Development report and masterplan For Faculty of Agriculture Can-Tho University in Vietnam

カントー大学農学部校舎建設計画 調査報告書

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国際協力事業団

JAPAN INTERNATIONAL COOPERATION AGENCY

Development report and masterplan For Faculty of Agriculture Can-Tho University in Vietnam

FOREWORD

The problems which lie between the countries of the south and the north have a tendency to be viewed from the technical side or the financial side but the basic problem which the developing countries face at present is not just how to produce the wealth but how to develop the capability to produce the wealth.
For this reason, you can see the importance of the cooperation on the educational field for the development of the human resources.

On March 7, 1970, Japanese Government and Vietnamese Government made an agreement concerning to the Faculty of Agriculture, Can-Tho University and according to this agreement, despatchment of the specialist and professor, provision of necessary equipments, and teaching of students and staffs in Japan have been executed.

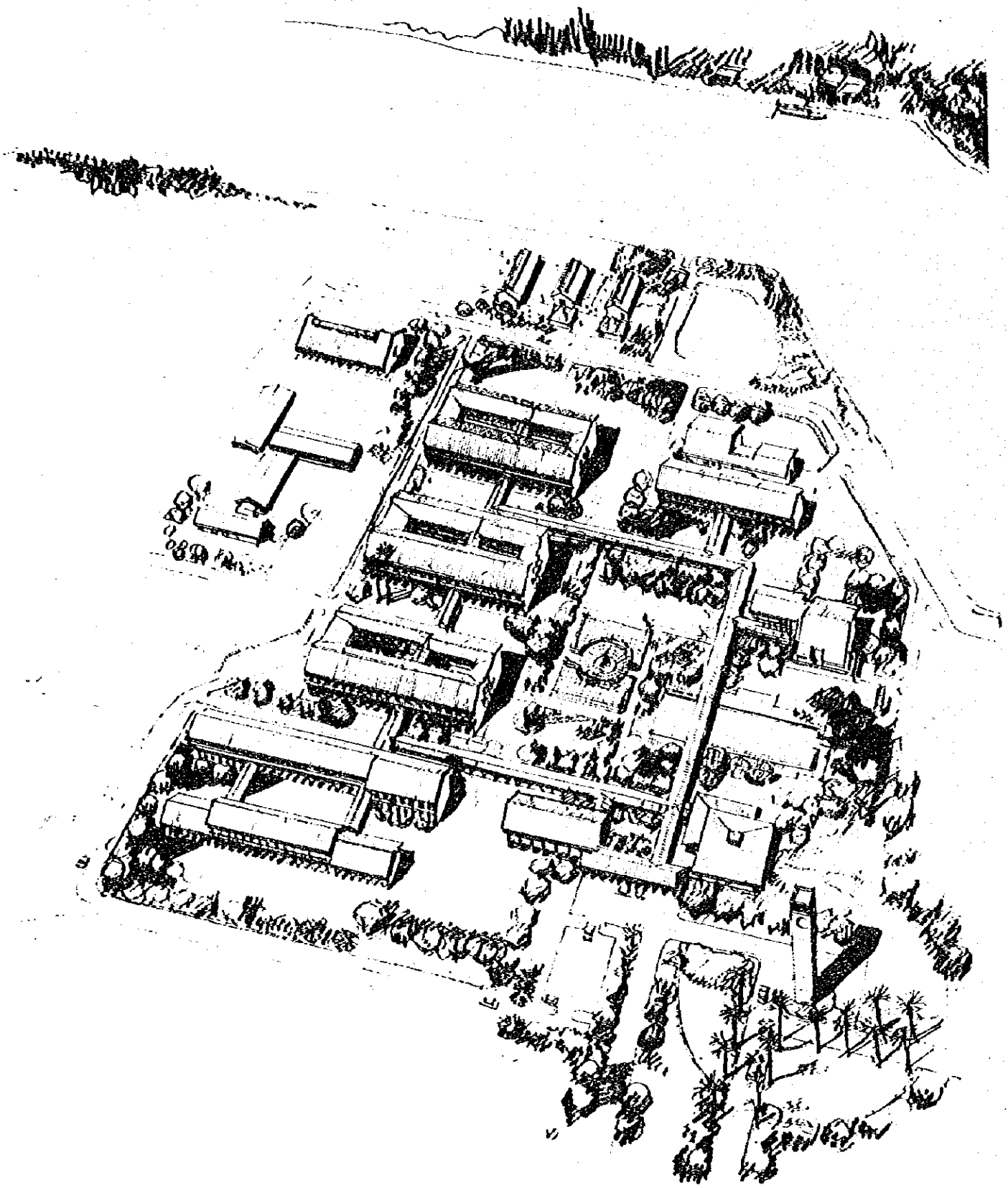
Through these progress, necessity of school building of Faculty of Agriculture has been recognized.

This report was prepared by Japan International Cooperation Agency in accordance with the study made by Kume Architects-Engineers through a survey in Vietnam.

Finally, we would like to show our appreciation to Mr. Seiichi Marsuda, Mr. Hajime Tsuchiya and Mr. Hidefumi Inoue of Kume Architects-Engineers and many other persons for their cooperation.

It is our hope that the report from Educational Eid Mission (1974 publication) which describes the background together with this report may help your understanding of this project.

International Cooperation Agency



BIRD - EYE VIEW OF FACULTY OF AGRICULTURE UNIVERSITY OF CAN-THO

PREFACE

This Developement Report and Masterplan for the Can-Tho University, Faculty of Agriculture in Vietnam, commissioned by Japan International Cooperation Agency, at the request of the Can-Tho University, is the outcome of investigation and studies made by Kume Architects-Engineers between January 17, 1975 and February 9, 1975 in close collaboration with the president of Can-Tho University, dean of Agriculture and many of their colleagues.

We have found the essential nature of Faculty of Agriculture as the agriculture institution conceived to serve specifically the interest of the Mekong region. Concept to develop the Agricultural education facilities adapted for this purpose is carefully planned with the consideration of regional nature.

We hope heartily, this project will soon actualized and contribute to development of the Agriculture in Vietnam.

In the preparation of this report, we have received valuable assistance from many source, we would like to mention here very ready help we have had from several department of Can-Tho and Saigon city, Can-Tho University, Japan International Cooperation Agency and Japanese Covernment.

By Consultant
Kume Architects-Engineers.

