

5-8-2. Plumbing Planning

1). Source of Water Supply

Municipal water is not supplied to KMITL and Ladkrabang district, where the existing facilities use wells. Water supply to the proposed facilities will be provided by a well in proximity to the construction site through a water storage tank of the facilities.

Capacity of water supply to the water storage tank shall be more than 40m^3 per hour.

2). Water Supply System

Water will be pumped up from the water tank to an elevated water tank, and then is distributed to the various locations in the facilities by gravity water supply system. This system will be most suitable on stable water volume and pressure as well as simple operation and maintenance.

3). Water Drainage System

Water drainage is divided to 4 systems; sewage, general water, storm water and laboratory water, to be designed to fully utilize a function of the buildings.

a. Sewage System

Sewage from lavatories will be flushed to a septic tank for secondary treatment, and then joined in general water drainage. Although no regulation on sewage discharge control is applied to Ladkrabang district and KMITL, the plan spontaneously employs U.S.A. Graphic standard to show an example of environmental pollution control measure.

b. General Water Drainage System

General water from the various sources will come together outside of the buildings, and then will be flushed into drainage ditch which will be connected to water channels around the facilities. KMITL has a

plan to cope with flood during rainy seasons by adjusting water level in water channels of the campus by pumping.

c. Stormwater Drainage System

Drainage of rain on roofs of the buildings and area around the facilities will be done through same system as general water drainage.

d. Laboratory Water Drainage System

Water containing acid and alkali will be diluted and neutralized in neutralization tank, before joined in general water and then flushed to drainage ditch.

4). Sanitary Fixture

Sanitary fixture will be installed in lavatories, wash rooms, and laboratories. Type of fixture in lavatories will be of Thai style for students and administrative staff, and partly of Western style in the lavatories around waiting rooms for foreign instructors. Flushing equipment will be of flush valve type.

5). Sewage Treatment System

Although widely used system in Thailand is of ground filtration type (primary treatment), in the facilities septic tank system with secondary treatment will be installed on account of relatively simple operation and maintenance.

6). Gas Supply System

LPG gas, rather than municipal gas, is available in Thailand. In this plan, a central gas distribution system will be installed at exterior to be supplied to laboratories and other rooms. To prevent an accident of abnormal high pressure caused by exterior air temperature, appropriate location of exterior piping and installation of safety valves will be considered as important element of the system. As special gas used in laboratory, such as hydrogen, oxygen and nitrogen, will be of small amount of volume, small gas cylinders will be used in the

laboratory areas. LPG and special gas can be supplied from Ladkrabang district and Bangkok metropolitan area.

7). Drinking Water Supply

Drinking water tanks, widely used water supply system in Thailand, will be installed at places instead of piping supply. KMITL will furnish the tanks, which are easily available in Ladkrabang district.

8). Fire Extinguisher

KMITL will furnish fire extinguishers which will be installed at required places in the facility. Exterior and interior fire hydrant systems are not planned because of difficulty of maintenance.

5-8-3. Electrical Planning

1). Main Electrical

(1) Transformer Sub-Station System

* Main Power Supply System

Electricity will be supplied through power line of Metropolitan Electricity Authority (MEA) along Lamplatew Road on north side of the proposed site.

Incoming voltage: 3ϕ , 3W, 22kV, 50Hz

* Receiving and Transformer System

Transformer system in the proposed facilities will be centralized to one location, and transformers will be installed at exterior.

Power supply load will be as follows:

- a) General lighting and outlet
- b) Airconditioning and ventilation
- c) Water supply equipment
- d) Laboratory equipment and machinery

Low tension central distribution panel will be installed at interior for operation and maintenance, and then connected to individual distribution panels.

(2) Telephone Main Supply System

* Telephone Incoming

Existing telephone system is connected to Bangkok through microwave line. At present, Telephone Organization of Thailand (TOT) is installing telephone network cable in Ladkrabang district. On completion of the proposed facilities, telephone cable will be installed on same route as power supply, and will be connected to switch board installed in the new administration office.

* Telephone Exchange System

New switch board will be installed in the proposed facilities. KMITL requested 20 lines connection from TOT line. Individual telephone units will be installed in selected rooms of an central administration building.

* KMITL Internal Extension System

An exchange system of the existing facilities will be mutually connected to the proposed one through TOT line, to allow internal communication.

2). General Power Supply System

(1) Main Power Line

Electricity distribution work is planned for airconditioning, ventilation, water supply, laboratory equipment and machinery, and lighting. Distributed voltage will be as follows:

- a) General lighting and outlet load:
3 phase 4 line 380V/220V
- b) Airconditioning, ventilation and water supply load:
3 phase 3 line 380V
- c) Laboratory equipment and machinery:
3 phase 4 line 380V/220V

(2) Listing Fixture

Light Source and Fixture

In order to reduce operating cost and to achieve high efficiency, luminescent light of direct installation type is mainly used. Light sources in selected rooms are as follows:

Flourescent lamp: Office, meeting room, laboratory room and class room

Incandescent lamp: Hall

Mercury vapor lamp: Exterior lighting

A circuit will be separated for individual turning on and off of light in each room so as to reduce the operating cost.

* Designed Intensity of Illumination (TIS Standard)

- Office and conference room: 350 - 400lx. (35 - 40 f/cd)
- Class room and meeting room: 300 - 350lx. (30 - 35 f/cd)
- Corridor and hall: 100 - 110lx. (10 - 15 f/cd)

(3) Fire Alarming System

Display panel will be installed in an office to indicate a source of fire by manual division, which is activated by manual operation of bell and buzzer.

(4) TV broadcast Receiving System

An antenna will be installed on a roof to be connected to outlets in telecommunication laboratory room and office to receive 4 VHF waves.

(5) Lightning Protection System

Rod type is generally used in Thailand and radio isotope type is used for the important buildings, to be installed on the top of building. Radio isotope type will be installed in the proposed facilities.

(6) Exterior Lighting System

Exterior lighting will be planned in the area around the proposed facilities, with automatic turn-on and off.

5-8-4. Demarcation of Mechanical and Electrical Works

After discussion with KMITL, on an occasion of basic design field study, concerning demarcation of responsibility of both governments on principal electric and mechanical work, basic understanding was confirmed as follows:

Boundary: 10m radius in perimeter of the proposed facilities

1). Water Supply

Thailand: to install water pipes from the well to the boundary along with terminal valve

Japan: to install valve at a site boundary and rest of water supply system

2). Water Drainage

Thailand: to provide the drainage system outside of the boundary

Japan: to install drainage system from the facilities and drainage ditch to the boundary

3). Power Supply

Thailand: to install metering outfit (MOF) at the electric poles inside of the boundary which will be installed by Japan, and to connect it to power lines

Japan: to install the electric poles and power supply system beyond MOF

4). Telephone Mainline

Thailand: to furnish wiring up to main distribution frame (MDF)

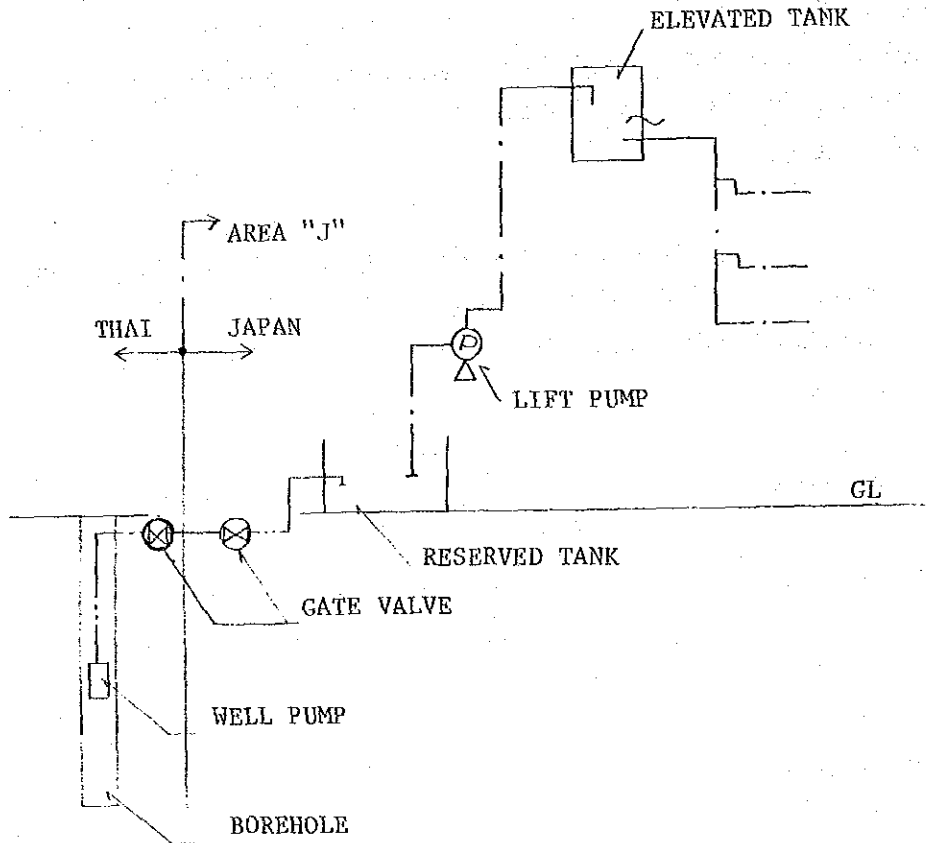
Japan: to install telephone poles in the site, to furnish wiring from the poles to MDF in the building, and further to a switch and internal extension system

Note: The following diagrams illustrate demarcation of both countries' responsibility on water supply, water drainage, power supply and telephone mainline.

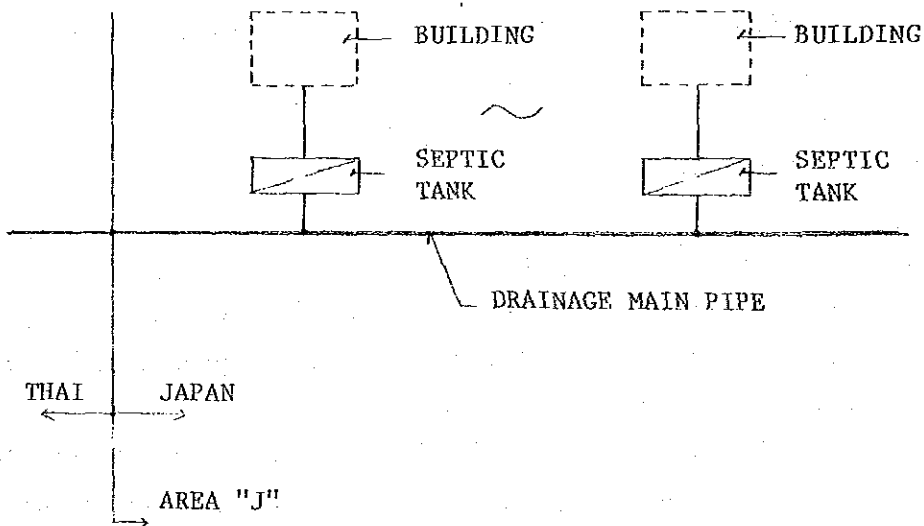
Demarcation of Works to be Done by Thai/Japan Side

AREA "J" : within boundary line of works to be done by Japanese side

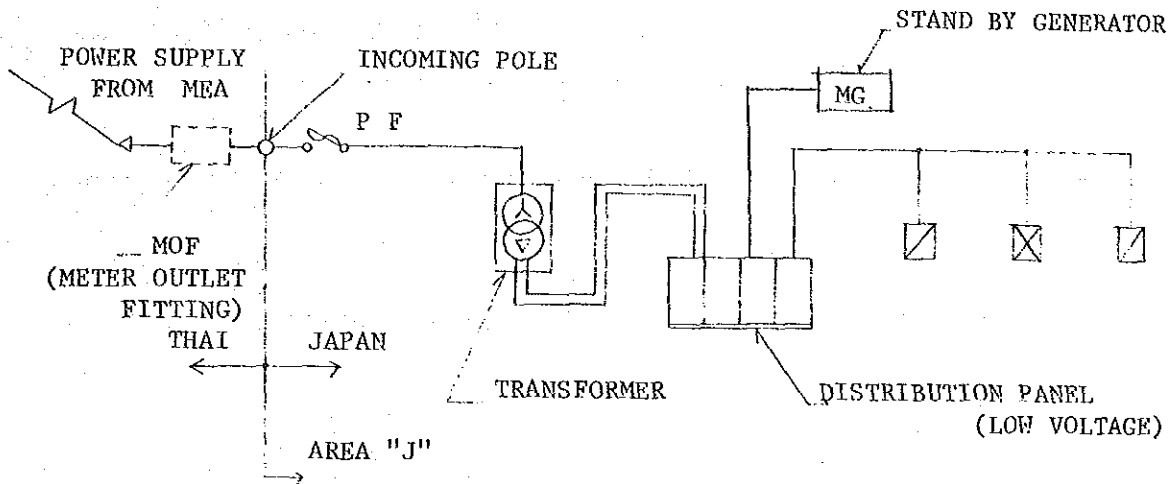
A. WATER SUPPLY



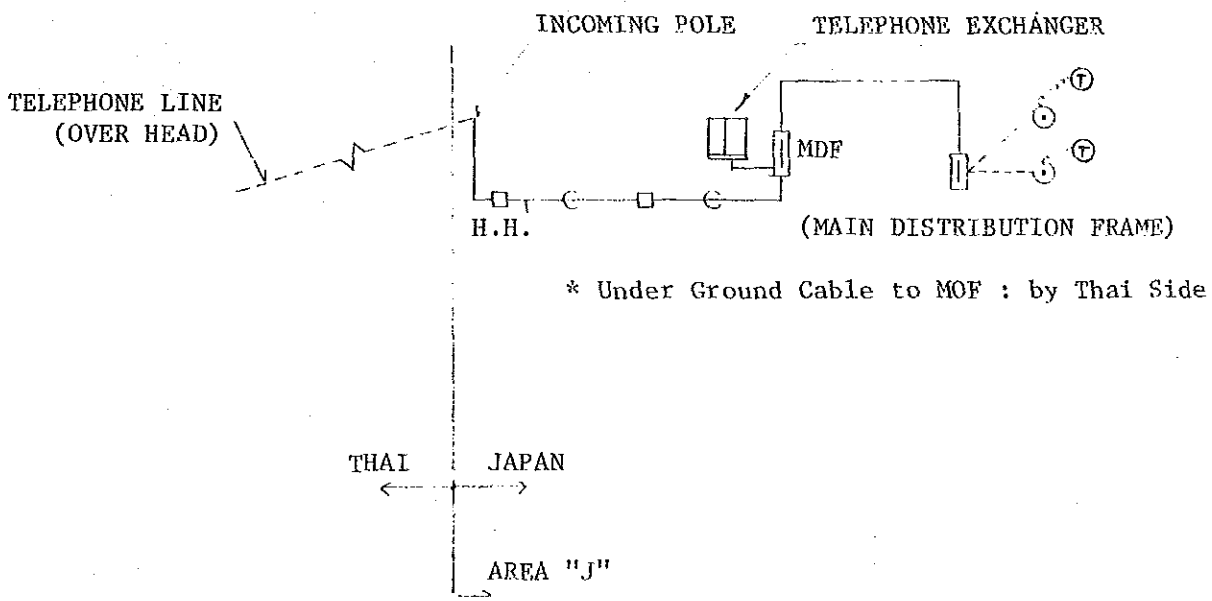
B. DRAINAGE



C. ELECTRICAL POWER SUPPLY



D. TELEPHONE MAIN LINE



5-9. Equipment Planning

Selected equipment are listed in APPENDIX-9. Criteria of selecting equipment are shown as follows.

- 1). Appropriate equipment and grade shall be selected in regard to educational course of basic study and laboratory.
- 2). Equipment shall be easily maintained with minimum maintenance cost.
- 3). Equipment KMITL faculty and staffs are accustomed to use shall be selected.
- 4). Periodical maintenance and spare parts for the selected equipment shall be easily provided in Thailand.

DRAWINGS OF BASIC DESIGN

01. MASTER PLAN
02. SITE PLAN
03. 1ST FLOOR PLAN
04. 2ND FLOOR PLAN
05. 3RD FLOOR PLAN
06. 4TH & 5TH FLOOR PLAN
07. ELEVATIONS
08. SECTIONS
09. PLAN, ELEVATION & SECTION FOR DORMITORY
10. WATER SUPPLY & DRAINAGE SYSTEM
11. ELECTRICAL SUPPLY SYSTEM

THE UNIVERSITY OF CHICAGO

PH.D. THESIS

DEPARTMENT OF CHEMISTRY

PHYSICAL CHEMISTRY

BY

JOHN H. VAN VLECK

1931

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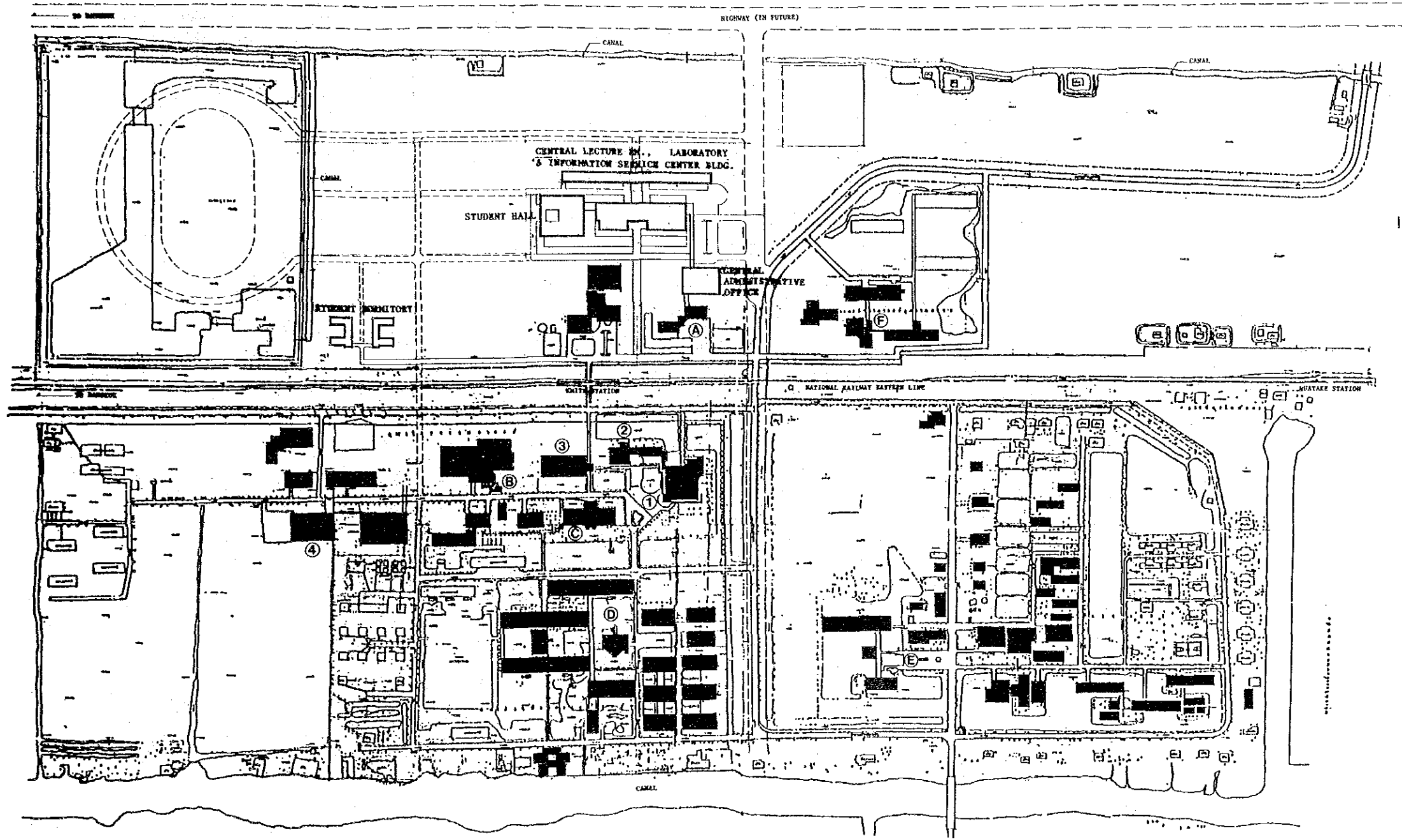
PHYSICAL CHEMISTRY

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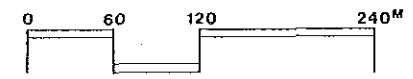


