MECHANICAL ENGI. LABORATORY BLDG.



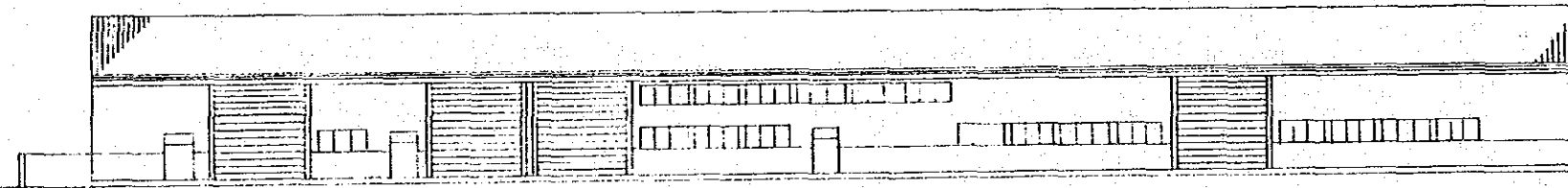
SOUTH SIDE ELEVATION



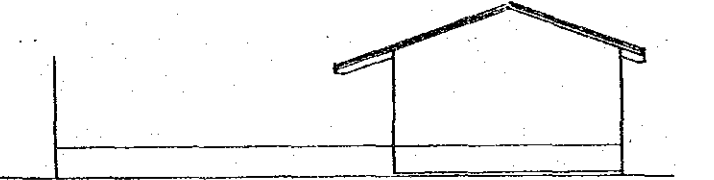
EAST SIDE ELEVATION



SECTION-2

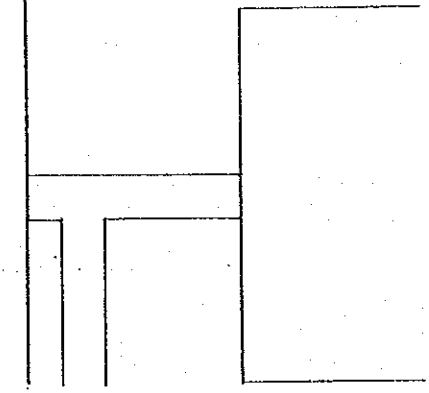
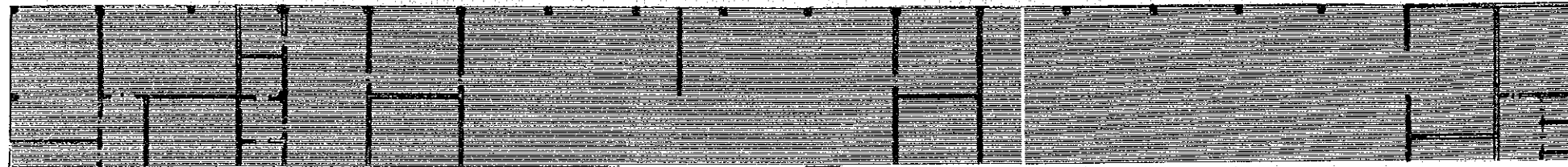
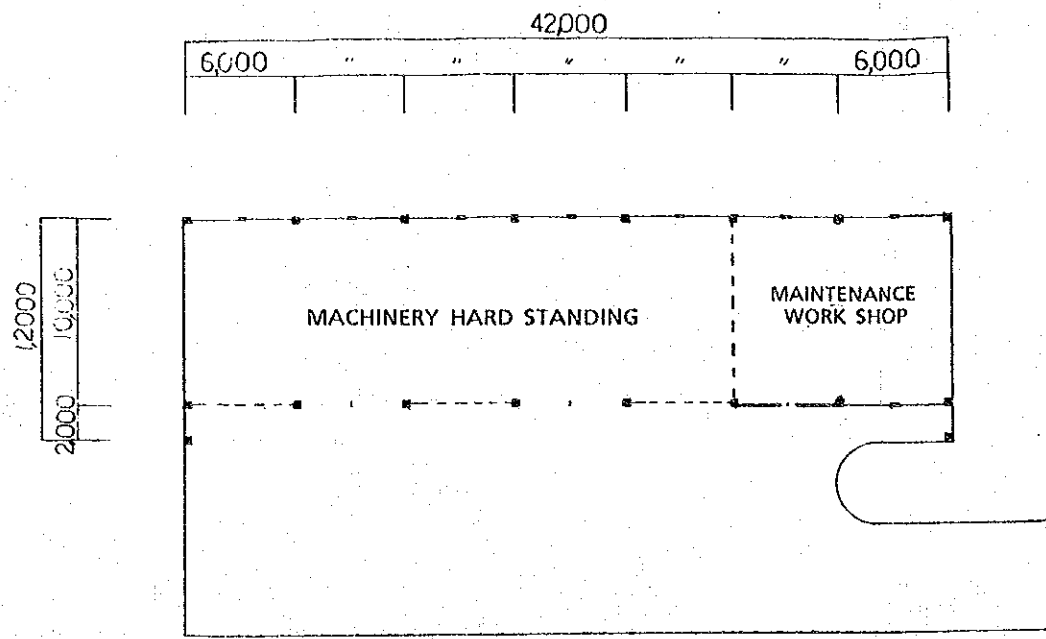
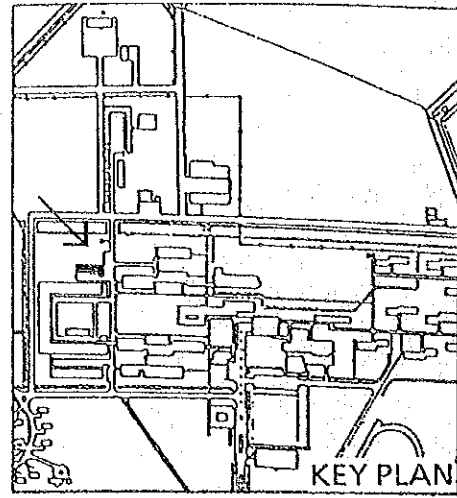


NORTH SIDE ELEVATION

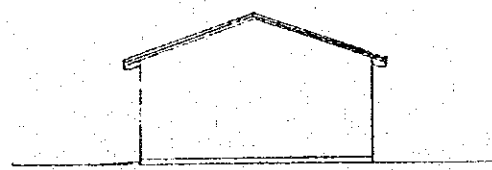


WEST SIDE ELEVATION

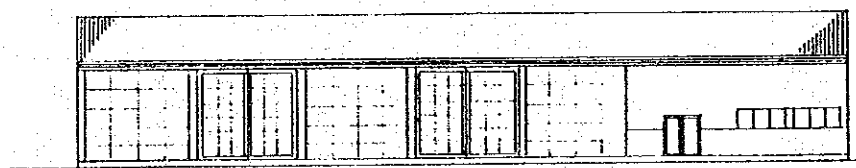
**1ST FLOOR PLAN, ELEVATION & SECTION S. 1: 400
CIVIL & MECHANICAL ENGI. LABORATORY BLDG.**



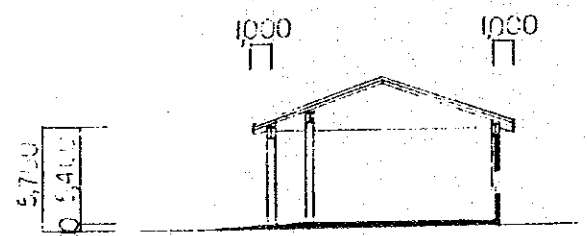
PLAN



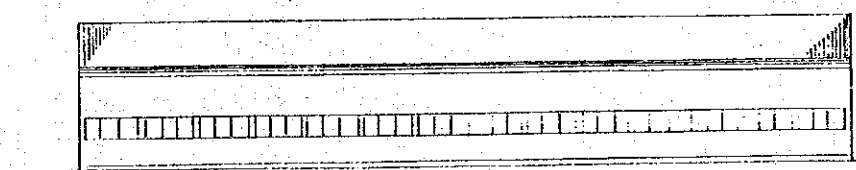
EAST SIDE ELEVATION



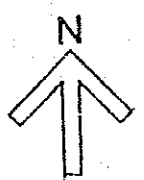
SOUTH SIDE ELEVATION



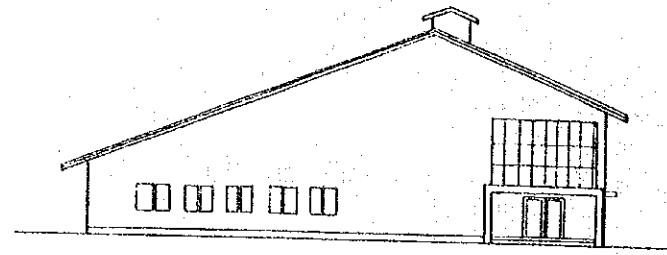
SECTION



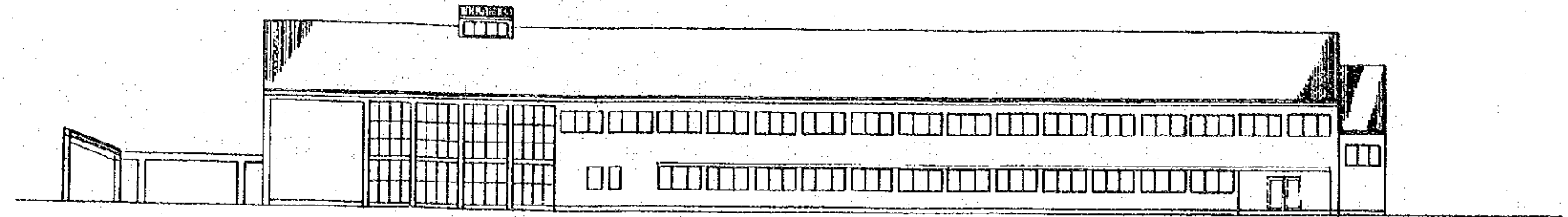
NORTH SIDE ELEVATION



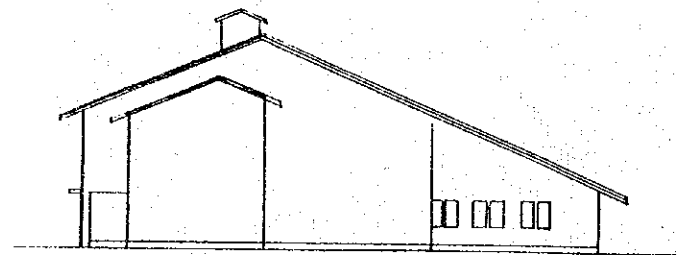
**PLAN, ELEVATION & SECTION S. 1: 400
MACHINERY HARD STANDING**



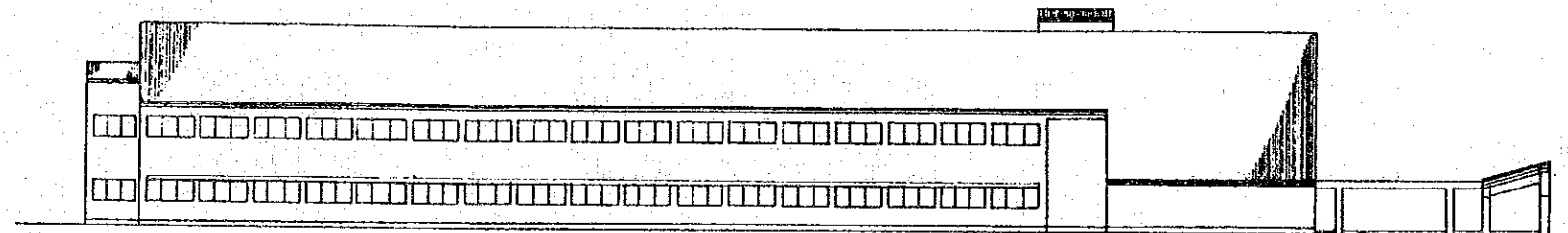
WEST SIDE ELEVATION



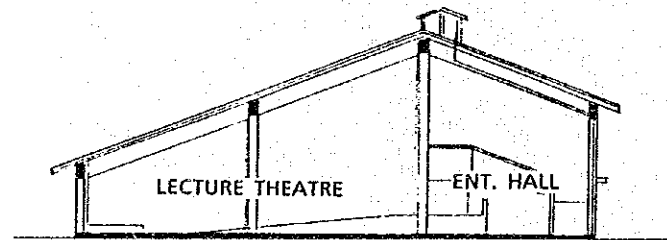
SOUTH SIDE ELEVATION



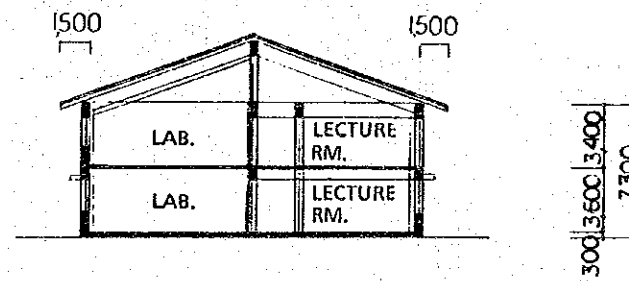
EAST SIDE ELEVATION



NORTH SIDE ELEVATION

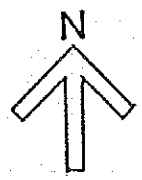
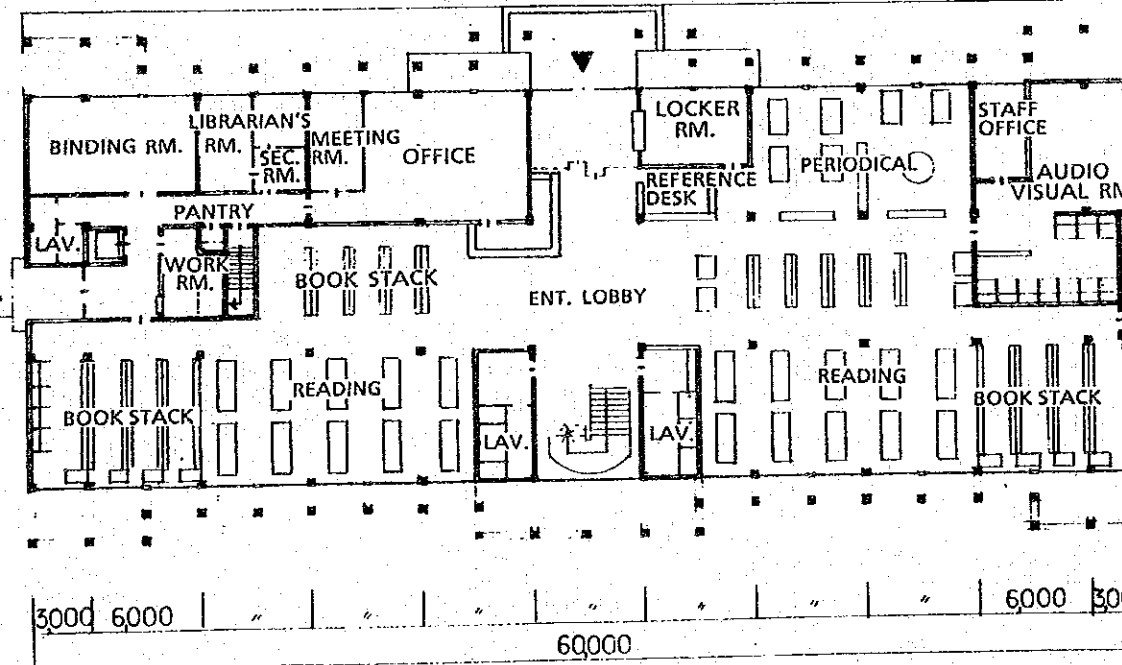
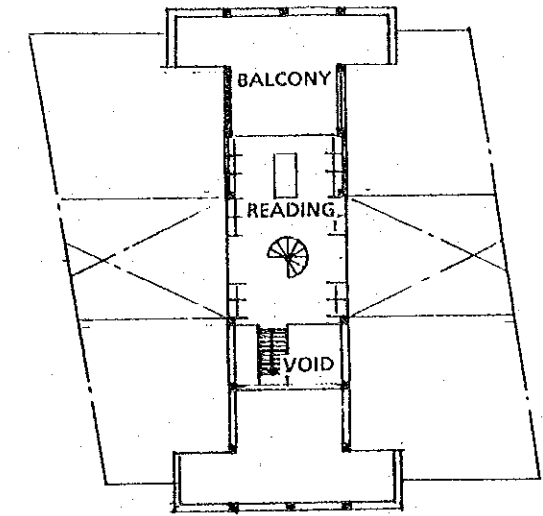
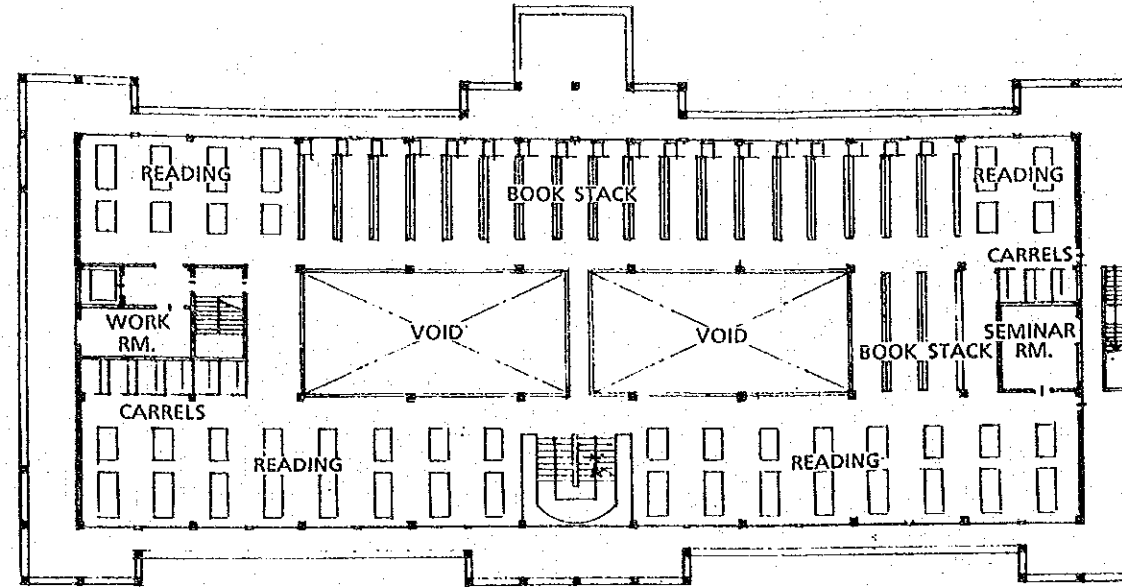
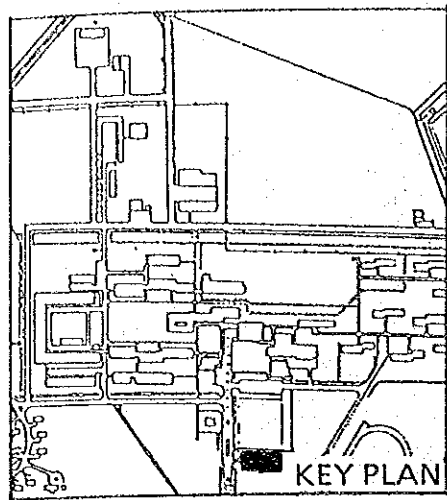