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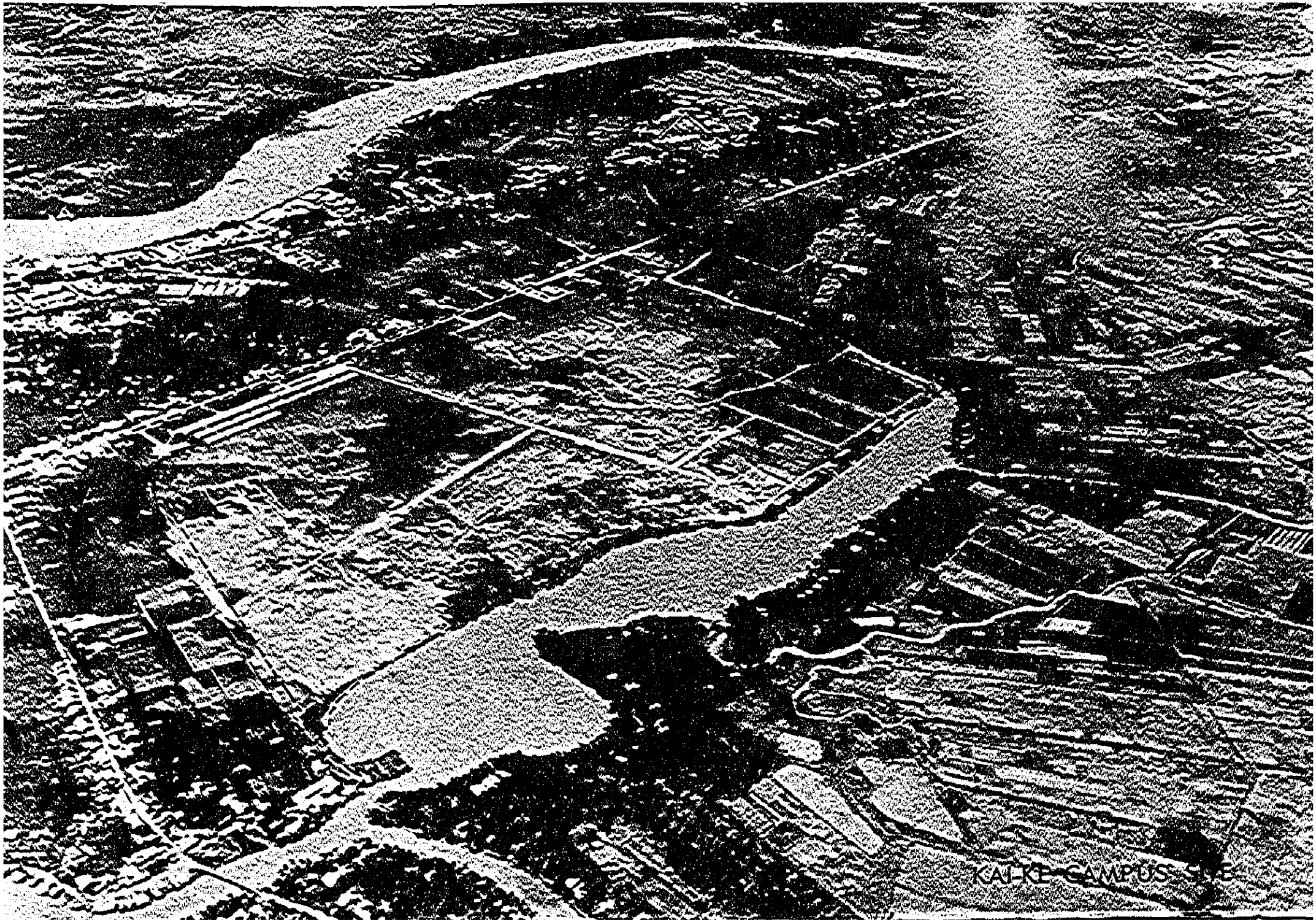
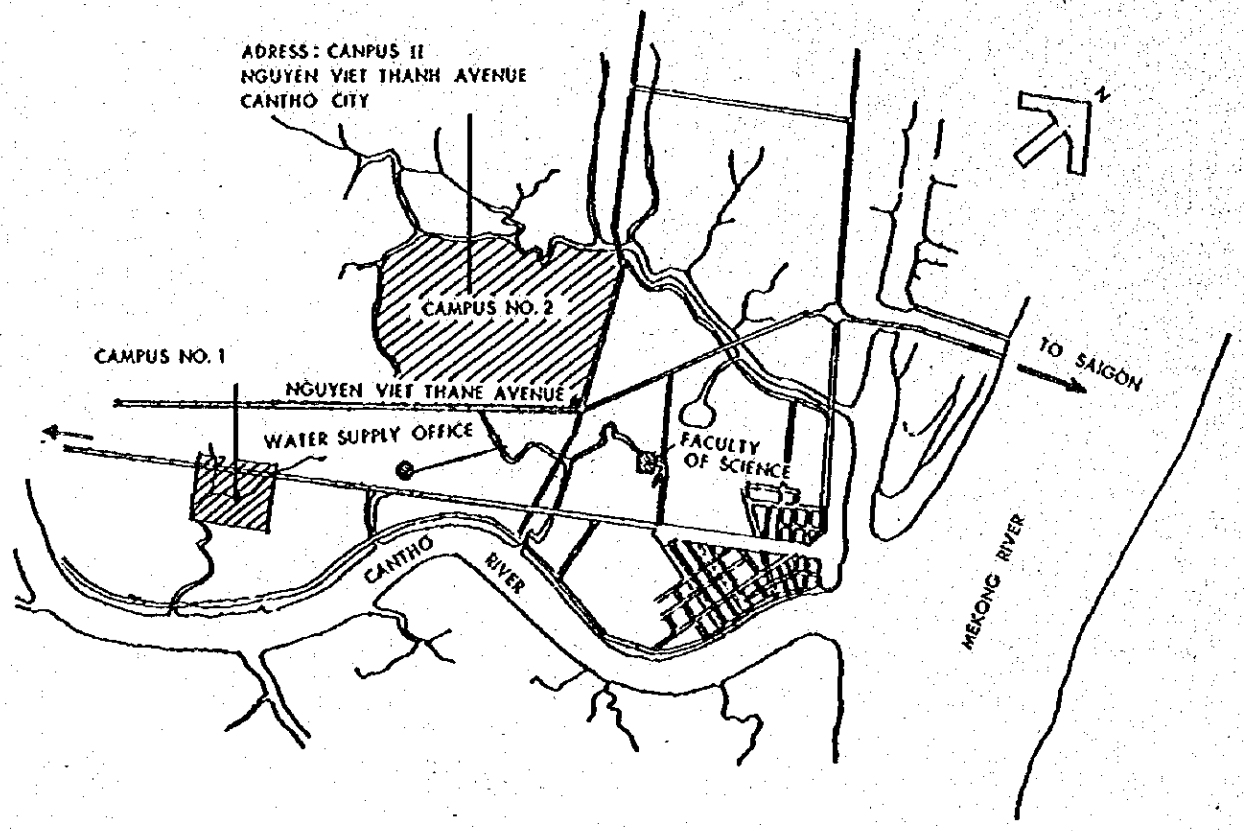

KAI-KE CAMPUS SITE

1. OBJECTIVE

The purpose of this servey mission is to provide the necessary information for advance stage of the Faculty of Agriculture Project. Since Can-Tho University has already provided the basic master plan for the Cai-Khe campus and Faculty of Agriculture, our primary intension was to analize the site condition, study the local situation of construction, and examine the proposed master plan in more detail, and provide the nesessary guide line to produce the document for the construction of this Project.