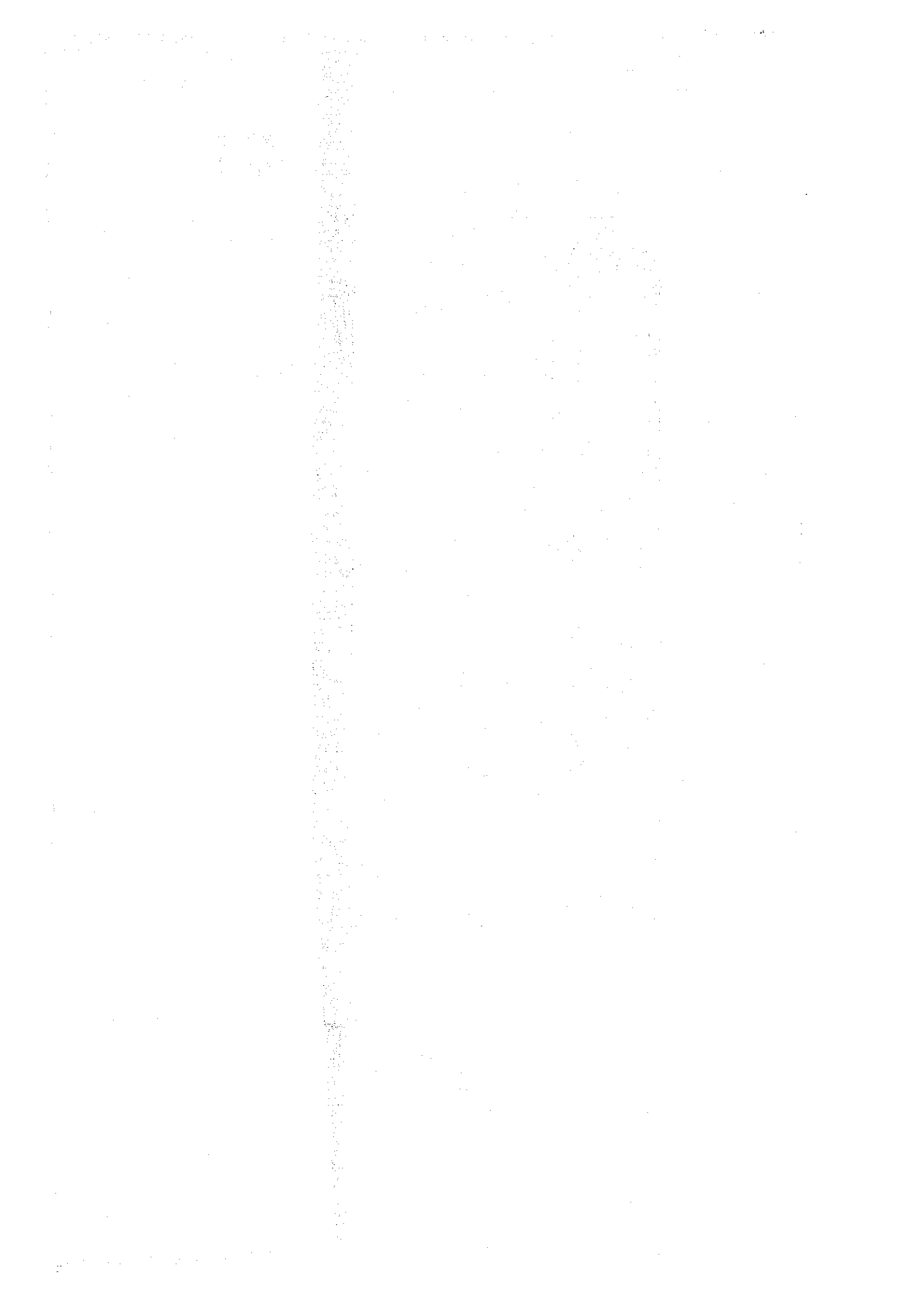
THE LECTURE ROOM BUILDING KING MONKGUT'S INSTITUTE OF TECHNOLOGY

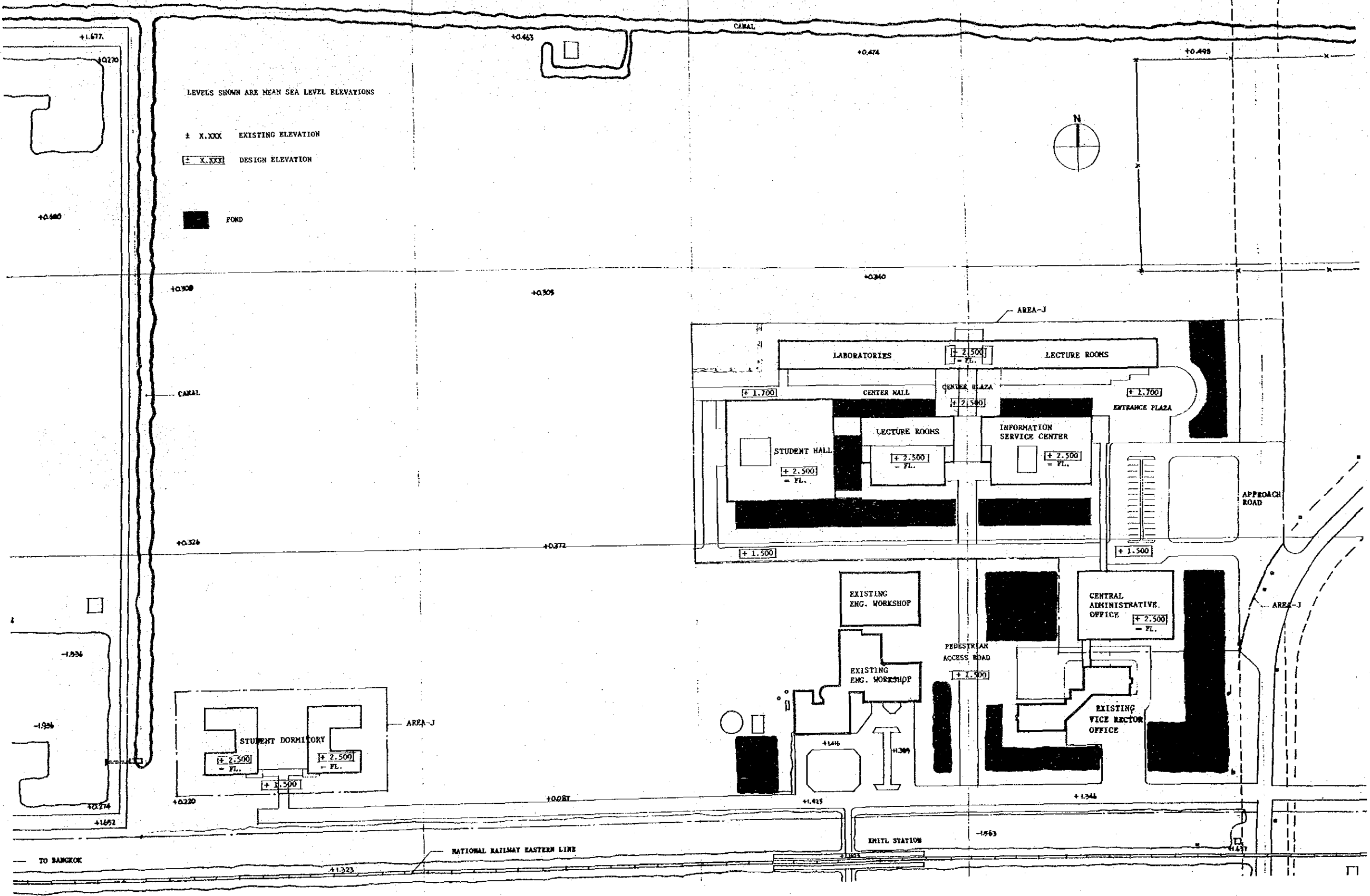


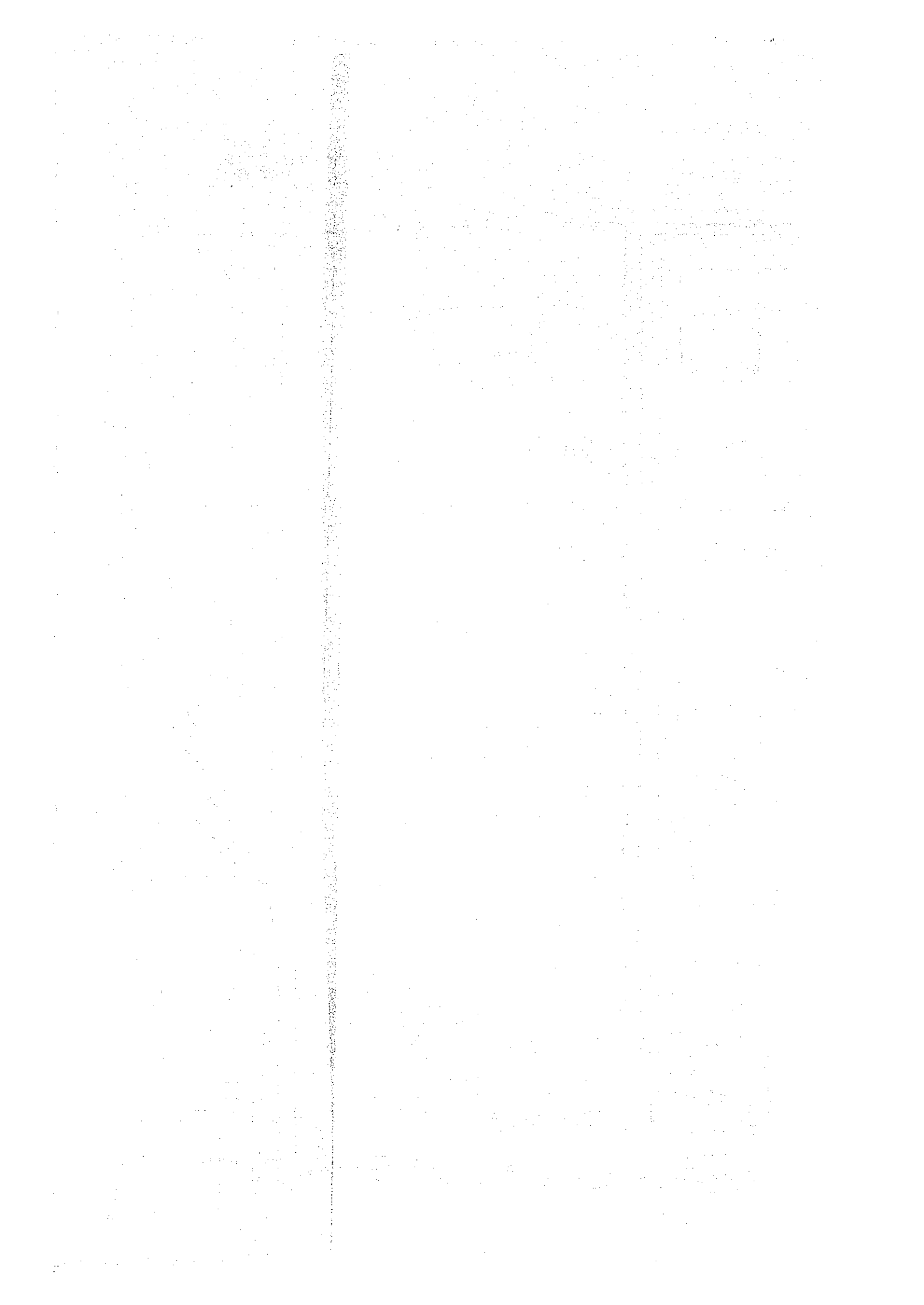
- EXISTING BUILDING
- ① AUDITORIUM
- ② MEMORIAL HALL & LIBRARY
- ③ TELECOMMUNICATION LABORATORY
- ④ GYMNASIUM
- (A) VICE RECTOR OFFICE
- (B) COMPUTER CENTER
- (C) FACULTY OF ENGINEERING
- (D) FACULTY OF ARCHITECTURE
- (E) FACULTY OF AGRICULTURAL TECHNOLOGY
- (F) FACULTY OF INDUSTRIAL EDUCATION & SCIENCE

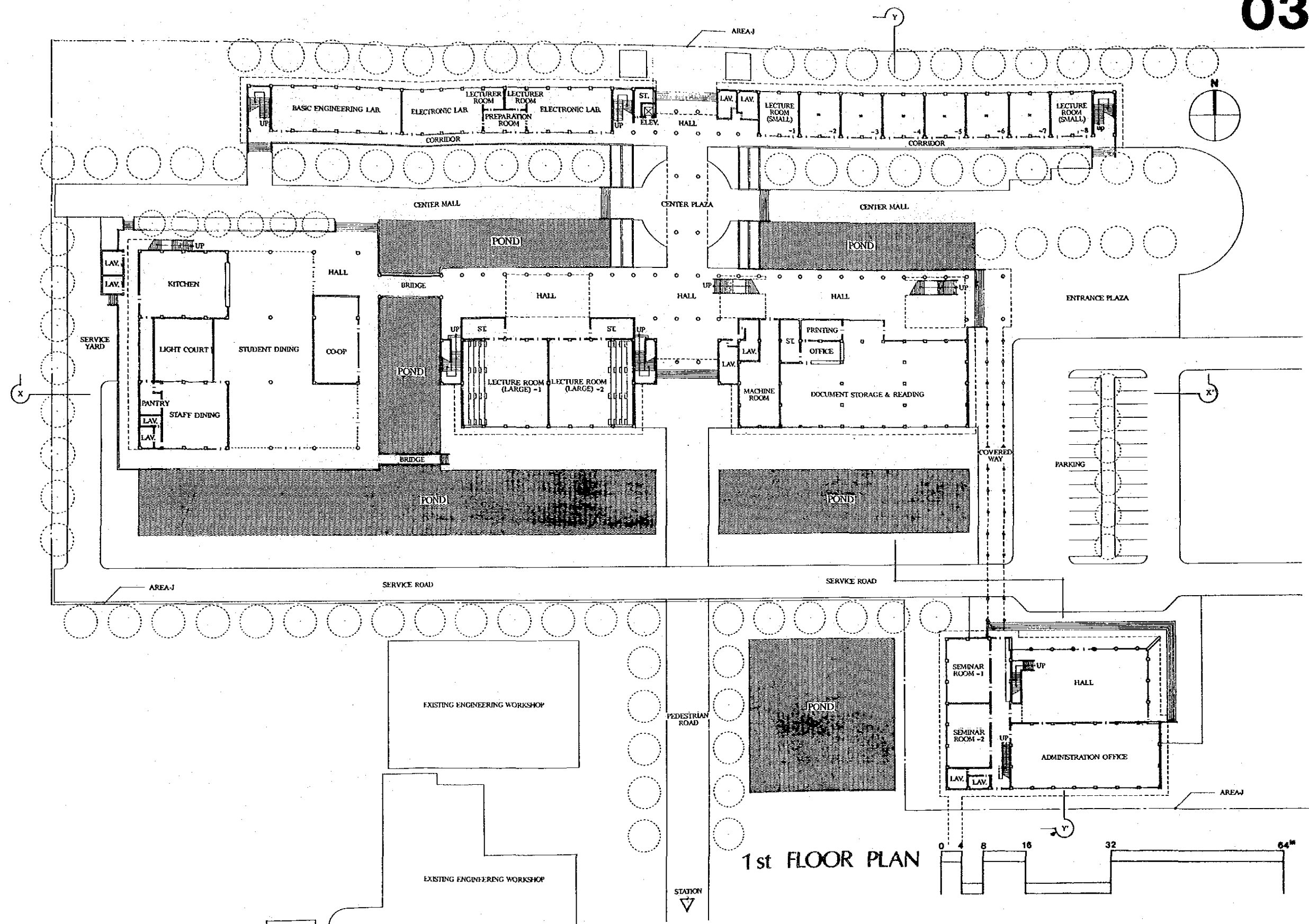
MASTER PLAN



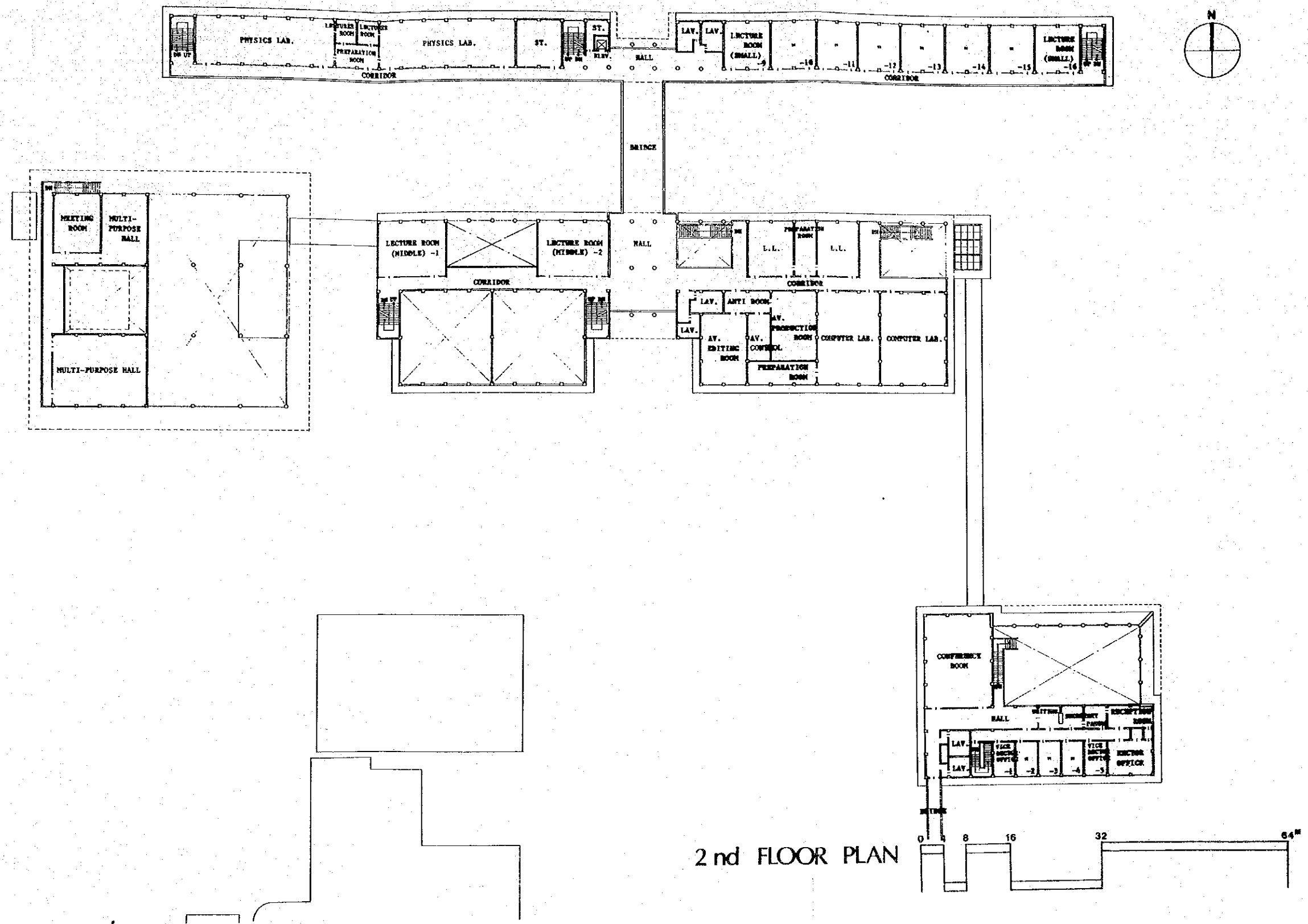




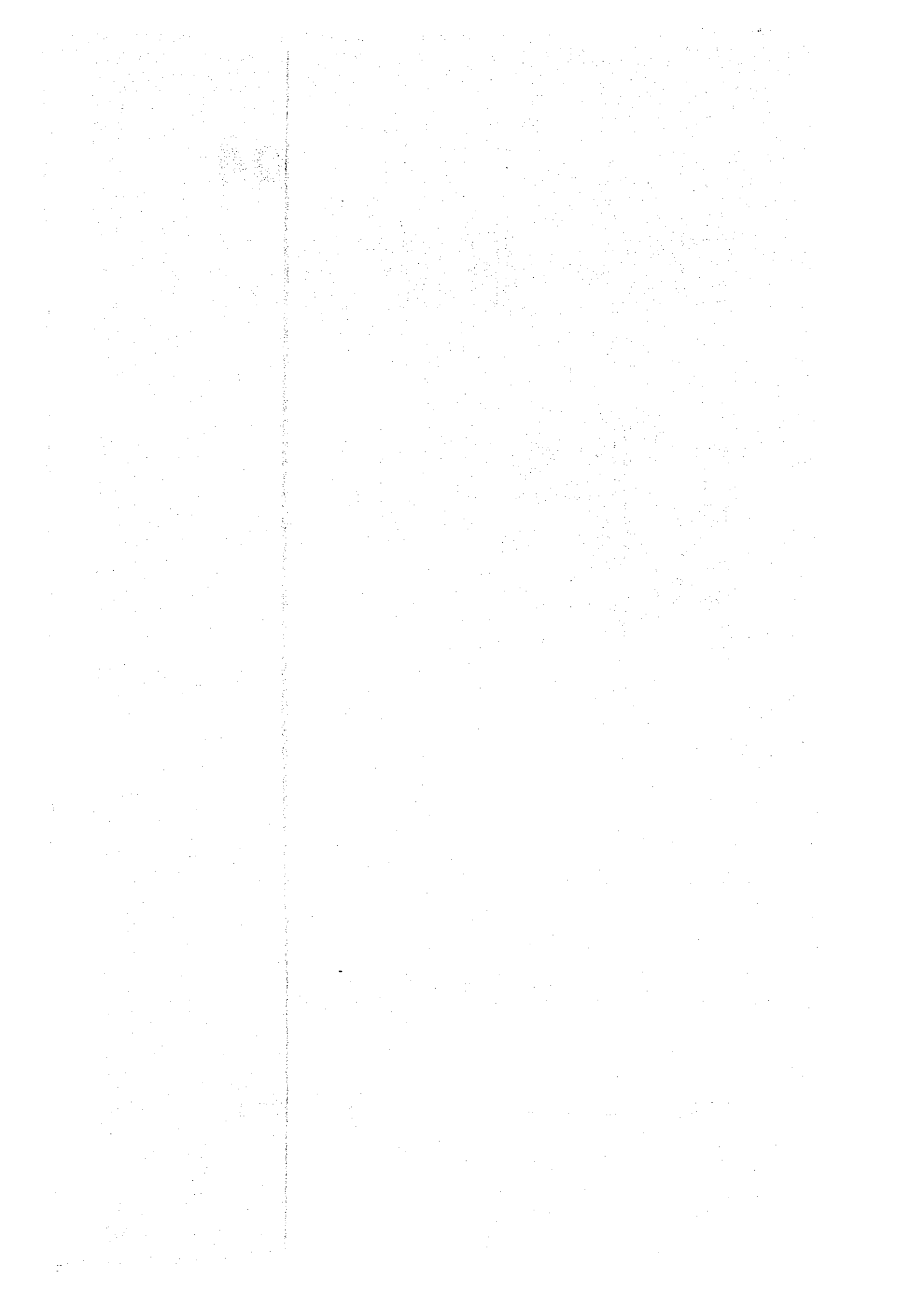


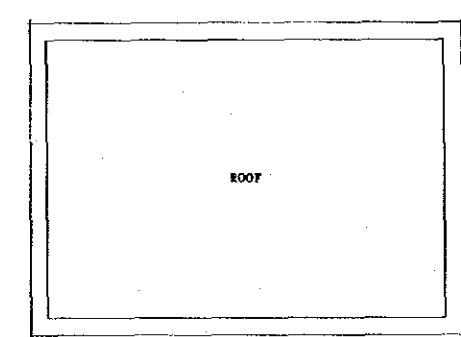
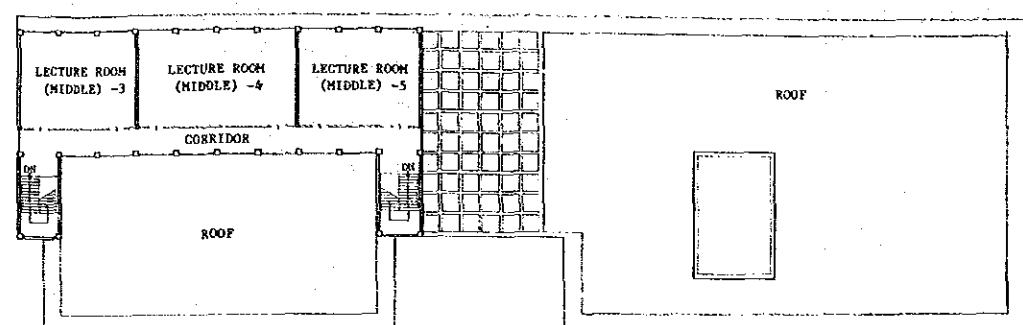
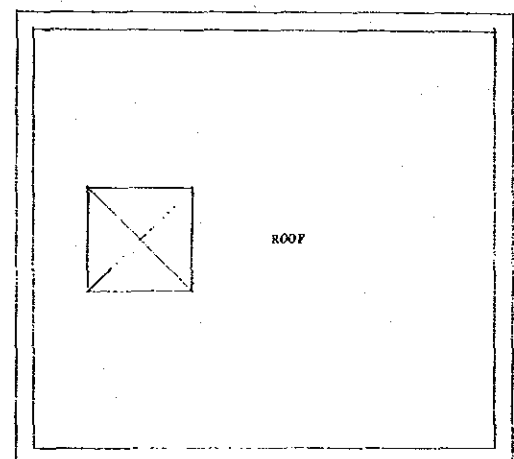
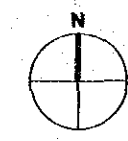
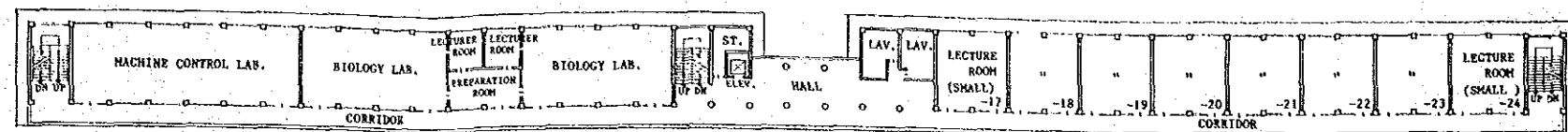