SECTION-1

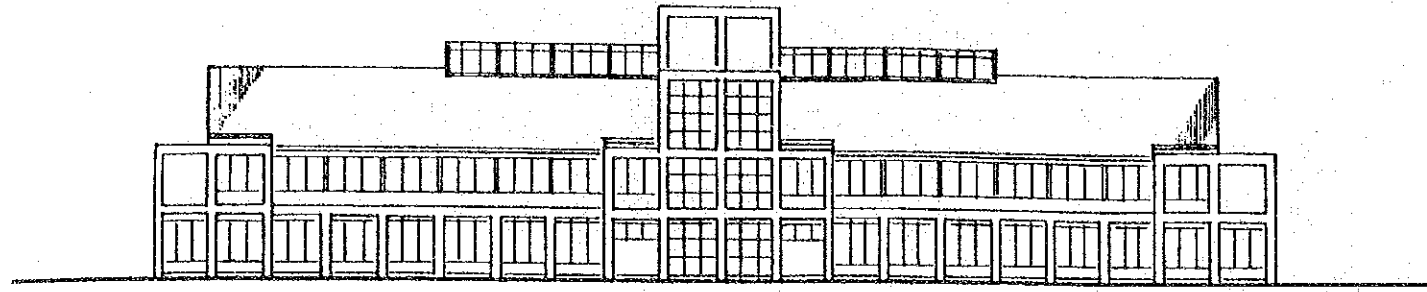


SECTION-2

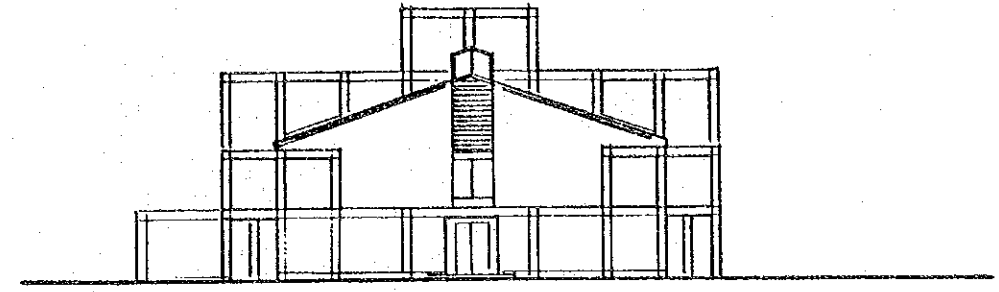
**ELEVATION & SECTION S. 1: 400
NEW COMMON LECTURE BLDG.**



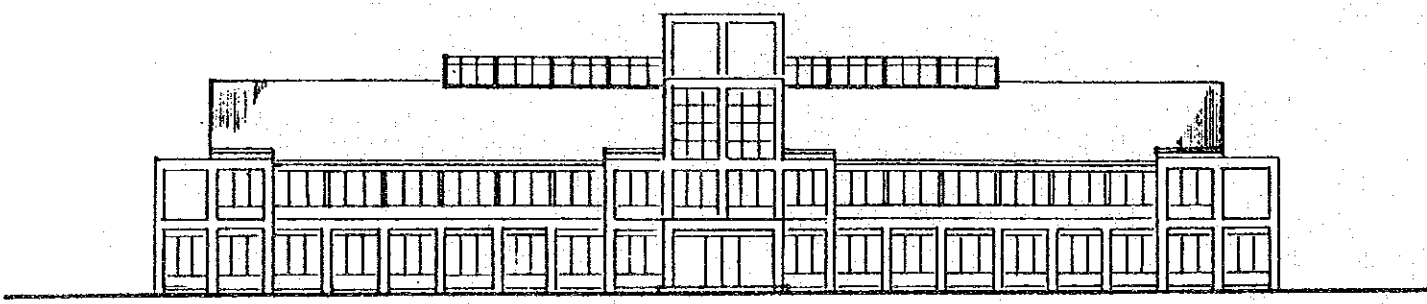
**ELEVATION & SECTION S. 1: 400
LIBRARY BUILDING**



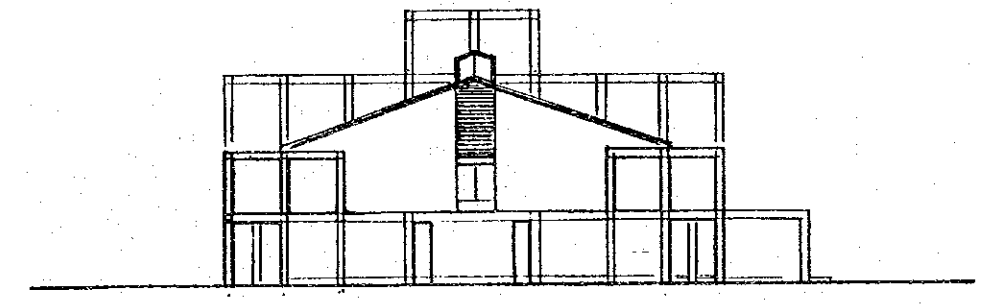
SOUTH SIDE ELEVATION



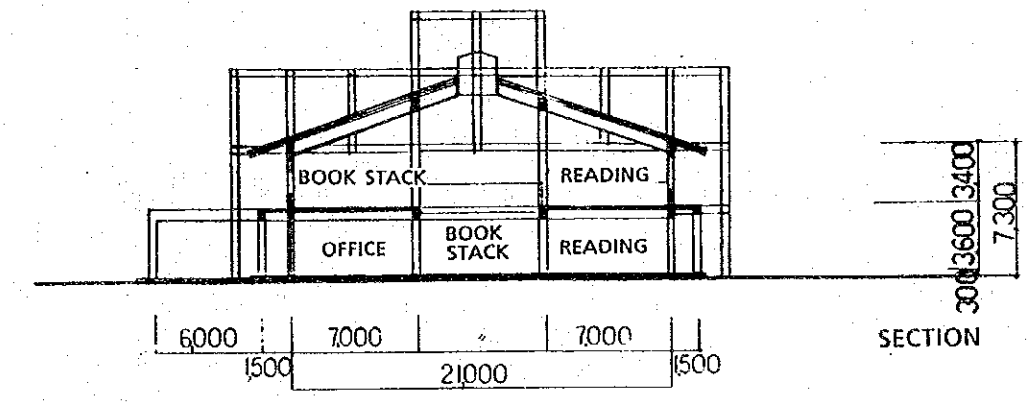
WEST SIDE ELEVATION



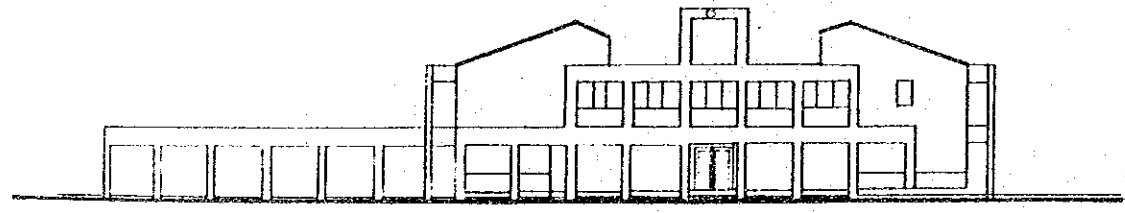
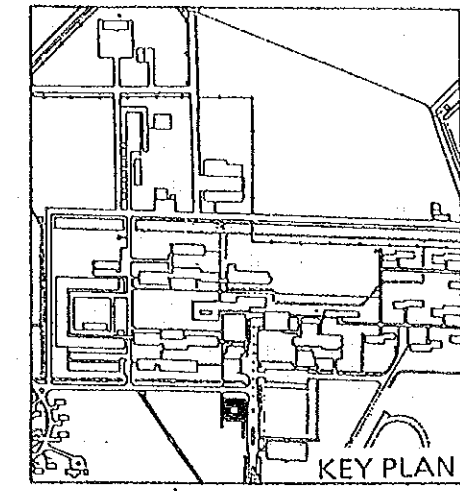
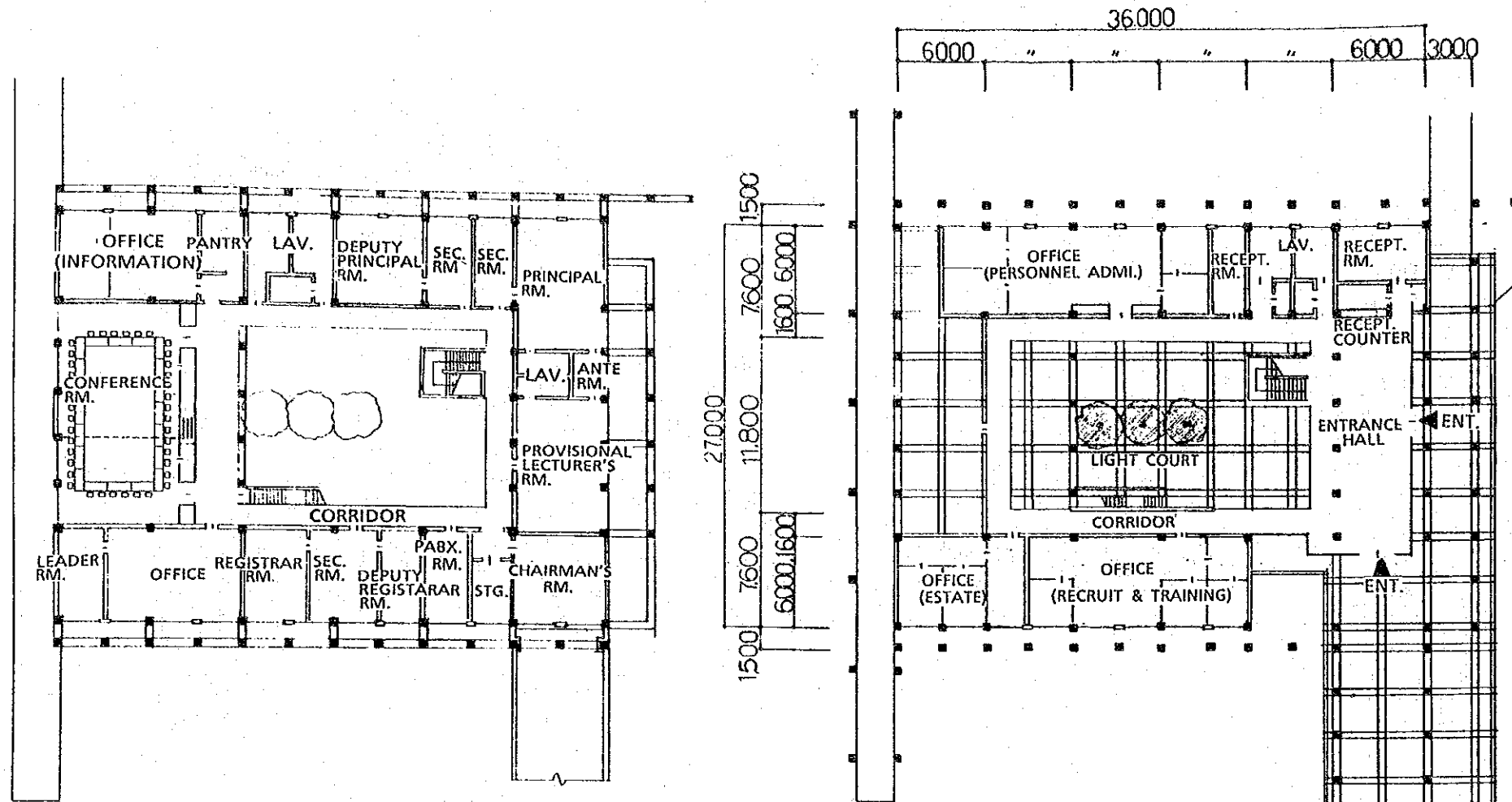
NORTH SIDE ELEVATION



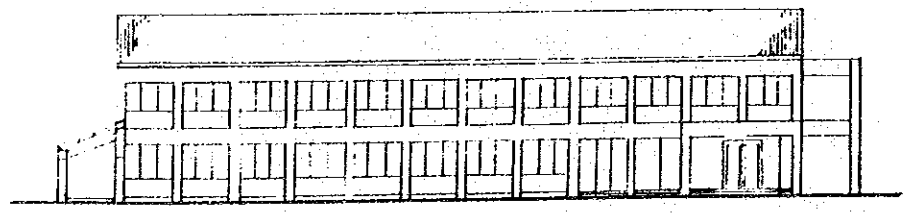
EAST SIDE ELEVATION



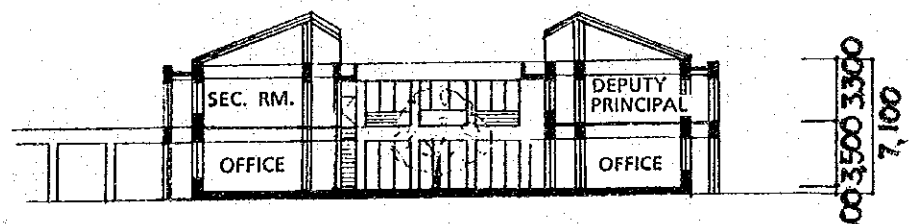
**ELEVATION & SECTION S. 1: 400
LIBRARY BUILDING**



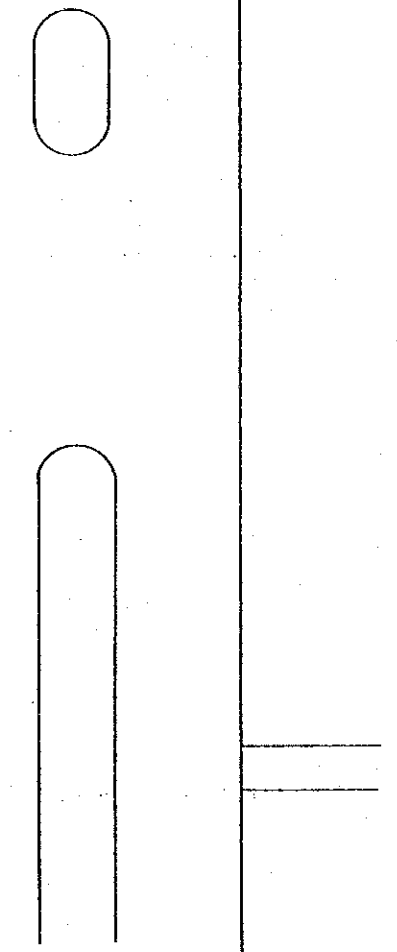
EAST SIDE ELEVATION



SOUTH SIDE ELEVATION

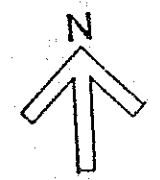
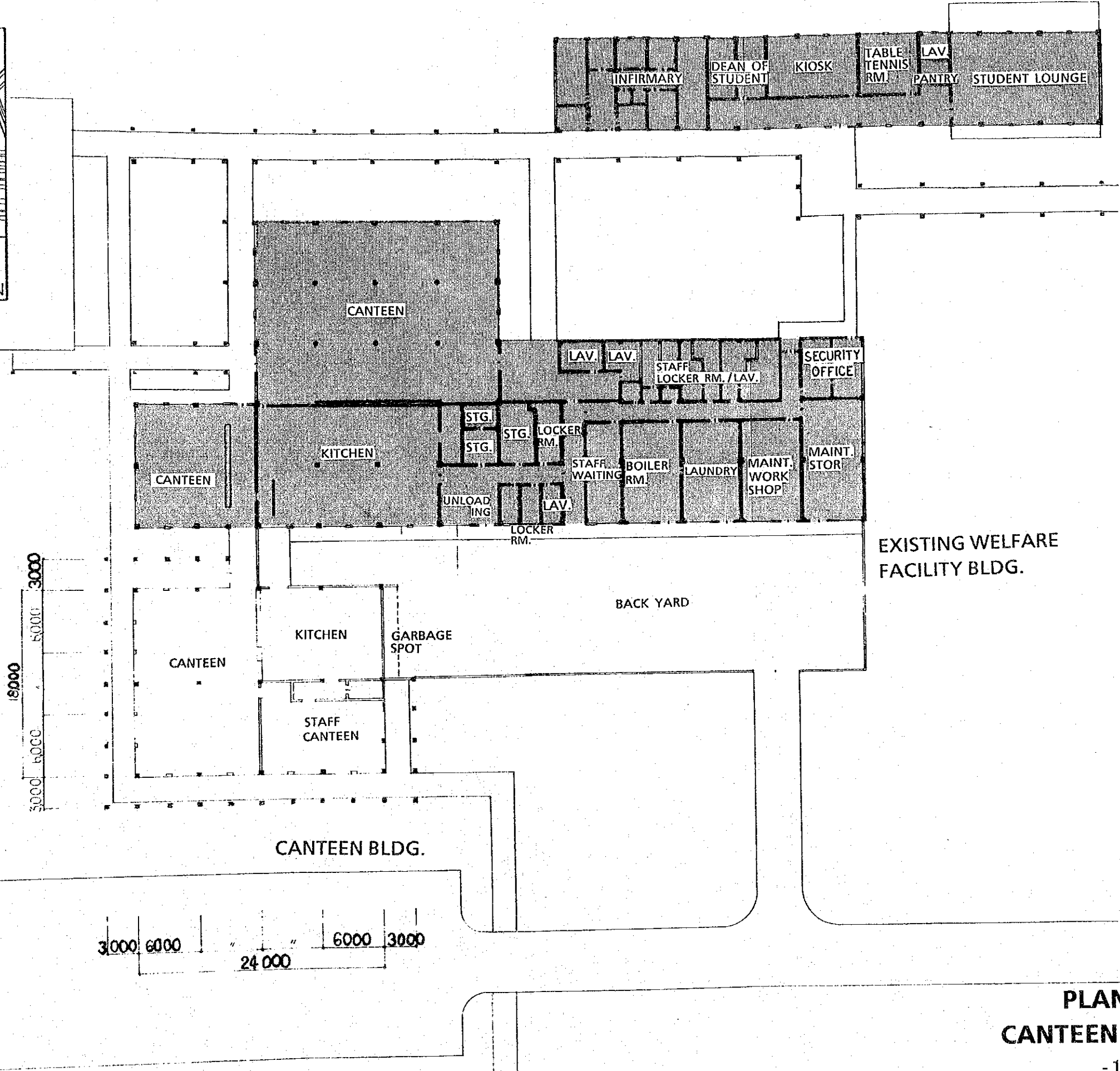
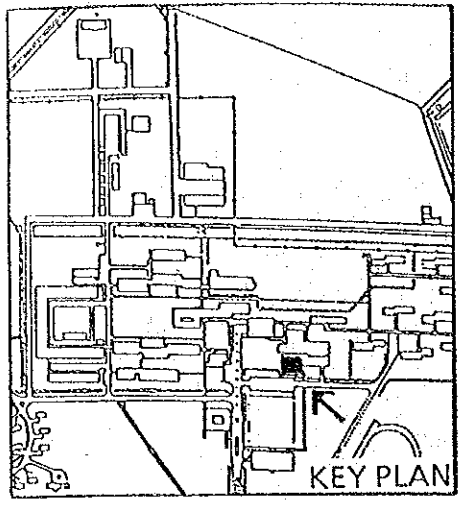