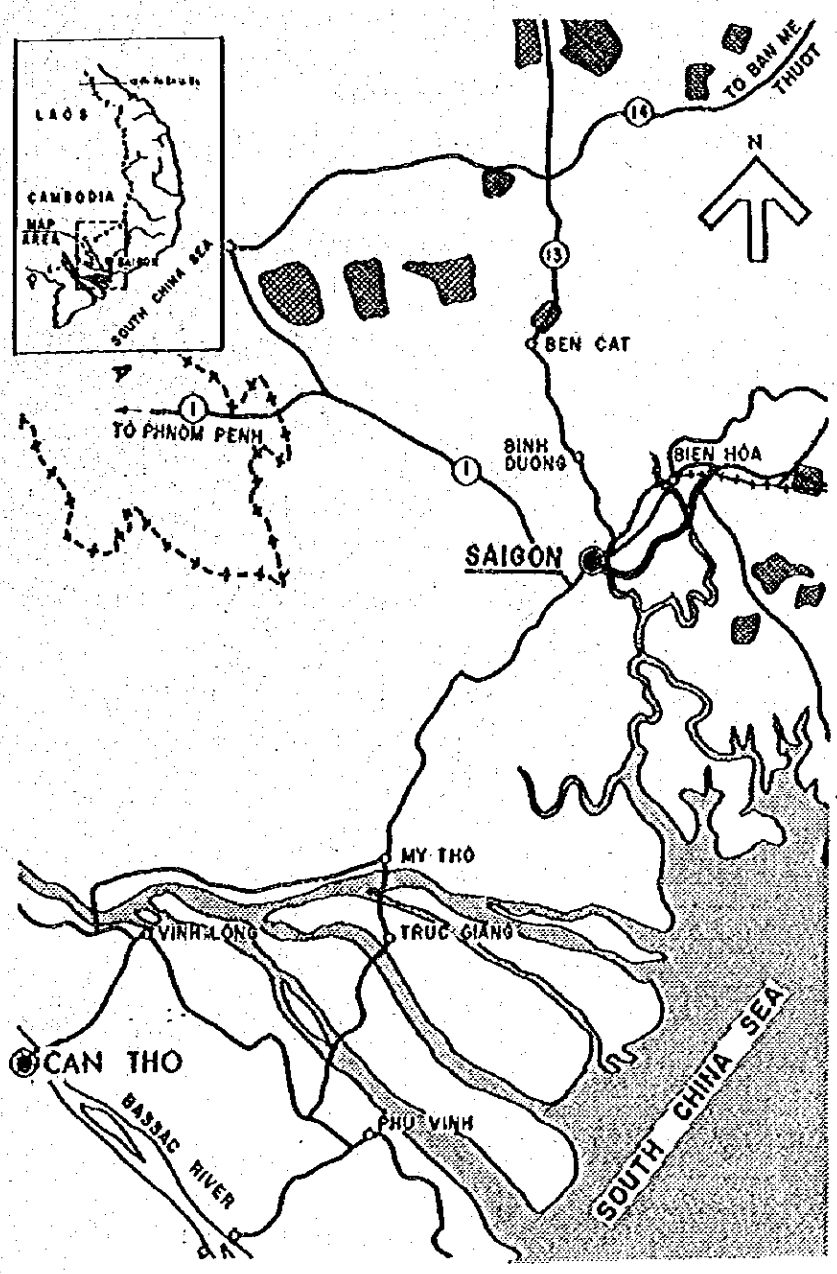


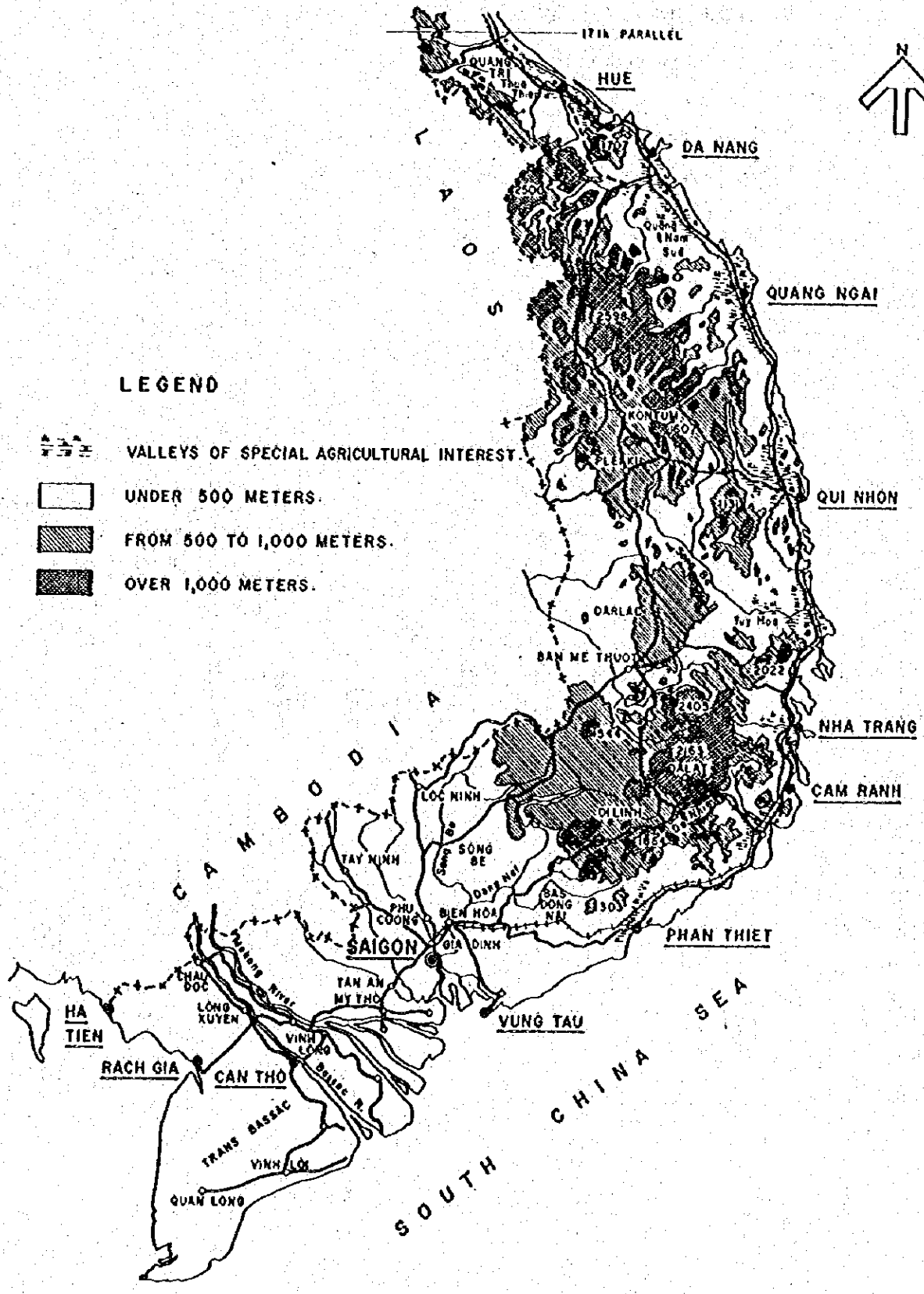
LOCATION MAP

2. CAI-KHE CAMPUS

2 – 1 SITE LOCATION

Can-Tho city situated in the heart of the Mekong Delta which is 160 Km south west of Saigon and about four hours by car crossing the river twice by ferry boat.





SOURCE:
UNITED NATIONS PUBLICATION,
SALES NUMBER 59. II. H.1, ANNEX 81

VIETNAM TOPOGRAPHIC MAP

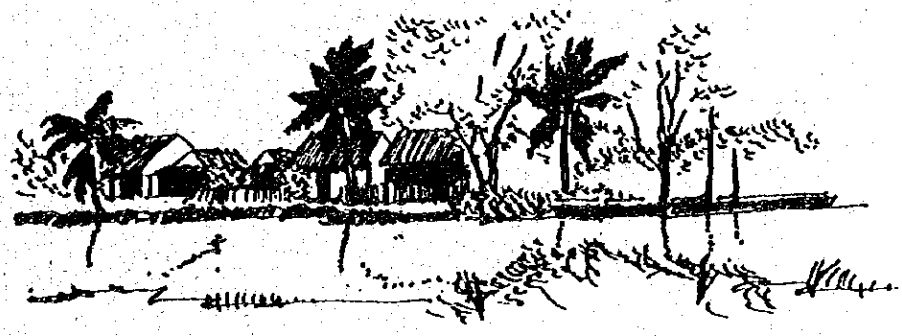
Cai-Khe campus where the Faculty of Agriculture to be developed, locate only 1 Km from the center of Can-Tho city. The site was old rice field face to the national road, which size is 1,100 m by 800 m wide and by dredging, the ground level was elevated 1 m to 1.5 m in relation to surrounding farm land level. About 40 hectares out of 87 hectares new site will be used for the construction of the Faculty of Agriculture and its experimental farm.

In the campus along the road, 14 temporary class room buildings, 2 story RC class room building for teaching staff training and two dormitories have been built.

Temporary road and power line have been built to the site of Faculty of Agriculture and V.P.C. sub-station locate at the corner of Cai-Khe site which will be the power source for the new campus.

As you can see in the photo of site, there is no buildings around the Faculty of Agriculture site and open to the all directions. Around the river in the north side of site, many tropical trees grow and it will be the nice social activity place for the student and staff when the proposed campus facilities completed.

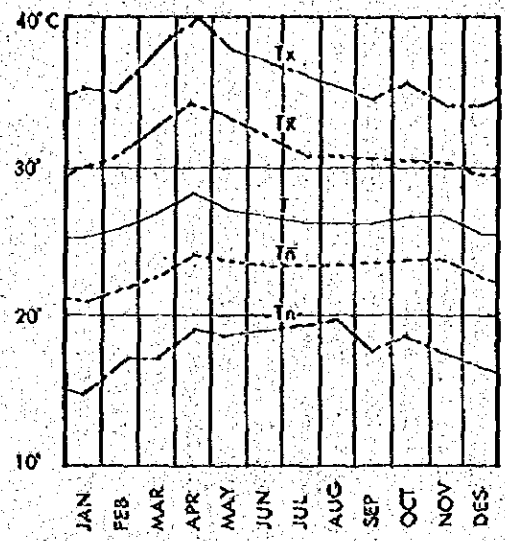
Since Cai-Khe campus has enough space for the other faculties, when the whole faculties facility completed in this campus, the Can-Tho University will be the one of the center of high education in Vietnam.