1st FLOOR PLAN

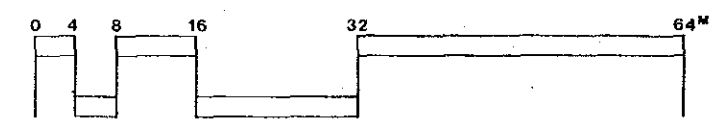


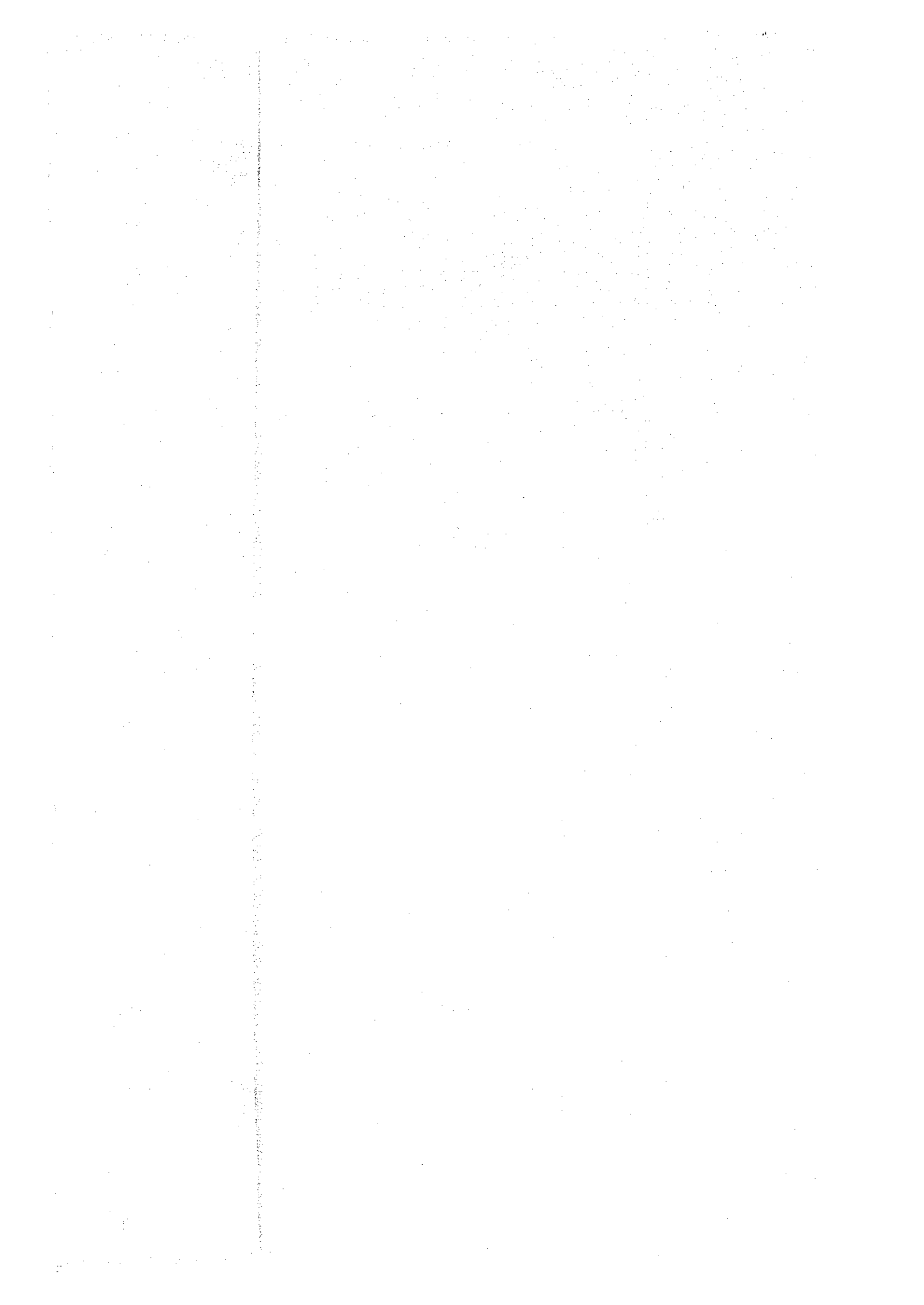
2nd FLOOR PLAN



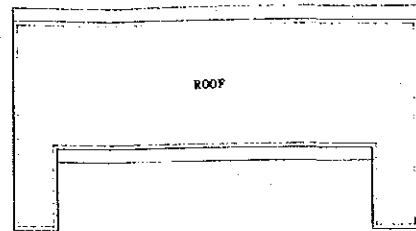
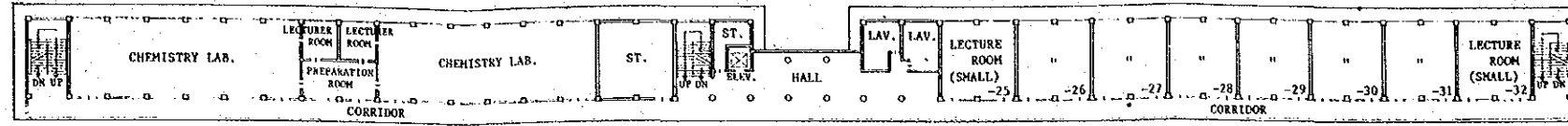


3rd FLOOR PLAN

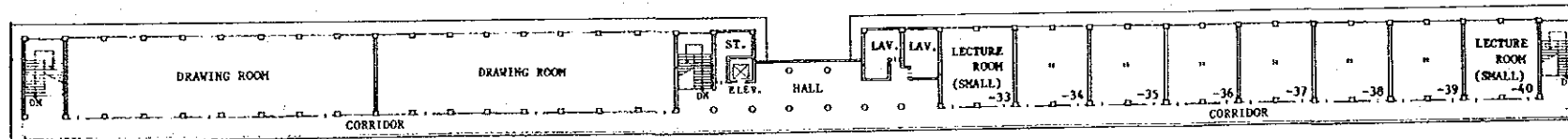




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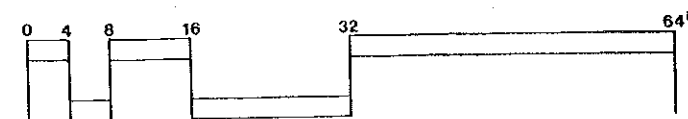