SECTION

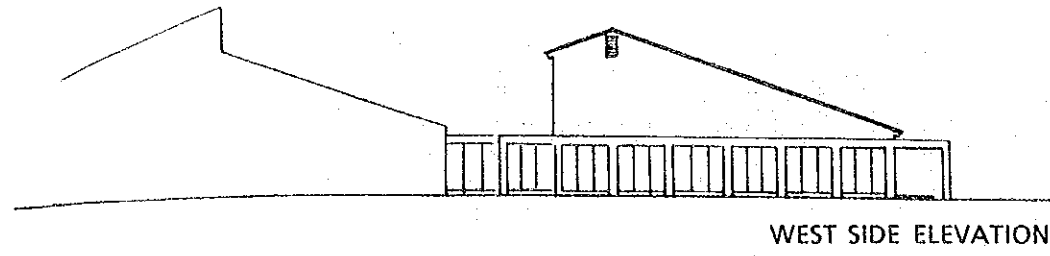


**PLAN, ELEVATION & SECTION S. 1: 400
NEW ADMINISTRATION BUILDING**

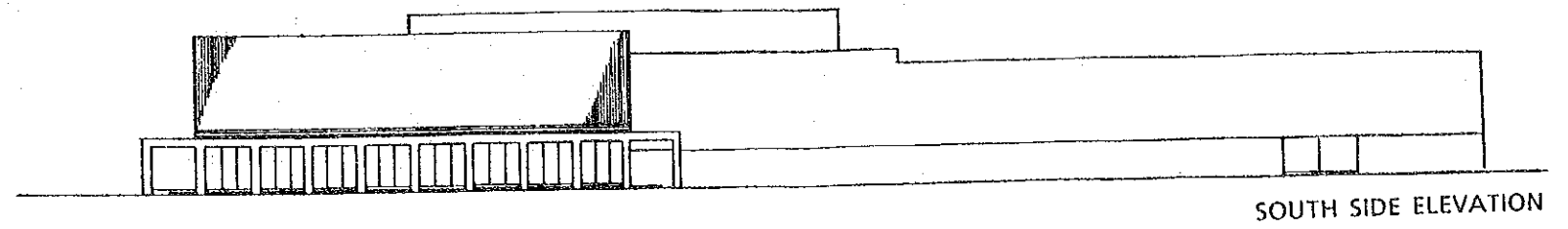




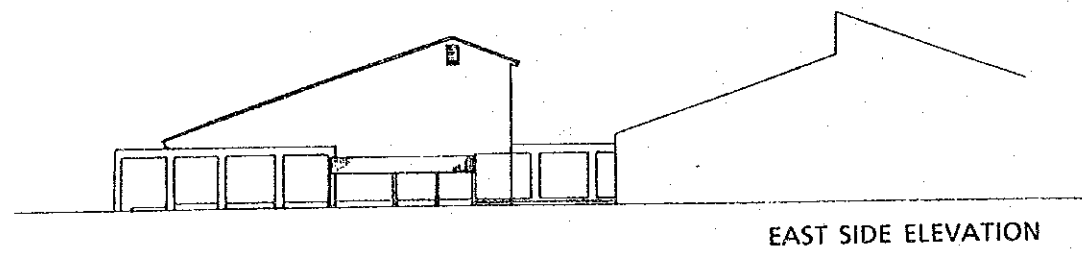
PLAN S. 1: 400
CANTEEN BUILDING



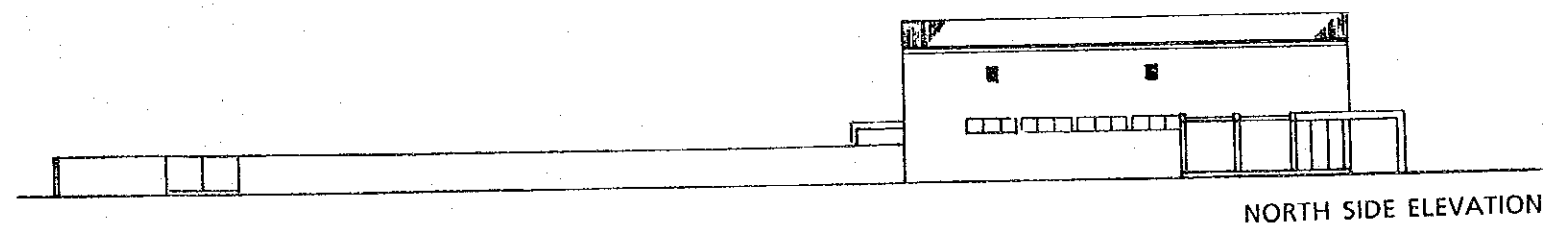
WEST SIDE ELEVATION



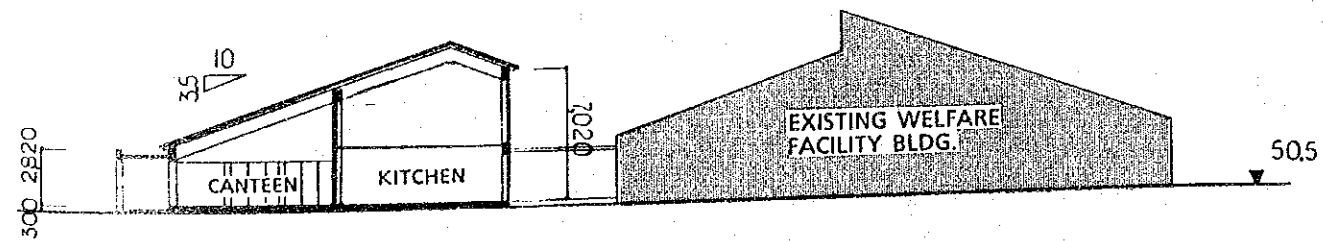
SOUTH SIDE ELEVATION



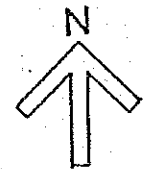
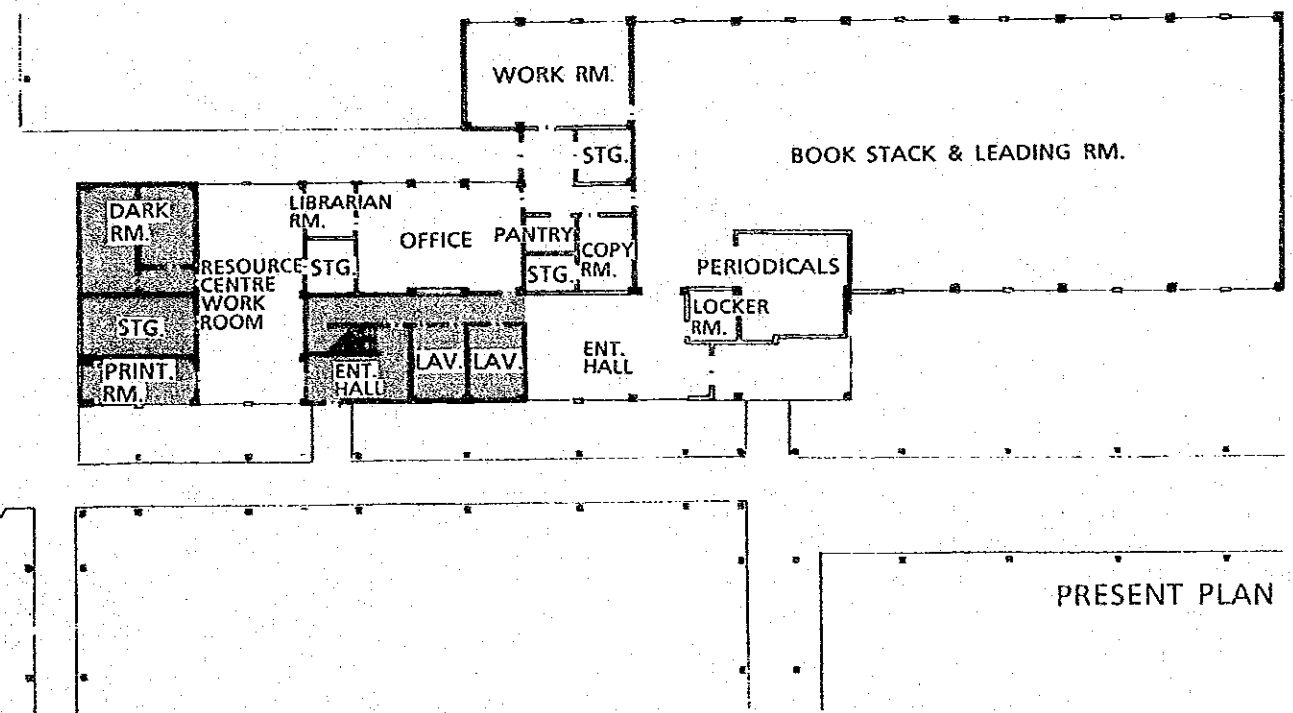
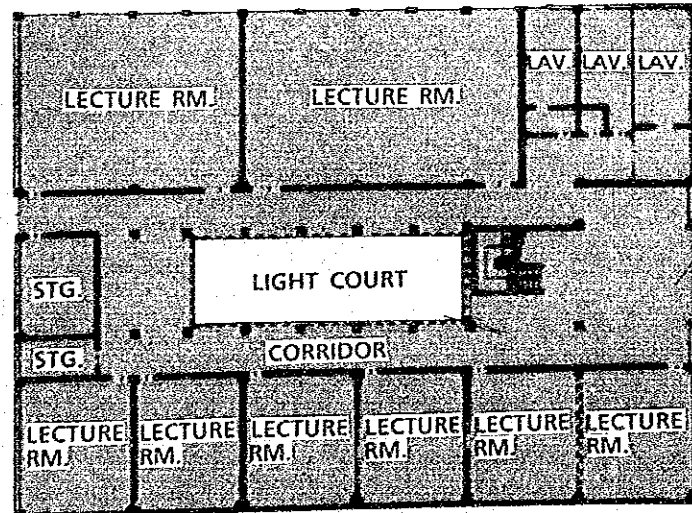
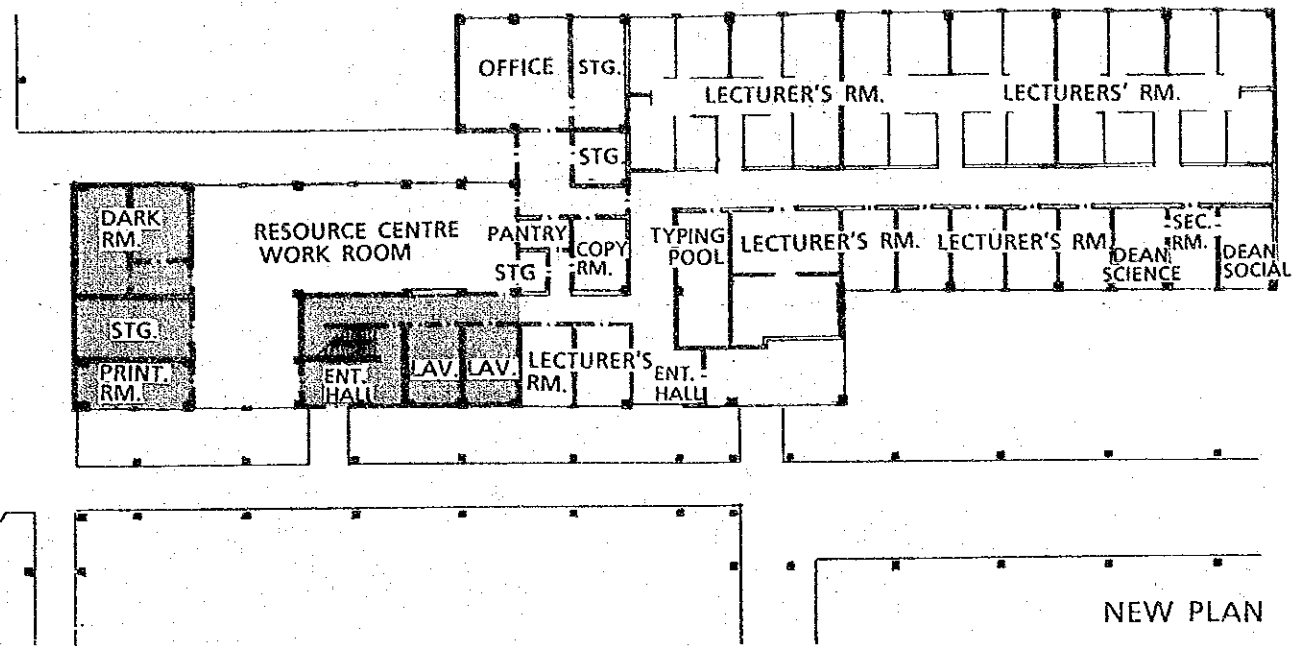
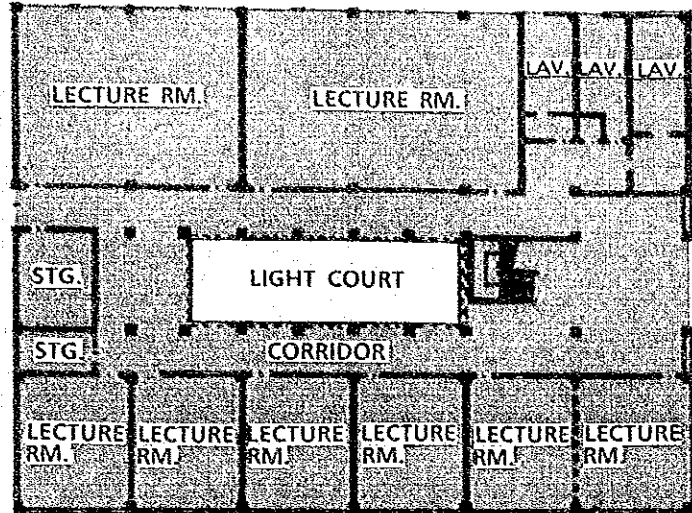
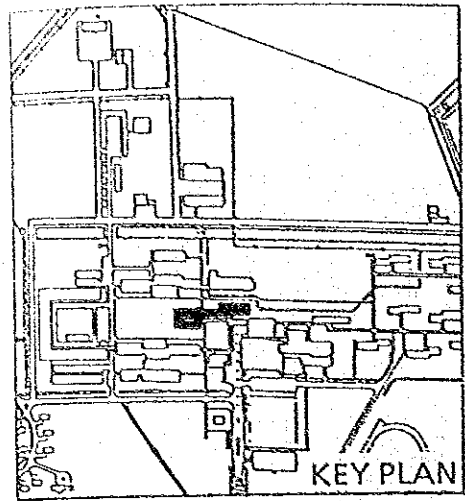
EAST SIDE ELEVATION



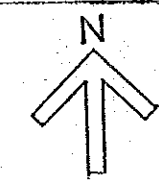
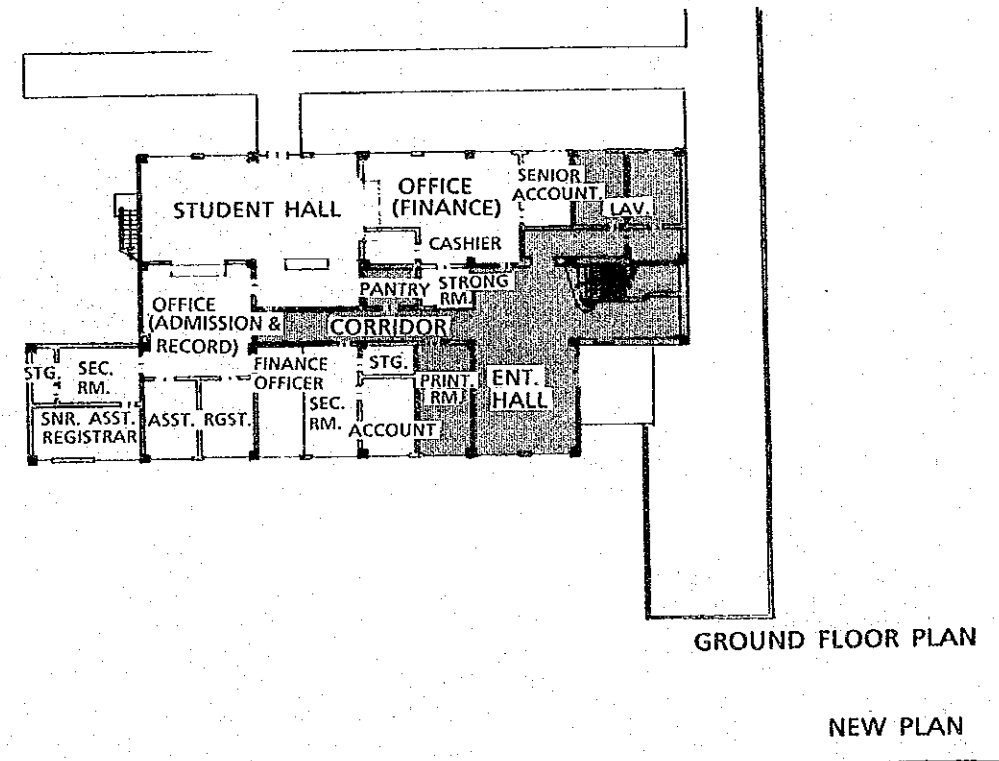
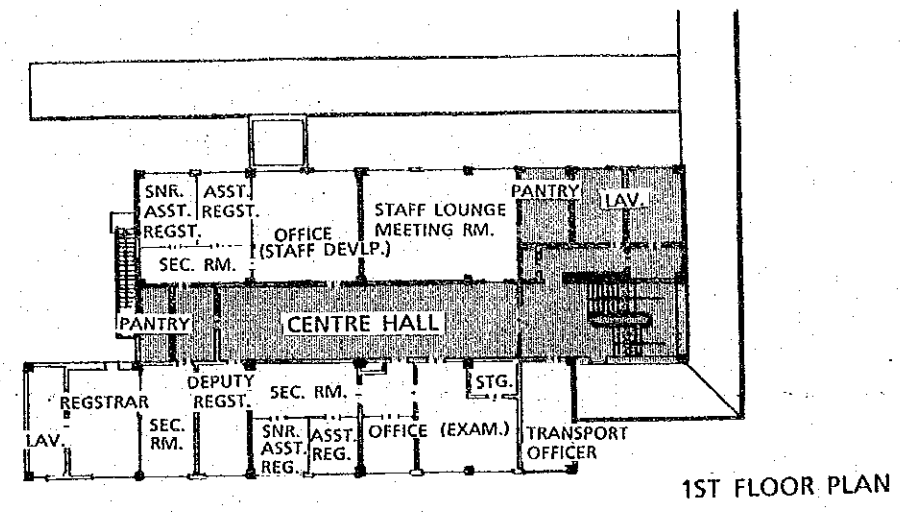
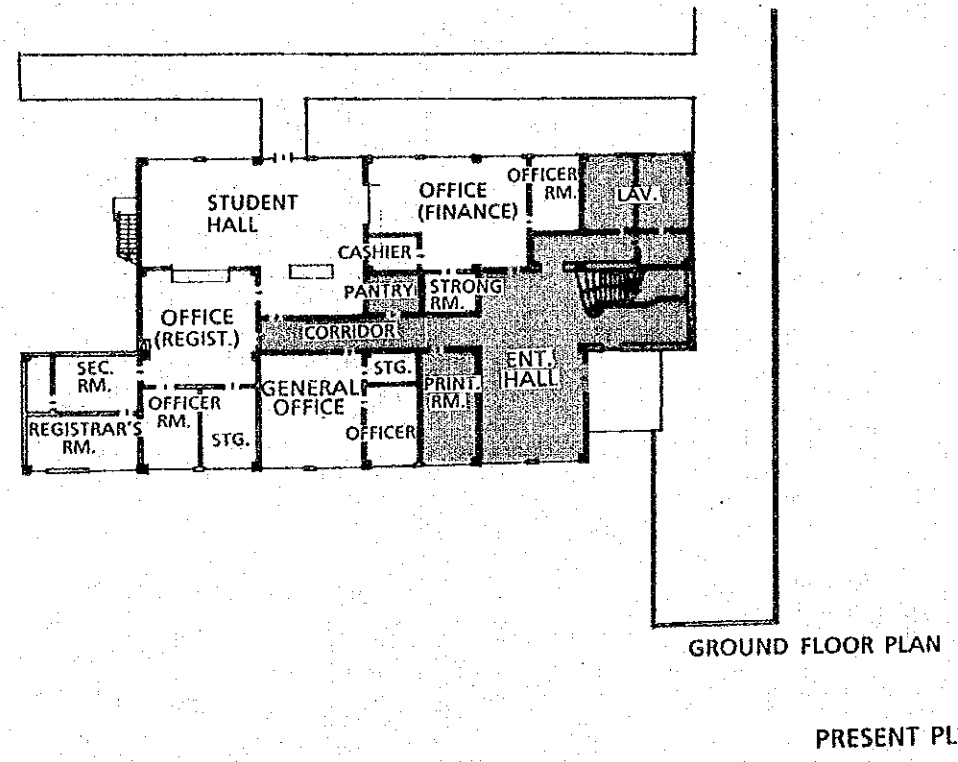
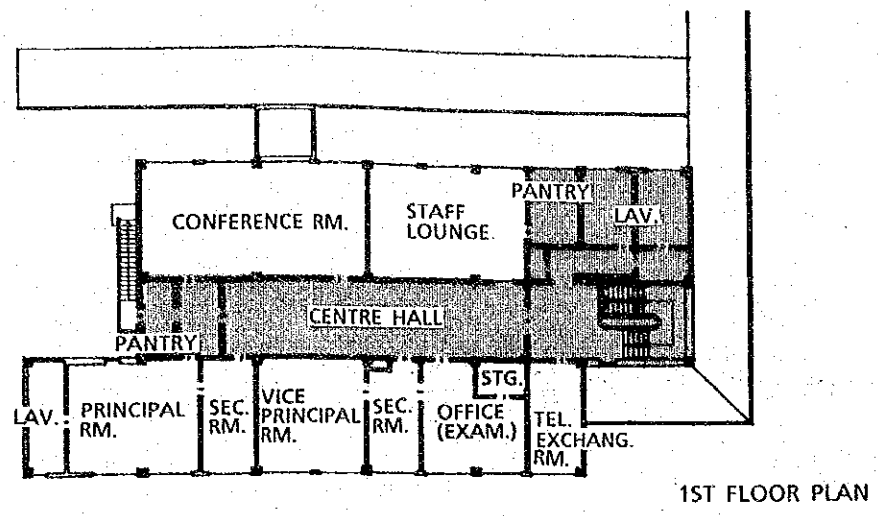
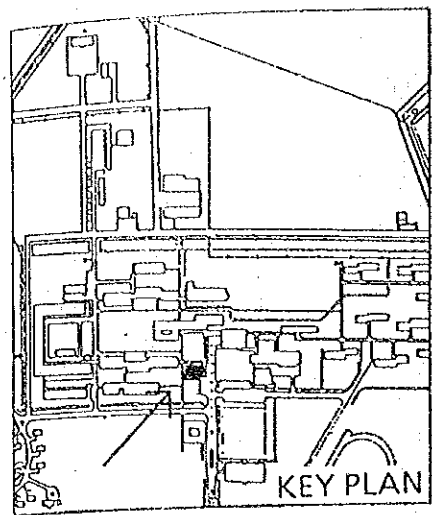
NORTH SIDE ELEVATION