VIEW FROM THE SITE TO RACH NGONG RIVER

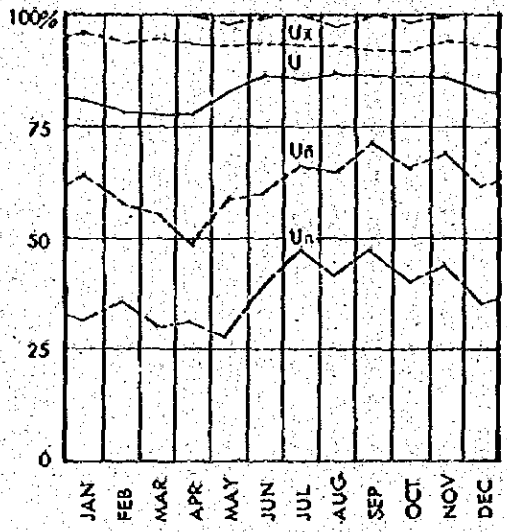
TEMPERATURE

Tx Absolute Max
Tx̄ Average Max
T Average
Tn̄ Average Min
Tn Absolute Min

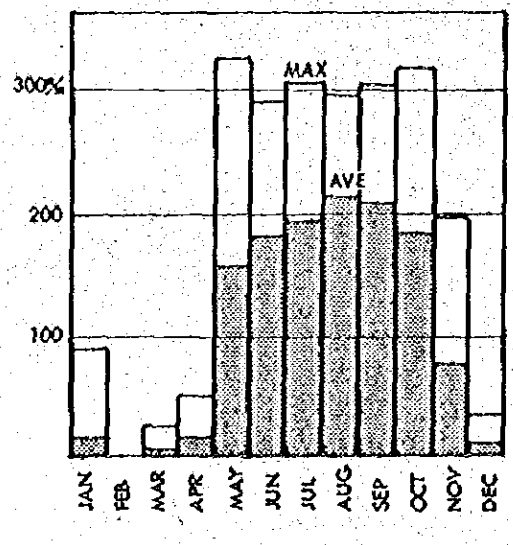


HUMIDITY

Ux Absolute Max
Ux̄ Average Max
U Average
Un̄ Average Min
Un Absolute Min



RAINFALL



3. CLIMATIC DATE AND BUILDING CODE

Climatic data is the one of the fundamental factor in planning for the Project. Specially this project is planned in the region of the tropical climate, without using air-conditioning system, because of the maintenance problem and economization of cost, it is essential to analize the charactor of climate and utilize it to provide the comfortable space.

3 – 1. TEMPERATURE, HUMIDITY, RAINFALL

Temperature:

Can-Tho city locate at north latitude 10°02' and east longitude 105°47', in the tropical monsoon zone which charactor is high temperature and humidity. Even the most comfort month of January records mean temperature over 25°C and the hottest month in April, mean temperature records 28°C and absolute max temperature sometime cross 40°C.

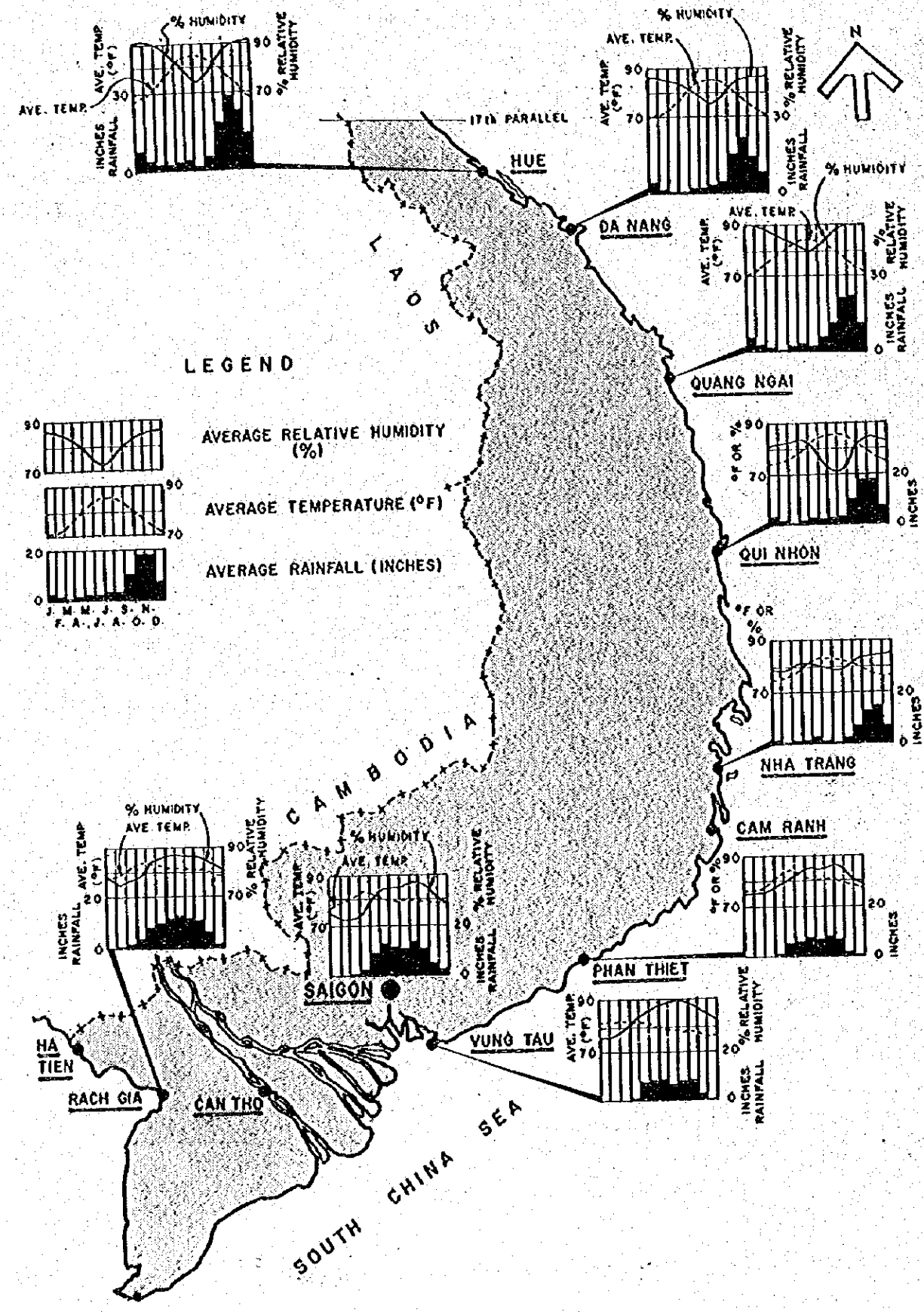
Humidity:

Humidity in Can-Tho city shows the high persentage all year around. Min. average relative humidity show 77.1% in March and Max. 85.8% in October. Absolute maximum humidity show 100% most of the month.

Rainfall:

In accordance with the seasonal shifting of monsoon and tropical wind, in the rainy season which is May to October, the southwest monsoon crosses the bay of Bengal and bring the moisture of ocean to Indochina region.

Can-Tho area in July, August and September, it records over 200 mm rainfall per month and rainy day continues about 20 days every month. Maximum rainfall records over 300 mm in rainy season.