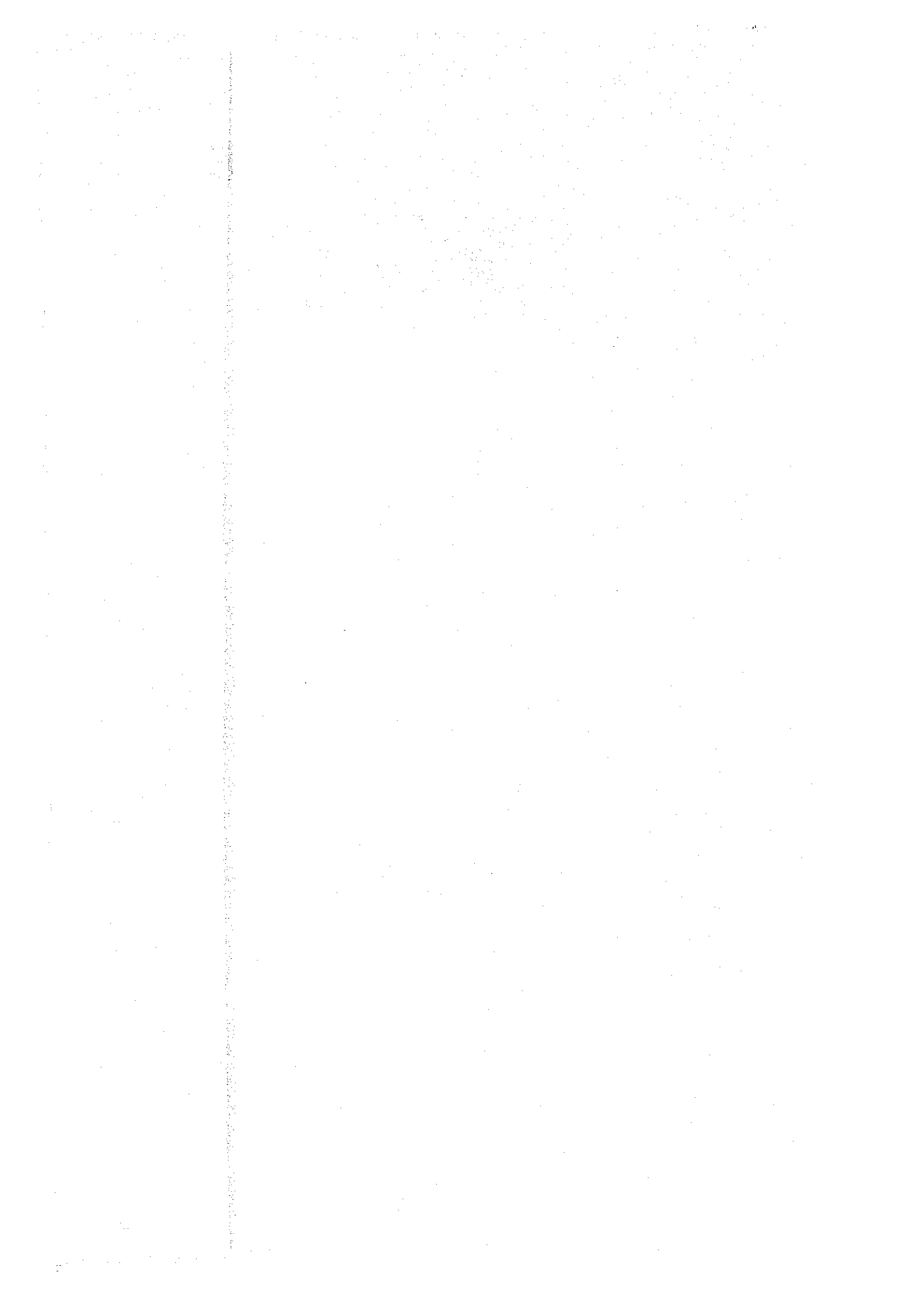
4TH FLOOR PLAN

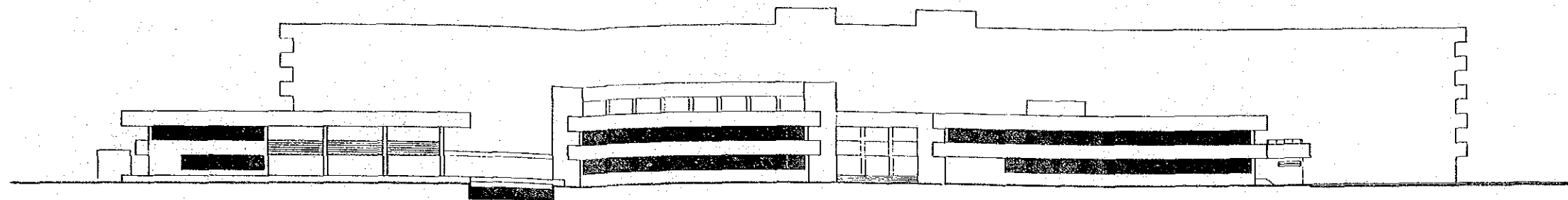


5TH FLOOR PLAN

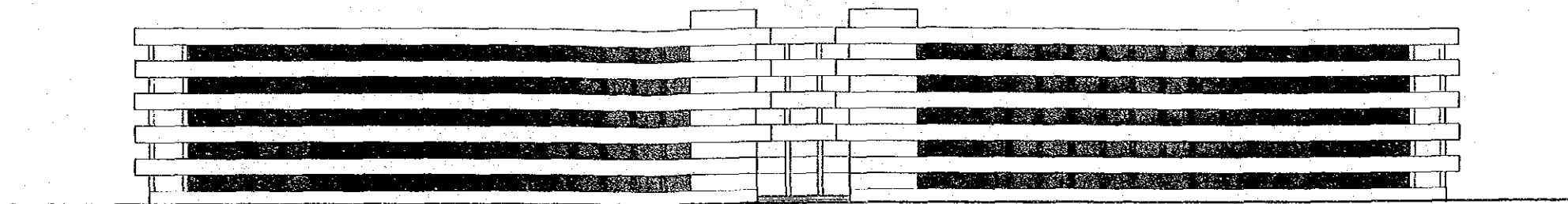
4th, 5th FLOOR PLAN



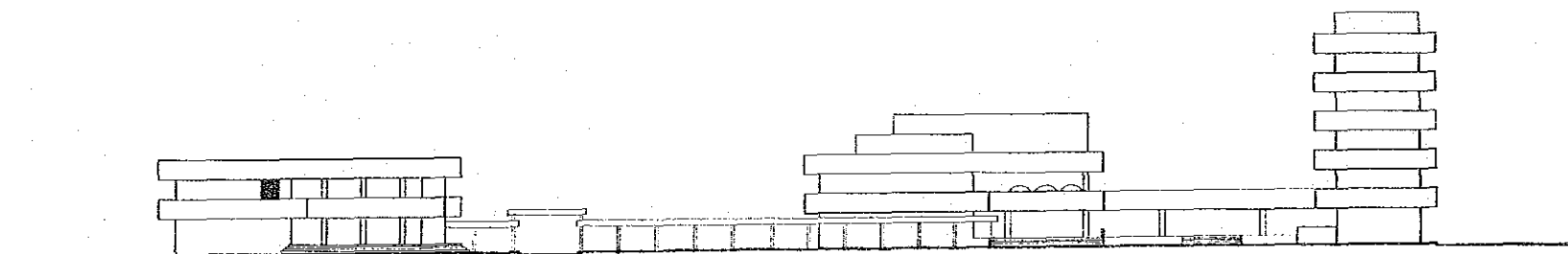




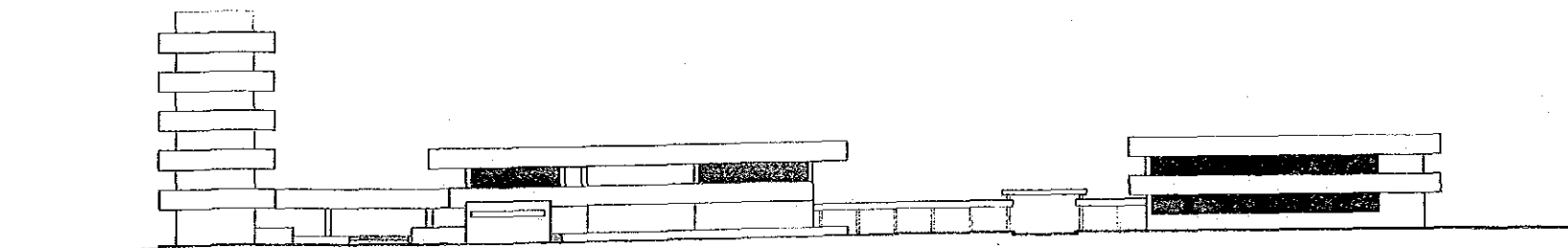
SOUTH ELEVATION



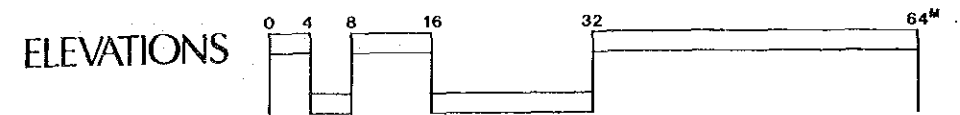
NORTH ELEVATION

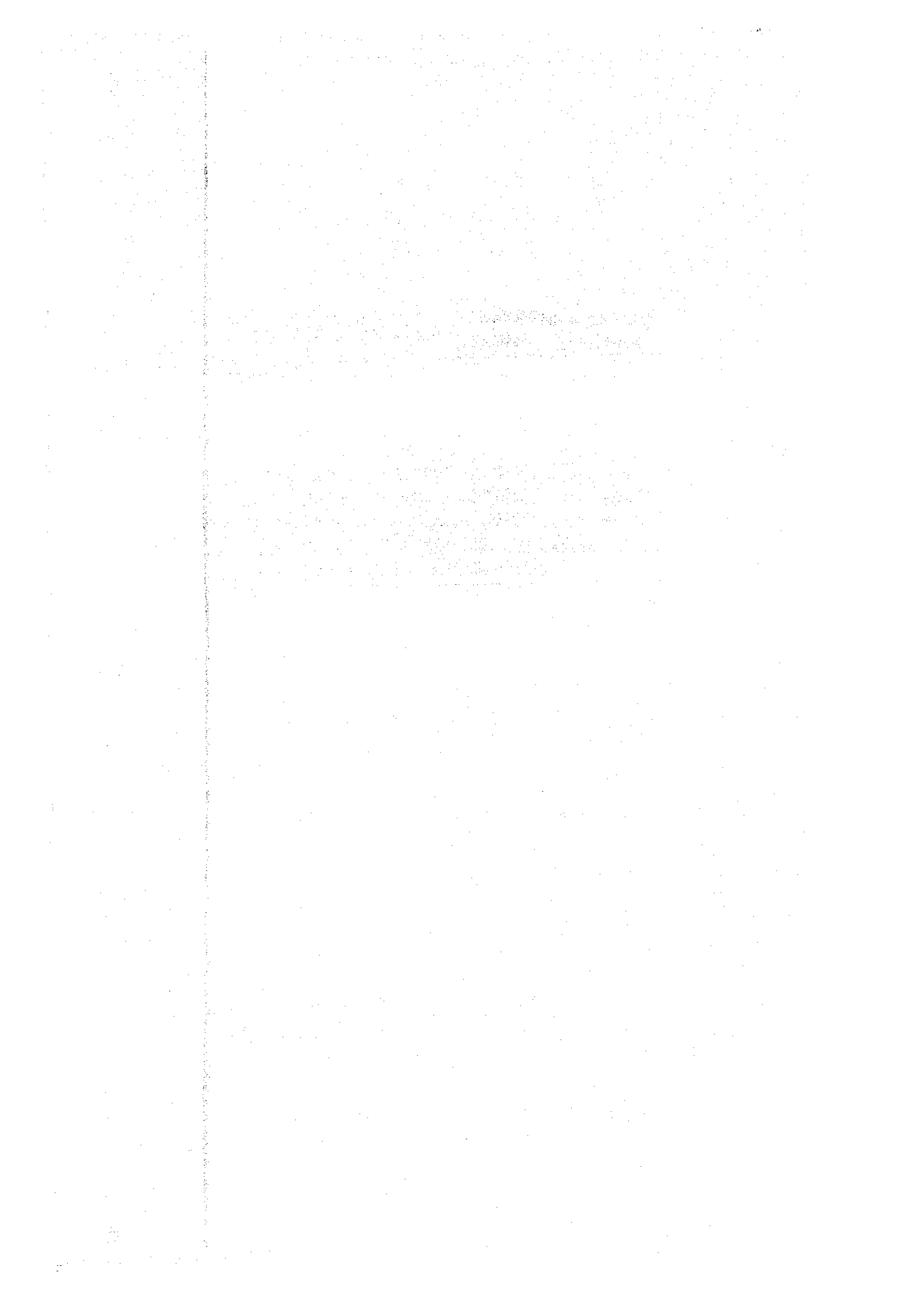


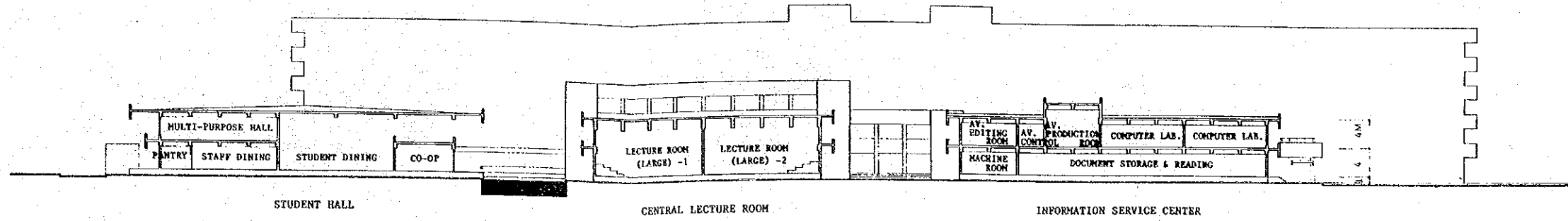
EAST ELEVATION



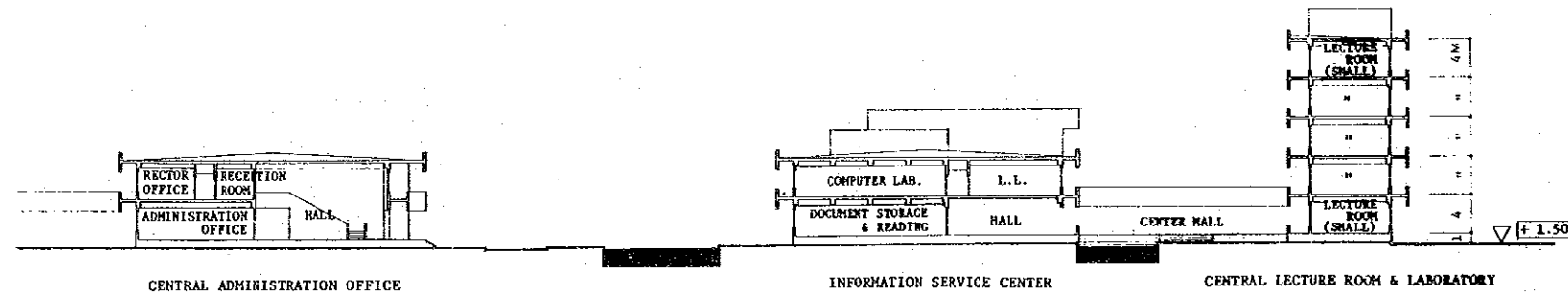
WEST ELEVATION



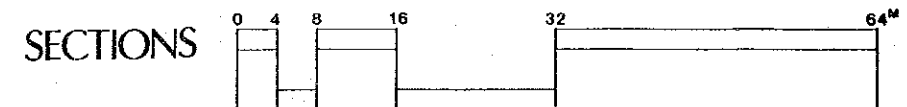


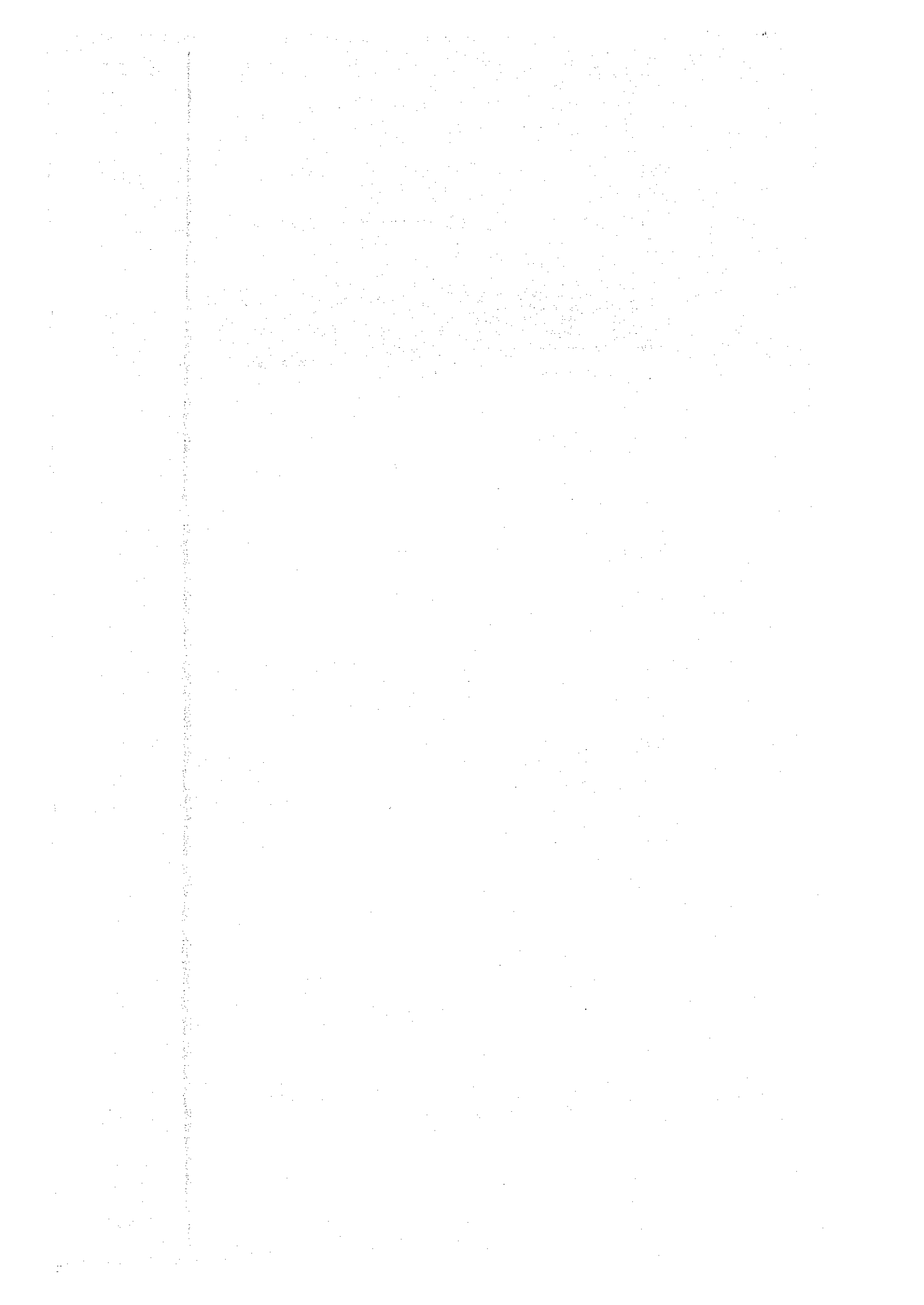


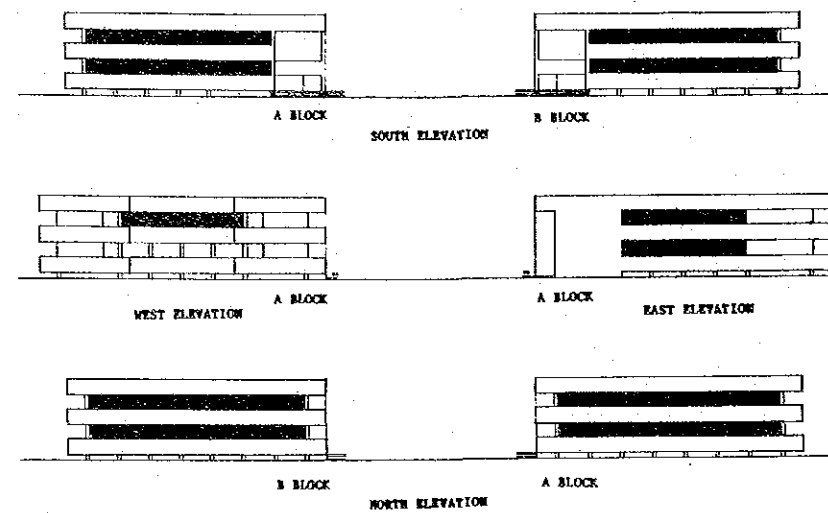
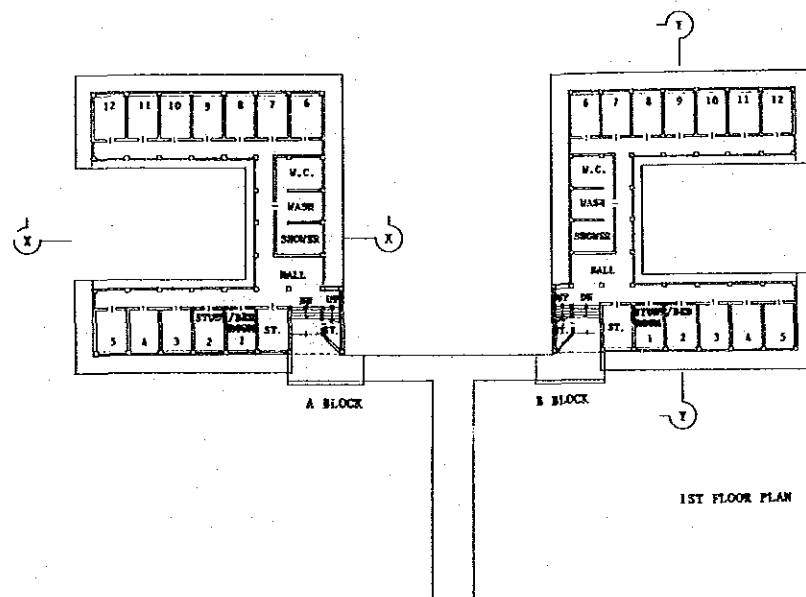
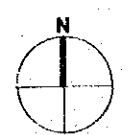
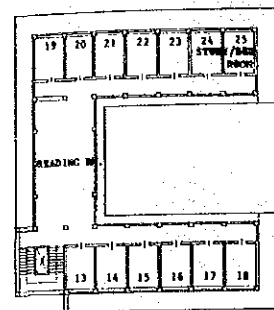
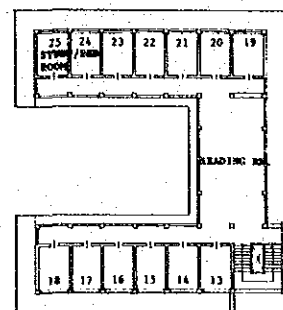
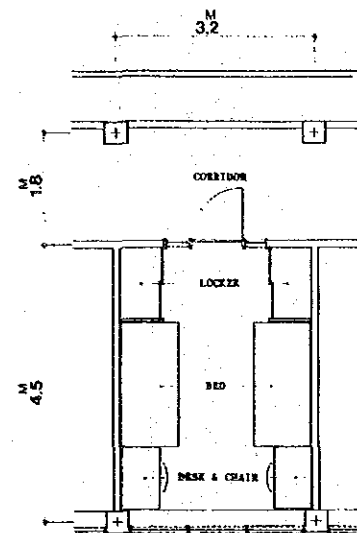
SECTION X - X'



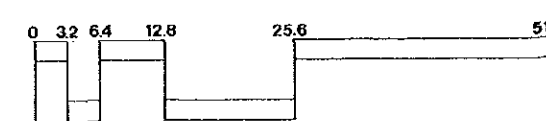
SECTION Y - Y'





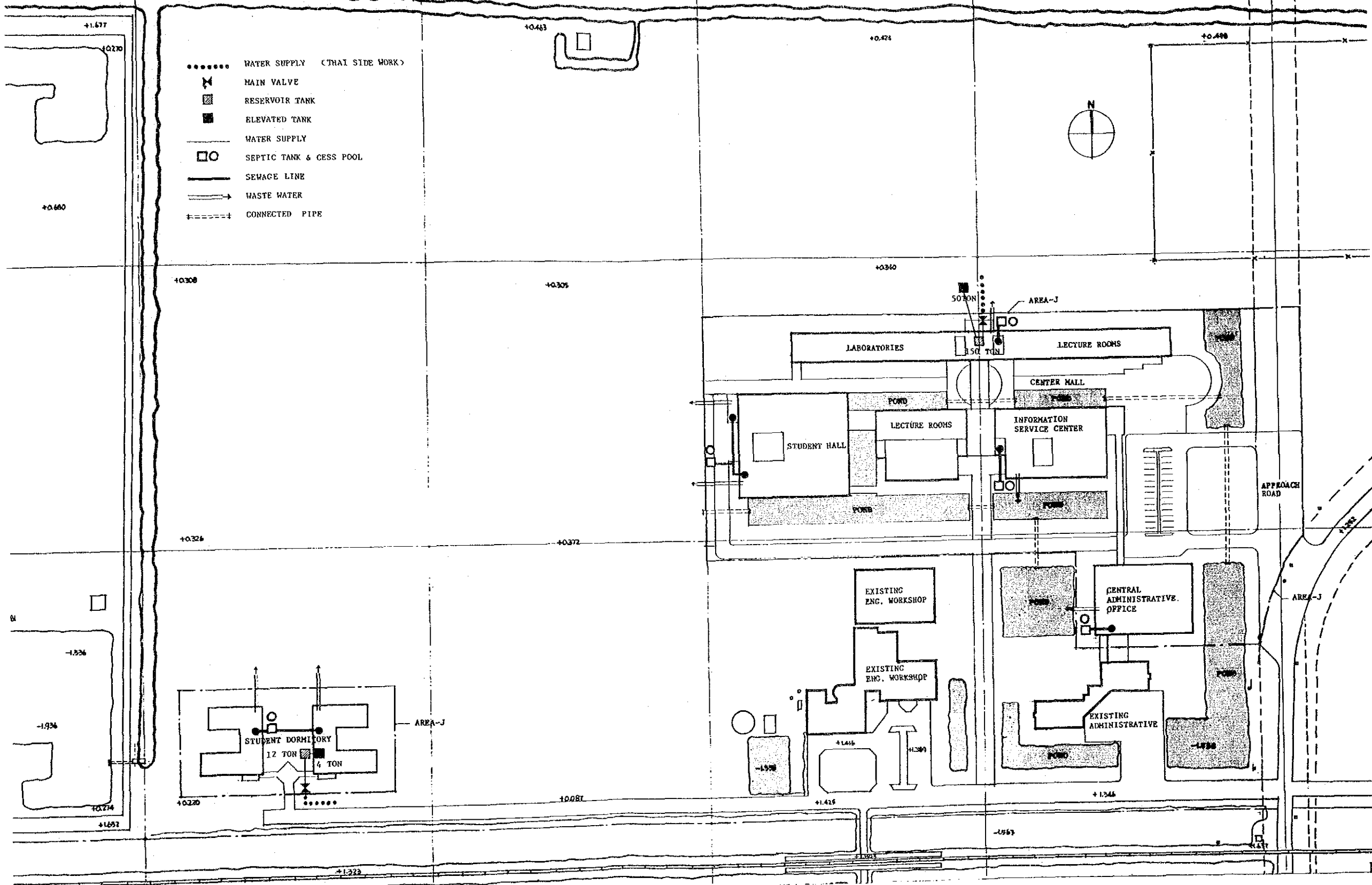


PLAN, ELEVATION & SECTION FOR DORMITORY



WATER SUPPLY & DRAINAGE SYSTEM

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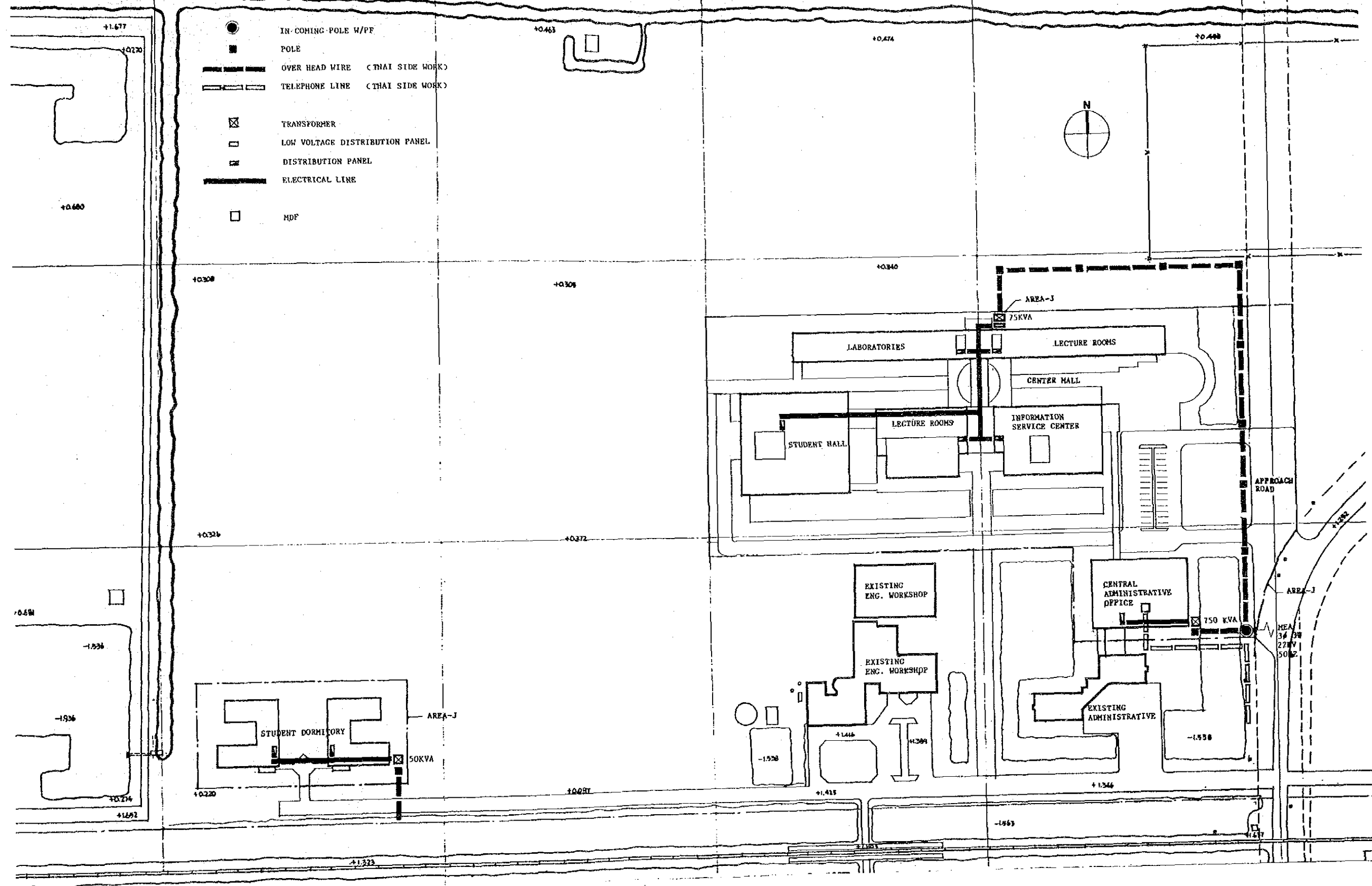


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ELECTRICAL SUPPLY SYSTEM

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CHAPTER 6. PROJECT EXECUTION PLAN

In the case of KMITL lecture building construction is executed on the basis of grant aid assistance system provided by the Government of Japan, the project execution plan is described thereafter.

6-1. Execution System

On planning and execution of the project, responsible government agencies of Thailand are Ministry of University Affairs, Department of Technical and Economic Co-operation (DTEC) and KMITL. Ministry of University Affairs will, in accordance with a guideline of National Social/Economic Development Plan, direct KMITL of King Mongkut's Institute of Technology 3 campuses on actual policy of university expansion plan, and carry out coordination among universities in Thailand.

DTEC will be a contact with Japanese officials with regard to verification of responsibility of Thailand on the project, coordination of concerned parties, and conclusion on the Exchange of Notes up until the execution of financial assistance. Also, during the period of execution of the financial assistance, DTEC will provide customs clearance and unloading service of the construction equipment and materials, guidance and coordination of the concerned agencies with regard to tax exemption program, and monitoring function up to effective period stipulated in the Exchange of Notes.

Ministry of University Affairs and KMITL will negotiate demarcation of the works by the governments, amount of financial assistance and its term, with Japanese officials, and then Exchange of Notes will be signed by two government. The official documents of the project will be signed by Ambassador of Japan to Thailand and Minister of University Affairs.

After conclusion on the Exchange of Notes, KMITL will deal with an actual business concerning the various procedures such as final design and construction management contract, construction contact and bank agreement in accordance with financial assistance formality.

When the Department of Law in the Ministry of Interior carries out verification of terms of design consultation service contract and construction contract, an adjustment of execution schedule will be required due to translation of English versions of the contracts before examination which is expected to take relatively long time.

At the stage of commencement of construction work, the various personnels, such as construction management staffs of consulting engineering firm, staffs of general contractors, and dispatched engineers are expected to stay in Thailand on short or long term basis. The procedures for these personnels to enter, stay and assume the assignment in Thailand will be handled by responsible government agencies of Thailand; work registration with the Department of Labor in the Ministry of Interior, and immigration, residence permit and tax exemption by Immigration Office. As the application forms for the above procedures will be transmitted through a channel of KMITL - Ministry of University Affairs. Department of Labor - Immigration Office, prompt transaction by the concerned agencies is desirable.

6-1-1. Organization of Project Execution

On planning and execution of the project, vice rector of KMITL, will be the principal responsible person representing KMITL, to deal with the various procedures throughout the project execution stage; design and supervisory service contract, construction contract, construction period until completion and delivery of the facilities.

At stage of execution of the lecture building construction project, the following personnels from KMITL will constitute Construction Committee to act as decision making bodies on the various matters, including negotiation with Japanese design consultant and general contractors.

1). KMITL Construction Committee

Chairman	Vice Rector	Dr. Kosol Petchsuwan
Member	Dean, Faculty of Engineering	Dr. Sitticai Pookaiyaudom
	Dean, Faculty of Architecture	Mr. Somluk Asvahem
	Dean, Faculty of Industrial Education and Science	Dr. Boonsong Siwamogsatham
	Dean, Faculty of Agricultural Technology	Dr. Supachai Ratanopas
	Director, Computer Research and Service Center	Dr. Pairash Tajchayapong
	Assist. Rector for Academic Affairs	Dr. Pirasak Varasundharosoth
	Assist. Rector for Student Affairs	Mr. Sompol Kosalwit
	Assistant Rector for Planning and Development	Mr. Pisit Viriyavadhana
	Assist. Rector for Administration	Mrs. Wilaiwan Worniyodpon
	Assist. Rector for Special Affairs	Mrs. Wanita Dhupelemya

KMITL Construction Committee consist of above member and added to following Basic Design Planning Committee's member.

2). Basic Design Planning Committee

Chief:	Assistant Rector for Planning and Development	Mr. Pisit Viriyavadhana
Staff:	Faculty of Engineering	Mr. Manon Sukasaem
	Faculty of Architecture	Mr. Chirapong Poomijit
	Faculty of Industrial Education and Science	Mr. Maitree Podisuk
	Faculty of Agricultural Technology	Mr. Voradej Chantrasorn
	Computer Research and Service Center	Mr. Chom Kimpan
	Planning and Development	Mr. Uab Herarajaya

6-2. Construction Execution Plan

6-2-1. Project Finance

The lecture building construction is scheduled to execute in accordance with a formality concerning financial assistance by the Government of Japan.

Following a conclusion on the Exchange of Notes by both governments on decision of the project execution, the Government of Thailand will conclude a delegation contract on payment of financial assistance by Japan with foreign exchange banks in Thailand, and will select design consultation firms of Japanese national and general contractor for construction execution.

6-2-2. Construction Execution Plan

After a conclusion on the Exchange of Notes to decide the construction project execution, appointed design consultant and Lecture Building Construction Commission planned by KMITL will carry out detailed discussions on final design in accordance with basic design principle, tender and construction contract procedure, and execution of construction, so as to coordinate opinions.

On execution of the lecture building construction, when filling and leveling work on the proposed site will have been completed by Thailand before execution of the construction work, the commencement of the construction is feasible as soon as design documents are completed and general contractors are selected, as the other infrastructure has been already provided.

On construction execution planning, a responsible party of Japan and KMITL Construction Committee will thoroughly examine construction schedule, determine scope of the works furnished by the governments, and establish schedule on major events such as procurement, delivery, fabrication and installation of construction materials, and presence of engineers on operation and adjustment of equipment and machineries. As tentative construction schedule, earth work, piling work, foundation work and framing work are planned to execute

during dry season (November - April), and building interior work during rainy season (May - October), to plan the commencement of the works suitable to local climate condition.

Construction schedule should be planned so as to complete and deliver the facilities on schedule without idling or backtracking, particularly by means of carefully considering delivery time of equipment and materials procured in Japan and timely dispatch of the various specialists from Japan.

6-2-3. Design Supervision Plan

Design consultant, under design and supervisory service contract with KMITL, will perform supervisory service on the work for completion of the facilities in accordance with final design documents to fulfill the intention of basic design on the basis of a guideline of financial assistance by the Government of Japan.

Appointed design consultant firm should form a project execution team which is consistent throughout preparation of final design documents and provision of supervisory service for the purpose of an effective communication, so as to aim at smoothly completing of the facilities.

At the stage of performing supervisory service, appointed design consultant will be required to dispatch competent full time superintendents to the construction site for instruction and communication with general contractor, and to dispatch the specialists at a time required for work on short or long term basis for inspection, presence and instruction on the works.