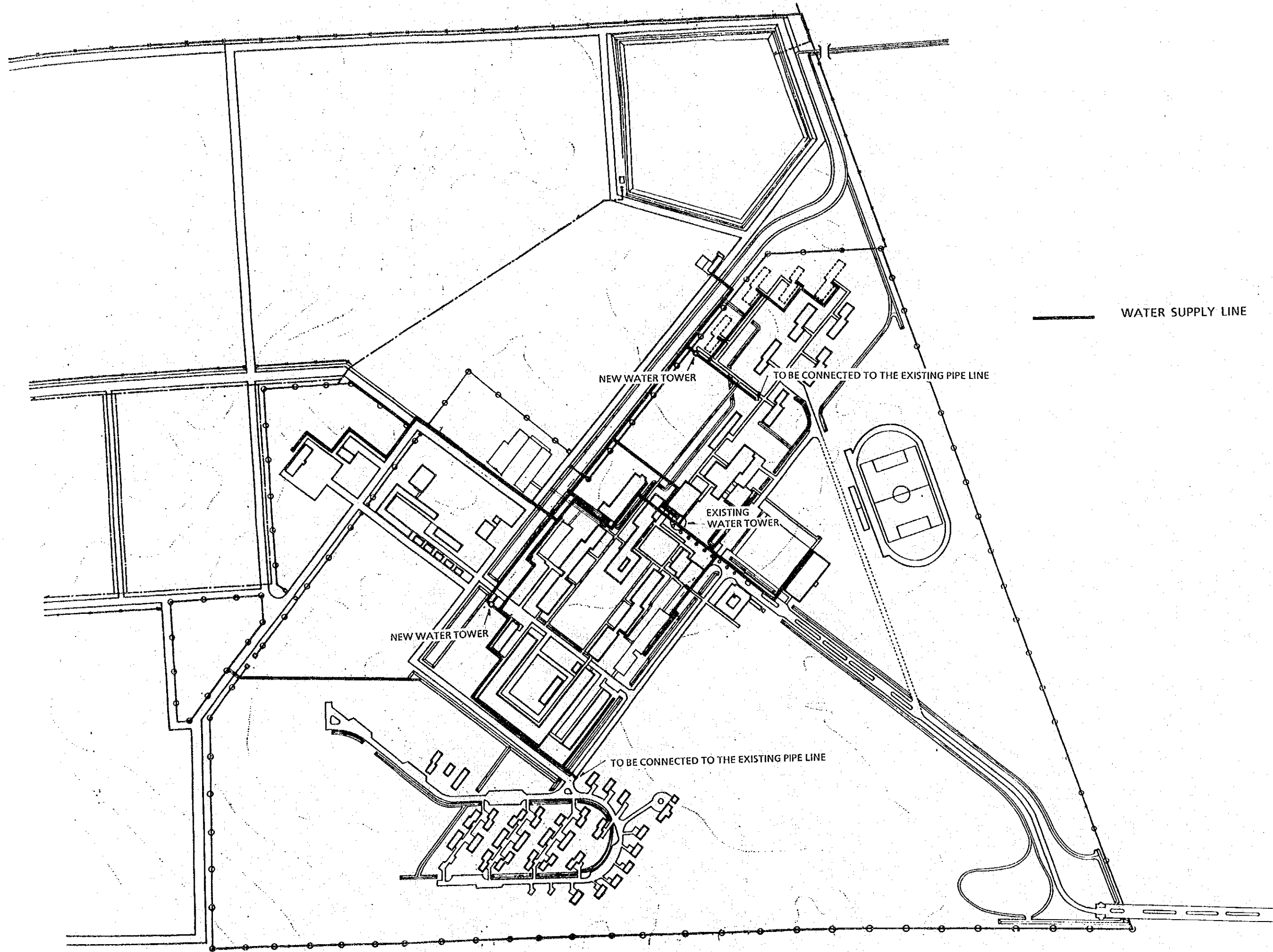
**ELEVATION & SECTION S. 1: 400
CANTEEN BUILDING**



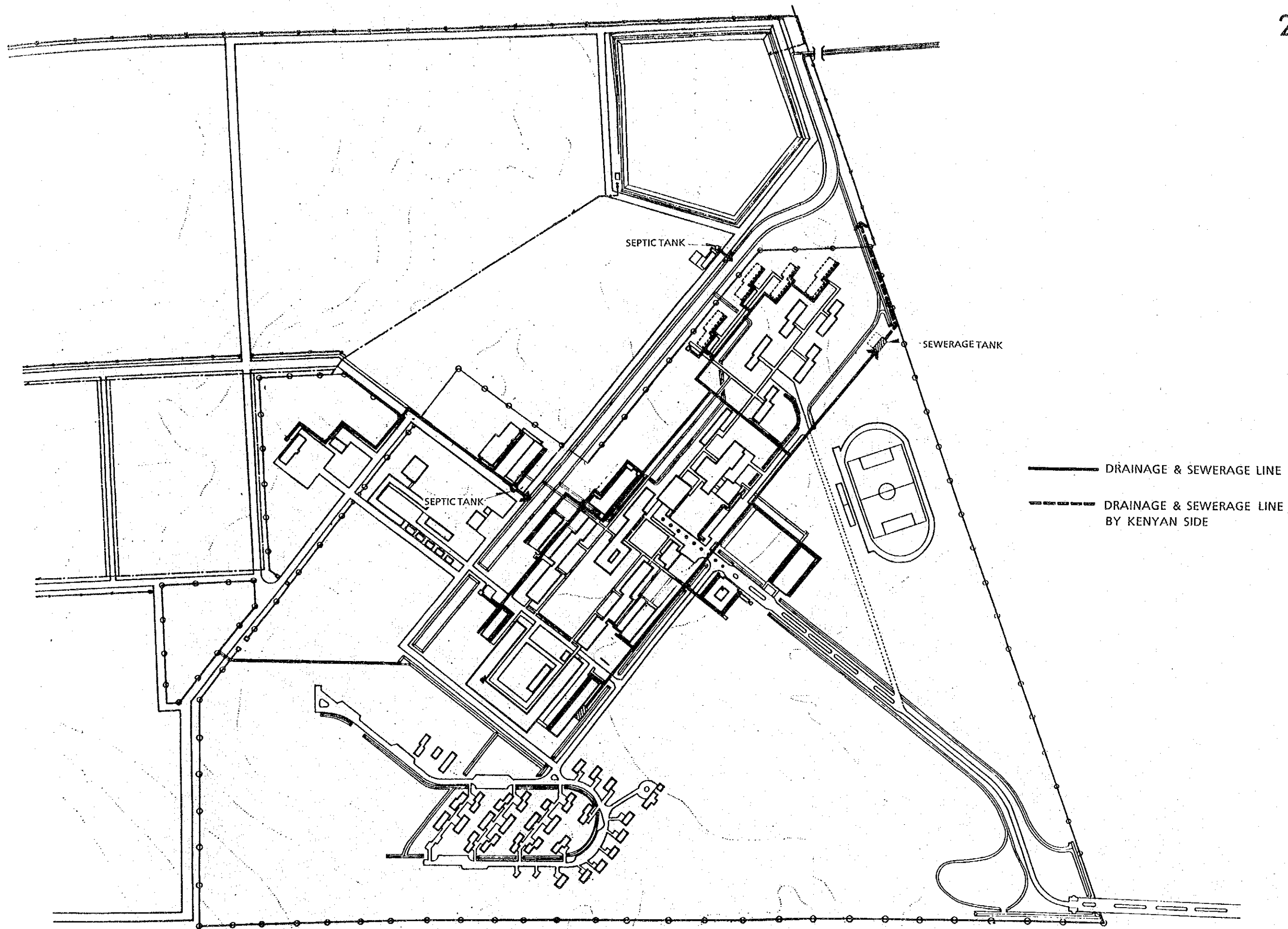
GROUND FLOOR PLAN S. 1: 400
EXISTING COMMON LECTURE BUILDING



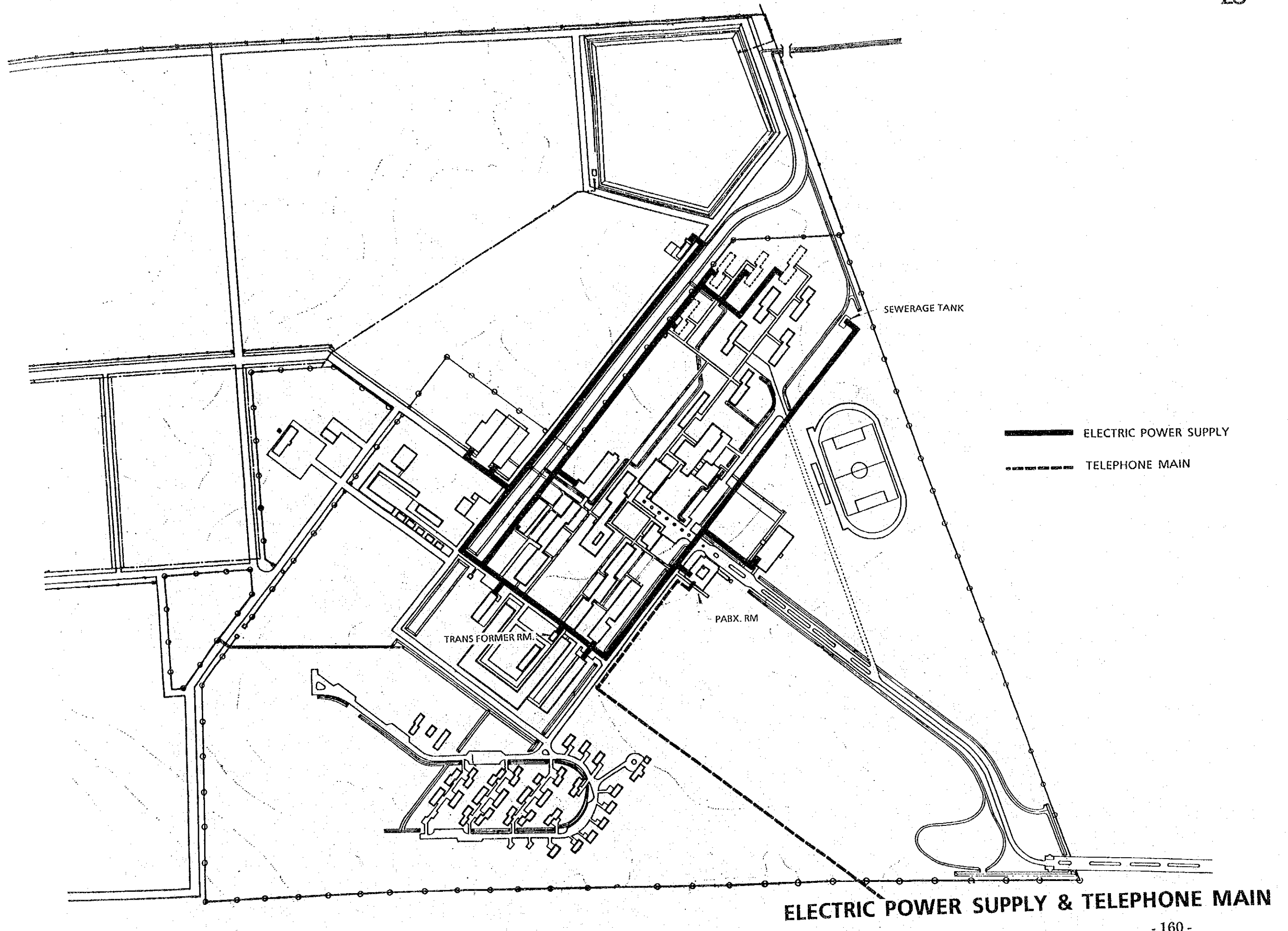
**GROUND FLOOR & 1ST FLOOR PLAN S. 1: 400
EXISTING ADMINISTRATION BUILDING**



WATER SUPPLY SYSTEM PLAN

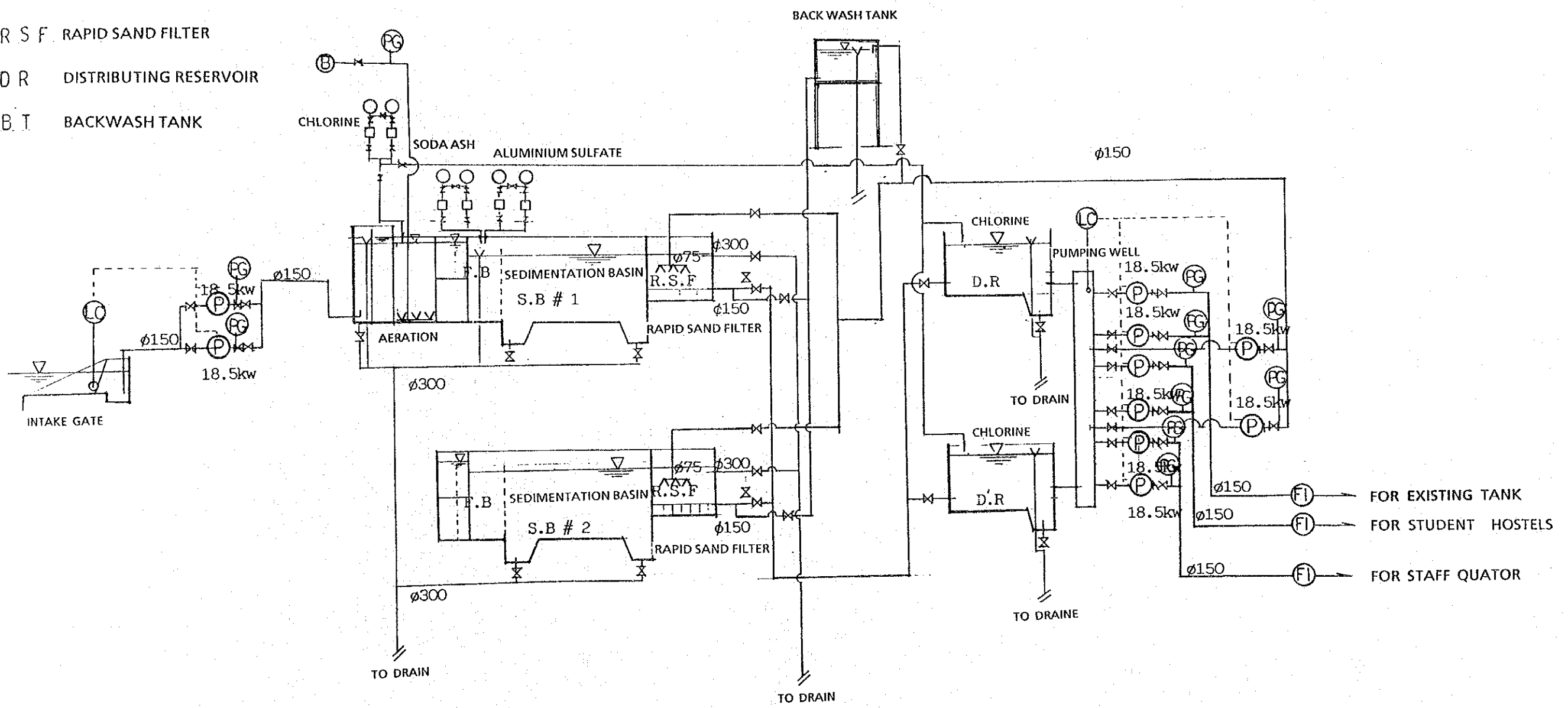


DRAINAGE & SEWERAGE SYSTEM PLAN

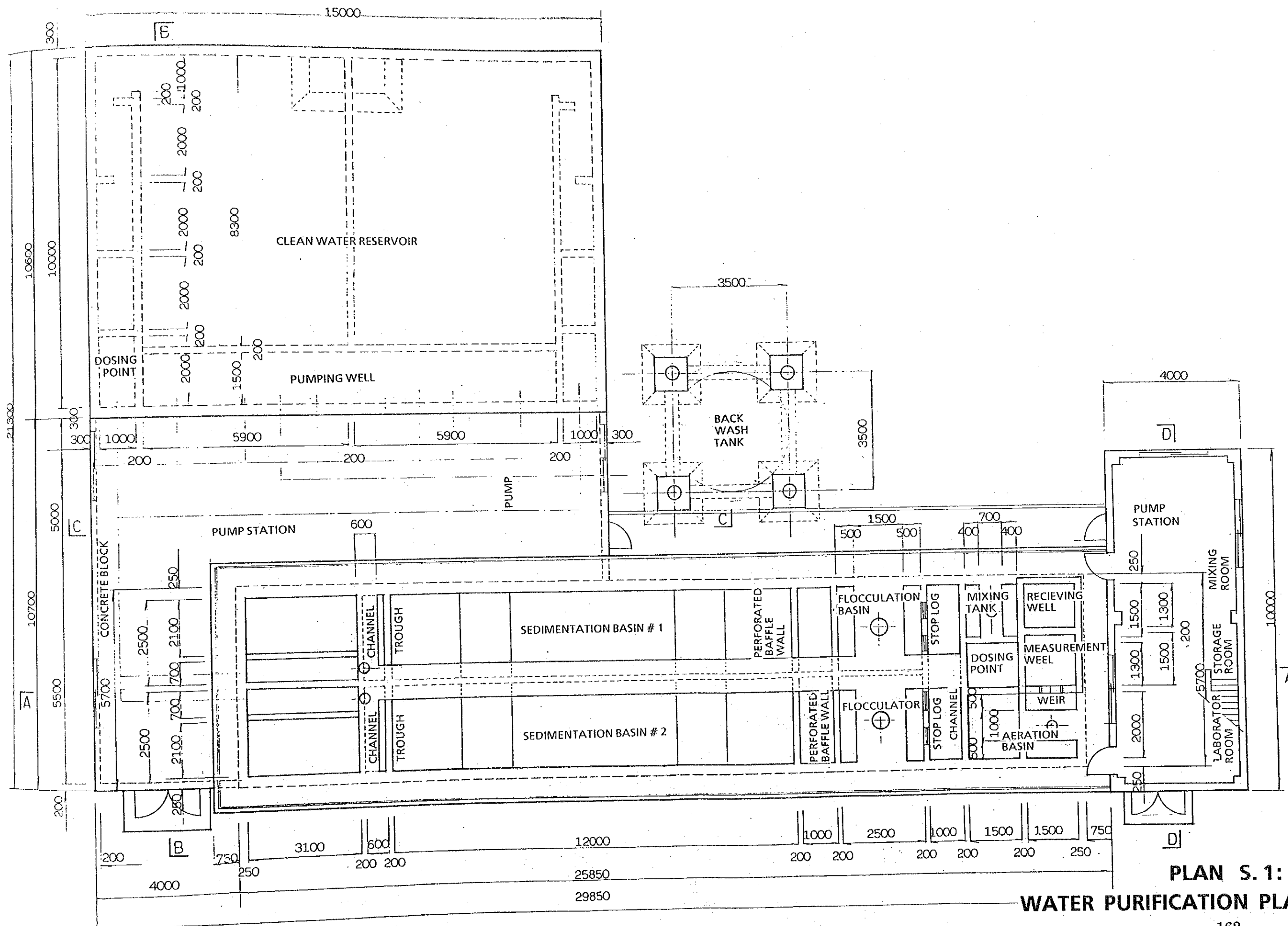


ELECTRIC POWER SUPPLY & TELEPHONE MAIN

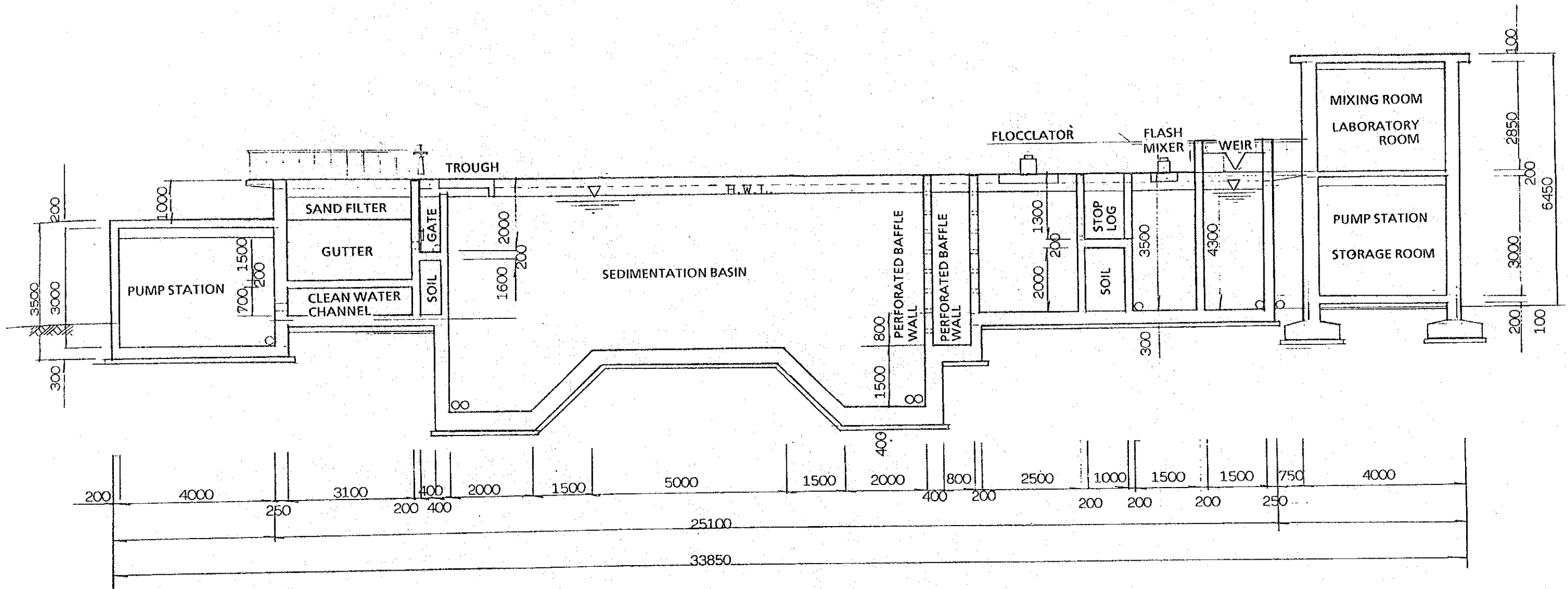
- R W RECEIVED WELL
 - M W MIXING WELL
 - A B AERATION BASIN
 - F B FLOCCULATION BASIN
 - S B SEDIMENTATION BASIN
 - R S F RAPID SAND FILTER
 - D R DISTRIBUTING RESERVOIR
 - B T BACKWASH TANK
- (P) PUMP
 - (PG) PRESSURE GAUGE
 - (LC) LEVEL CHECK METER
 - (FI) FLOW METER
 - (B) AERATION BLOW