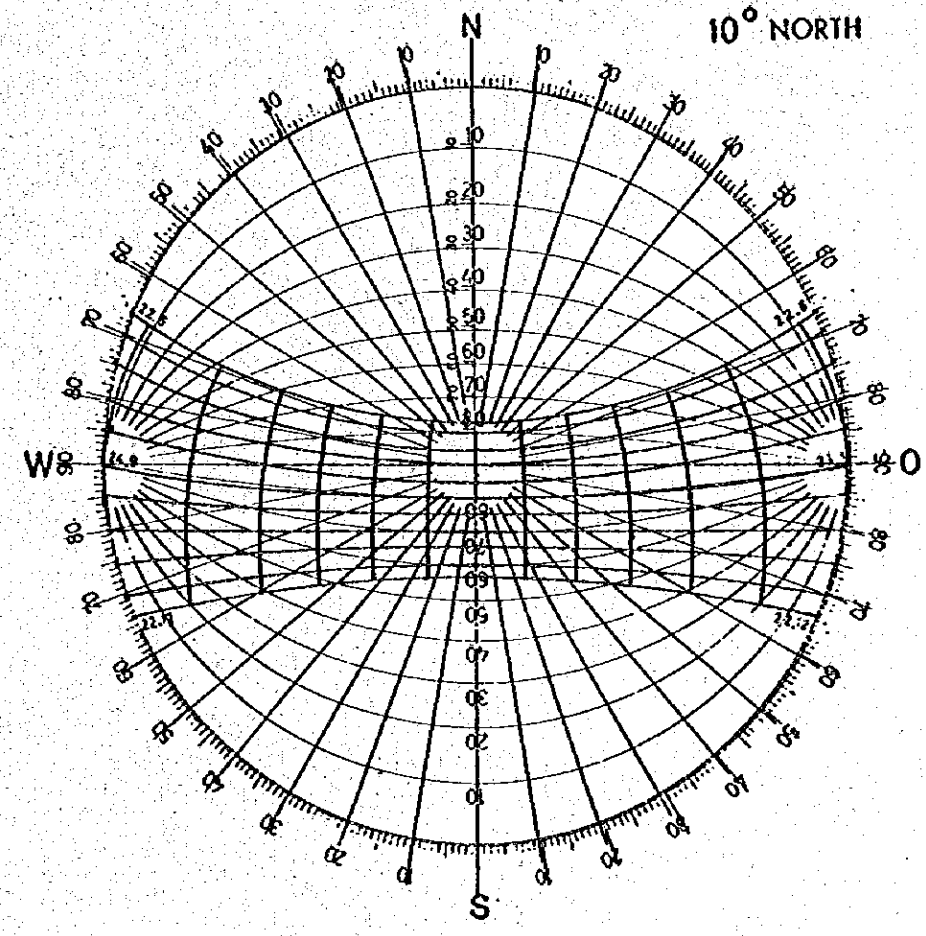
VIETNAM CLIMATE

3 — 2 SOLAR CONDITION

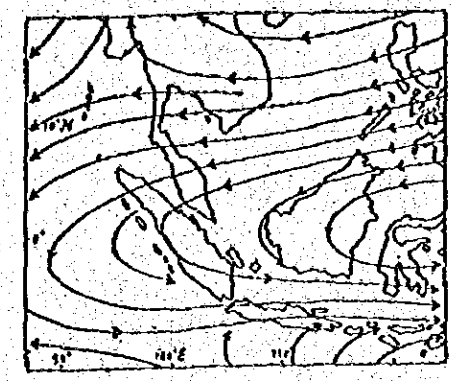
Since Can-Tho city locate in high latitude, the sun beam is the important factor for planning. Average sunshine duration shows the longest 9 hours in March and April and maximum shows more than 10 hours every month. About the angle of sunbeam, as you can see in the sun-path diagram, carefull consideration has to be paid for the sun shine from the north side together with the east and west side.

SUNSHINE DURATION

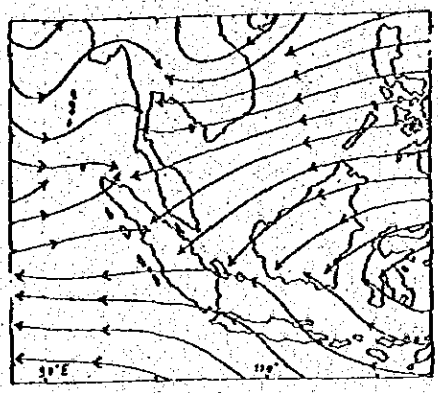
MONTH / SUNSHINE DURATION	1	2	3	4	5	6	7	8	9	10	11	12	
Absolute daily max sunshine duratiof	11.6	11.0	11.0	11.8	10.5	12.0	10.5	10.5	10.5	(1) 10.5	(1) 11.0	(1) 10.5	12.0
Average daily Sunshine dovation	8.2	8.8	9.1	9.0	6.9	6.6	6.1	6.2	5.7	(1) 6.6	(1) 7.4	(1) 8.2	7.4



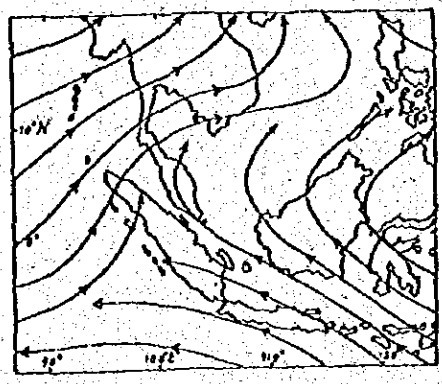
SUN-PATH DIAGRAM



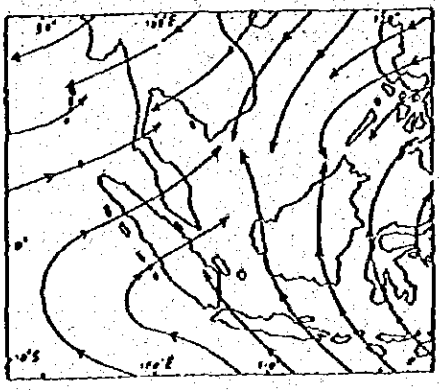
Surface Winds(January)



Surface Winds(April)



Surface Winds(July)



Surface Winds(October)

SUN-PATH DIAGRAM

3 — 3 WIND

The weather of Southeastern Asia is mainly influenced by the Southwest Monsoon and Northeast Monsoon with transition periods between them.

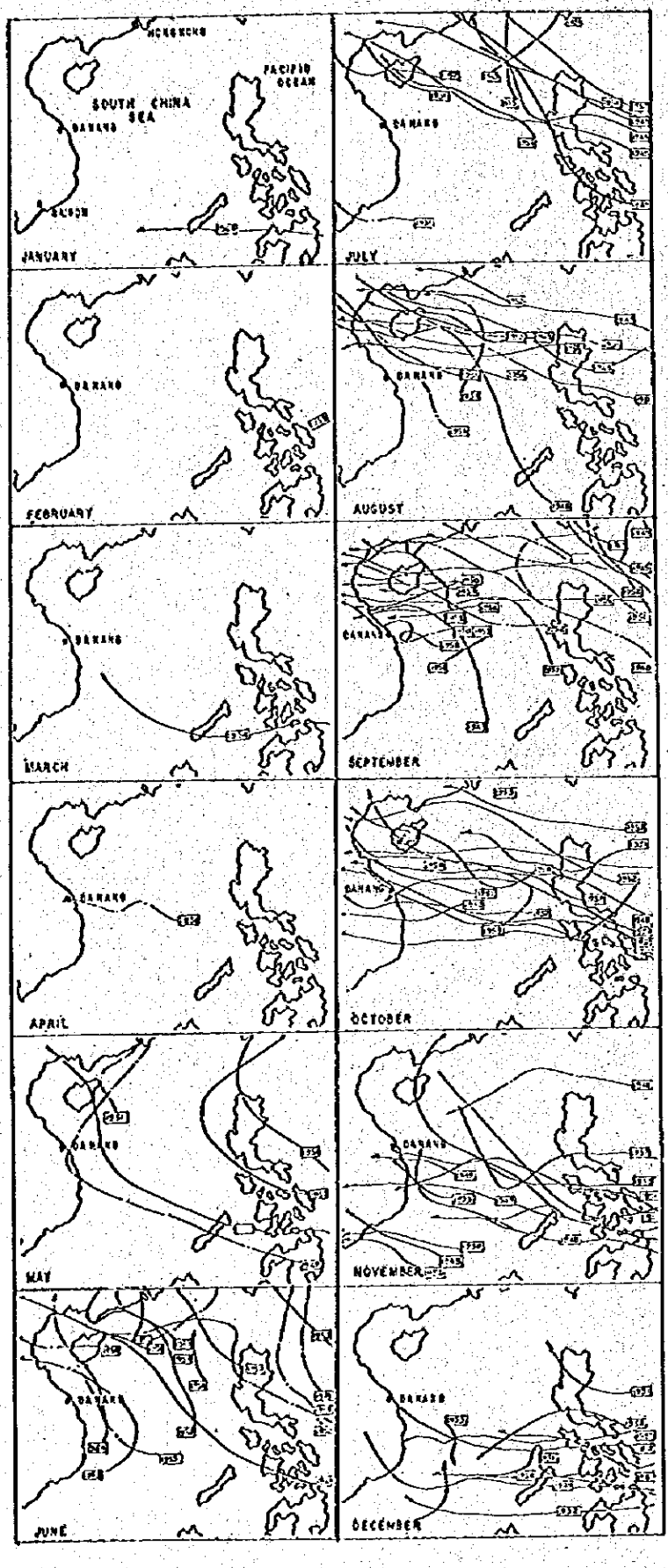
In January, the Northeast Monsoon has extended for south and covers to the region from South Vietnam, Thailand and Philippines to Java. During the months follow, the Siberian anticyclone slowly loses intensity, and the southernmost boundary of the northeasterlies retreats northward, accompanied by an advance of the Southern Hemisphere Trade.

By April, the Siberian outflow is very small, and the northeasterlies over the Southwest Pacific Trades.

From May onward, the Southwest Monsoon rapidly crosses the bay of Bengal, Thailand, and South Vietnam. The trades of the Southeast Pacific have also advanced, northward in the region east of longitude 100° E, so that by July they have reached latitude 6° N.

In August there occurs a lessening of the Southwest Monsoon and there after wind-streams begin to slacken.

MONTH	Prevailing wind direction	Average wind speed in knots	% of Calm
January	NNE	6.6	0.0
February	ENE	6.8	0.0
March	ESE	8.0	0.0
April	ESE	6.4	0.0
May	ESE WSW	6.7	0.0
June	WSW	7.7	0.0
July	WSW	7.1	0.0
August	WSW	6.6	0.0
September	WSW	7.3	0.0
October	NNE	6.4	0.0
November		6.8	0.0
December	NNW NNE	7.6	0.0
Year	WSW	7.0	0.0



TYPHOON TRACKS

By October the Northeast Monsoon is again developing in the far north, and as it moves southward the North Pacific Trades are restricted to the East China Sea. The Northeast Monsoon slowly advances until by January, it covers practically all Equatorial Southeast Asia.