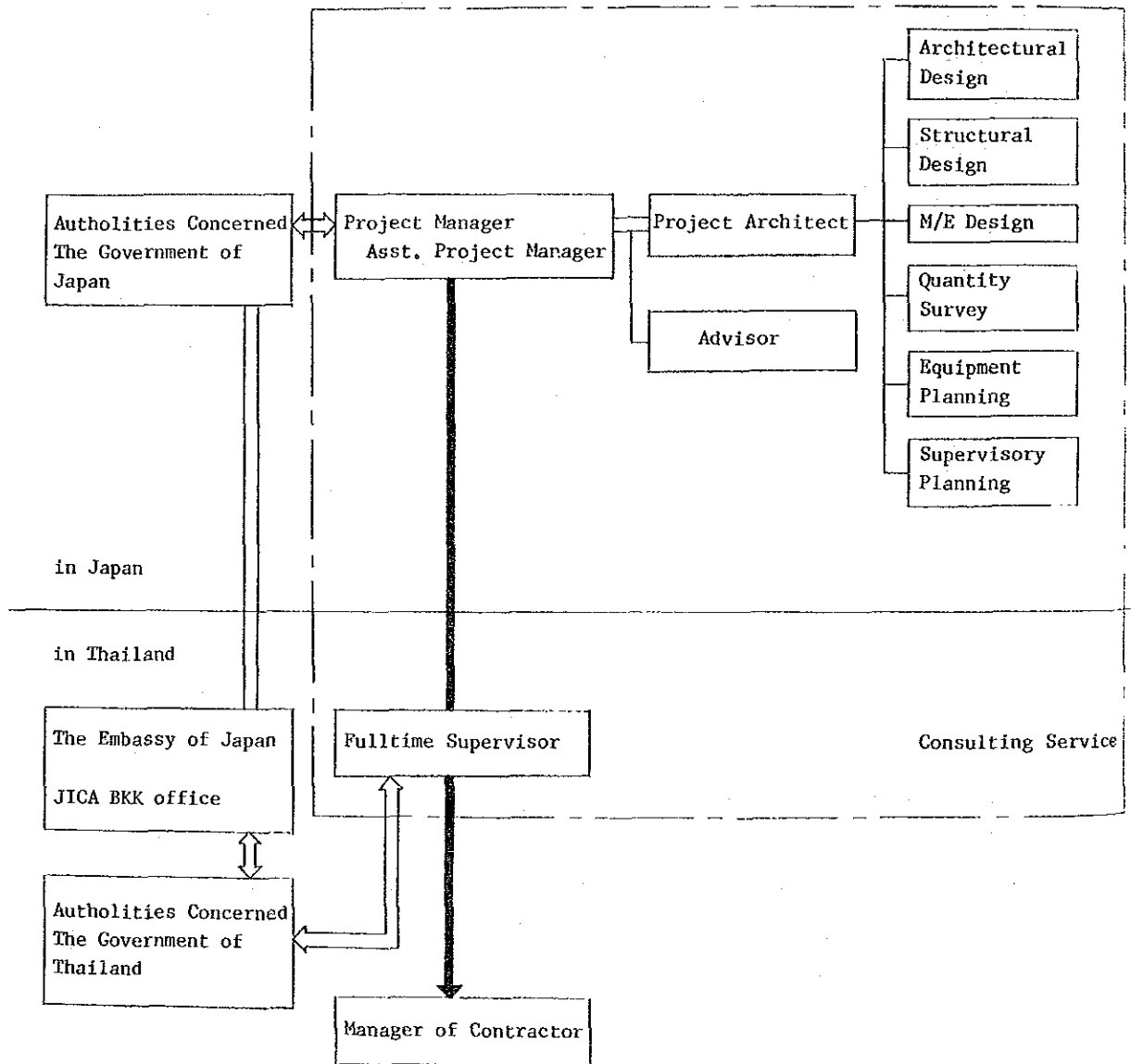
Major scope of the construction management is as follows:

- 1). to closely communicate and inform to a responsible party of two governments so as to aim for completion of the facilities without delay in accordance with construction schedule
- 2). to instruct and advise to the general contractor from time to time for the completion of the facilities strictly in accordance with design documents

- 3). to give preference to local construction method by using local equipment and materials, where possible, keeping in mind a promotion of local construction industries; to aim for transfer of technology from Japan with regard to construction execution planning and construction method so as to generate an effect of grant project

- 4). to give appropriate advice and instruction on operation and maintenance of the facilities after completion, and to monitor smooth management of the facilities

Supervisory System



* Scope of Construction Management Service

- 1). Assistance to construction contract procedure; selection of general contractor, determination of type of contract, preparation of draft of contract, study of construction execution plan by general contractor, and presence at signing of contract
- 2). Inspection and Approval of Shop Drawings and Other Documents; inspection and approval of shop drawings, materials, samples, plants, equipment, machineries submitted by general contractor
- 3). Supervisory Service; examination of construction plan and schedule, instruction to general contractor, and report to the owner on progress of work
- 4). Assistance to Payment Approval Procedure; evaluation of bill on progress and final payment, and assistance to billing procedure
- 5). Inspection and Testing; inspection of work at each phase of construction from commencement through completion, and instruction to general contractor

Appointed design consultant will, after verifying completion of the work and accomplishment of condition of contract, be present at delivery of the facilities, obtain acceptance and approval of the owner, to complete his obligation. In addition, progress report of construction, payment procedure, completion and delivery of the facilities and other required informations will be reported to a responsible party in the Government of Japan.

6-3. Scope of Works

Basic design study team records a result of actual discussion on demarcation of works furnished by two governments with concerned parties of the project lead by Dr. Kosol, vice rector of KMITL, to prepare the minutes for confirmation of fundamental items.

Outline of scope of the works furnished by Japan and Thailand within scope of financial assistance is described thereafter.

6-3-1. Works to be done by the Government of Japan

1). Facilities

- (a) Class room and laboratory room section
- (b) Administration office section
- (c) Information service center section
- (d) Student's hall section
- (e) Student's dormitory section

2). Equipment and Material

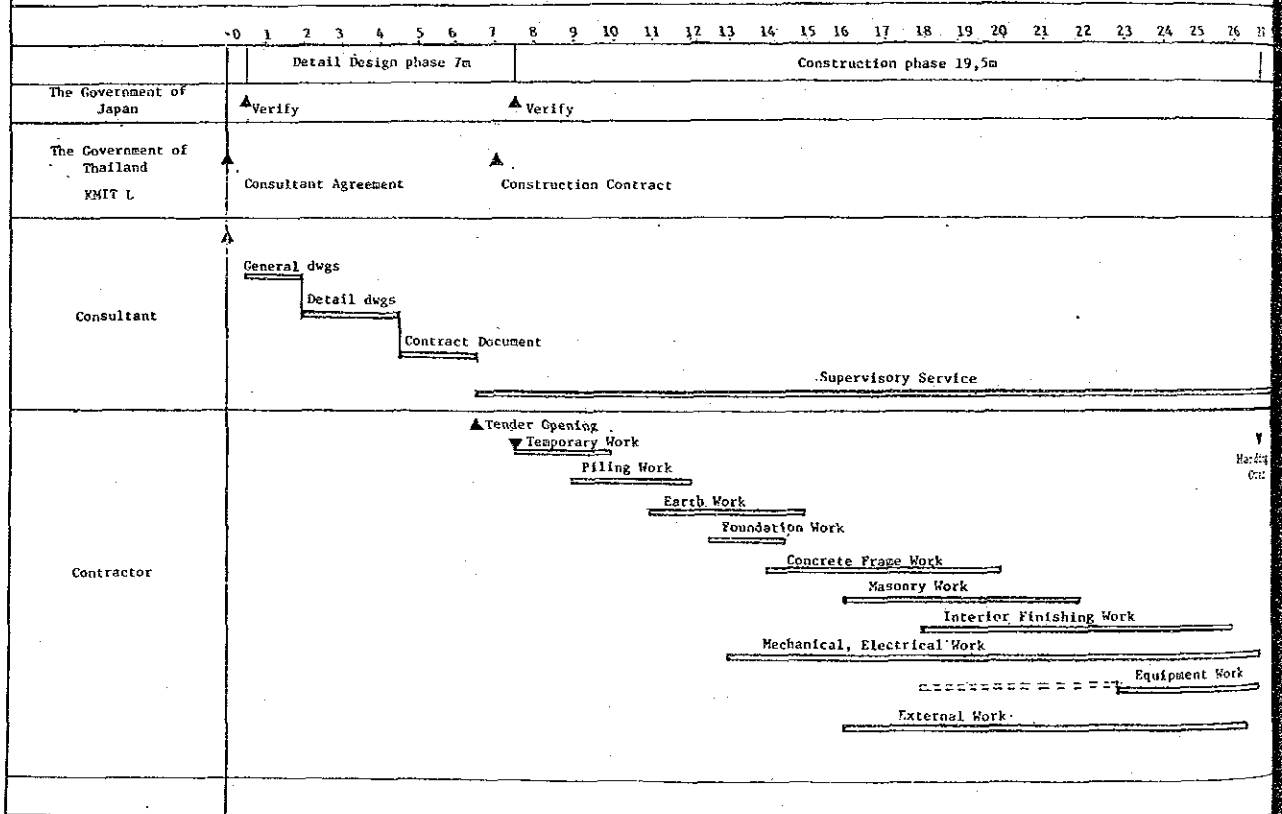
- (a) Equipments and materials related to the facilities

6-3-2. Works to be done by the Government of Thailand

- 1). to reserve, fill and level the site required for the facility before construction
- 2). to furnish documents on geological survey on the proposed site required for basic design
- 3). to connect electricity, telephone service, water, drainage system and auxiliary service to the construction site

- 4). to provide prompt service at port of entry on unloading, tax exemption, customs clearance, and transportation of equipment and materials furnished within scope of the financial assistance
- 5). to exempt Japanese personnels, who are engaged in provision of equipment, material and service in accordance with attested contract, from duties, taxes and other levies imposed in Thailand
- 6). to provide necessary assistance for Japanese personnels, who are required for provision of service in connection with provision equipment, material and service in accordance with attested contract, concerning their entry and stay in Thailand
- 7). to adequately and effectively operate and maintain the facilities and equipment furnished within scope of the financial assistance
- 8). to install garden, fence, gate, lighting, and other auxiliary facilities whenever necessary
- 9). to install furnitures in the buildings
note; Construction site is limited to 10m radius in parameter of buildings, including the buildings.

Tentative Construction Schedule



6-4. Project Execution Schedule

The lecture building construction is executed, in accordance with financial assistance system of the Government of Japan, by the schedule consisting of three phases, namely final design, tender and construction, after a conclusion on the Exchange of Notes by two governments.

1). Final Design

After Verification by the Government of Japan on the consultancy agreement concluded between KMITL, final design will be prepared on the basis of basic design. Final design documents consists of general drawings, detail drawings, specification, calculation sheets, budget statement, condition of contract, and tender instruction and condition of cost estimate. During the period, the firm will have discussion with Japanese agencies concerned, and visit Thailand to discuss with Thai agencies concerned and KMITL on preliminary, intermediate and final phase of the project, before going into tender phase. The required time for this phase will be 4 months.

2). Tender

Tender offer, qualification of applying contractors, tender instruction, opening of tender, evaluation of quotation furnished by contractors, and signing of contract will be included in this phase. The required time for this phase will be 3 months after the completion of final design documents.

3). Construction

After signing on the construction contract which will be verified by the Government of Japan, construction will be commenced. Judged from scale of the lecture buildings and type of the facilities, construction period will be 19.5 months (Fig. 6-2).

6-5. Operation and Maintenance Plan

An effect of Grant project will be realized when smooth management of the facilities and activities according to the objectives after delivery, are carried out by self-help effort of Thailand, not when the facilities and equipment are provided.

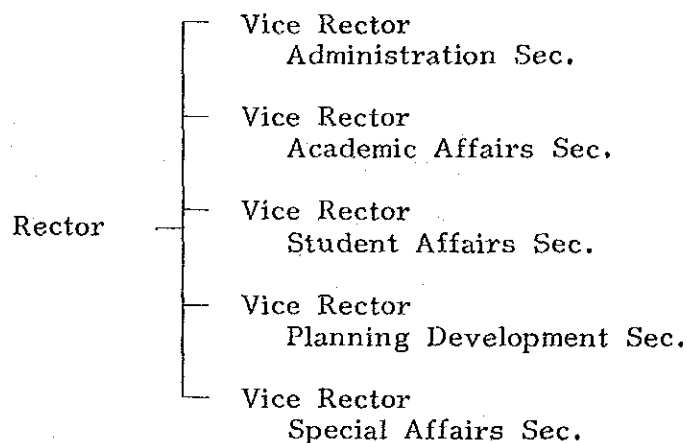
Thus it is necessary to establish an appropriate management and administration system in order to smoothly promote educational and research activities in the lecture buildings and auxiliary facilities planned by KMITL as a main scheme.

6-5-1. Maintenance and Administration System

As the proposed lecture buildings are planned to become a core facility of KMITL as a new national university in the form of integrated administration section of 8 faculties including additional 4 faculties, the Central Administration Office, which is a central administration section of existing 4 faculties at present, will be expanded to do management and administration of the lecture buildings. Central Administration Office, under a rector and 5 vice rectors to have 43 staff, consists of administration section, academic affairs section, student affairs section, and planning and development section.

Organization of Central Administration Office is presented in the Table 6.1.

Organization of Central Administrative Office



Central Administration Office consists of 4 sections, (special affairs section will be added in future), with the following functions:

- 1) Administration Section: 20 persons
 - Finance
 - Accountancy
 - Correspondence, Typing
 - Budget
 - Purchasing, Inventory
 - Building Service, Cleaner

- 2) Academic Affairs Section: 10 persons
 - Curriculum
 - Examination
 - Post Graduate Activities
 - Transcript

- 3) Student Affairs Section: 10 persons
 - Student's Activities
 - Student's Welfare/Clinic
 - Military Training, Job Placement

- 4) Planning & Development Section: 3 persons
 - Planning
 - Budget
 - Master Plan
 - Building Construction Planning

Management and administration are mainly done by Central Administration Office. Organization of educational and research instructors will be selected from each faculty in accordance with its curriculum planning. Planning and Development Section will be responsible for maintenance of facilities and equipment, and will employ an electrical and a mechanical technicians from the graduates of industrial technology school, as well as 20 janitor for regular cleaning of the facilities.

Category	Cost existing facilities	Lecture buildings
Unit: thousand Baht		
Personnel expenses (Salary and Wage)	36,000	800
Personnel expenses (Contingency)	8,400	
Administration	6,900	
Miscellaneous	4,500	
Electricity and Telephone	10,400	2,350
Expendables	19,400	800
Research	3,200	1,000
Total	89,600	4,150

(UNIT 1,000,000 BART)

	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990
1.Salarly	13.6	19.8	21.4	27.0	29.7	32.7	36.8	40.5	44.6	49.1	54.0
2.Extra	2.7	3.8	4.3	5.1	5.8	7.0	8.4	10.1	12.1	14.5	17.4
3.Administration Expenses	1.8	2.4	2.9	3.7	4.4	5.5	6.9	8.6	10.8	13.5	16.9
4.Sundries	1.4	1.7	2.2	2.4	3.0	3.7	4.5	5.6	6.8	8.3	10.2
5.Energy (Elec, Tel)	2.0	2.5	2.9	3.8	4.9	6.4	10.4	13.0	16.3	20.5	25.9
6.Materials	6.2	9.3	10.5	12.7	14.6	16.5	19.4	22.0	24.9	28.2	31.1
7.Research Fund	0.48	0.84	0.84	1.6	1.8	2.0	3.2	3.6	3.9	4.3	4.7
TOTAL	28.18	40.23	45.04	56.3	64.2	73.8	89.6	103.4	119.4	138.4	160.2
Remark		Compu- ter Center					NEW LEC- TURE ROOM BLDG.				
KMIT L TOTAL	55.68	99.44	114.16	76.8							

6-5-2. Operation and Maintenance Plan

In addition to the design of the facilities for simple operation and maintenance, recommendation and advice by consultant on appropriate method of operation and maintenance should be given at the time of delivery of the facilities; preparation and presentation of operation and maintenance manual for the facilities, equipment and machineries to the staffs responsible for operation and maintenance, instructors and maintenance technicians, along with demonstration of the actual operation and maintenance. Facility and building operation/maintenance manual will consist of operation, cleaning and maintenance, and electrical and mechanical equipment, and laboratory equipment manual will consist of operation, optimal operating time and maintenance and inspection. In accordance with types of repair, mending and procurement of fixture and spare parts, addresses of responsible contractors and agents will be notified after delivery of equipment and materials.

6-5-3. Operation and Maintenance Cost

Cost required for administration of the lecture building, facility maintenance cost and equipment operation cost will be allocated from budget of Ministry of University Affairs. Present and projected administration cost for activities in all facilities of KMITL between 1980 through 1990, and an estimate of operation and maintenance cost are presented in the table thereafter. Also, an estimate of costs in 1986, when the lecture building facilities will have been completed and started of the operation, is presented below:

1). An estimate of electricity cost in the first year, required for operation of equipment and machineries in the lecture buildings, is as follows:

a. Estimate Base

- (1) Operating time; 8 hours/d, 25 days/m
- (2) Average rate of use; 40%

b. Estimate of Capacity for General Equipment, Machineries, and Electricity

<u>Building</u>	<u>Power (kW)</u>	<u>Lighting (kW)</u>
Central Lecture Building and Labs.	80	150
Central Administration Building	40	26
Information Service Center	114	112
Student's Hall	5	22
Student's Dormitory	5	15
Total Capacity	244	325 569kW

c. Monthly Consumption

$$569\text{kW} \times 8\text{h} \times 25\text{d} \times 40\% = 45,520 \text{ kWh/m}$$

d. Monthly Electricity Bill

$$\text{Basic Charge: } 600\text{kW} \times 98 \text{ baht} = 58,800 \text{ baht/m}$$

$$\text{User's Charge: } 45,520\text{kWh} \times 1.54 \text{ baht} = 70,100 \text{ baht/m}$$

$$\text{Total Monthly Bill: } 128,900 \text{ baht/m}$$

6-6. Procurement Plan

Judged from level of construction technology in Thailand, capability of facility operation and maintenance, functions of the facilities, and construction period, procurement of construction equipment and material will be done from local source to a possible extent.

Labor force will be provided from local labor market, except for Japanese specialists to do installation and adjustment work of a part of laboratory equipment and machineries as well as Japanese contractors to instruct fabrication, installation, and other works of construction materials, equipment and machineries.

1). Equipment and Materials Procured in Japan

airconditioning equipments (because of high local price due to import, procurement in Japan is economical if taxes and customs duties are exempted. Procurement of spare parts is locally feasible), pumps, transformer, electric fans, valves, switches, laboratory equipment, broadcasting equipment, language laboratory equipment, printing machines, and floor materials for laboratory room

2). Locally Procured Equipment and Materials

survey equipment, construction machineries (cranes, trucks, bulldozers, agitator, and etc), scaffolding materials, cement and aggregates (sand and gravel), concrete products (piles, concrete blocks and pipes, and etc), reinforcement bar and light shape steel, wood materials, plywoods, galvanized steel plates, window and door (aluminum and stainless steel), glasses, bricks, asbestos products, paints, general interior materials (ceiling, floor, and wall), pipes, cables and wires, panels, general lighting equipment, outlets and switches, telephones, office furnitures, and kitchen goods

Although locally procured construction equipments and materials are not very reliable in terms of quantity and quality, no possible difficulty is observed to use them in the construction of the proposed facilities, provided that quantity and location of their use will have been carefully considered as well as strict selection.

As manufacturers, factories and agents of the above equipment and materials and located mostly in around Bangkok metropolitan area as well as Ladkrabang district, coordination of required time in the construction site, transportation and delivery will be feasible if production capacity and inventory will have been checked beforehand.

CHAPTER 7. EVALUATION OF THE PROJECT

In this chapter, "King Mongkut's Institute of Technology - Lecture Building Construction Project" is evaluated by social and economic aspects.

1). Social and Economic Evaluation

The objectives of Thailand 5th Social/Economic Development 5 years Plan (1981 - 1986) are to transform from agricultural national to semi-industrial nation, to promote the perform of the economic structure, and to achieve economic stability by means of promoting industrialization of national economy for the purpose of increasing ratio of industrial component in its export structure. The target is set at domestic gross national products which is expected to grow by two times from 817 billion bahts at present to 1,859 billion bahts, and at per capita income which is expected to grow from 17,204 bahts to 35,692 bahts.

Under the top priority of the policy toward semi-industrialization, implementation plan at lower level is to supply a maximum number of competent engineers to the society. To establish a foundation for this objective, it will be important task for universities and colleges including nation universities as well as the various technical schools to upgrade educational facilities, to entirely reorganize and improve curriculum, and to train and educate instructors. Particularly, effective measures to cope with a lack of equipment and resources for basic education and research in the field of engineering and technology, and to train and educate researchers, are considered to be most required, but a shortage of budget allocation for the measures is serious obstacles to be dealt with.

Under these circumstances, it is thought to meet objectives of the national development plan that KMITL, which achieved a considerable improvement of the quality as a result of technical cooperation by Japan among only engineering related colleges of KMITL 3 campuses in Thailand, will execute lecture building construction project in order to upgrade the facilities which will be used for basic education and

research, and thereby serve as an example to other national universities and technical schools. An attempt of KMITL, to develop as a new national university by means of executing the project so as to establish lecture buildings as core facility and adding 4 faculties in future, will bring a great expectation to Thai public which is recently oriented toward higher educational background. Also the attempt of KMITL is expected to stimulate other universities and technical schools, and thereby to promote supply of human resources to government and private sector who aim for semi-industrialization of Thailand; while social structure, which has employment problem caused by overproduction of the graduates in field of liberal arts and social science, is reformed, a maximum number of qualified graduates in field of engineering and technology, so as to make a great contribution to stability and prosperity of the country. From the above viewpoint, the lecture building construction project is evaluated as appropriate plan to be based on the social/economic development plan, and the scheme is expected to have a considerable effect and influence on development of higher education and reform of economic structure of Thailand.

KMITL set a target of completion of entire campus expansion plan, including establishment of new faculties based on core facility (lecture building) in a new national university, in 1990, or the last year of 6th National Development Plan (1986 - 1990). Scale of the proposed facilities in the lecture building is determined on the basis of projected number of student enrollment and educational activity plan in 1990 when campus expansion plan will have completed. Although not much allowance for unforeseeable increase, a function and activity of the facilities as a core facility of KMITL will be satisfactorily accomplished. Furthermore the quality of the proposed facilities is at same level as similar facilities in other areas and the existing facilities of KMITL, and the design of the buildings is planned to be in harmony with campus facility complex. Also, by employing local equipment, materials, labors, and construction method wherever possible, low cost construction is intended so that the execution plan could be evaluated as a great contribution to the promotion of local construction industries.

2). Financial Evaluation

Scope of the works furnished by Thailand on the lecture building construction is as described in Chapter 5, 6-3-2, "The Works to be done by Thailand".

* Construction Cost

The actual construction cost borne by Thailand is at approximately 7.2 million bahts estimated by basic design study team.

KMITL plans to secure the budget for expenditure of the existing facility maintenance and equipment and material supply are 20.5 million bahts in 1983 and 22.6 million bahts in 1984. On execution of the project, the cost will be provided preferentially from the allocated budget. At the same time, special allocation as development expenditure for the lecture building has been tentatively promised by Thai government.

* Operation and Maintenance Cost

As the facility plan of the lecture building is based on architectural, mechanical and electrical planning which fully take into account natural condition in the area, operation and maintenance of the facilities will be relatively simple if the appropriate management is carried out. Operation and maintenance cost in the first year is estimated at 4.15 million bahts, with breakdown 800,000 bahts for personnel expenses as a result of an increase of administrative staffs, 2,350,000 bahts for electricity, 1,800,000 bahts for expandables and research. Since the completion of the lecture building will not bring about the establishment of new administrative section or rapid growth of student enrollment, an impact of operation and maintenance cost of the facilities will be relatively small; approximately 4.6% of projected total administration budget of KMITL (89.6 million bahts).