WATER PURIFICATION SYSTEM DIAGRAM

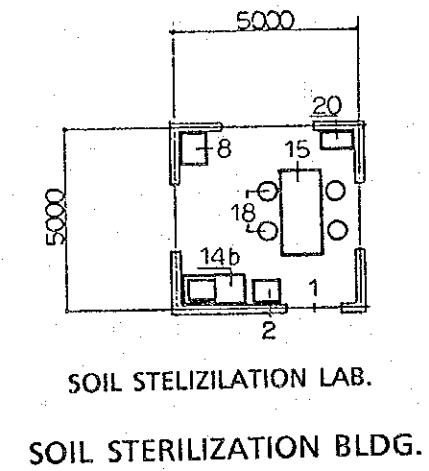
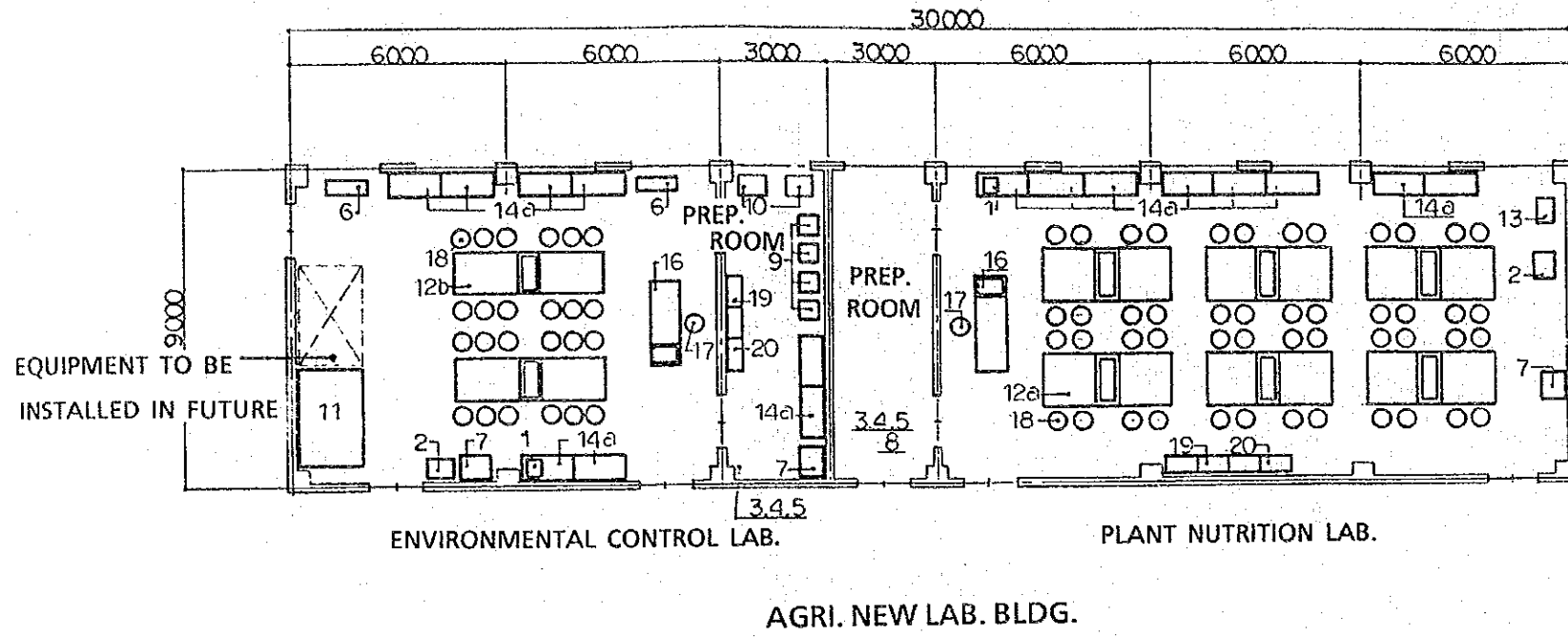


PLAN S. 1: 100
WATER PURIFICATION PLANT



A-A SECTION

SECTION S. 1: 100
WATER PURIFICATION PLANT



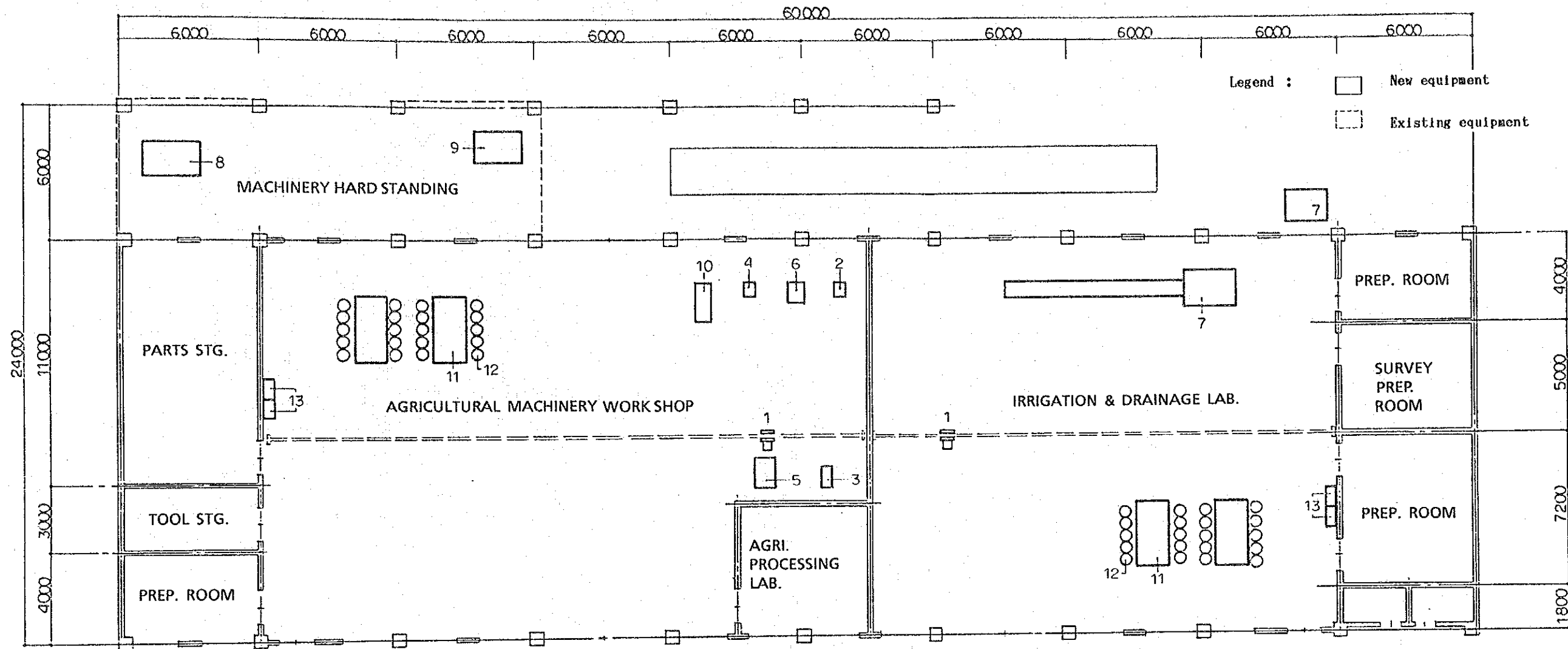
LIST OF EQUIPMENT

Item	Description	Total Q'ty	Room		
			1	2	3
A-1	Automatic Muffle Furnace	3	1	1	1
A-2	Drying Oven (Mechanical Convectional Large Type)	3	1	1	1
A-3	Kjeldahl Sets	7	6	1	
A-4	pH Meter	10	5	5	
A-5	EC Meter	10	5	5	
A-6	Hydroponic Sets	2		2	
A-7	Chemical Balance (Digital) & Table	3	2	1	
A-8	Electronic Balance	3	1	1	1
A-9	Growth Cabinets	4		4	
A-10	Phytotron Chamber	2		2	
A-11	Prefabricated Incubator	1		1	

Item	Description	Total Q'ty	Room		
			1	2	3
A-12a	Center Table with Sink	6	6		
A-12b	Center Table with Sink	2		2	
A-13	Draft Chamber	1	1		
A-14a	Side Table	16	8	8	
A-14b	Side Table with Sink	1			1
A-15	Work Table	1			1
A-16	Teacher's Table	1	1		
A-17	Teacher's Chair	2	1	1	
A-18	Student's Chair	72	48	20	4
A-19	Reagent Storage Cabinet	3	2	1	
A-20	Shelf	5	2	2	1

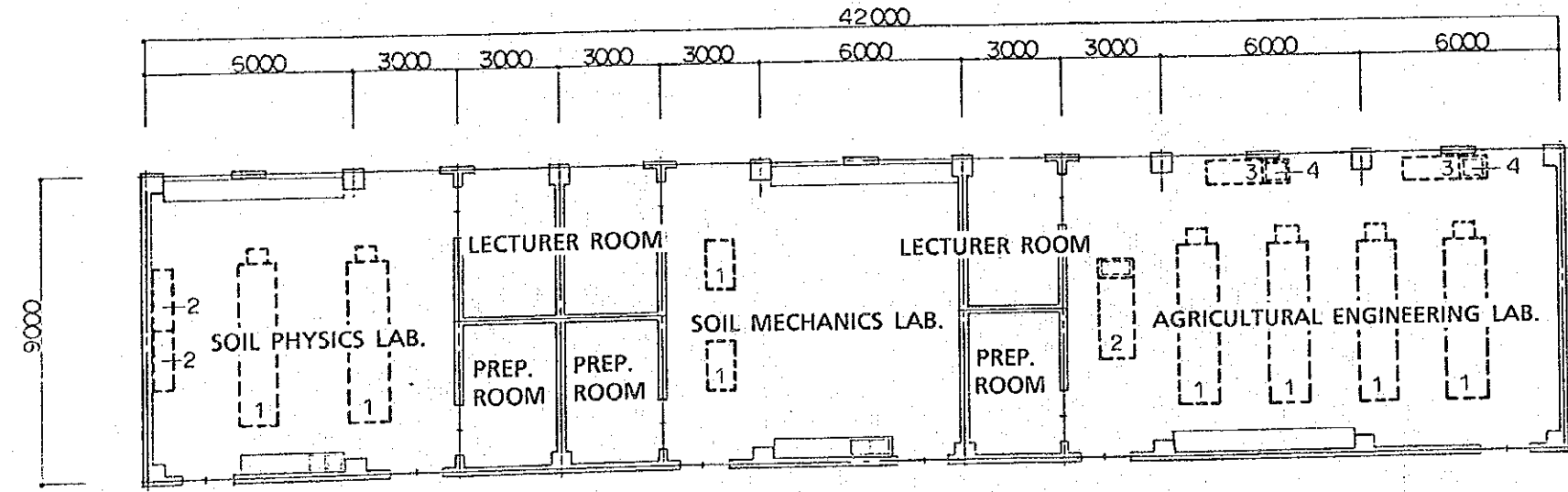
Room 1 : Plant Nutrition Laboratory
 2 : Environmental Control Laboratory
 3 : Soil Conservation Bldg.

**LAYOUT OF EQUIPMENT NO. 1 S 1: 200
 (Dept. of Horticulture)**



Legend :
 □ New equipment
 □ Existing equipment

AGRI. ENG. WORKSHOP BLDG.



AGRI. ENGI. LAB. BLDG.

[List of existing equipments to be transferred from existing Lab.]

- SOIL PHYSICS LAB
 1. LAB. CENTER TABLE
 2. STORAGE CABINET
- SOIL MECHANICS LAB.
 1. WORK TABLE

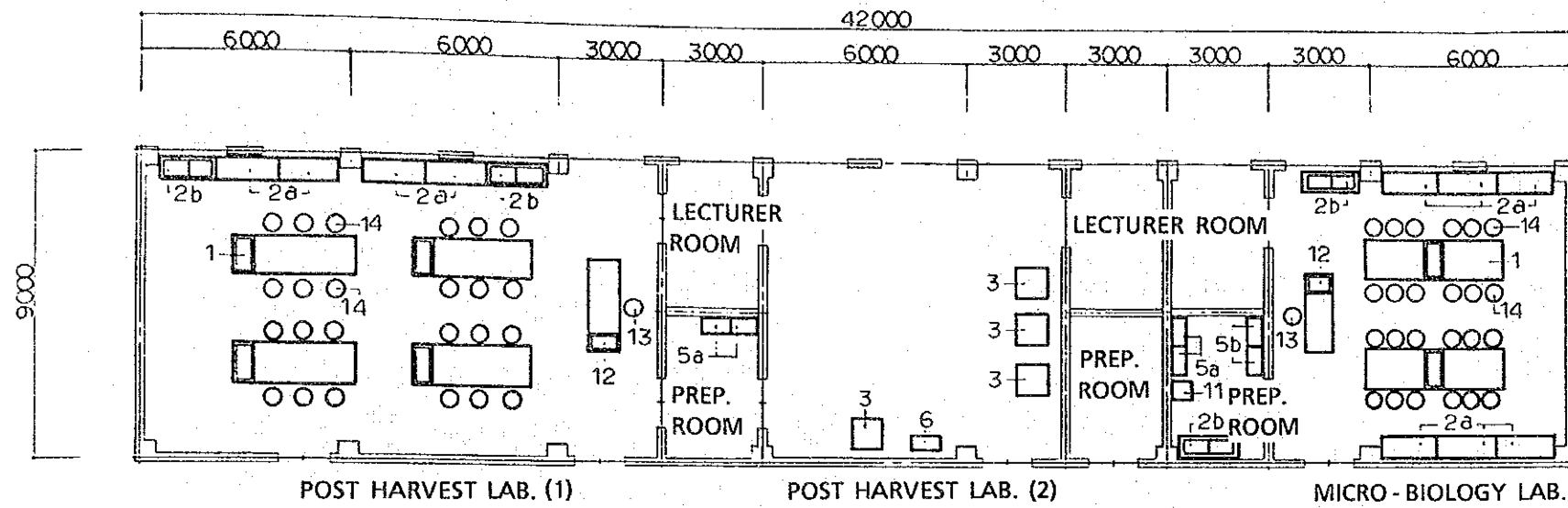
- | Q'ty | AGRICULTURAL ENGINEERING LAB. | Q'ty |
|------|-------------------------------|------|
| 2 | 1. LAB. CENTER TABLE | 4 |
| 2 | 2. LAB. TABLE (For Teacher) | 1 |
| | 3. SIDE TABLE | 2 |
| 2 | 4. SINK UNIT | 2 |

LIST OF EQUIPMENT

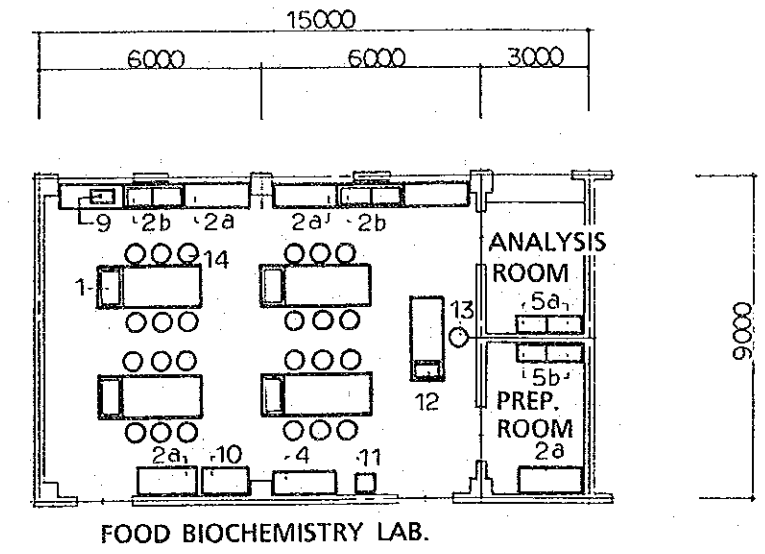
Item	Description	Total Q'ty	Room	
			1	2
B-1	Hoist Crane (3 Ton)	2	1	1
B-2	Drilling Machine (1-25 MM)	1		1
B-3	Power Hacksaw	1		1
B-4	Pedestal Grinding Machine	1		1
B-5	Power Saw (Wood)	1		1
B-6	Electric Pipe Threading Machine	1		1
B-7	Open Channel Experiment Apparatus	1	1	
B-8	Tractor (4 Wheel Drive, 70hp)	1		1
B-9	Tractor (2 Wheel Drive, 35-40hp)	1		1
B-10	Metal Shear	1		1
B-11	Work Table	4	2	2
B-12	Student's Chair	40	20	20
B-13	Shelf	4	2	2

Room 1 : Irrigation & Drainage Laboratory
 2 : Agricultural Machinery Hard Standing

LAYOUT OF EQUIPMENT NO. 2 S 1: 200
 (Dept. of Agricultural Engineering)



EXISTING AGRI. LAB. BLDG. GROUND FLOOR



AGRI. NEW LAB. BLDG. 1ST FLOOR

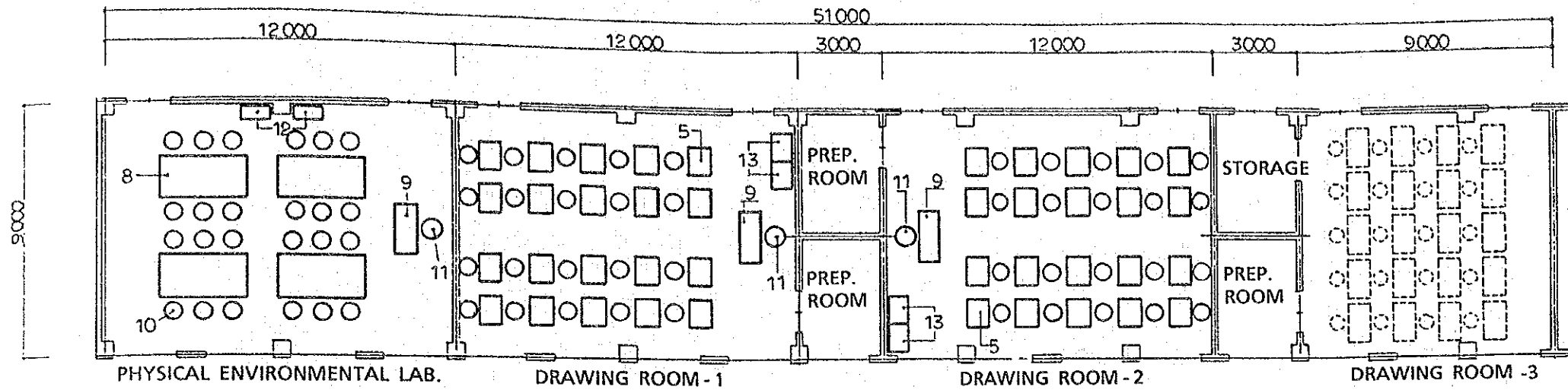
LIST OF EQUIPMENT

Item	Description	Total Q'ty	Room		
			1	2	3
C-1	Center Table	10	4	2	4
C-2a	Side Table	16	6	6	4
C-2b	Sink Unit	6	2	2	2
C-3	Constant Low Temperature & Humidity Room	4			4
C-4	Draft Chamber	1	1		
C-5a	Reagent Storage Cabinet	5	2	2	1
C-5b	Shelf	5	2	2	1
C-6	Spray Dryer	1			1