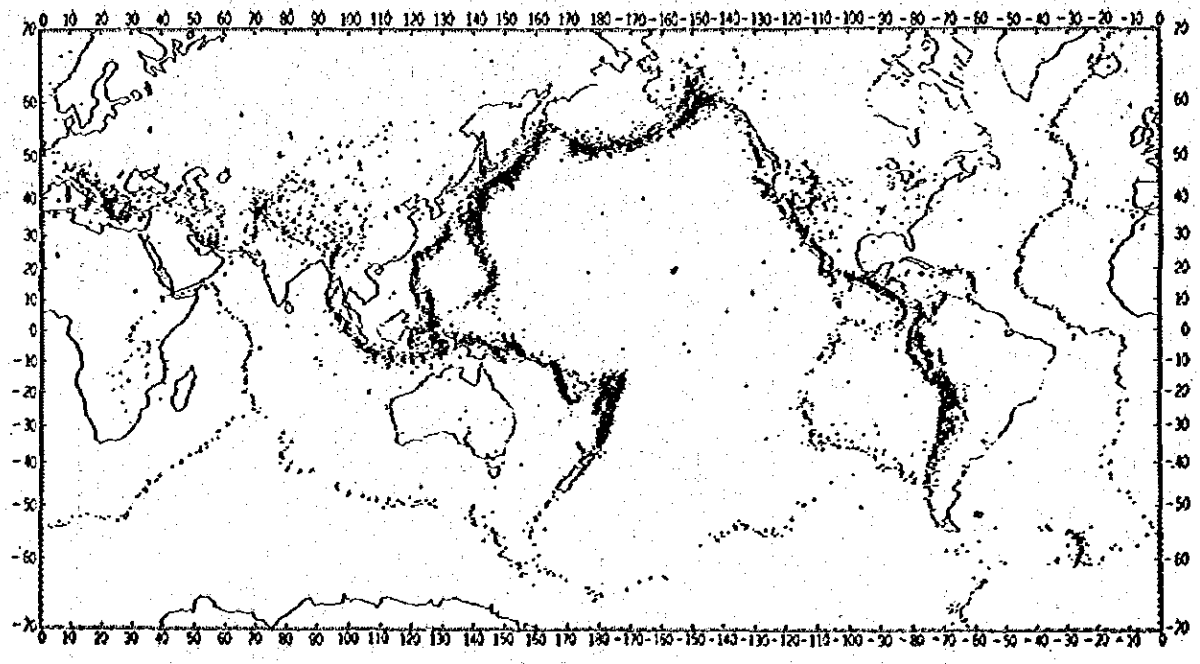
Typhoon:

Typhoons which originate in ocean area off philippine island, has seldom affected to Can-Tho area. For reference, approximate typhoon tracks which entered from the South China Sea from 1948 through 1957 is shown.

TOTAL NUMBER OF TYPHOONS WITH CENTERS STRIKING OR COMING WITHIN 100 MILES OF THE COAST BETWEEN SPECIFIED LATITUDE DURING 50 YEARS

Month	Latitude 5 to 10° N.	Latitude 10 to 15° N.	Latitude 15 to 20° N.	10° N. to Fu-chi-chiao (Fokai point) (including Hai-nan tao)
January	0	0	0	0
February	0	0	0	0
March	0	0	0	0
April	0	0	0	0
May	0	1	2	6
June	0	1	2	14
July	0	0	9	43
August	0	0	6	32
September	0	3	29	37
October	0	14	20	17
November	3	16	6	7
December	1	2	0	0
50 year total	4	37	74	156

(from Starbuck, ROYAL OBSERVATORY, Hong Kong)



ZONE OF EARTHQUAKE

3 – 4 EARTHQUIKE AND LIGHTNING

The record of the earthquake and lightning have not taken by the Public Authorities. Consideration for the earthquake maybe omitted because of little possibility in this region, but the lightning will be the factor to be considered for planning since the damages of building have been reported. The Zone of earthquake source is shown in the map.

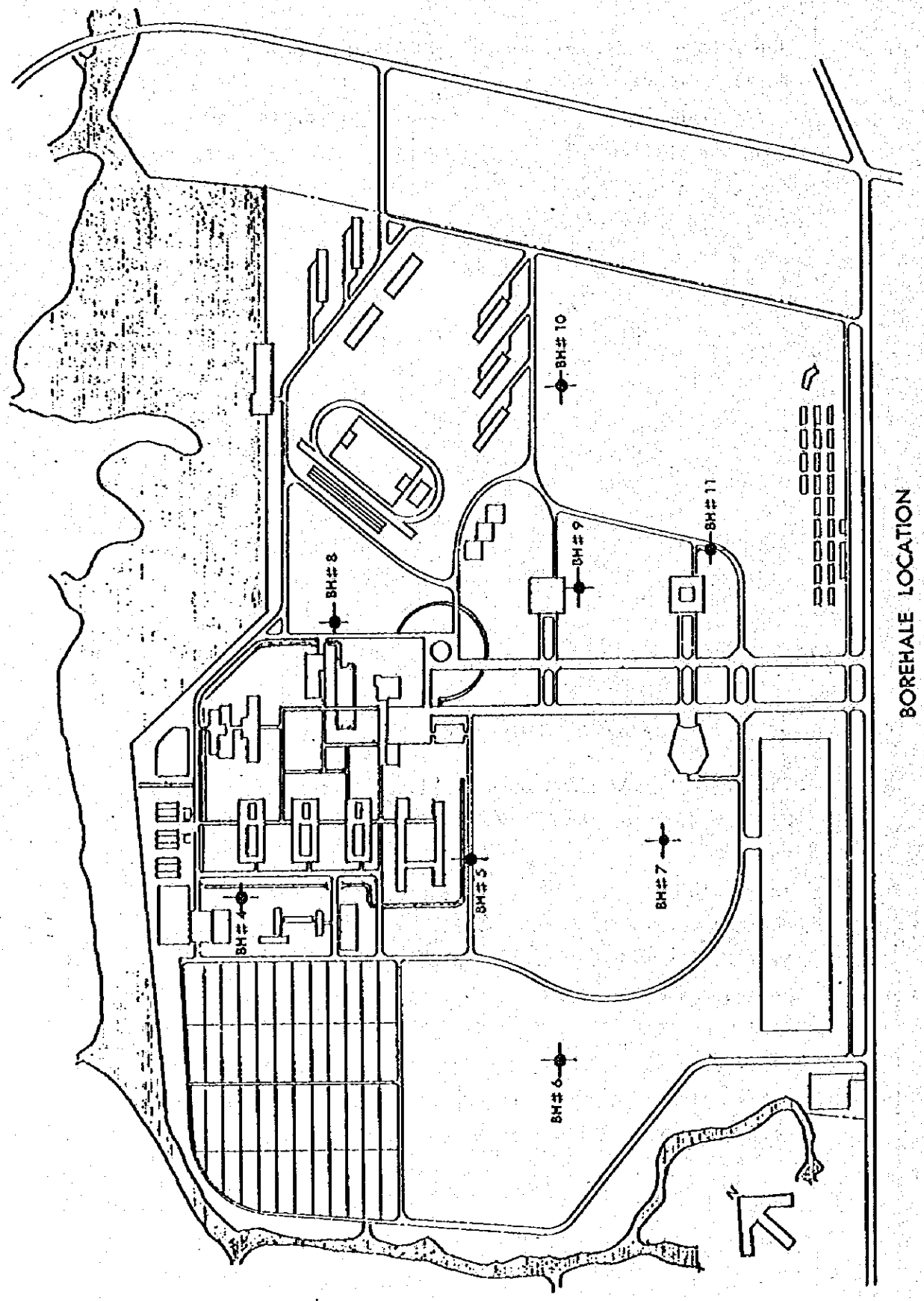
3 – 5 VIETNAMES BUILDING AND SAFETY CODE

The current code being used in Vietnam was adopted in July of 1931. Since that time, there have been a few revisions for special cases.

The basis for the code is evidently French and is a collection of decrees which date back to 1874. The code consists of Building, Fire zoning, Health safety and Restrictive zoning ordinances. Because of difficulties present in Vietnam, inspection and enforcement of the code is currently at a minimum. Inspections of Structural and plumbing elements are the only requirements which are specified in the current code. Provisions for electrical work inspection and approval are not indicated.