3) Evaluation of Administration and Management System

A responsible body of administration and management of the lecture building will be the lecture building administration section, which is a succession of Central Administration Office to manage the existing 4 faculties of KMITL. Through this transformation of administration office, completion of lecture building is believed to bring about smoother management practice and effective management system which is already planned.

CHAPTER 8. CONCLUSION AND RECOMMENDATION

1). Conclusion

The project has been evaluated on its 1) social usefulness in accordance with the objective of social/economic development 5 years Plan of Thailand, 2) appropriateness, 3) KMITL's development cost, 4) management and administration system, and 5) operation and maintenance plan. As a result, it is concluded that the project will contribute to development of society and economy of Thailand, and will bring about a sufficient effect, since KMITL will be reliable on finance and management of the project.

Therefore it is recommended that the project is eligible for Grand aid by the Government of Japan, for an effect of the assistance on furnishing of the lecture building facilities and equipment will be considerably high.

2). Recommendation

On the basis of understanding that political and economic stability of Thailand is influential and essential to stability and prosperity of Asian countries including Japan, an effect of construction of KMITL lecture building, Grant aid by Japan to aim at building a foundation of semi-industrialization process, is expected to serve the purpose. However, promotion and achievement of educational activity of KMITL by effectuating its management and function so as to become an example to other higher educational institutions will be largely dependent upon self-help effort of KMITL.

1. As management and administration system of the lecture building will be chiefly operated by Central Administration Office in accordance with its function as the facilities to be thoroughly used by all the faculties (incl. newly established ones), the plans concerning the optimal use of the facilities and curriculum should be formulated in detail. Also preparation of operation and

maintenance system should be desirable so as to make responsible staffs familiar with the facility design, and thereby to immediately establish the smooth administration practice.

2. It is recommended that a responsible party of Thailand will prepare an execution system at appropriate time to furnish construction work and service in accordance with the agreement on demarcation of works to be done by Thailand, and will establish a system on efficient and prompt import and customs clearance procedures for construction equipment and materials delivered to the site, which affect construction period. Cost required during construction and borne by Thailand is estimated at approximately 7.2 million bahts.
3. It is required that a responsible party of Thailand will reserve a budget for procurement of general furniture for office etc. furnished by Thai side and which essentially needed on operation and maintenance of the facilities cost required for this is estimated at approximately 1 million bahts.
4. It is recommended that 2 full time technicians, responsible for operation and maintenance of the equipment and machineries in the buildings, will be employed during the period of the construction and will be trained on adequate methods of operation and maintenance, regular inspection, and regular replenishment of expendables, thereby to prepare the system for smooth operation and maintenance. Also, it is required that the responsible instructors, who will instruct an operation of equipment and machineries on basic practice and research, become familiar with operation of heat and power source, equipment and machineries.
5. It is recommended that dormitories in the campus will be promptly provided, as 80% of the students is unable to have a sufficient time of study at home due to extremely long travel time to school of more than 2 hours and otherwise the existing student's housings in Ladkrabang district is expensive with poor living

condition because of a shortage of housing. In the project, student's dormitory with capacity of 100 students is planned as auxiliary facility of the lecture building within scope of the financial assistance, yet the need of adequate students housing is not entirely satisfied. Hence-forth, an expansion of students housing by self-help effort of Thailand will be required from the standpoint of student's welfare.

APPENDIX

1. Dispatch of Study Team
2. Minutes of Discussions
3. Organization of Authorities Concerned
4. Construction Site
5. Structural Design Data
6. KMITL's Curriculum (First, Second year)
7. KMITL's Staff and Teachers studied in Japan
8. Enquête Data of Studentes in KMITL
9. List of Equipment
10. Ladkrabang Industrial Estate

1. Dispatch of Study Team

Study teams have been dispatched two times for Basic Design Study and Draft Report of Basic Design Study for construction of the Lecture Room Building of KMITL.

1). Member List of Basic Design Study Team (Aug. 7 to Aug. 27, 1983)

Mr. Yoshifusa Shikama	Team Leader	Basic Design Division Grant Aid Department Japan International Cooperation Agency (JICA)
Mr. Osamu Matsumura	Architectural Planning	Architect Kume Architects-Engineers
Mr. Akitada Yanagisawa	Architectural Design	Architect Kume Architects-Engineers
Mr. Shinobu Iwasaki	Structural Planning	Structural Engineer Kume Architects-Engineers
Mr. Katsuei Osao	M/E Planning	M/E Engineer Kume Architects-Engineers
Mr. Masao Iida	Equipment Planning	Architect Kume Architects-Engineers

2). Member List of Draft Report of Basic Design Study Team (Oct. 23 - Nov. 1, 1983)

Mr. Yoshifusa Shikama	Team Leader	Basic Design Division Grant Aid Department Japan International Cooperation Agency (JICA)
Mr. Osamu Matsumura	Architectural Planning	Architect Kume Architects-Engineers
Mr. Akitada Yanagisawa	Architectural Design	Architect Kume Architects-Engineers
Mr. Masao Iida	Equipment Planning	Architect Kume Architects-Engineers

2. Minutes of Discussions

The Basic Design Study, Draft Report of Basic Design Study Team and the Government of Thailand have held series of discussion and exchanged views.

The both parties summerized their agreements on Minutes as the result, and exchanged their signatures by and among Mr. Shikama, Team Leader, Dr. Kosol, Vice Rector of KMITL.

* Copy of signed minutes of both study team (Basic Design Study and Draft Report of Basic Design Study) are shown in next pages.

Minutes of Discussion

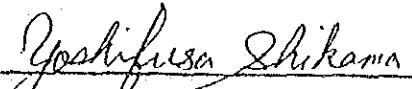
on

The Construction of the Lecture Room Building,
King Mongkut's Institute of Technology Ladkrabang
in the Kingdom of Thailand

In response to the request made by the Government of the Kingdom of Thailand for the King Mongkut's Institute of Technology Ladkrabang (KMITL) for the Construction Project of the Lecture Room Building, King Mongkut's Institute of Technology Ladkrabang (hereafter referred to as "the Project"), the Government of Japan has sent, through the Japan International Cooperation Agency (hereafter referred to as "JICA"), a team headed by Mr. Yoshifusa SHIKAMA, Basic Design Division of Grant Aid Department, JICA, to conduct a basic design study for 21 days from August 7th, 1983. The team has carried out a field survey, held a series of discussions and exchanged views with the authorities concerned of the Project.

As the result of the study and discussions, both parties have agreed to recommend to their respective Governments to examine the results of the survey attached herewith towards the realization of the Project.

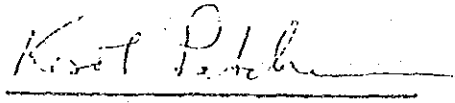
August 19th, 1983


Mr. Yoshifusa SHIKAMA

Team Leader

Basic Design Study Team

JICA



Dr. Kosol PETCHSUWAN

Vice rector

KMITL

ATTACHMENT

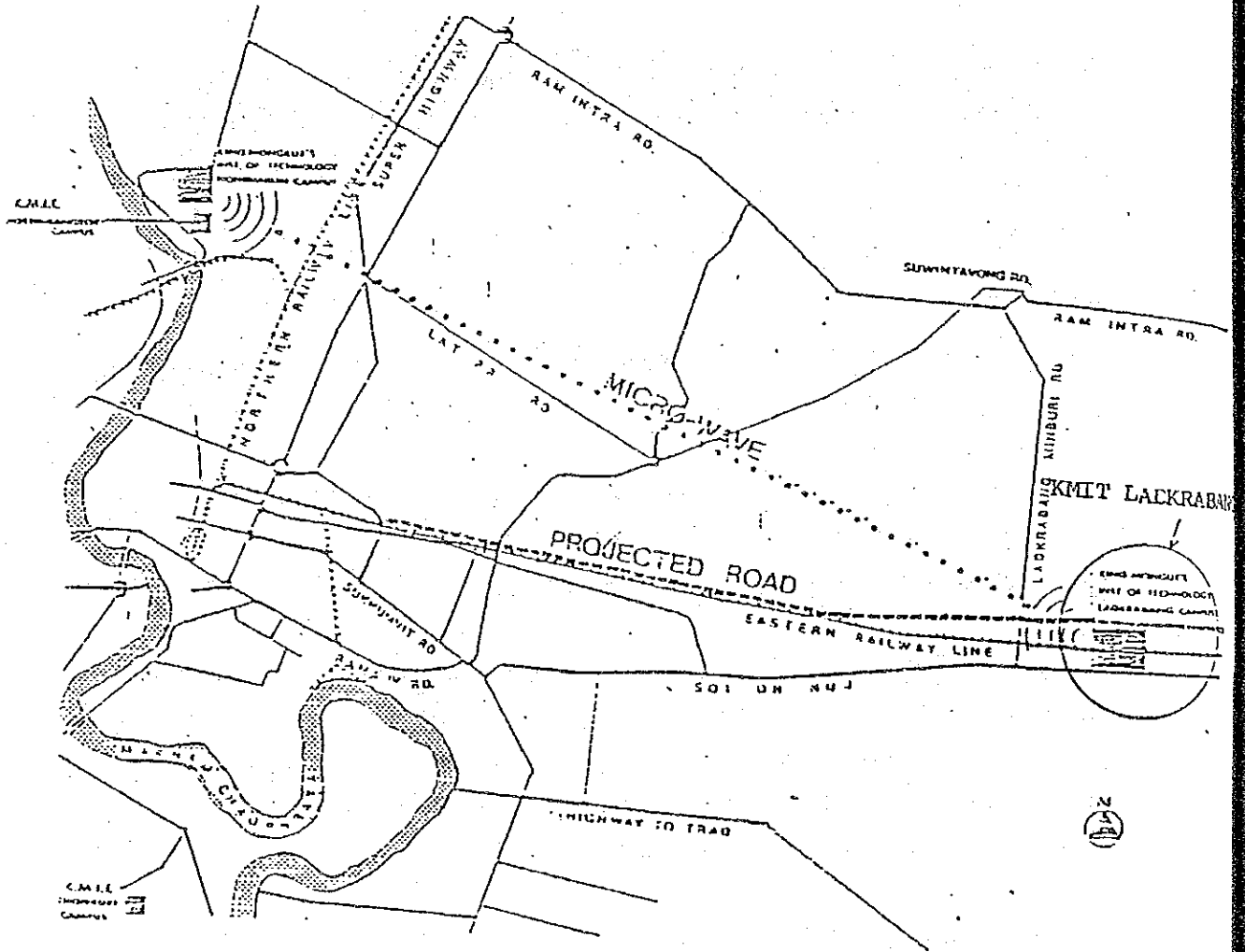
1. The objective of the Project is to provide necessary building, facilities and equipment for the Construction of the Lecture Room Building, King Mongkut's Institute of Technology Ladkrabang (hereinafter referred to as "the Building").
2. The proposed site of the Project is the land acquired by KMITL, (hereinafter referred to as "the Project Site"). The Project Site is shown in Annex I.
3. The Building will undertake its activities with following basic objectives ;
 - (1) to study, research and experimentalize the basic and high technique in the field of science and technology for further producing of high-quality graduate to the local demand
 - (2) to provide necessary data and informations for students and teaching staff by information service section, and
 - (3) to support daily life for students and staff by welfare section.
4. The Japanese Survey Team will convey to the Government of Japan the desire of KMITL that the former takes necessary measures to co-operate in implementing the Project and provides the building and other items listed in Annex II within the scope of Japanese economic cooperation programme in grant form.
5. The Government of Thailand has understood Japan's grant aid system explained by the Team which includes a principle of use of a Japanese Consultant Firm and a Japanese General constructor for implementation of the Project.
6. The Government of Thailand will take necessary measures listed in Annex III on condition that the grant assistance by the Government of Japan is extended to the Project.

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ANNEX I

Location Map



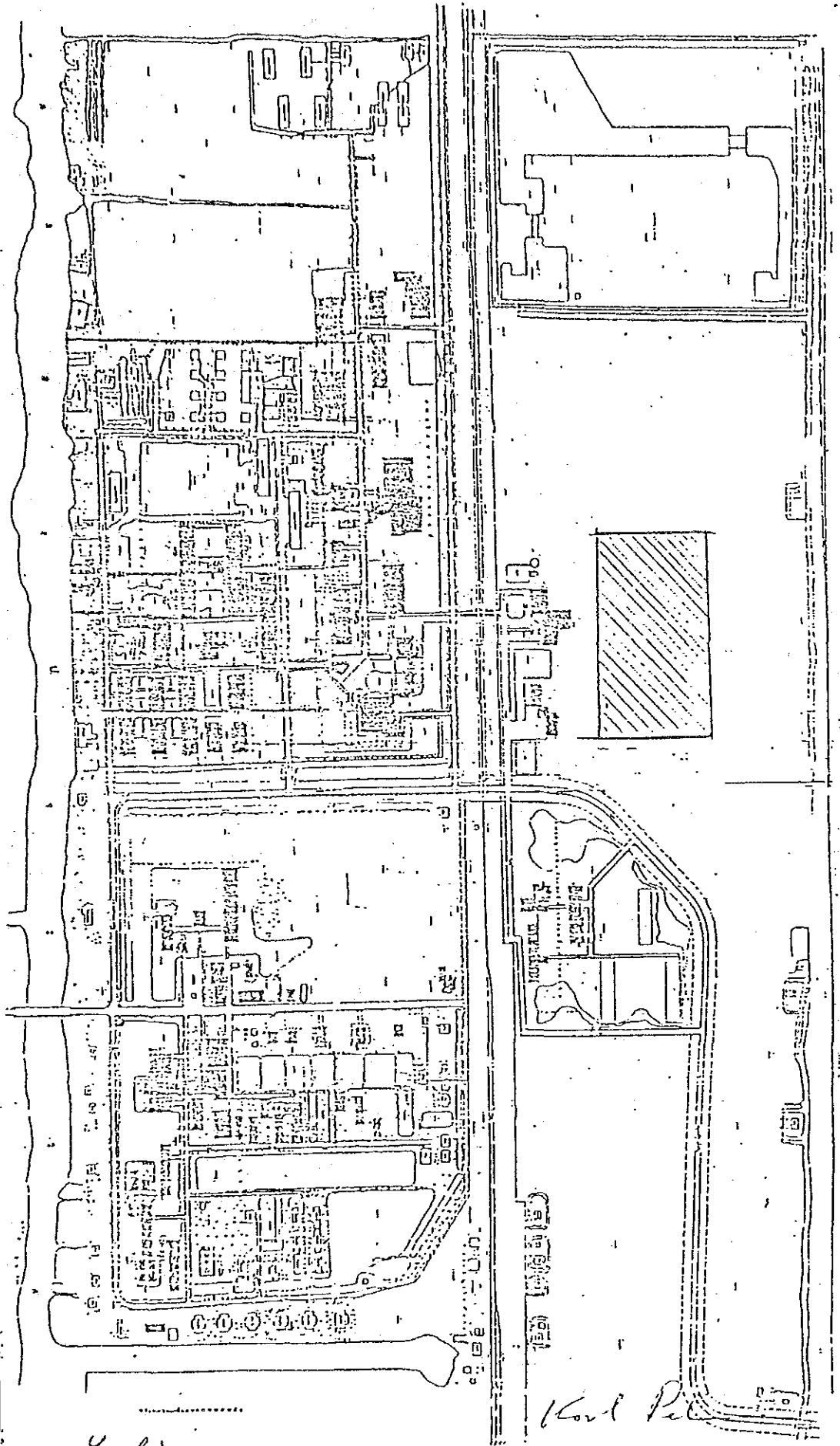
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PROPOSED PROJECT SIZE

โครงการพัฒนาระบบขนส่งมวลชนและอาคารพาณิชย์
ของกรุงเทพมหานคร

Map of KNIT, Ladkrabang Campus



Karl Pich

Yoshi

ANNEX II

Items requested by KMITL the cost of which will be borne by the Government of Japan.

1) Building for:

a) Lecture Rooms & Laboratories

b) Administration

c) Information Center

d) Student Hall

c) Dormitory.

2) Equipment for:

a) Related equipment of the Building.

Yoshi

Kent P. ...

ANNEX III

Following arrangements are required to be taken by the Government of Thailand

1. To secure a lot of land necessary for the construction of facilities and to clear, fill and level the site as needed before the start of the construction.
2. To provide necessary data for basic design such as condition of sub-soil until end of September 1983.
3. To provide facilities for distribution of electricity, telephone, water supply and drainage and other incidental facilities to the proposed building site.*
4. To ensure prompt unloading, tax exemption, customs clearance at ports of disembarkation in Thailand, and prompt internal transportation therein of the products purchased under the grant.
5. To exempt Japanese nationals from customs duties, internal taxes and other fiscal levies which may be imposed in Thailand with respect to the supply of the products and the services under the verified contracts.
6. To accord Japanese nationals whose services may be required in connection with the supply of the products and the services under the verified contract such facilities as may be necessary for their entry into Thailand and stay therein for the performance of their work.
7. To maintain and use properly and effectively that the facilities constructed and equipment purchased under the grant.
8. To undertake incidental civil works such as gardening, fencing, gates and exterior lighting, if needed.
9. To furnish general furniture in the building.

Note : The building site is to cover the ground of the building itself and up to 10 meters around the building.

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Kent P. K.

MINUTES OF DISCUSSIONS
ON
THE DRAFT REPORT OF BASIC DESIGN STUDY
ON
THE CONSTRUCTION OF
THE LECTURE ROOM BUILDING
KING MONGKUT'S INSTITUTE OF TECHNOLOGY
IN THE KINGDOM OF THAILAND

With the view to assist the Government of the Kingdom of Thailand with the grant aid project for the Construction of the Lecture Room Building, King Mongkut's Institute of Technology, the Government of Japan dispatched a Mission to carry out the Basic Design Study (hereinafter referred to as "the Study") on the Construction of the Lecture Room Building, King Mongkut's Institute of Technology (hereinafter referred to as "the Project") through Japan International Cooperation Agency (JICA) from August 7th to August 27th, 1983.

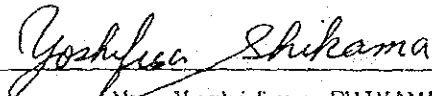
The Mission carried out a field survey and had a series of discussions with the authorities concerned of the Government of Thailand.


As a result of these survey and discussions, JICA prepared and submitted a Draft Final Report on the Study and dispatched a Mission to explain and discuss on this Report starting from October 23rd to November 1st, 1983.

Both parties had a series of discussions on the Report and have agreed to recommend to their respective Governments that the major points of understanding reached between them, attached herewith, should be examined toward the realization of the Project.

October 31st, 1983

Bangkok, Thailand


Mr. Yoshifusa SHIKAMA
Team Leader
Draft Report of Basic Design Study Team
JICA


Dr. Kosol PEICHISUWAN
Vice Rector
KMITL

MAJOR POINTS OF UNDERSTANDING

BASIC DESIGN

1. Thai side principally has agreed to the basic design proposed in the Draft Final Report.
2. The Final Report (10 copies in English) on the Project will be submitted to Thai side by the end of December, 1983.
3. Major undertakings to be taken by both Governments for the Construction of the Lecture Room Building, King Monkut's Institute of Technology are shown in annex 1.

Shikema

K. Petchan

Major undertakings to be taken by both Government

		Japanese side	Thai side
1.	To secure a lot of land		0
2.	To clear, level and reclaim the site		0
3.	To construct the gate and fence in and around the site		0
4.	To construct the parking lot and develop the landscape in the site		0
5.	To construct the road		
	Within/outside of the site		0
6.	To construct the building	0	
7.	To provide facilities for distribution of electricity, water supply, drainage and other incidental facilities		
	1) Electricity		
	a. Distributing line to the site		0
	b. Drop wiring and internal wiring within the site	0	
	c. Main circuit breaker and transformer	0	

Shikama

K. Petchas

	Japanese side	Thai side
2) Water Supply		
a. Water distribution main to the site		0
b. Supply system within the site (receiving and elevated tanks)	0	
3) Drainage		
a. Drainage main (for storm, sewer and others) to the site		0
b. Drainage system (for toilet sewer, ordinary waster, storm drainage and others) within the site	0	
4) Telephone System		
a. Telephone trunk line to the main distribution frame/ panel (MDF) of the building		0
b. MDF and the extension after the frame/panel	0	
5) Furniture and Equipment		
a. Furniture for office		0
b. Furniture and Equipment for facilities for Project	0	

Shikama

K. Petcha

		Japanese side	Thai side
8.	To bear the following commissions to the Japanese foreign exchange bank for the banking services based upon the B/A		
	1) Advising commission of A/P		0
	2) Payment commission		0
9.	To ensure unloading and customs clearance at port disembarkation in recipient country		
	1) Marine (Air) transportation of the products from Japan to the recipient country	0	
	2) Tax exemption and customs clearance of the products and bonded Warehouse charge at the port of disembarkation		0
	3) Internal transportation from the port of disembarkation to the project site	0	
10.	To accord Japanese nationals whose services may be required in connection with the supply of the products and the services under the verified contract such facilities as may be necessary for their entry into recipient country and stay therein for the performance of their work		0
11.	To maintain and use properly and effectively that the facilities constructed and equipment purchased under the Grant		0
12.	To bear all the expense other than those to be borne by the Grant		0

3. Organization of Authorities Concerned

1). Thai Authorities Concerned

. King Mongkut's Institute of Technology, Ladkrabang

(Executive Staff)

Vice Rector	Dr. Kosol Petchsuwan
Dean, Faculty of Engineering	Dr. Sitthichal Pookaiyudom
Dean, Faculty of Architecture	Mr. Somluk Asvahem
Dean, Faculty of Industrial Education and Science	Dr. Boonsong Siwamogsatham
Dean, Faculty of Agricultural Technology	Dr. Supachai Ratanopas
Director Computer Research and Service Center	Dr. Pairash Tajchayapong
Assistant Rector for Academic Affairs	Dr. Pirasak Varasundharosoth
Assistant Rector for Planning and Development	Mr. Pisit Viriyavadhana
Assistant Rector for Administration	Mrs. Wilawan Worniyodpun
Assistant Rector for Student Affairs	Mr. Sompol Kosalwit
Assistant Rector for Special Affairs	Mrs. Wanida Dhupalemya

. KMITL Committe Member of Basic Design

Chief	Mr. Pisit Viriyavadhana
Member	Mr. Manoon Sukasaem
Faculty of Engineering	Mr. Chirapong Poomijit
Faculty of Architecture	Mr. Maitree Podisuk
Faculty of Industrial Education and Science	Mr. Voradej Chantrasorn
Faculty of Agricultural Technology	Mr. Chom Kimpan
Facility Planning	Mr. Uab Hemarataja