Item	Description	Total Q'ty	Room		
			1	2	3
C-7	Milling Machine	1			1
C-8	Fermentation Box	1			1
C-9	Automatic Water Distilling Apparatus	1	1		
C-10	Clean Bench	1	1		
C-11	Autoclave	2	1	1	
C-12	Teacher's Table	3	1	1	1
C-13	Teacher's Chair	3	1	1	1
C-14	Student's Chair	72	24	24	24

Room 1 : Food Biochemistry Laboratory
 2 : Micro-Biology Laboratory
 3 : Post-Harvest Laboratory

LAYOUT OF EQUIPMENT NO. 3 S 1: 200
 (Dept. of Food Technology)



Legend:
 □ New Equipment
 □ Existing Equipment / In Future Equipment

Room
 1 : Construction Material Testing Laboratory
 2 : Drawing Room - 1
 3 : Drawing Room - 2
 4 : Physical Environmental Laboratory
 5 : Architectural model Work Room
 6 : Architectural model Room

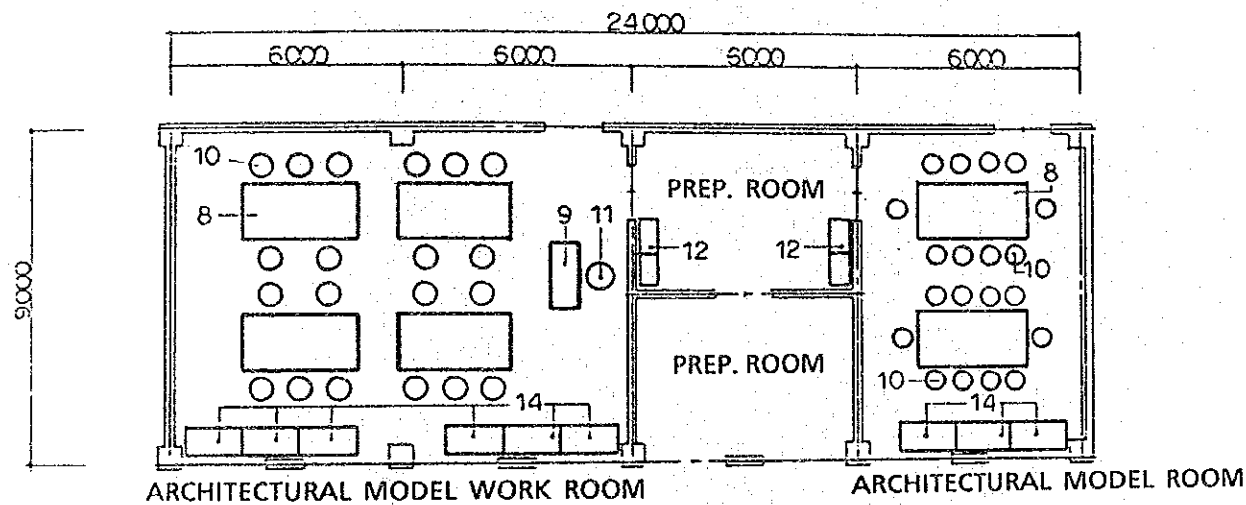
ENG. NEW LAB. BLDG. 1ST FLOOR

LIST OF EQUIPMENT

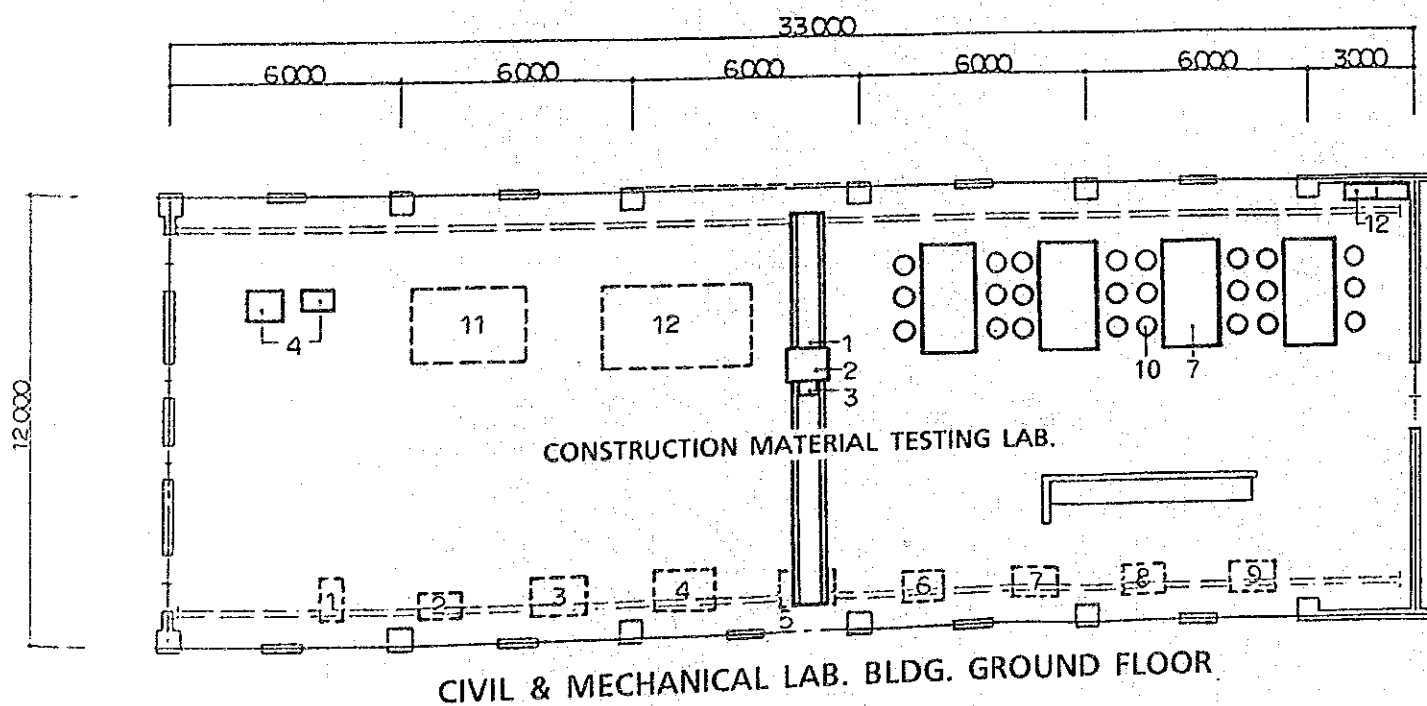
Item	Description	Total Q'ty	Room					
			1	2	3	4	5	6
D-1	Hoist Crane	1	1					
D-2	Saddle Units	1	1					
D-3	Guide Rail System	1	1					
D-4	Universal Testing Machine	1	1					
D-5	A set of Drafting Machine	40		20	20			
D-6	A set of Drawing Instruments	40		20	20			
D-7	Work Tables	4	4					
D-8	Work Bench	10				4	4	2
D-9	Teacher's Table	4		1	1	1	1	
D-10	Student's Chair	88	24			24	20	20
D-11	Teacher's Chair	4		1	1	1	1	
D-12	Shelf	8	2			2	2	2
D-13	Drawing Case	4		2	2			
D-14	Side Table	9				6	3	

(List of equipment to be installed in future)

CONSTRUCTION MATERIAL TESTING LAB.	Q'ty
1. COARSE AGGREGATE MECHANICAL SIEVER	1
2. CONCRETE MIXER	1
3. UNIVERSAL TESTING MACHINE FOR CONCRETE	1
4. UNIVERSAL TESTING MACHINE FOR TIMBER	1
5. METALLIC HARDNESS PRINT MACHINE	1
6. ASPHALT MARSHALL PLOW TEST MACHINE	1
7. ASPHALT IVEEM TEST MACHINE	1
8. CBR TEST APPARATUS	1
9. SOIL COMPACTION MACHINE	1
10. COMPRESSOR	1
11. CONCRETE STRUCTURE BENDING MACHINE	1
12. STRUCTURES VIBRATION MACHINE	1



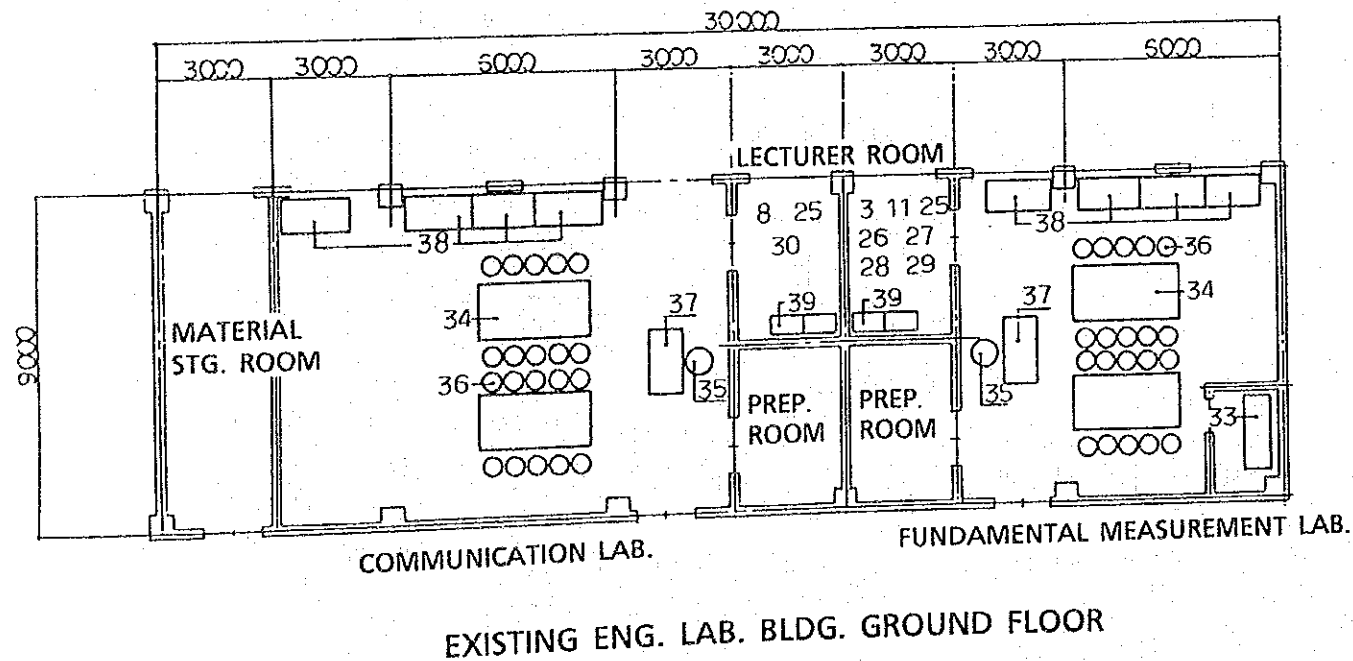
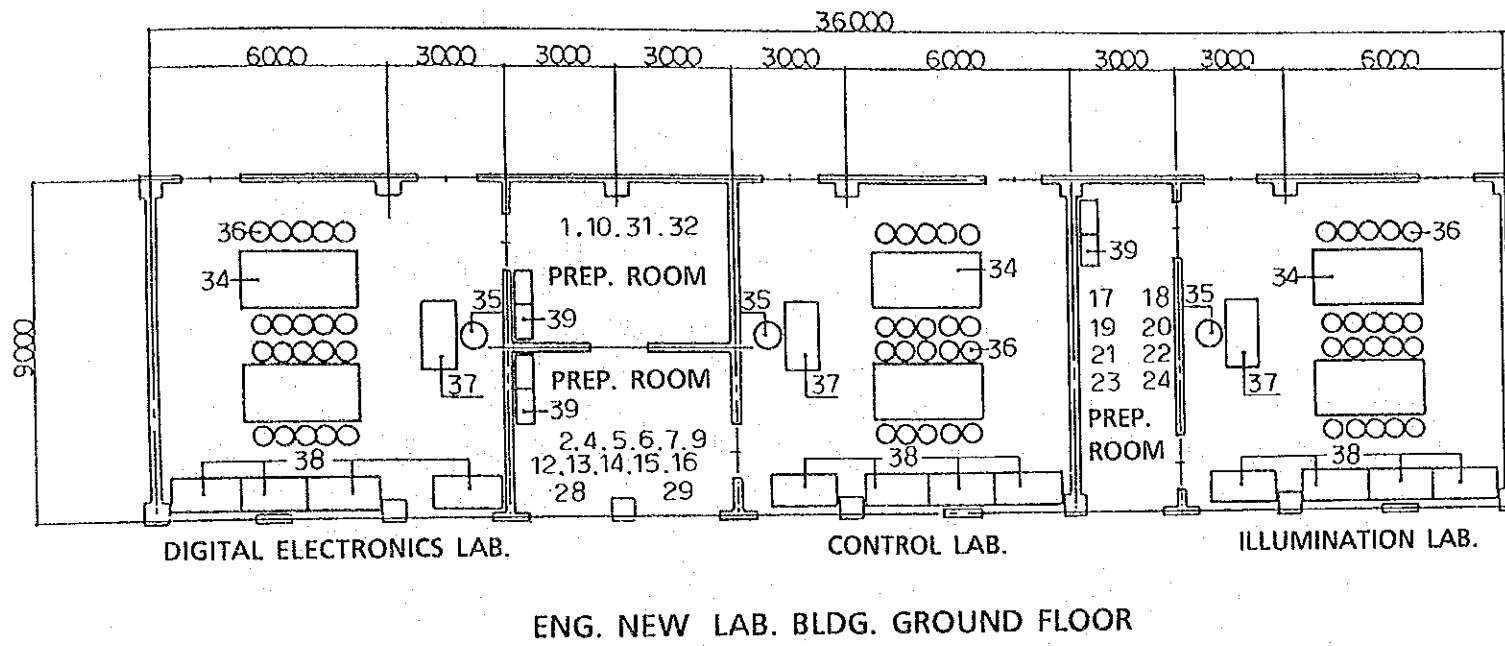
ENG. NEW LAB. BLDG. GROUND FLOOR



CIVIL & MECHANICAL LAB. BLDG. GROUND FLOOR

LAYOUT OF EQUIPMENT NO. 4 S 1: 200
 (Dept. of Building & Civil Engineering)

LIST OF EQUIPMENT

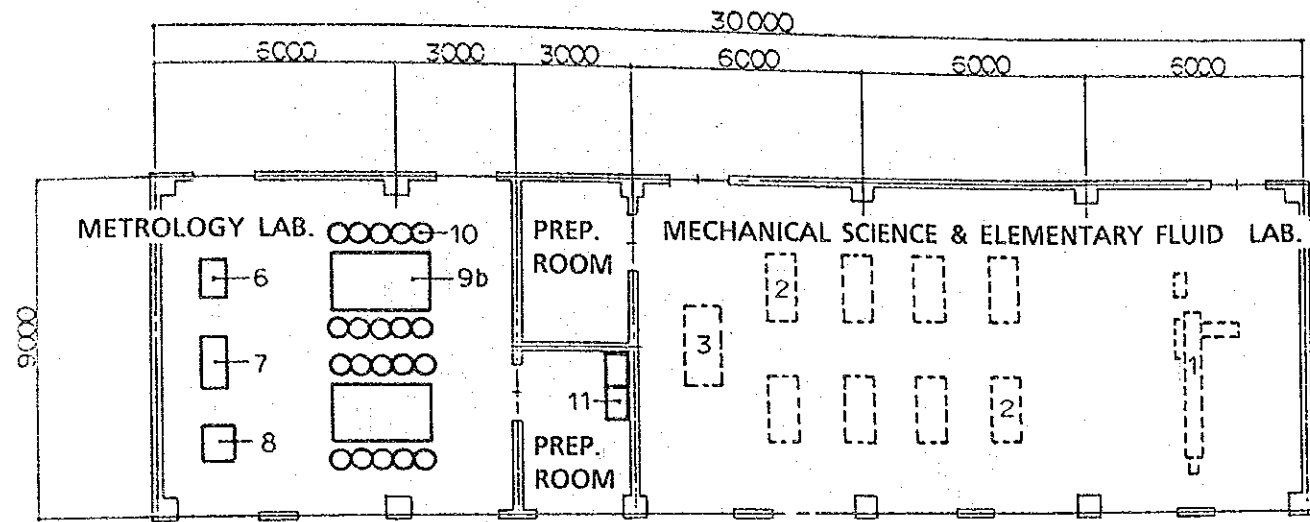


Item	Description	Total Qty	Room					
			1	2	3	4	5	
E-1	Power Electronics Control Unit	1	1					
E-2	Power Electronics Shunt Motor Control	1		1				
E-3	Transformer Trainer	1				1		
E-4	DC Servo System	1		1				
E-5	Process Control Simulator W/Personal Computer	1		1				
E-6	AC Servo System	1		1				
E-7	Thyristor Trainer	1		1				
E-8	Telephone System	1						1
E-9	Servo Feedback Unit	1		1				
E-10	Microprocessor Applications Trainer W/Personal Computer	1	1					
E-11	Transducers & Instrumentation Kit	1					1	
E-12	Variable Speed Drive Unit	1		1				
E-13	Motor Load Unit	1		1				
E-14	Power Supply Unit	1		1				
E-15	Thyristor Control of Machines Kit	1		1				
E-16	Machine Control Panel	1		1				
E-17	He-Ne Gas Laser complete Apparatus	1				1		
E-18	Optical Fiber Connector Assembly	1				1		
E-19	Experimental He-Ne Laser Beam Launching into O.F.	1				1		
E-20	Laser Power Meter	1				1		
E-21	Optical Fiber Set	1				1		
E-22	Semiconductor Laser	1				1		
E-23	E/O Converter & Modulator	1				1		
E-24	O/E Converter & Demodulator	2				2		
E-25	Oscilloscope	2						1
E-26	Sweep Generator	2					2	
E-27	Filter Circuit Trainer	2					2	
E-28	A/D Converter W/Personal Computer	2			1		1	
E-29	D/A Converter W/Personal Computer	2			1		1	
E-30	Antenna System Demonstrator	2						2
E-31	Symmetric Board Computer	2	2					
E-32	Symmetric Robot	2	2					
E-33	High Voltage Experimental Equipment	1					1	
E-34	Work Table	10	2	2	2	2	2	2
E-35	Teacher's Chair	5	1	1	1	1	1	1
E-36	Student's Chair	100	20	20	20	20	20	20
E-37	Teacher's Table	5	1	1	1	1	1	1
E-38	Side Table	20	4	4	4	4	4	4
E-39	Shelf	10	2	2	2	2	2	2

Room 1 : Digital Electronics Laboratory
 2 : Control Laboratory
 3 : Illumination Laboratory
 4 : Fundamental Measurement Laboratory
 5 : Communication Laboratory