In Can-Tho city, re-construction office publish the zoning of city and site of Cai-Khe campus is shown as educational zone.

There is no Vietnamise structure design standard and U.S. and French standard are used by engineer as design standard.



BOREHALE LOCATION

4. ANALYSIS OF SITE

As already mentioned in this report, the site of Faculty of Agriculture was elevated by reclamation and quite distance from the main road, necessary information was collected to built the new facilities for Faculty of Agriculture about soil condition, services, ground level and etc.
Following datas were obtained from Can-Tho University, other related offices and our own survey.

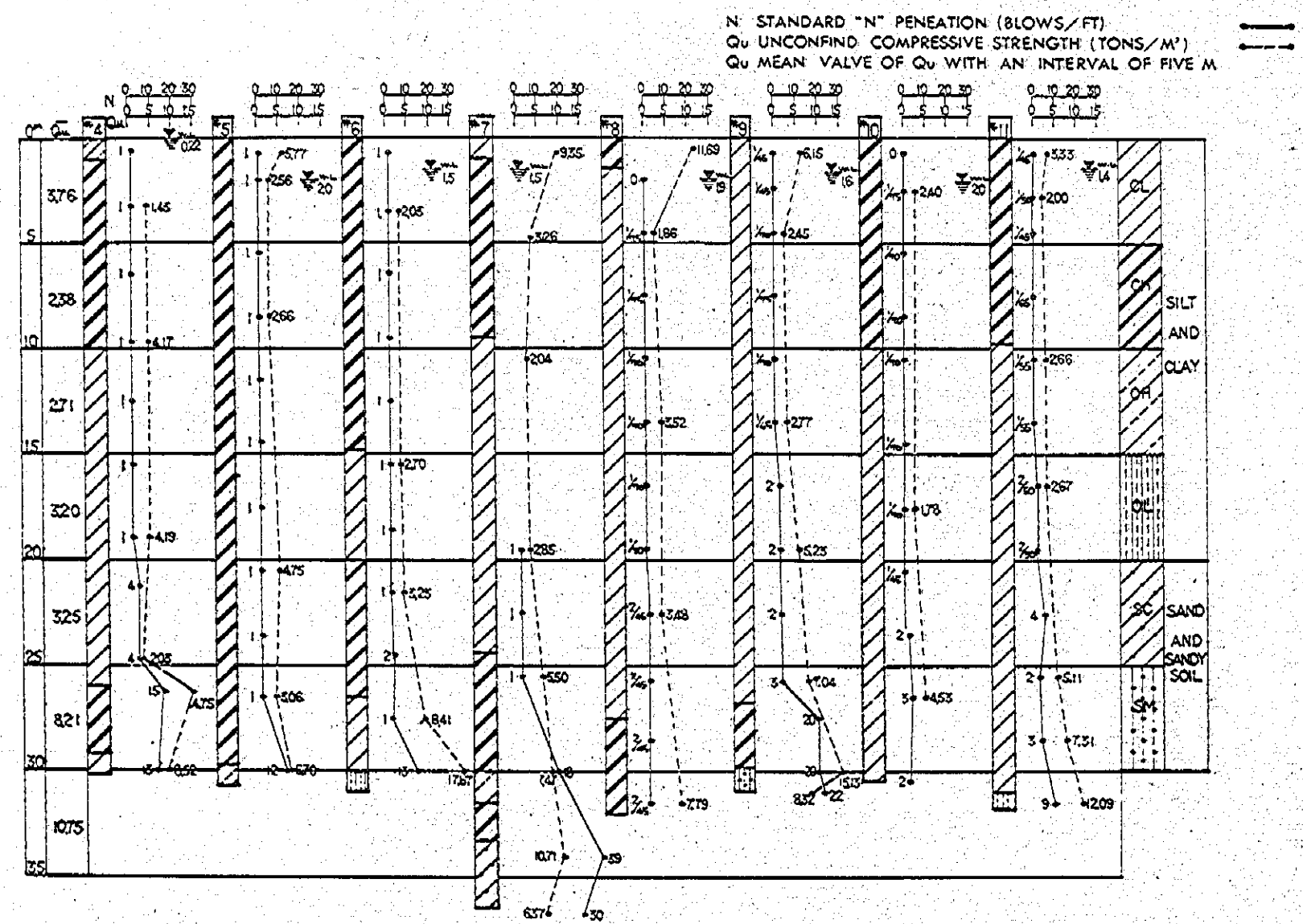
4 – 1 SOIL CONDITION

i) General
At the site of Cai-Khe campus, 8 boreholes were drilled in 1974 to investigate the soil condition and necessary data was reported by Vietnam Engineering Service LTD., for the construction of this project.
According to soil report, in all 8 boreholes spread over Cai-Khe campus, until sandy clay is encountered at approximate depth of 35 m below surface, the soil consists entirely of dark gray clays, varying from extremely (CH) to medium plastic (CL) or the reverse, interspersed with organic clay (OH or OL), all very soft down to a depth of about 25 m.
The ground water level average 1.5 m below the surface in full dry season. It is, therefore, reasonable to assume that the soil under the foundation will be entirely submerged.

ii) Laboratory testing
Eight boreholes were carried down to a depth of 31 m below ground, except one borehole which was advanced to a depth of 37.5 m in order to find sand. In each borehole, three series of test were performed.

Series I: The basic test
Natural water content determination
Wet and dry unit weight determination
Specific gravity determination

Series II : The classification tests
Grain size determination by sieving
Grain size analysis by hydrometer
Atterberg limits determination



GROUND ELEVATION OF THE CAI-KHE SITE

Series III : Structural characteristics determination
Unconfined compression test
Consolidation test

Summary of test result is as follow.
From the ground surface down to a depth of 10 m, the average natural moisture content is w=70%, the average liquid limit LL=55%, the compression index Cc=0.80, void ratio e_o=1.90, and unconfined compressive strength qu=0.2 Kg per cm^2

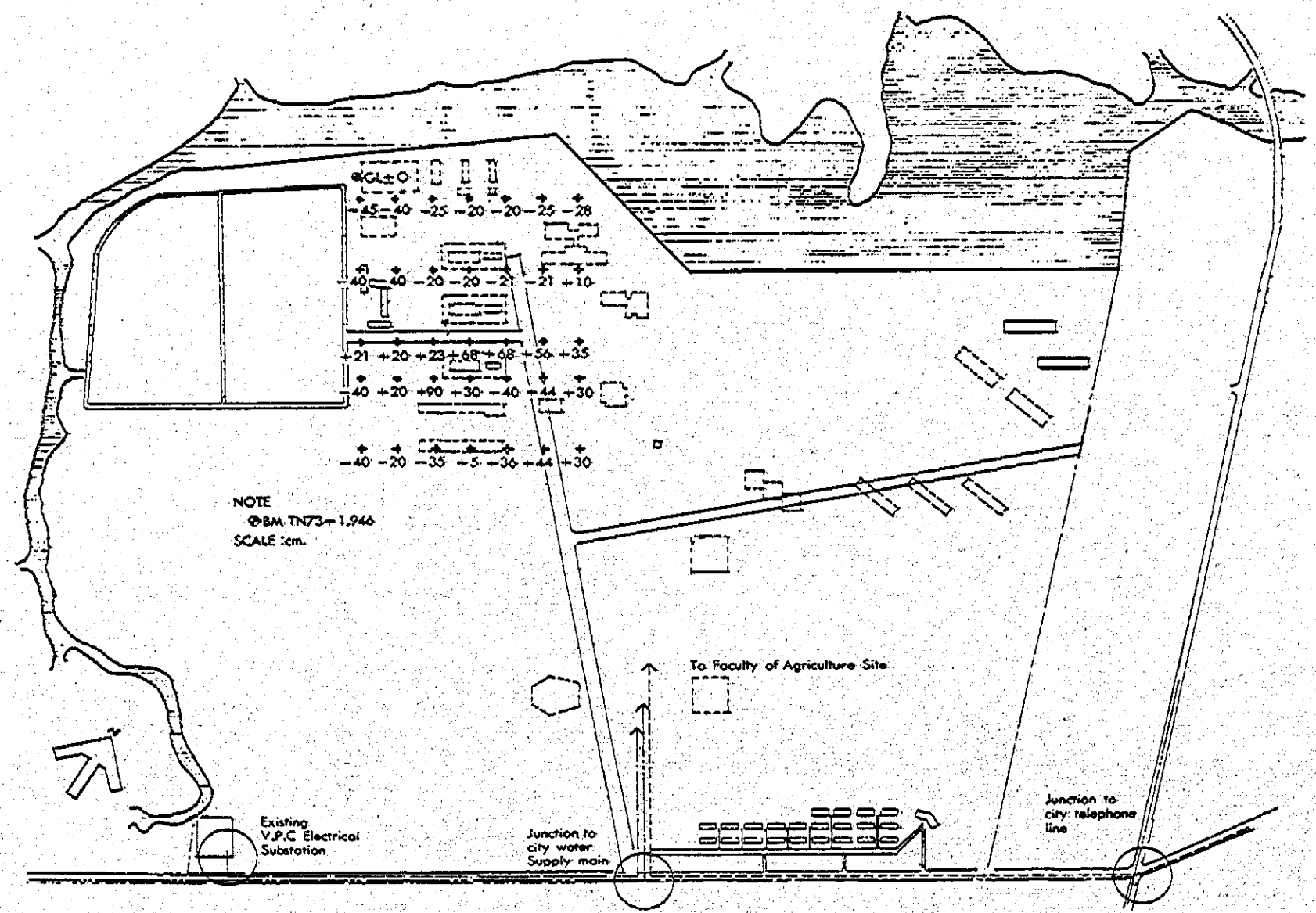
Deeper than 10 m, the natural water content averages w=40% and the liquid limit LL=40%. The design values are Cc=0.37, e_o=1.33, and qu=0.4 Kg/cm^2
Unlike the case of cohesionless soil, the standard penetration test does not yield reliable results concerning cohesive soils, and should be looked upon as merely providing some guidance.