. Japanese Expert (KMITL)	Mr. Kaku Mr. Yasumura
. Ministry of University Affairs	
Minister	Mr. Preeda Pattanathabutr
Deputy Minister	Mr. Arthorn Cholhenchob
. DTEC	
Deputy Director General	Mr. Kasem Unahaasuvan
Director of Division II of External Cooperation	Mr. Precha Chaowaslip
Director of Colombo Plan Sub-Division	Mr. Thawal Polpuech
Member	Mr. Sutin Susila
Member	Mr. Surayuth Kungsadan
. ChulalongKorn University Faculty of Engineering	
Librarian	Mrs. Tatpuree Chongteungprinya
. ChulalongKorn University Language Institute	
Deputy Director	Mrs. Marina
. Tamasart University	
Asst. Rector Foreign Relations	Dr. Ninnat Olanvoravuth
2). Japanese Authorities Concerned in Thailand	
. The Embassy of Japan	
Minister	Mr. Taizo Watanabe
Councilor	Mr. Hiroshi Shigeta
Secretary	Mr. Takao Ito

. JICA Bangkok Office

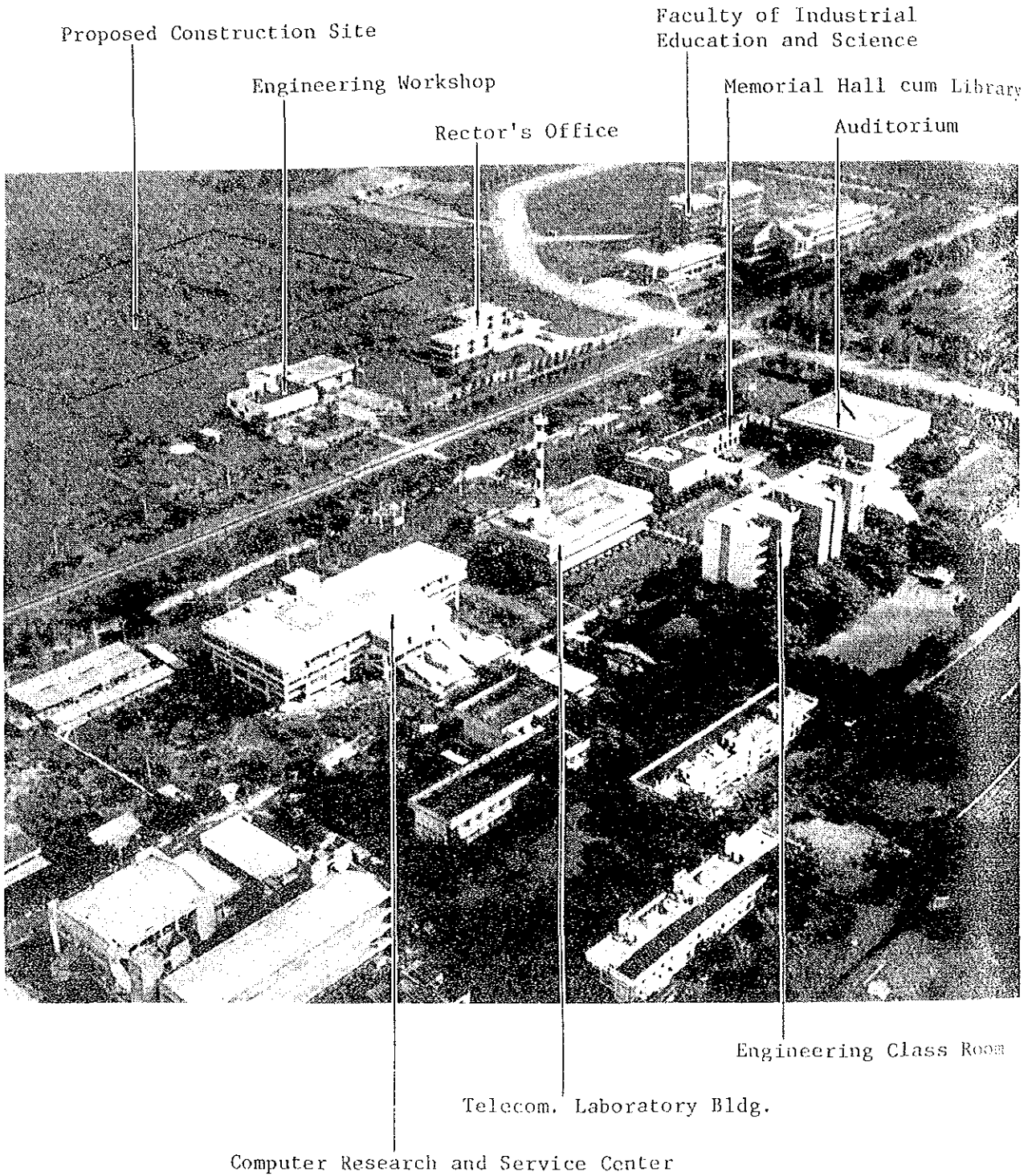
Director

Mr. Akira Kasai

Staff

Mr. Kanehiro Kawakami

4. Construction Site



5. Structural Design Data

แผนที่ จุดเจาะสำรวจดิน B-1, B-2

ลาดกระบัง

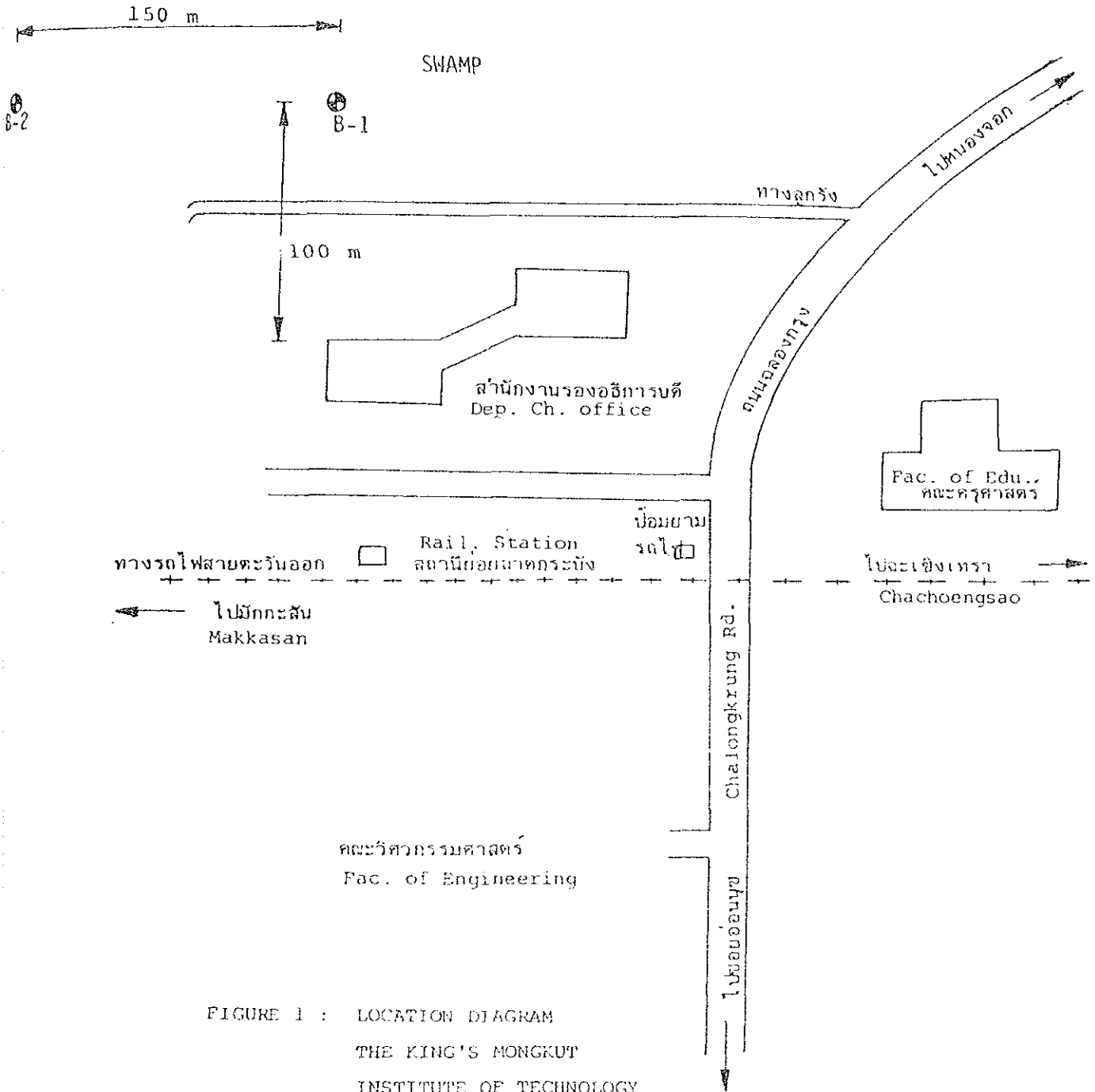


FIGURE 1 : LOCATION DIAGRAM
THE KING'S MONGKUT
INSTITUTE OF TECHNOLOGY
LADKRABANG
BANGKOK

6. KMITL's Curriculum for First and Second Year

Faculty	Department	Subjects	Number of Students
Engineering	Telecommunication Engineering	First Semester, First Year	
		FORTTRAN Programming	40
		Mathematics I	"
		Mechanics	"
		Thermodynamics	"
		Electric Circuits Analysis	"
		Physics Lab. I	"
		Engineering Drawing I	"
		Engineering Workshop I	"
		Elective on Social Science	"
		Second Semester, First Year	
		Mathematics II	40
		Electro-Magnetics	"
		Quantum Physics	"
		Physics Lab. II	"
		Design of Digital Circuits	"
		COBOL Programming and Logic	"
		Engineering Drawing II	"
		Engineering Workshop II	"
		Elective on Social Science	"
		First Semester, Second Year	
		Mathematics III	40
		Solid State Electronics	"
		Electrical Machines	"
		Engineering Electro-Magnetics	"
		Theory of Electric Circuits	"
		Engineering English I	"
		Japanese I	"
		Engineering Lab. I	"

		Second Semester, Second Year	
		Mathematics IV	40
		Electrical Power System	"
		Communication Engineering	"
		Electronics Engineering	"
		Engineering English II	"
		Japanese II	"
		Engineering Lab. II	"
Engineering	Electrical Engineering	First Semester, First Year	
		FORTRAN Programming	40
		Mathematics I	"
		Mechanics	"
		Thermodynamics	"
		Electric Circuits Analysis	"
		Physics Lab. I	"
		Engineering Drawing I	"
		Engineering Workshop I	"
		Elective on Social Science	"
		Secon Semester, First Year	
		Mathematics II	40
		Electro-Magnetics	"
		Quantun Physics	"
		Physics Lab. II	"
		Design of Digital Circuits	"
		COBOL Programming and Logic	"
		Engineering DrawingII	"
		Engineering Workshop II.	"
		Elective on Social Science	40
		First Semester, Second Year	
		Mathematics III	40
		Theory of Electric Circuits	"
		Electronics Engineering	"
		Electronics Lab. I	"
		Electronics Measurement and Electronic Instrument	"

		Engineering English I	40
		Japanese I	"
		Engineering Electro-Magnetics	"
		Second Semester, Second Year	
		Mathematics IV	40
		Principle of Communication	"
		Semi-Conductor Physics	"
		Design of Electronics Circuit	"
		Theory of Electric Circuits Active Form	"
		Electronics Lab. II	"
		Engineering English II	"
		Japanese II	"
Engineering	Computer		
	Engineering	First Semester, First Year	
		FORTRAN Programming	40
		Mathematics I	"
		Mechanics	"
		Thermodynamics	"
		Electric Circuits Analysis	"
		Physics Lab. I	"
		Engineering Drawing I	"
		Engineering Workshop I	"
		Elective on Social Science	"
		Second Semestre, jFirst Year	
		Mathematics II	40
		Electro-Magnetics	"
		Quantun Physics	"
		Physics Lab. II	"
		Design of Digital Circuits	"
		COBOL Programming and Logic	"
		Engineering Drawing II	"
		Engineering Workshop II	"
		Elective on Social Science	"

First Semester, Second Year

Mathematics III	40
Solid State Electronics	"
Electronics Engineering	"
Electrical Machines	"
Engineering English I	"
Japanese I	"
Computer System	"
Engineering Lab. I	"

Second Semester, Second Year

Mathematics IV	40
Electrical Power System	"
Design of Electronics Circuit	"
Feedback Control System	"
Theory of Electric Circuit	"
Engineering English II	"
Japanese II	"
Engineering Lab. II	"

Engineering Control
Engineering

First Semester, First Year

FORTTRAN Programming	40
Mathematics I	"
Mechanics	"
Thermodynamics	"
Electric Circuits Analysis	"
Physics Lab. I	"
Engineering Drawing I	"
Engineering Workshop I	"
Elective on Social Science	"

Second Semester, First Year

Mathematics II	40
Electro-Magnetics	"
Quantum Physics	"
Physics Lab. II	"
COBOL Programming and Logic	"

Engineering Drawing II	40
Engineering Workshop II	"
Elective on Social Science	"

First Semester, Second Year

Mathematics III	40
Solid and Fluid Mechanics	"
Electrical Transformation	"
Solid State Electronics	"
Theory of Electric Circuits	"
Engineering Lab. I	"
Engineering English I	"
Japanese I	"

Second Semester, Second Year

Mathematics IV	40
Electrical Machines	"
Electronics Engineering	"
Electrical Measurement and Electrical Instrument	"
Engineering System with Analog Computer	"
Engineering Lab. II	"
Engineering English II	"
Japanese II	"

Mechanical
Engineering

First Semester, First Year

FORTTRAN Programming	40
Mathematics I	"
Mechanics	"
Thermodynamics	"
Electric Circuits Analysis	"
Physics Lab. I	"
Engineering Drawing I	"
Engineering Workshop I	"
Elective on Social Science	"

Second Semester, First Year

Mathematics II	40
Electromagnetics	"
Physics Lab. II	"
COBOL Programming	"
Design of Digital Circuits and Logic	"
Engineering Drawing II	"
Engineering Workshop II	"
Elective on Social Science	"

First Semester, Second Year

Mathematics III	40
Mechanic of Solids I	"
Engineering Thermodynamics	"
Electrical Machines	"
Engineering Materials	"
Production Process I	"
Engineering English I	"
Japanese I	"

Second Semester, Second Year

Mathematics IV	40
Mechanic of Solids II	"
Fluid Mechanics I	"
Engineering Mechanics	"
Electrical Power System	"
Production Process II	"
Engineering English II	"
Japanese II	"

Architecture Architecture

First Semester, First Year

English I	40
Mathematics	"
Physics	"
Delineation I	"
Basic Architectural Drawing	"
Visual Design	"

	Workshop	40
	Fundamental Design I	"
	Building Technology I	"
	Second Semester, First Year	
	English II	40
	Physical Education	"
	Delineation II	"
	Applied Mechanics	"
	Strength of Materials	"
	Fundamental Design II	"
	Building Technology II	"
	First Semester, Second Year	
	English III	40
	History of Architecture I	"
	Structure I	"
	Interior Architecture	"
	Principle of Design I	"
	Architectural Design I	"
	Building Technology III	"
	Second Semester, Second Year	
	English IV	40
	Statistics	"
	History of Architecture II	"
	Structures II	"
	Surveying	"
	Climatology	"
	Principle of Design II	"
	Architectural Design II	"
	Building Technology IV	"
Interior Architecture	First Semester, First Year	
	Mathematics	40
	English I	"
	Delineation I	"

Basic Architectural Drawing	40
Fine Arts I	"
Ergonomics I	"
Workshop I	"
Interior Architecture I	"
Second Semester, First Year	
Physics	40
English II	"
Physical Education	"
Delineation II	"
Fine Arts II	"
Ergonomics II	"
Applied Mechanics	"
Workshop II	"
Interior Architecture II	"
Materials and Usages	"
First Semester, Second Year	
English III	40
History of Interior Architecture I	"
Delineation III	"
Fine Arts III	"
Decoration Plant I	"
Architectural Technology I	"
Interior Architecture III	"
Interior Structure I	"
Exhibition I	"
Second Semester, Second Year	
English IV	40
History of Interior Architecture II	"
Philosophy	"
Psychology	"
Fine Arts IV	"
Decoration Plant II	"
Architectural Technology II	"

	Interior Architecture IV	40
	Interior Structure II	"
	Exhibition II	"
Industrial Design	First Semester, First Year	
	Mathematics	40
	Visual Design	"
	Delineation I	"
	Metal Workshop	"
	Ergonomics I	"
	Physical Education	"
	English I	"
	History of Art	"
	Engineering Technology	"
	Industrial Drawing	"
	Second Semester, First Year	
	English II	40
	Fine Arts I	"
	Delineation II	"
	Wood Workshop	"
	Ergonomics II	"
	Physics	"
	Engineering Technology	"
	Design Fundamental	"
	Industrial Drawing II	"
	First Semester, Second Year	
	English III	40
	Fine Arts	"
	Material & Usage	"
	Industrial Drawing III	"
	Industrial Design I	"
	Plactic Design I	"
	Ceramic Design I	"
	Furniture Design I	"
	Textile Design I	"
	Metal Design I	"

Second Semester, Second Year

English IV	40
Fine Arts III	"
Psychology	"
Textile Design II	"
Industrial Design II	"
Plastic Design II	"
Ceramic Design II	"
Furniture Design II	"
Metal Design II	"

Construction
Technology

First Semester, First Year

English I	20
Mathematics I	"
Physics	"
Chemistry	"
Construction Technology I	"
Wood and Steel Lab.	"
Construction Drawing I	"
Social and Culture	"

Second Semester, First Year

English II	20
Mathematics II	"
Applied Mechanics	"
Human Relations	"
Physical Education	"
Construction Technology II	"
Construction Drawing II	"
Cement and Concrete Lab.	"
Safety and Health	"

First Semester, Second Year

English III	20
Quantitative Analysis	"
Organization Management and Business Administration	"
Construction Technology III	"

Environmental Technology	20
Construction Materials and Testing I	"
Strength of Materials	"
Second Semester, Second Year	
English IV	20
Introduction to Economics	"
Construction Technology IV	"
Construction Materials and Testing II	"
Surveying I	"
Structure Analysis I	"
Elective	"

Science	Applied Mathematics		
		First Semester, First Year	
		English I	20
		Sociology	"
		Physical Education I	"
		Calculus I	"
		Introduction to Programming	"
		Introduction to Statistics	"
		General Physics I	"
		Second Semester, First Year	
		English II	20
		Human Relations	"
		Physical Education II	"
		Calculus II	"
		FORTRAN Programming	"
		Introduction to Probability	"
		General Physics II	"
		First Semester, Second Year	
		Scientific English I	20
		Calculus III	"
		Linear Algebra	"
		COBOL Programming	"
		Mechanics	"
		Inorganic Chemistry I	"
		Inorganic Chemistry Lab.	"
		Elective on Social Science	"
		Second Semester, Second Year	
		Scientific English II	20
		Applied Mathematics I	"
		Computer Programming (ASSEMBLY)	"
		File Management	"
		Physics of Atoms and Nuclear	"
		Physical Chemistry I	"
		Physical Chemistry Lab. I	"
		Elective on Social Science	"

Industrial
Chemistry

First Semester, First Year

English I	30
Mathematics for Chemist I	"
General Physics I	"
Inorganic Chemistry I	"
Inorganic Chemistry Lab.	"
Engineering Drawing	"
Engineering Workshop	"
Physical Education I	"
Elective on Social Science	"

Second Semester, First Year

English II	30
Mathematics for Chemist II	"
General Physics II	"
Physical Chemistry I	"
Physical Chemistry Lab. I	"
Organic Chemistry I	"
Organic Chemistry Lab. I	"
Physical Education II	"
Elective on Social Science	"

First Semester, Second Year

Scientific English I	30
Mathematics for Chemist III	"
Organic Chemistry II	"
Physical Chemistry II	"
Physical Chemistry Lab. II	"
Analytical Chemistry Lab. I	"
Elective on Social Science	"

Second Semester, Second Year

Scientific English II	30
Probability and Statistics	"
Organic Chemistry III	"
Inorganic Chemistry II	"
Analytical Chemistry II	"

Biological
Technology

Analytical Chemistry Lab. II	30
Engineering Thermodynamic and ----- Chemistry	"
Elective on Social Science	"
First Semester, First Year	
English I	20
Mathematics for Biological Science I	"
General Physics I	"
Inorganic Chemistry I	"
Inorganic Chemistry Lab.	"
Principle of Biology Lab.	"
Physical Education I	"
Elective on Social Science	"
Second Semester, First Year	
English II	20
Mathematics for Biological Science II	"
General Physics II	"
Organic Chemistry I	"
Organic Chemistry Lab. I	"
General Botany	"
General Zoology	"
Physical Education II	"
First Semester, Second Year	
Scientific English I	20
Mathematics for Biological Science III	"
Analytical Chemistry I	"
Analytical Chemistry Lab. I	"
Organic Chemistry II	"
Organic Chemistry Lab. II	"
Principle of Genetics	"
Engineering Drawing	"
Engineering Workshop	"

	Second Semester, Second Year	
	Scientific English II	20
	Probability and Statistics	"
	Introduction to computer and Programming	"
	Biochemistry	"
	General Microbiology	"
	General Microbiology Lab.	"
	Elective on Social Science	"
Applied Physics	First Semester, First Year	
	English I	30
	Mathematics for Physics I	"
	Probability and Statistics	"
	General Physics I	"
	General Chemistry I	"
	Engineering Drawing I	"
	Engineering Workshop I	"
	Physical Education I	"
	Elective on Social Science	"
	Second Semester, First Year	
	English II	30
	Mathematics for Physics II	"
	Mathematics for Physics III	"
	General Physics II	"
	General Chemistry II	"
	Engineering Drawing II	"
	Engineering Workshop II	"
	Physical Education II	"
	Elective on Social Science	"
	First Semester, Second Year	
	Scientific English II	30
	Mathematics for Physics III	"
	Thermodynamics and Statistical Physics	"
	Physics of Atoms and Nucleus	"
	Electrical Circuits Analysis	"

	Scientific Computer Programming I	30
	Physics Lab. I	"
Second Semester, Second Year		
	Scientific English II	30
	Mechanics	"
	Electromagnetic Field	"
	Quantum Mechanics I	"
	Electronics I	"
	Electronics Lab. I	"
	Physics Lab. II	"
	Scientific Computer Programming II	"
Applied Statistics	First Semester, First Year	
	Physical Education	20
	Human Relations	"
	Sociology	"
	English I	"
	Calculus I	"
	Introduction to statistics	"
	General Physics I	"
Second Semester, First Year		
	Physical Education II	20
	English II	"
	Calculus II	"
	Introduction to Probability	"
	General Physics II	"
	Elective on Social Science	"
First Semester, Second Year		
	Japanese I	20
	Scientific English I	"
	Calculus III	"
	Linear Algebra	"
	FORTTRAN Programming	"
	Sampling Theory	"
	Elective on Social Science	"

Elective on Social Science	20
Second Semester, Second Year	
Japanese II	20
Scientific English II	"
Foundation of Mathematics	"
Differential Equations I	"
COBOL Programming	"
Regression and Co----- Analysis	"
Elective on Social Science	"
Face Elective	"

Agricultural
Technology Agriculture

First Semester, First Year

Technical English	80
Labor Laws	"
Humanities	"
Applied Mathematics I	"
Nursery Operation	"
Intensive Crop Production	"
Tropical Grassland and Foddes Production	"
Poultry Meat Production Operation	"
Irrigation and Drainage	"