**LAYOUT OF EQUIPMENT NO. 5 S 1: 200
 (Dept. of Electrical & Electronics)**

Legend : New equipment
 Existing equipment



ENG. NEW LAB. BLDG. GROUND FLOOR

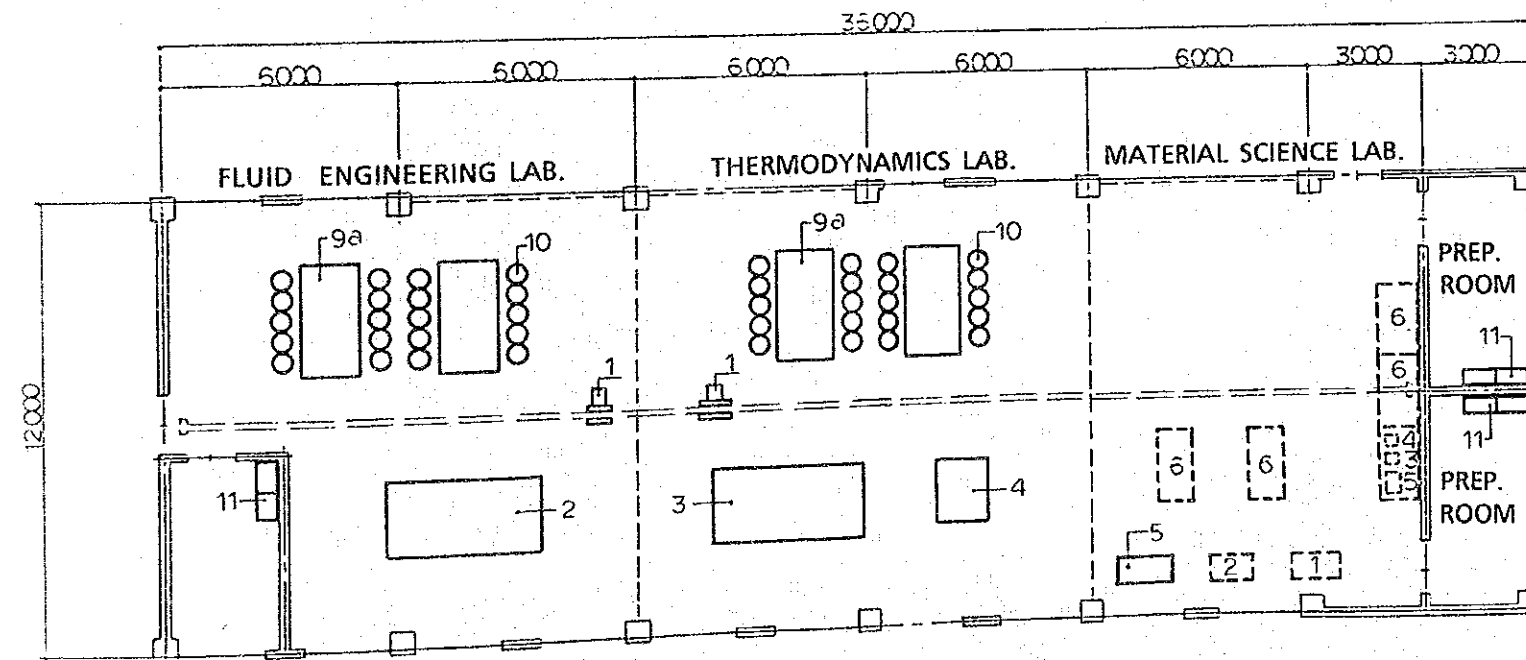
LIST OF EQUIPMENT

Item	Description	Total Qty	Room			
			1	2	3	4
F-1	Hoist with Trolley	2			2	
F-2	Total Hydraulics Experimental Equipment	1			1	
F-3	Experimental Steam Power Unit	1		1		
F-4	Experimental Device for Performance of Refrigeration & Air-Conditioning	1		1		
F-5	High Speed High Temperature Rotary Bending Fatigue Testing Machine	1				1
F-6	Dynamic Balancing Machine	1	1			
F-7	Vibration Experimental Equipment	1	1			
F-8	Process Feedback Control Study Unit	1	1			
F-9a	Work Table	4		2	2	
F-9b	Work Table	2	2			
F-10	Student's Chair	60	20	20	20	
F-11	Shelf	6	2	2	2	

Room 1 : Metrology Laboratory
 2 : Thermodynamics Laboratory
 3 : Fluids Engineering Laboratory
 4 : Material Testing Laboratory

[List of existing equipments to be transferred from existing Lab.]

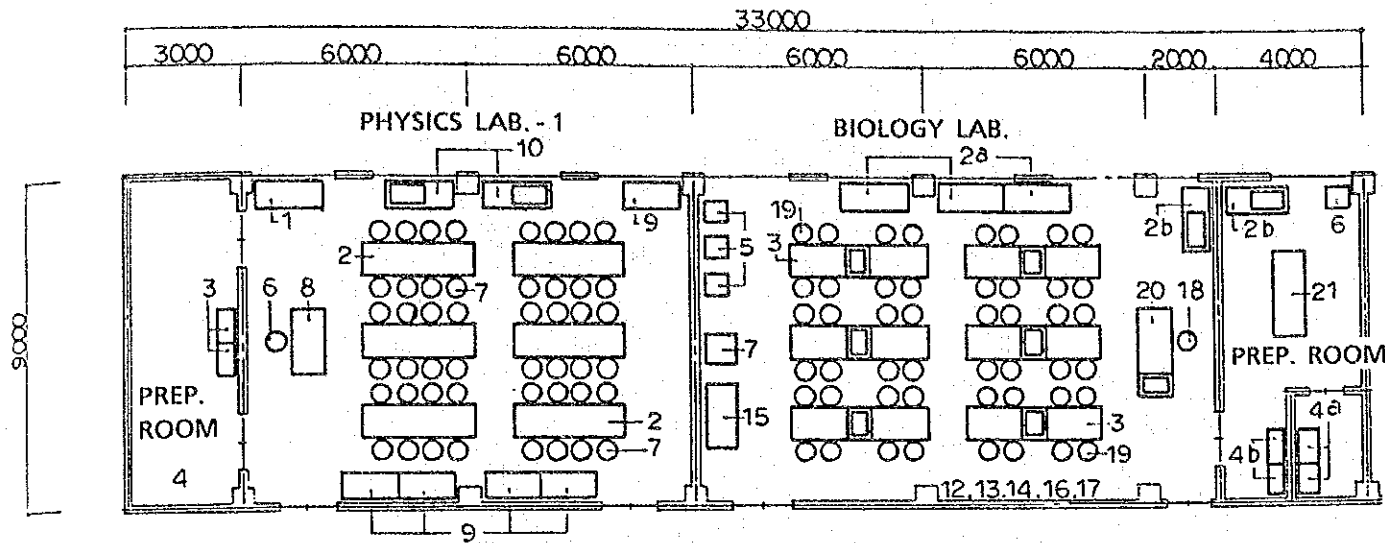
MECHANICAL SCIENCE & ELEMENTARY FLUIDS LAB.	Qty
1. PNEUMATIC EXPERIMENTAL MACHINE	1
2. WORK TABLE	8
3. TEACHER'S DESK	1
MATERIAL TESTING LAB.	
1. TORSION TESTING MACHINE	1
2. CHARPY SYSTEM IMPACT TESTING MACHINE	1
3. MICRO-VICKERS SYSTEM HARDNESS TESTER	1
4. VICKERS SYSTEM HARDNESS TESTER	1
5. BRINNELL HARDNESS TESTER	1
6. WORK TABLE	5



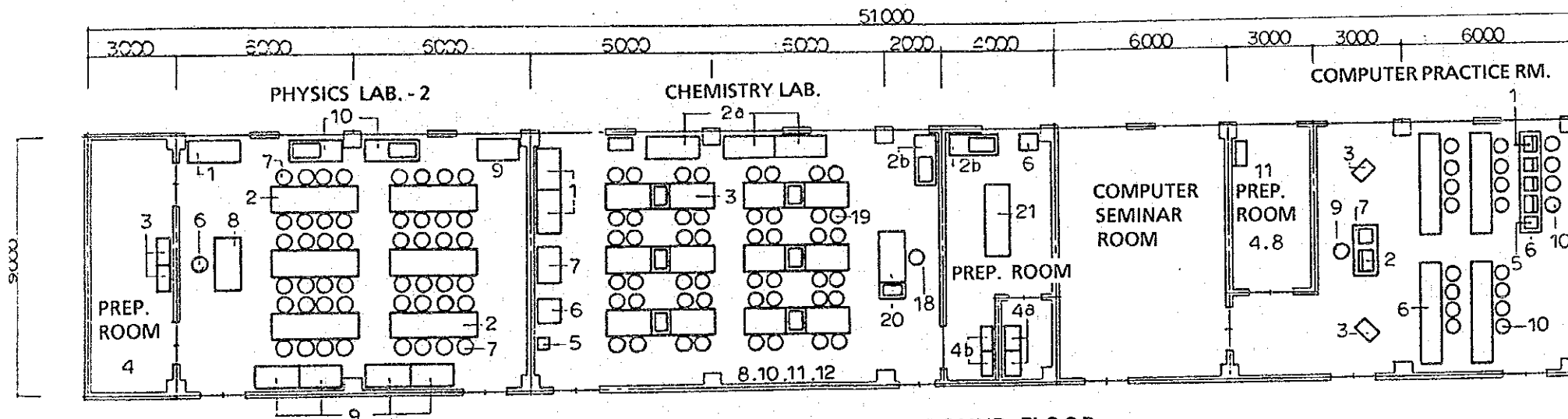
CIVIL & MECHANICAL LAB. BLDG. GROUND FLOOR

LAYOUT OF EQUIPMENT NO. 6 S 1: 200
 (Dept. of Mechanical Engineering)

G. CHEMICAL & BIOLOGY LAB.
 H. PHYSICS LAB.
 I. COMPUTER PRACTICE RM.



NEW COMMON LECTURE BLDG. 1ST FLOOR



NEW COMMON LECTURE BLDG. GROUND FLOOR

LIST OF EQUIPMENT

Item	Description	Total Q'ty	Room	
			1	2
G-1	Draft Chamber	2	2	
G-2a	Side Table	6	3	3
G-2b	Side Table with Sink	4	2	2
G-3	Center Table	12	6	6
G-4a	Reagent Storage Cabinet	4	2	2
G-4b	Shelf	4	2	2
G-5	Centrifuge	4	1	3
G-6	Laboratory Balance & Table	3	2	1
G-7	Refrigerator	2	1	1
G-8	Drying Oven	2	2	
G-9	Water Distilling Apparatus	1	1	
G-10	Constant Temperature Water Bath	1	1	
G-11	Magnetic Stirrer	6	6	
G-12	Electronic Balance	7	5	2
G-13	Biological Microscope	6		6
G-14	Stereo Microscope	6		6
G-15	Freezer	1		1
G-16	Incubator	2		2
G-17	Oven	1		1
G-18	Teacher's Chair	2	1	1
G-19	Student's Chair	96	48	48
G-20	Teacher's Table	2	1	1
G-21	Work Table	2	1	1

Room 1 : Chemistry Laboratory
 2 : Biology Laboratory

LIST OF EQUIPMENT

Item	Description	Total Q'ty	Room		
			1	2	3
H-1	Side Table	2	1	1	
H-2	Center Table	12	6	6	
H-3	Shelf	4	2	2	
H-4	Oscilloscope	4	4		
H-5	Mathematical Models	4			4
H-6	Teacher's Chair	2	1	1	
H-7	Student's Chair	96	48	48	
H-8	Teacher's Table	2	1	1	
H-9	Side Table	10	5	5	
H-10	Side Table with Sink	4	2	2	

Room 1 : Physics Laboratory -1
 2 : Physics Laboratory -2
 3 : Class Room

Item	Description	Q'ty
I-1	Personal Computer	20
I-2	Personal Computer for Teacher	1
I-3	Monitor Screen	2
I-4	Laser Pointer	1
I-5	Printer	6
I-6	Student's Table	5
I-7	Teacher's Table	1
I-8	X-Y Plotter	6
I-9	Teacher's Chair	1
I-10	Student's Chair	20
I-11	Shelf	1

Room : Computer Practice Room

LAYOUT OF EQUIPMENT NO. 7 S 1: 200
 (MATHS. & SCIENCE)

4.4 Construction Plan

4.4.1 Conditions of Local Construction Industry and Points to Note in Construction Work

(1) Conditions of Local Construction Industry

The conditions of the construction industry in Metropolitan Nairobi and the neighbouring areas are as follows:

- Most of the construction companies are managed by Indian Kenyans and the technical level of some large construction companies owned by Indian Kenyans is fairly high. While there is a good supply of unskilled workers due to the high unemployment rate, there is a shortage of skilled workers due to their small number and also due to the increasing demand for skilled workers following the construction boom after 1985.
- Although carpentry, plastering and reinforcing bar assembly have been established as specialized fields, the technical levels are much lower than in Japan. Except for painting, finishing work is often conducted by carpenters with inadequate results. Unskilled workers tend to work on a part-time basis. The required manpower level is an average of 2.5 - 3 times higher than in Japan.
- Most construction materials, except those for building services and electrical installation, are available domestically. However, it is difficult to secure the necessary quantities, except for cement and reinforcing bars, and the performance and precision of domestic materials are generally inferior to those of their Japanese equivalents.
- Construction material prices have been rapidly rising due to the recent construction boom. For example, the prices of such main materials as concrete and reinforcing bars have increased by 12 - 17% in the last 12 months. There is a critical shortage of reinforcing bars and the price has consequently sharply risen.
- According to a memorandum exchanged between the Kenyan building and civil engineering industries and the construction workers' union on December 1, 1988, the minimum wage for 1990 will be increased by an average of 10.5% from the 1989 level.

- If the Project is implemented with the grant aid cooperation of the Government of Japan, no application to those agencies responsible for construction administration will be necessary except for the application to the Ministry of Public Works for the approval of design documents which must correspond to the relevant laws and regulations in Kenya, including the Building Code.

(2) Points to Note in Construction Work

The planned buildings will be either two-storey, reinforced concrete buildings or one-storey, steel-frame buildings. While no special construction technologies will be required, the following points must be noted.

- As the existing facilities will continue to be used during the construction of the new buildings, the construction plan should minimize any disturbance to the ongoing educational activities.
- Appropriate instruction should be given to the local construction companies and manufacturers in regard to quality and process control. The dispatch of Japanese engineers may be necessary to conduct certain types of work involving materials imported from Japan and which the local skilled workers may find difficult (for example, window frame installation and steel frame assembly).
- In the case of equipment installation, except that of special equipment, the technical staff of the local agents should be able to conduct the required work, including maintenance. The dispatch of engineers by manufacturers, however, will be necessary in view of the special nature and required precision of the installation work and the necessity to provide explanations on equipment handling.

4.4.2 Project Implementation Policies

The construction of the project buildings will be conducted within the framework of the grant aid cooperation system of the Government of Japan. The Project will be formally implemented upon the signing of the Exchange of Notes (E/N) following project approval by both the Kenyan and Japanese Governments. The Kenyan Government will then select a Japanese consultant (corporation) to conduct the detailed design work for the facilities and equipment. Following completion of the detailed design documents, the Japanese construction company and equipment suppliers who are successful bidders will conduct their respective work, i.e., construction of the buildings and the supply and installation of the equipment. The basic items regarding project implementation and points for particular attention are as follows:

(1) Project Implementation Body

The Kenyan ministries responsible for the implementation of the Project and their respective assignments are as follows.

- Ministry of Education

The Ministry of Education will be the project implementation body directly responsible for the completion of the Project and will represent the Kenyan side in consultations on the Basic Design Study and work contracts. It will also be a witness to the consultancy contract.

- Ministry of Finance

The Ministry of Finance will represent the Kenyan side in the signing of the E/N and will issue the A/P. It will also countersign the consultancy and work contracts.

- Ministry of Public Works

The Ministry of Public Works is responsible for all order placement and design approval for government buildings in Kenya. In the case of the present Project, the Ministry of Public Works will be responsible for the approval of the Basic Design, signing of the consultancy contract, approval of the detailed design, being present at the tender, witnessing of work contracts and inspection of the construction work.

(2) Consultant

A Japanese consulting company (the Consultant) will conclude a design and supervision contract with the Kenyan Government to conduct the detailed design for all new buildings and equipment, the supervision of the construction work in view of the smooth implementation of building construction and equipment provision with Japanese grant aid cooperation. The Consultant will also prepare the tender documents and will conduct the tender procedure on behalf of the project implementation body.

(3) Contractor

A Japanese construction company and Japanese equipment suppliers, selected through open tender pursuant to the grant aid cooperation procedure of the Government of Japan, will conduct the construction work and equipment supply and installation work respectively.

(4) Work Implementation Plan

With regard to the work implementation plan, the Consultant and the working group will hold preparatory meetings during the detailed design study period to confirm the time of commencement and implementation for each item of work to be conducted by either the Japanese or Kenyan side so that all work is smoothly conducted.

Of the work to be conducted by the Kenyan side described in 4.4.6, site preparation (including reclamation) must be completed in accordance with the schedule prior to the commencement of the actual construction of the new buildings. The construction work process should be carefully planned in order to avoid any waiting time or retrogressing by coordinating between the delivery of those construction materials procured in Japan and the delivery of those procured locally to the site.

(5) Dispatch of Japanese Engineers

As described earlier, the Japanese manufacturers should dispatch engineers to Kenya to supervise the equipment installation work and to explain the equipment handling to the Kenyan side.

4.4.3 Construction Supervision Plan

The Consultant will organize a project implementation team to smoothly implement the detailed design and construction supervision work based on the basic design and pursuant to the grant aid cooperation procedure of the Government of Japan. At the construction supervision stage, the Consultant will dispatch on-site supervisors with appropriate expertise in the relevant construction work. In addition, the Consultant will dispatch those responsible for the detailed design to Kenya for a short period of time to inspect and supervise the work in accordance with its progress.

(1) Main Policies for Construction Supervision Plan

- Close communication between the government agencies of both countries and those responsible for work implementation should be maintained so that there are no delays in the construction schedule.
- Prompt and appropriate advice and guidance should be provided for those involved in the construction work to ensure the construction of the buildings does not deviate from the design drawings.
- Priority should be given to the adoption of local construction methods and the use of local materials.
- The technical transfer of construction methods and construction technologies should be promoted to maximize the positive effects of the grant aid cooperation.
- Appropriate advice and guidance should be provided in terms of facility maintenance following project completion to facilitate the smooth operation of the buildings.

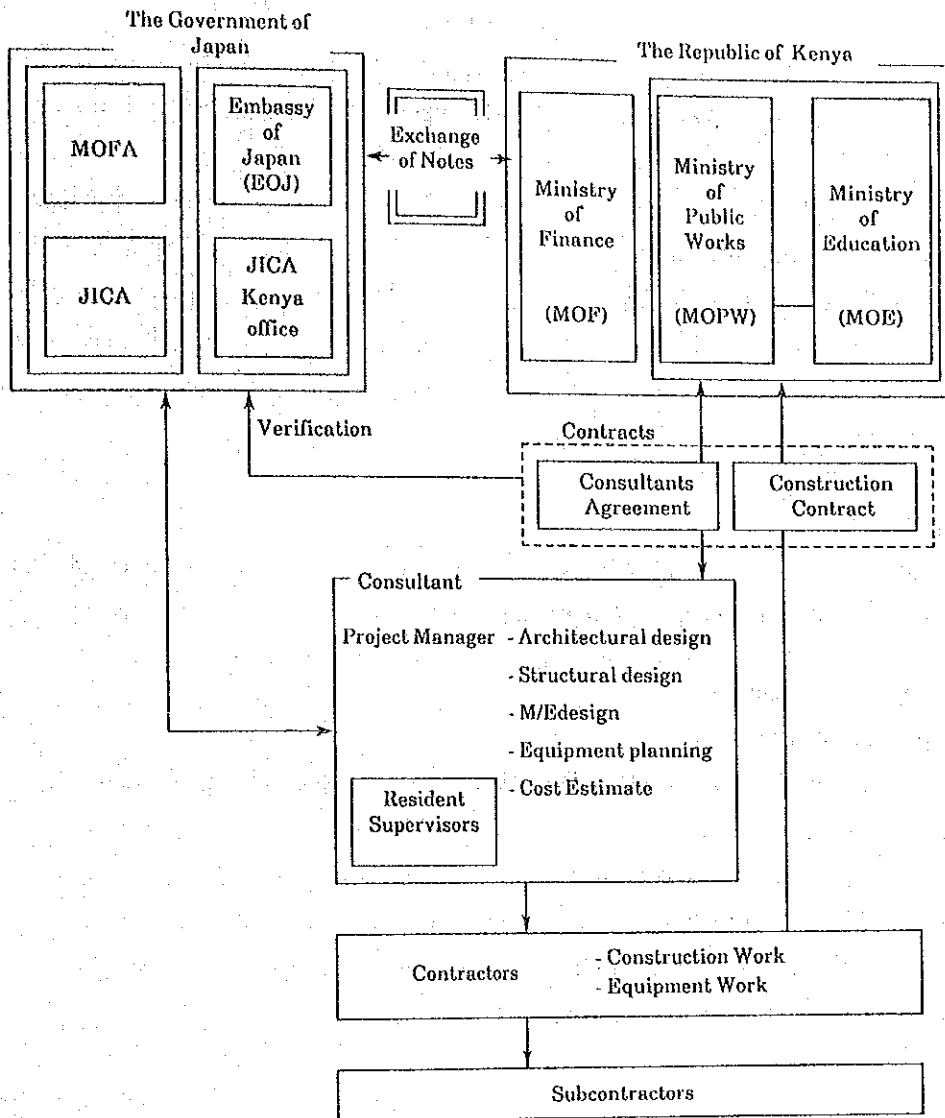
(2) Contents of Construction Supervision Plan

- Work Contract Cooperation
Selection of construction companies, decision on work contract procedure, preparation of draft work contracts, examination of work details and attendance at the signing of work contracts, etc.

- **Inspection and Confirmation of Drawings**
Inspection and confirmation of drawings, materials, finishing samples and equipment, etc., offered by the Contractor.
- **Work Supervision**
Examination of work schedule and processes, provision of guidance to the Contractor and reporting of the work progress to the project implementation body (the Employer).
- **Payment Authorization Procedure Cooperation**
Cooperation in regard to checking bills payable during and after the completion of construction work and establishing the relevant procedure.
- **Inspection**
Inspection of completed individual work when required during the construction period to advise the Contractor.
Following the confirmation of the execution of the agreed conditions for the construction work, the Consultant will be present at the time of delivery of the contracted items to obtain the approval of the Employer to conclude its assignment. The Consultant will also report to the Government of Japan on the work progress, payment procedure and relevant information regarding the delivery of the buildings and other contracted items upon their completion.

The construction supervision system and related organizations are illustrated below based on the above description of the Consultant's assigned work.

■ Executing Organizational Chart



3) On-Site Supervisors

The smooth management of the joint work by the local sub-contractors and the provision of proper technical guidance for these sub-contractors will be required for the completion of the planned facilities as indicated in the design drawings without any delay. Therefore, the on-site supervisors must have the necessary abilities and preferably also have previous experience in the construction of facilities similar to those planned in the Project so that they properly understand the nature of the Project and to ensure good building quality.

In view of the size of the buildings and the types of work involved, the following full-time on-site supervisors will be required.

● Facilities

Manager	(1):	general supervision
Construction Engineers	(2):	construction supervision and schedule control
Construction Engineer (also responsible for drawings)	(1):	work management and guidance on drawings preparation
Building Services Engineers	(2):	guidance on building services
Clerk	(1):	control of imported equipment and materials, labour management and administration

● Equipment

The dispatch of engineers will also be required to supervise installation and handling of the following equipment.

- analysis equipment
- computer equipment
- teaching equipment for the department of Electrical and Electronic Engineering
- test benches and environmental experiment equipment
- water channel for debris flow experiments
- processing machinery (overhead crane and universal lathe, etc.)
- spray dryer for food processing tests

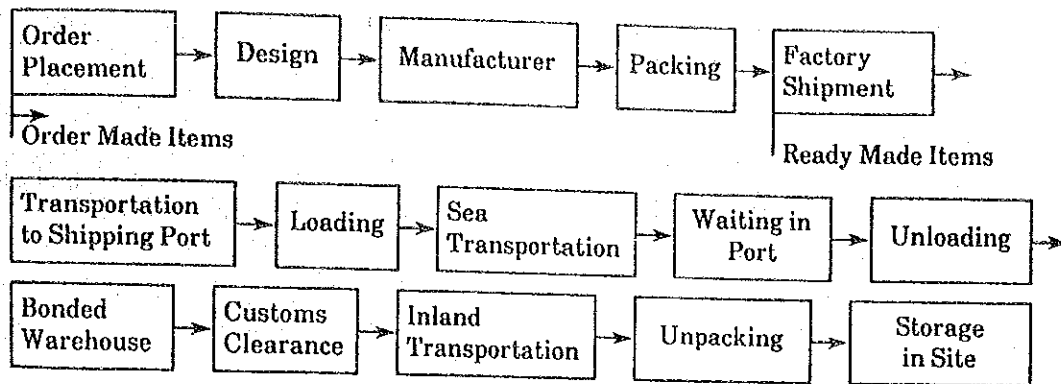
4.4.4 Equipment and Materials Procurement Plan

(1) Construction Work

The following points should be carefully noted in the procurement of the equipment and materials for the construction of the new JKUCAT buildings.

1) Procurement in Japan

As the delivery of the equipment and materials to be procured in Japan on special order (i.e., steel doors and window frames, transformer, panel boards and power switchboards, etc.) will require more time than the delivery of those readily available in the local market due to such processes as order placement, design (and design approval), manufacture, packing and transportation, order placement must be coordinated with the progress of the construction work.



In addition, as the landing and customs clearance procedures at the port of arrival may take a long time, close contact with the project implementation body in Kenya must be maintained to ensure that these procedures are smoothly handled.

2) Local Procurement

Local procurement should be promoted as much as possible in view of the ease of obtaining equipment and materials and the subsequent maintenance and repair of the facilities. However, those items whose quality or available quantity appear inadequate should be procured in Japan.

3) Cost

In principle, the cheapest supply sources will be selected by comparing the procurement costs of domestic and Japanese suppliers for each item. In the case of a minimal cost difference, local procurement should be given priority in view of easy maintenance, providing the quality is satisfactory. For those items to be procured in Japan, the fact that the cost includes packing, transportation and insurance but excludes import tax should be carefully noted. Based on the above considerations, the procurement of the following items for the new JKUCAT buildings is planned.

Work Type	Equipment & Materials	Local Procurement	Procurement in Japan	Remarks
Structural Work	Aggregates	o		steady supply of crushed stones produced in Tandoula near Nairobi
	Cement	o		based on BS but quality is not uniform
	Concrete	o		
	Reinforcing Bars	o		twist bars (high tension round bars (normal)) based on BS are available but harder & less fragile than Japanese products
	Forms	o		previous use of less frequency than those in Japan
	Structural Steels	o	o	heavy structural steels to be procured in Japan; only cold processing products made in Kenya; press products imported but supply is unstable
	Concrete Blocks	o		not usable for pressure resistant walls; lack of uniform strength due to inadequate control on BS requirements, order-made production & curing period
Building Work	Timber	o		based on BS; cypress, podo & cedar products formerly available but felling of podo and cedar has been banned since 1984; distortion generally tends to be large due to insufficient drying
	Steel Doors & Window Frames	o	o	local products inferior in terms of air and water tightness; substitutes for wood products

	Aluminium Frames		0	
	Hardware		0	based on BS; locally produced using imported parts; bulk local purchase is impossible; master key system is virtually unavailable in Kenya
	Plaster Work	0		both materials and skilled workers are abundant
	Terrazzo	0		Local and imported chips are available; white cement is exclusively imported & is therefore expensive and not readily available; import of white cement from Japan should be considered; terrazzo in Kenya generally means on-site terrazzo application
	Grinding	0		both materials and skilled workers are abundant
	Tiles	0	0	most semi-ceramic & ceramic tiles are imported from Europe; distortion & irregularity are more noticeable than Japanese products
	Stones	0		so-called Nairobi stones are widely used
	Slate	0		more fragile than Japanese products
	Paint	0	0	many types but less durable than Japanese products; special paint should be imported from Japan
	PVC Tiles	0		based on BS; local products are fragile due to high asbestos content, procurement of products with certain colours is difficult due to limited stock (import from Japan may be necessary depending on supply situation)

Air-Conditioning & Sanitary Work	PVC Sheets		o	no local products suitable for laboratory floor
	Rockwool Acoustic Boards		o	no local products
	Glass	o		locally available except special glass
	Roof Tiles	o		cement & clay tiles are widely used; either ready made or order made; as the stock level of ready made tiles is low, tiles are usually ordered
	Parquet Flooring	o		used as a relatively high class floor material in Kenya with sufficient supply
	Ventilation Fans		o	local products mainly for home use
	Pumps		o	high performance pumps not produced locally
	Steel Pipes	o	o	based on BS; local products may break at joints due to thinner thickness than JIS products; joints have pinholes as pipes are not seamless, causing quality problems; import from Japan may be necessary when high quality & strong steel pipes are required
	Steel Joints		o	based on BS; mostly imported from India, Taiwan & China; quality of these imported products is not high & it is realistic to plan import from Japan
Sanitary Items	o	o	based on BS; quality of local products is not high but used for local housing; buildings in Nairobi generally use imported products	

Electrical Work	Vinyl Chloride Tubes		0	based on BS; mostly imported; import of Japanese products may be necessary when high quality & strong pipes are required
	Concrete Pipes	0		based on BS; sufficient supply of local products
	Kitchen Appliances	0		most items for business use are imported
	Septic Tank			local products cannot meet water discharge quality standard
	Panel Boards & Switchboard		0	virtually not produced locally
	Power Boards & Lighting Switchboard		0	breakers for these boards are not produced locally
	Lighting Appliances	0	0	use of local products depends on application purposes; based on BS; local products (partially KD products) are adequate for general purposes but not many types are available
	Lamps	0		based on BS; both fluorescent & incandescent lamps are locally produced with sufficient supply
	Telephone Switchboard		0	high performance switchboards are all imported
	Broadcasting Equipment		0	system unit not produced locally
	Fire Warning Equipment		0	not produced locally
	Electric Wires & Cables	0	0	based on BS; sufficient supply of local products for ordinary purposes
	Wiring Tubes		0	quality of local products is low
Socket Outlets	0		based on BS; local & imported products are marketed with sufficient supply except those for special purposes	

(2) Equipment Work

Most of the workshop and laboratory equipment to be provided for educational purposes with the expansion of JKUCAT is not available locally and, therefore, will be procured in Japan. As most of the equipment to be imported is not mass-produced but is specially ordered, the design and manufacturing period must be taken into consideration in the equipment procurement plan.

The equipment to be procured in Japan will include precision equipment and extreme care must be taken in regard to the sea and land transportation of this type of equipment. In addition, the dispatch of specialized engineers will be necessary for the installation of the equipment at JKUCAT. In the case of high standard educational equipment, a training period should be provided following its installation for the Kenyan staff operating the equipment in view of its efficient use.

4.4.5 Implementation Schedule

Following the decision on the expansion of JKUCAT with the grant aid cooperation of the Government of Japan, the actual construction work and equipment transfer will be conducted in three stages, i.e., (i) preparation of the detailed design documents following the signing of the E/N by the two countries, (ii) tender and construction contracts and (iii) actual construction. The Ministry of Education will be responsible for the implementation of the Project on the Kenyan side following the signing of the E/N.

(1) Detailed Design

The tender documents will be prepared on the basis of the Basic Design and will include detailed design drawings, specifications, bills of quantities and price analyses, etc. Close consultations between the Consultant and the Kenyan side will be held at the initial, half-way and final stages of the detailed design work and the tender process will commence after approval of the final detailed design by the Kenyan side. The periods required to complete the detailed designs are expected to be 3 months for the first phase, 2 months for the second phase and 2 months for the third phase.

(2) Tender

Following the completion of the detailed design, applications for the preliminary qualification examination will be invited. Based on these examination results, the project implementation body will invite qualified bidders for open tender with the attendance of all related parties. If the contents of the bid with the lowest price are assessed as appropriate, the bidder will be announced successful and will conclude the contract with the Kenyan Government. The period required to complete the process from tender announcement to the signing of the contract is expected to be 2 months for the first phase.

(3) Building and Equipment Work

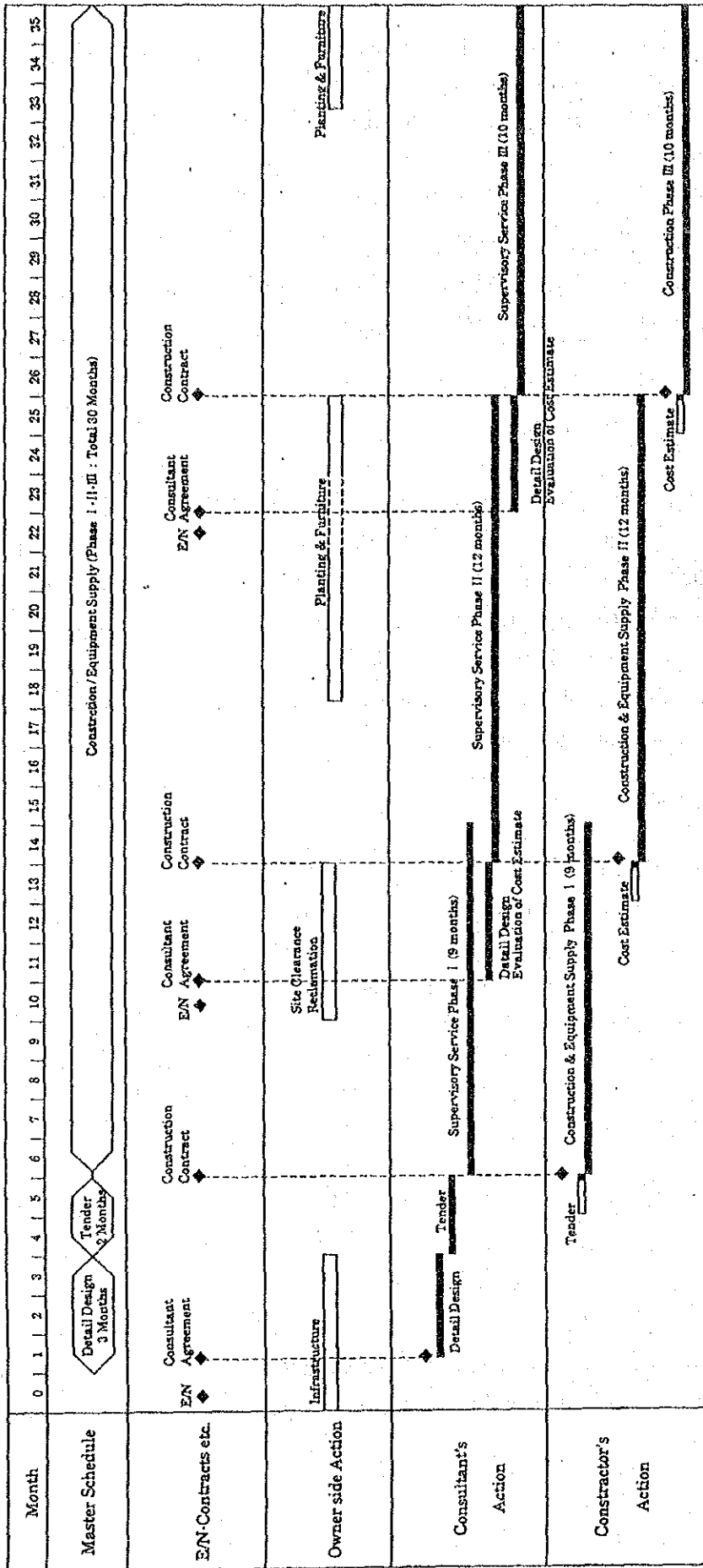
After the signing of the construction contract, the Contractor will commence the work on receipt of verification from the Government of Japan. In view of the size and contents of the facilities to be constructed, the periods required to complete the work are expected to be 9 months for the first phase, 12 months for the second phase and 10 months for the third phase provided that the procurement of the construction materials and the preparation work by the Kenyan side are smoothly conducted.

The contents of the building and equipment work in each phase are expected to be as follows:

First Phase

- Building
 - 1. New Common Lecture Building
- Service Facilities
 - 1. Water Purification Plant
 - 2. Elevated Water Tanks (2)
 - 3. Sewerage Tank
 - 4. Power Facility
- Exterior
 - 1. Covered Way
 - 2. Perimeter Fencing of Water Purification Plant
 - 3. Others
- Equipment
 - 1. Teaching Equipment for New Common Lecture Building

Project Implementation Schedule



Second Phase

- Buildings
 1. Agricultural New Laboratory Building
 2. Agricultural Engineering Laboratory Building
 3. Agricultural Engineering Workshop Building
 4. Soil Sterilization Building
 5. Engineering New Laboratory Building
 6. Civil and Mechanical Engineering Laboratory Building
 7. Machinery Hardstanding Building
- Exterior
 1. Covered Way
 2. Paving of Premises Roads
 3. Others
- Equipment
 1. Teaching Equipment for Faculty of Agriculture
 2. Teaching Equipment for Faculty of Engineering

Third Phase

- Buildings
 1. Library
 2. New Administration Building
 3. Canteen Building
 4. Conversion of Existing Library and Administration Building
- Service Facility
 1. Telephone Exchange System
- Exterior
 1. Covered Way
 2. Paving of Premises Roads
 3. Others (Flag Pole, Name Plates and Signposts, etc.)

4.4.6 Estimated Project Cost

(1) Classification of Work Responsibility

It should prove appropriate to classify the work relating to the improvement and expansion of the JKUCAT in the following manner.

1) Work to be Undertaken by Government of Japan

Buildings

(Faculty of Agriculture)

- Agricultural New Laboratory Building
- Agricultural Engineering Laboratory Building
- Agricultural Engineering Workshop Building
- Soil sterilization Building

(Department of Engineering)

- Engineering New Laboratory Building
- Civil and Mechanical Engineering Laboratory Building
- Machinery Hardstanding Building

(Common for Faculties of Agriculture and Engineering)

- New Common Lecture Building for Faculties of Agriculture and Engineering
- Library
- Resource Center
- New Administration Building and Maintenance Workshop
- Canteen
- Water Purification Plant

Equipment

- Teaching equipment

Building Services

- Water supply system
- Power receiving and transforming system
- Telephone system

Outdoor Facilities

- Premises roads and carpark
- Covered way
- Drainage system
- Outdoor lighting

Related Work

- Transportation of equipment and materials from Japan to Kenya
 - Land transportation of equipment and materials from the port of arrival to the project site.
- 2) Work to be Undertaken by Government of Kenya
- Removal of buried objects on the premises and land preparation work, including reclamation, prior to the commencement of the construction work.
 - Implementation of auxiliary outdoor work, including landscaping and the construction of perimeter walls and gate.
 - Provision of such services as electricity, water, telephone and drainage to the site.
 - Provision of standard office furniture and fixtures, etc.
 - Payment of bank transfer costs.
 - Provision of appropriate measures regarding the landing, tax exemption, customs clearance and land transportation of the equipment and materials to be procured in Japan with Japanese grant aid cooperation.
 - Exemption of Japanese nationals engaged in the supply of equipment and materials and labour for the Project from any financial levies enforced in Kenya, including customs duties and domestic taxes.
 - Provision of all conveniences for the above Japanese nationals visiting and staying in Kenya to conduct work based on certified contracts.
 - Proper maintenance and control of the facilities and equipment provided by Japanese grant aid cooperation.
 - Payment of all project-related costs outside the scope of the Japanese grant aid cooperation.
 - Provision of adequate budget and manpower to properly manage and maintain the facilities and equipment provided by Japanese grant aid cooperation.

(2) Cost to be Borne by Government of Kenya

The Government of Kenya has already applied the funds for the Project in its fiscal 1989 budget (July, 1989 - June, 1990) as shown below.

	<u>Budget</u>
Land Preparation and Reclamation (Second Phase)	3,307,000 K.sh
Premises Road Construction (Gate - Student Dormitories)	947,000 K.sh
Premises Road Construction (Gate - Staff Housing)	1,666,000 K.sh
Relocation of Existing Fences	250,000 K.sh
Improvement of Graduation Court	667,000 K.sh
Telephone Extension	740,000 K.sh
Drainage Construction (some 800m Outside Premises)	552,000 K.sh
Bank Commission	455,000 K.sh
Sub-Total	<u>8,584,000 K.sh</u> ①

In addition to the above, it is estimated that the Government of Kenya will also be required to secure the following amount in fiscal 1989 with the confirmation of the Project implementation through Japanese grant aid assistance.

Student Dormitories (4 buildings with total floor area of 6,831m ³)	65,950,000 K.sh
Landscaping	650,000 K.sh
Furniture and Fixtures	5,000,000 K.sh
Sub-Total	<u>71,600,000 K.sh</u> ②
Total (① + ②)	<u>80,184,000 K.sh</u>

The Government of Kenya plans the following annual budgetary appropriation for the Project to conduct the work for which it is responsible.

(Unit: 1,000 K.sh)

	1989/90	1990/91	1991/92	1992/93	1993/94	1994/95
Staff Housing	25,000	35,000	45,000	30,000	13,000	-
Infirmery	4,000	6,000	2,000	-	-	-
Staff Centre	-	5,000	4,000	2,000	-	-
Sports Facilities	2,000	2,000	2,000	1,000	-	-
Primary School	-	5,000	5,000	2,000	2,000	1,000