Second Semester, First Year

Consumer Economics	80
Verbal Communication	"
Applied Mathematics II	"
Farm Organization with Accountancy	"
Intensive Animal Production I	"
Engine and Agricultural Machine Practice	"
Farm Machinery I	"
Agricultural Production Operation	"

First Semester, Second Year

Agricultural Extension	80
Selected Field Crop Operation	"
Tropical Soils	"
Advanced Crop Production	"
Artificial Insemination Operation	"
Intensive Animal Production II	"
Farm Machinery II	"
Elective	"
Elective	"

Second Semester, Second Year

Genetics	80
Agricultural Production Machinery	"
Plantation Labour Management	"

	Agricultural Field Simulating	80
	Operation and Problem Solving	"
	Advance Animal Production	"
	Agricultural Processing Practice	"
	Agricultural Mechanisation and Farm Power	"
	Elective	"
	Elective	"
Floriculture and Ornamental Morticulture	First Semester, First Year	
	Technical English	40
	Humanitics	"
	Applied Mathematics I	"
	Principle of Floriculture and Ornamental Norticulture	"
	Landscape Drafting	"
	Nursery Operation	"
	Plant Propagation Practice II	"
	Principle of Plant Production	"
	Irrigation and Drainage	"
	Second Semester, First Year	
	Verbal Communicaiton	40
	General Psychology	"
	Applied Mathematics II	"
	Farm Organization with Accountancy	"
	Landscape Design	"
	Eloriculture and Ornamental Equipment	"
	Plant Pest and Control	"
	Ornamental Norticulture Practice	"
	Engine and Agricultural Machine Practice	"
	First Semester, Second Year	
	Labour Law	40
	Genetics	"
	Agricultural Extension	"

Landscaping Practice	40
Turf Grass Production	"
Tropical Soil	"
Nursery Management	"
Elective	"
Elective	"

Second Semester, Second Year

Consumer Economics	40
Floral and Ornamental Business	"
Agricultural Field Simulating	"
Operation and Problem Solving	"
Miniature Garden in Containers	"
Plant Containers	"
Indoor Landscaping	"
Commercial Floriculture Practice	"
Elective	"
Elective	"

Agricultural
Mechanics

First Semester, First Year

Consumer Economics	40
Verbal Communication	"
General Psychology	"
Applied Mathematics II	"
Agricultural Machine Workshop	"
Noncutting Technology Workshop	"
Pumps and Compressors	"
Machine Elements	"
Engine Instrument and Testing	"
Agricultural Production Machinery	"

First Semester, Second Year

Technical English	40
Plantation Labour Management	"
Agricultural Machine Fitting and Construction I	"
Electrical Measurement in Engine Shop	"

	Refrigeration and Cold Storage	40
	Basic Pneumatic and Hydraulic System	"
	Poultry and Livestock Equipments	"
	Elective	"
	Elective	"
	Second Semester, Secon Year	
	Tropical Soil	40
	Agricultural Machine Fitting and Construction II	"
	Agricultural Processing Workshop	"
	Earthmoving Equipments	"
	Irrigation and Drainage Equipments	"
	Dairy Equipments	"
	Agricultural Machinery Design	"
	Elective	"
	Elective	"
Agricultural Engineering	First Semester, First Year	
	Verbal Communication	20
	English I	"
	Mathematics I	"
	Physics I	"
	Chemical for Agricultural Engineering I	"
	Engineering Mechanics I	"
	Mechanical Drawing I	"
	Second Semester, First Year	
	Thai Composition	20
	English II	"
	Mathematics II	"
	Physics II	"
	Chemical for Agricultural Engineering II	"
	Engineering Mechanics II	"

Mechanical Drawing II	20
First Semester, Second Year	
English III	20
Mathematics III	"
Computer	"
Biology of Plant	"
Mechanics of Machinery	"
Strength of Materials	"
Principles of Electrical Engineering I	"
Second Semester, Second Year	
Mathematics IV	20
Biology of Animal	"
Physical Properties of Biological Materials	"
Environmental Relationships	"
Engineering Laboratory	"
Principles of Electrical Engineering II	"
Applied Thermodynamics	"

7. KMITL's Staff and Teachers Studied in Japan

TEACHING STAFF TRAINED IN JAPAN

	NAME		SUBJECT
1.	MR. SUKON	NAMPETCH	TELEGRAPH ENG.
2.	MR. SUCHIN	JANJOD	TELEPHONE ENG.
3.	MR. ROONG	POTISUWAN	RADIO & MICROWAVE
4.	MR. KEHTONG	NIMSIRI	TELEPHONE OUTSIDE PLANT
5.	MR. MANOON	SUKKASEM	TELEPHONE SWITCHING ENG.
6.	MR. THAWIL	KINGTONG	TELEPHONE OURSIDE PLANT
7.	MR. TAWIL	PAUNGMA	TELEPHONE SWITCHING ENG.
8.	MR. AMPORN	MANASPRON	TELEPHONE OUTSIDE PLANT
9.	Dr. KCSOL	PETCHSUWAN	COMPUTER
10.	Dr. PAIRUSH	TAJCHAYAPONG	SOFTWARE COM.
11.	Dr. BIRASAK VARASUENHAROSOTH		ELECTRICAL MACHINE (JSPS)
12.	MR. ETTICHAJ ARJUSRISEANGCHAI		SOLID STATE
13.	MR. VICHAI	SURAPATANA	T.V. BROADCASTING
14.	MR. VIPAN	PRIJAPANIJ	APP. OF CCMPUTER
15.	MISS WUNDEZ	WUTIKATANA	POWER SYSTEM
16.	MR. WIWAT	KIRANGH	CARRIER TELEPHONE
17.	MR. NARONG	HEMMAKORN	SATELLITE COM.

TEACHING STAFF STUDIED IN JAPAN

	NAME		SUBJECT	
1.	MR. MAHOON	SUKKASEN	TELECOM	B. Eng M. Eng
2.	MR. NARONG	NEMAKORN	TELECOM	B. Eng M. Eng
3.	MR. PRAKIT	TANGTISANON	TELECOM	B. Eng M. Eng (ECU)
4.	MR. THAWIL	KING TONG	TELECOM	B. Eng M. Eng
5.	MR. SOMPOL	KOSALWIT	TELECOM	B. Eng M. Eng
6.	MR. APINAN	MANYANONT	TELECOM	B. Eng M. Eng (ECU)
7.	MR. PALLOP	LAOCHAREON	TELECOM Control Eng.	B. Eng M. Eng (Osaka Univ.) D. Eng (Osaka Univ.)
8.	MR. PRADIT	VAJARAPIBOON	TELECOM	B. Eng M. Eng
9.	MR. DANUT	WISESKUL	ELECTRONICS	M. Eng
10.	MR. PRATEEP	BUYATNOPARAT	COMPUTER	M. Eng
11.	MR. WIWAT	KIRANOND	NETWORK DESIGN	M. Eng D. Eng
12.	MR. VICHEAL	SRISAUKARM	MATHEMATICS	M. Eng
13.	MISS JONGKOL	NGAMWIT	CONTROL Electrical Eng. Candidate	M. Eng D. Eng
14.	MR. KANCHIT	MAITREE	T.V. Eng PATTERN RECOGNITION Candidate	M. Eng D. Eng
15.	MR. MANAS	SANGVORASTIP	TRANSMISSION	M. Eng
16.	MR. SOMKIAT	SUPADEJ	APPLIED ELECTRONICS	M. Eng
17.	MR. ACHAWAKIT	RATANAKORN	COM. SYSTEM	M. Eng
18.	MR. KANOK	TENJENJIRAPONGVEJ	TELEGRAPH VIDEO SIGNAL TR&M Candidate	M. Eng D. Eng
19.	MR. SOMJET	TIENMUANG	POWER High Voltage Candidate.	M. Eng D. Eng
20.	MR. HOKE	SAEJEU	INDUSTRIAL Eng.	M. Eng

	NAME	SUBJECT
21.	MR.KITTI TEERASET	ELECTRICAL MACHINE M.Eng
22.	MR.PATIKORN WARAKULSIRIPUN	COMPUTER NETWORK Candidate M.Eng
23.	MR.BOONWAT ATACHOO	COMPUTER Eng. Candidate M.Eng
24.	MR.CHOM KIMPAN	COMPUTER Eng. M.Eng(Nippon)
25.	MR.YOTHIN PREMPANERUCH	CONTROL Eng. M.Eng(Nippon) (JSPS) Cadidate D.Eng(Nippon)

8. Enquête Data of Students in KMITL

1) Sex (120 students)

Male	100	Female	20
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2) Residence (Person) (Ratio)

Bangkok area	96	80%
Ladkrabang district	14	12%
The other area	10	8%

3) Attendance Hour (minutes) : One way

(Min.)	(Person)	(more than 130 min.)
- 30	17	* 240 - TAHORA (BANGKOK YAI, THON BURI)
31 - 59	16	163 - BANG-NA
60	17	160 - DUSIT
61 - 89	3	150 - BANGKOK NOI (THON BURI)
90	17	150 - SAMUTR PRAKARN
91 - 119	16	135 - YANABA
120 -	34	130 - ROSE-GARDENT
		130 - BANG KARI

4) Attendance Way

	(Person)
Bus	62
Train	95
Car	2
Ship	8
Bicycle or on foot	13

5) Tarffic Expenses (Baht)					
	(Person)		(Person)		(Person)
20	2	200	15	300	25
30	1	220	3	320	3
50	1	230	2	330	2
100	1	240	4	340	1
120	2	250	8	350	8
130	1	260	3	360	2
140	1	270	3	400	2
150	4	290	1	450	3
160	3			500	1
180	3			600	2
190	2				

6) Necessity of Student's Dormitory in Campus
 Yes 114 person (95%) No 6 person (5%)

7) Available Lodging Expenses (Baht)	
	(Person)
120	1
200	67
300	39
400	7
500	4

9. List of Equipment

	Q'TY
A. Class Room for 1,800 student	
A- 1) Blackboard	47
- 2) Desk & Chair for Student	1,800
- 3) Desk & Chair for Teacher	47
B. Physics Lab.	
B- 1) Blackboard	2
- 2) Lab. Table w/sink	16
- 3) Side Table	8
- 4) Balance Table	4
- 5) Teacher's Lab. Table	2
- 6) Acoustic and Supersonic Experiment sets	1
- 7) Microwave Experiment set	1
- 8) Electron Ray Diffraction Experiment	1
- 9) Physical Optics Experiment set	1
-10) Holograph Experimental Equipment	1
-11) IC Logic Circuit Experiment set	1
-12) Operational Amplifier Experiment set	1
-13) Transistor and Thyristor Experiment	1
-14) Digital Thermometer	1
-15) Diffusion Vacuum System	1
B'. Preparation Room for Pysics Lab.	
B'- 1) Blackboard	1
- 2) Table	2
- 3) Storage Cabinet	4
- 4) Locker	2
- 5) Side Table	2
- 6) Lab. Table	1

C. Chemistry Lab.

C- 1) Blackboard	2
- 2) Lab. Table w/sink	12
- 3) Side Table	8
- 4) Balance Table	4
- 5) Teacher's Lab. Table	2
- 6) Fume Hood	4
- 7) Heating Mantle for 250cm ³	10
" for 500cm ³	5
" for 1000cm ³	5
- 8) Mortor Stirrer	5
- 9) Vacuum Oven	2
-10) Melting Point Determination Apparatus	2
-11) Rotary Vacuum Evaporator	1
-12) Distillation Apparatus	2
-13) Freeze Dryer, Dry-Ice Freeze	1
-14) Desicator	5
-15) Water Bath	2
-16) Bomb-Calorimeters	1
-17) Automatic Recording Polorograph	1
-18) Thermoelectric Cooler	1
-19) DC Power Supply	2
-20) V-D Shaking Seperatory Funnel	1
-21) Constant Temperature Kinematic Viscometer Bath	1

C'. Preparation Room for Chemistry Lab.

C'- 1) Blackboard	1
- 2) Table	2
- 3) Storage Cabinet	4
- 4) Locker	2
- 5) Side Table	2
- 6) Lab. Table	1

D. Biology Lab.

D- 1) Blackboard	2
- 2) Lab. Table	6
- 3) Side Table	4
- 4) Teacher's Lab. Table	2
- 5) Hume Food	2
- 6) Microscope	30
- 7) Autoclaves	2
- 8) Incubator	2
- 9) Electric Drying Oven	2
-10) Aseptic Box	2
-11) Culture Bath Shaker	2
-12) P ^H Meter	2
-13) Glassware Washer	2
-14) Pipette Washer	2
-15) Stereomicroscope	15
-16) Semi-Automatic Top-Pan Balance	2
-17) Electric Drying Oven	1
-18) High Speed Centrifuge w/Rotor	1
-19) Spectrophotometer	1
-20) Genetics Apparatus	1
-21) Insect Gauge	15
-22) Breeding Bottle	15
-23) Growth Chamber	1
-24) Aseptic Box	15

D'. Preparation for Biology Lab.

D'- 1) Blackboard	1
- 2) Table	2
- 3) Storage Cabinet	4
- 4) Locker	2
- 5) Side Table	2
- 6) Lab. Table	1

E. Drawing Room	
- 1) Blackboard	2
- 2) Drawing Table w/Drawing Machine	120
- 3) Table for Teacher	2
- 4) Map Cabinet	2
F. Computer Lab.	
F- 1) Blackboard	2
- 2) Table	120
- 3) Table for Teacher	2
- 4) Microcomputer	60
F'. Preparation for Computer Lab.	
F'- 1) Blackboard	1
- 2) Table	2
- 3) Storage Cabinet	4
- 4) Locker	2
G. Electronic & Opto-Electronic Lab.	
G- 1) Blackboard	2
- 2) Working Table w/Rack & AC Power	30
- 3) Table for Teacher	2
- 4) Transister Circuit Trainers	1
- 5) Pulse Circuit Trainers	1
- 6) Digital Circuit Trainers	1
- 7) Power Supply Circuit Trainers	1
- 8) Thysister Trainer (SRC11,12,13,14,15)	1
- 9) Model Computer	1
-10) Magnetic Circuit Trainer	1
-11) Sequential Controller	1
-12) MOD/DEMOM Trainer	1
-13) AD/DA Trainer	1
-14) Stabilized Light Source	1
-15) Optical Power Meter	1
-16) Optical Tester	1
-17) Optical Attennator (Varibale 2 step)	1
-18) Dummy Filter	1
-19) Connector Adapter	2

-20) Bare Fiber Aapter	2
-21) Optical Fiber Cable	5
-22) Optical Power Sensor	1
G'. Preparation for Elec. Lab.	
G'- 1) Blackboard	1
- 2) Table	2
- 3) Storage Cabinet	4
- 4) Locker	2
H. Machine Control	
H- 1) Blackboard	1
- 2) Universal Rotation Experiment Apparatus	1
- 3) Thyristor Chopper Experiment System	1
- 4) Thyristor-Motor Experiment System	1
- 5) Thyristor-Inverter Experiment Systems	1
- 6) Thyristor Phase Shift Control Experiment System	1
- 7) DC Static Power Controller by Silicon Controlled Rectifier	1
- 8) Portable Protective Relay Test set	1
- 9) Thyristor Trainers	1
-10) Universal Bridge	1
-11) Digital LCR Meter	1
H'. Preparation for Machine Control	
H'- 1) Blackboard	1
- 2) Table	2
- 3) Storage Cabinet	4
- 4) Locker	2
- 5) Side Table	2
I. Basic Eng. Lab.	
I- 1) Blackboard	1
- 2) Exhaust Calorimeter	1
- 3) Subsohic Wind Tunnel	1
- 4) Multitube Manometer	1
- 5) Piston Pump Tester set	1
- 6) Two Stage Air Compressor Test set	1

- 7) Cross Flow Heat Exchanger	1
- 8) Pipet Flow and Nozzle Apparatus and Fan Test Rig.	1
I'. Preparation Rm. for Basic Eng. Lab.	
I'- 1) Blackboard	1
- 2) Table	2
- 3) Storage Cabinet	4
- 4) Locker	2
J. Language Lab.	
J- 1) Control Console	2
- 2) Master Tape Recorder	4
- 3) Booth Tape Recorder	60
- 4) Master Console	2
- 5) Student Booth	60
- 6) Chair	62
K. A/V Producing Rm.	
K- 1) Color Camera	3
- 2) Video Cassette Recorder	3
- 3) Righting System	3
- 4) Special Effect Generator	1
- 5) Monitor TU System	5
- 6) Telep. System	1
- 7) A/V Production Console	1
- 8) Audio System	1
- 9) Storage Cabinet	4
L. AV Editing & Printing Room	
L- 1) Blackboard	1
- 2) Table	4
- 3) Storage Cabinet	6
- 4) Locker	4
- 5) AV System	1

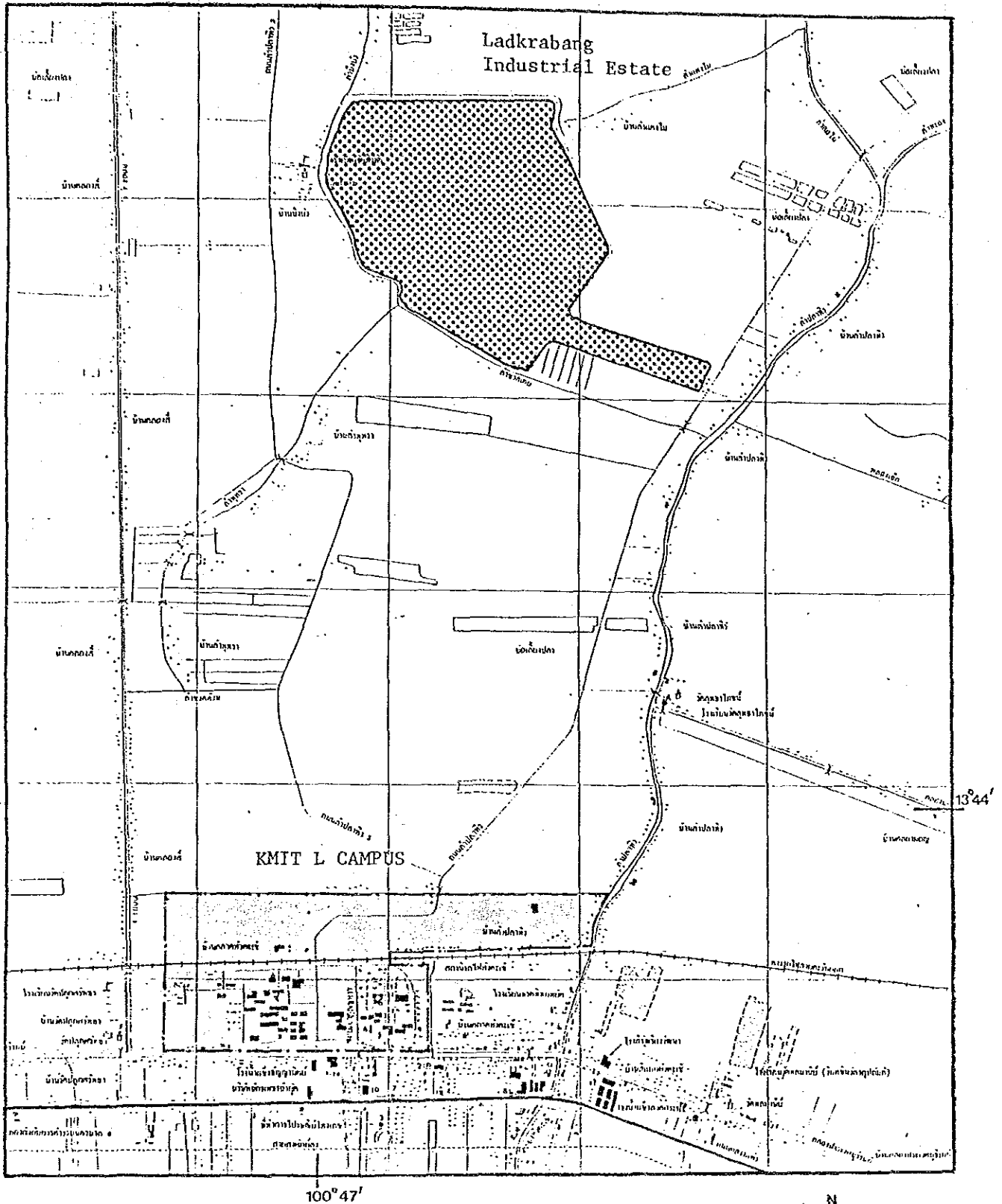
- 6)	AV Duplicating System	1
- 7)	Telecine System	3
- 8)	Console	1
- 9)	Projection System	3
-10)	Video Cassette Recorder	3
-11)	PA System	3
-12)	Console	3
-13)	Rotary Pres. Machine	1
-14)	Electronic Scanner	1
-15)	Binding System	1
-16)	Paper Cutter	1
-17)	Plain Paper Copier	1
M. Document Storage		
M- 1)	Book Rack	150
M- 2)	Reading Table	15
M- 3)	Check Counter	1
N. Conference Room		
N- 1)	Blackboard	1
N- 2)	Table & Chair	60
O. Seminar		
O- 1)	Blackboard	3
O- 2)	Table & Chair	60
P. Dormitory		
P- 1)	Bed, Table Chair & Locker	100

10. Ladkrabang Industrial Estate

List of Company at Ladkrabang Industrial Estate

1. TIPCO EMULSION CO., LTD.
2. CENTRAL DYNAMIC CO., LTD.
3. MR. PULLOP TRIKULTHA
4. THAI PRESIDENT FOOD
5. PRESIDENT BAKERY CO., LTD.
6. OLYMPIA
7. THAI GRANIT WORLD CO., LTD.
8. SANGTHI INDUSTRIAL CO., LTD.
9. POLYFOAM INDUSTREIS
10. INTERNATIONAL FOOD INDUSTRIAL GROUP CO., LTD.
11. THAI VENEGAR CO., LTD
12. SUNINK THAILAND
13. BULANUTIN CO., LTD.
14. MR. UDOM SRIRUREJA
15. THAI FACTORY DEVELOPMENT CO., LTD..
16. THAI MAJI PHARMACEUTICAL CO., LTD.
17. LEVER BROTHER THAILAND
18. STAR BLOCK CO., LTD.
19. HAWAII-THAI EXPORT CO., LTD.
20. KULTHON KIRBY CO., LTD.
21. Q & Q HOLDING CO., LTD.
22. JOHNSON & JOHNSON CO., LTD.
23. ISUZU ENGINE CO., LTD.
24. LADKRABANG HOSPITAL
25. YAMMAR THAILAND CO., LTD.
26. THAI HINO ENGINE CO., LTD.
27. SAHA UNION CO., LTD.
28. UNITED DEVELOPMENT INDUSTRIES
29. BANGKOK WRITING INSTRUMENT CO., LTD.
30. B.C.D & P CO., LTD.
31. SOLAR LENSE CO., LTD.
32. KUANGCHAROEN ELECTRONICS CO., LTD.
33. THONBURT CO., LTD.
34. MR. SUVAN SRIKURECHA AND MR. LEARCHAI SRIKURECHA
35. SIAM ARI FLOWERS COMPANY

MAP OF LADKRABANG PROVINCE



JICA