4 – 2 ELECTRICAL POWER SUPPLY

In Vietnam, the power supply is made by Vietnam Power Company and in Can-Tho city, the new thermal power station is almost completed, as far as capacity wise, there will be no difficulty to use the electricity for the project. There is V.P.C. substation at the corner of site along the road, the supply to the project site will be taken from this substation. Three phase 15,000 V is planned to be supply to the Faculty of Agriculture site. Because of frequent stoppage of electric current in the city under the situation of Vietnam right now, necessary supply of power have to be considered in order to make the continuous laboratory experiment possible by using the generator.

4 – 3 TELEPHONE

Telephone in Vietnam is managed by Vietnam Telecommunication Authority. For the temporary building at Cai-Khe site, the line has already provided, however, the new lines to the Faculty of Agriculture have to be connected direct to the junction of city line which is located near the site. This line from junction to project site will be provided by the University.



SITE LEVEL AND SERVICE TO SITE — ELECTRICAL, TELEPHONE, WATER

4 – 4 GAS

There is no city gas supply line in Can-Tho city. Presently available gas is the Butane gas which is sold by Shell or Esso gas service station. The site is close to center of Can-Tho city, supply of gas will be easily made by either company.

4 – 5 DRAINAGE

Discharge of the drainage from the project facilities will be to the Rach Ngong River. Since the water level of the river in rainy season is close to the ground level of site, it is necessary to plan the system to work even in this season. The Rach Ngong river is the source of the neighbor peoples' daily water, the discharge of the sewage, and laboratory water have to be carefully treated.

4 – 6 WATER SUPPLY

Can-Tho water supply system was completed 1973 by the Australian Aid. The water production capacity is 31,200 m^3 per day and will meet the water demand of the people up to 1985.

The nearest water line around the Cai-Khe site locate under the south side road which is 6" ϕ pipe and 22" ϕ line under the road of the west side of the site.

Can-Tho University has the plan to provide the water supply main not only for Faculty of Agriculture but also for other faculties from the water main locate under the south side road of campus.

Our estimate demand for project facilities is about 250 m^3 to 300 m^3 per day so that the campus main will be considered at least more then 6" ϕ pipe.

4 – 7 SITE LEVEL

The proposed site of Faculty of Agriculture locate the north end of the Cai-Khe site and ground elevation was relatively higher than other campus area.

The level of the proposed site was measured from the temporary bench mark which locate the west corner of the site - TN73, 1.946 - There is no record of Rach Ngong water level in rainy season at site, however, the level of the temporary road which is TN73, 1.946 + 200 h/m has never flooded.

5. CONSTRUCTION SITUATION IN VIETNAM

At Can-Tho and Saigon, we visited the several school buildings, construction sites, construction material suppliers and factories of products, and contacted with the Vietnam contractors transportation company and also Japanese constructor to correct the necessary information for the constuction of project. Also some of the information were obtained from government offices.

5 – 1 LOCAL CONSTRUCTION MATERIAL AND PRICE

i) Construction Materials

a) Lumber

There are excellent forest reserves in Vietnam but the security conditions and lack of transportation equipment and suitable travelway is inhabit production. Lumber is seldom used for structural purposes because of its excessive cost in comparison with steel and concrete.

The lumber is cut to metric dimensions as follows.

20x2	14x7	8x8	6x6	4x4	3x1
20x3		8x6		4x3	
20x4	12x6				
20x6					
20x8	10x10				
20x10					

b) Plywood

Plywood sheet size 1.00 m x 1.50 m, 1.25 m x 1.25 m, 1.00 m x 1.75 m with thickness in millimeters as 10,12,15,25, is localy produced. Primarily due to the low quality of glue used and inadequate pressurizing of panels into sheets, the plywood does not meet J.I.S. standard manufacture.

c) Cement

The sole manufacture of local cement is a Government owned plant at Bien-Hoa. Under normal manufacturing conditions, the Ha-Tien cement meets the ASTM Type I and II, Portland cement. It is said that the normal production capacity is 350,000 t/year, however, actural production is somewhere around 150,000 t/year. Due to instable supply of the clinker, it is not sufficient for the local demands so that import cement from Japan, Taiwan, and Thailand

have been done. The quality of the local cement varies excessively so carefull check has to be done.

d) Concrete Blocks

Three concrete block producers, CENACO, VINA BLOCK and VECCO produce the sufficient concrete block. The production equipment is from U.S. and the standard size meets with A.S.T.M. specification. The production capacity is above the normal local demands and hold the enough stock. Standard strength of block is 60 Kg/m^2, but quality block can be obtained from chosen suppliers by specify the strength.

d) Brick

Many type of brick for wall, slab and decoration are manufactured in abundance in Vietnam. Dong-Nai in Saigon is one of the main suppliers of brick. It is popular practice in Vietnam to use hollow brick for partition. The shape and size are not enough controlled, but it is within the allowance of the mortar finish.

e) Cement Tile

Cement tile is the most common floor finsih material in Vietnam. There are many colors and patterns of this tile and its cool touch agree with the people in hot climate. This product is produced by small back yard manufactures in many cities and also in Can-Tho city but the production is very small. In Saigon city, Doi-Tan is the biggest supplier and able to produce 160 m^2/day tile. For the large quantity, order has to be done in advance. Size and thickness are varied because of production method but it is sufficient enough for floor material if you pay good attention at setting.

f) Steel bar

VICAS, SADAKIN are main steel producer in Vietnam. However, these are regenerative steel bar so that the quality is not constant. It is advisable not to use for structural purpose and if it is really necessary to use them, frequent test for strength have to be carried out

g) Asbestos Cement Sheets

This material is very practical, durable, and inexpensive for the

construction in Vietnam. Eternit Vietnam is the biggest ...ility manufactures of Asbestos cement products and supplies are ...dequate for normal demands. In addition to the corrugated ...sbestos sheets for roofing and siding, this firm produce flat sidi...g sheets, gutters, drain pipes and pressure pipes.

h) Galvanized Corrugated Steel Sheets

This material is produced locally. It is readily procured in quantities now required. Galvanized repair for sizable quantities is usually done by C.A.R.I.C. who possess hot-dip galvanizing facilities and this work is considered acceptable.

i) Paints

Following firms are top three paint producers.

Durcico, Ets. bui-duy-can, Viet-dien-cong-ty,

The durability of locally produced oil and enamel paints seems adequate for local construction, however, Japanese manufactured paints are definitely of higher quality and longer lasting. Therefore, it is advisable not to use local paints.

j) Pile

Wood piles are available in large quantities throughout Vietnam. These wood pile, commonly called "Tram pile" are 8 to 10 cm in diameter and 5 meters in length. Reinforced concrete piles are usually made at site. Steel pile is used for heavy construction, but materials are imported from other country.

k) Others

There are many other products in Vietnam but because of those qualities and supply capabilities, it is not advisable to fully count on those products for construction. Structural steel, glass, caulking, aluminam sash, etc., those materials have to be imported.

ii) Electrical Materials

Most of the electrical materials and equipments are depend on the import. Some materials are locally manufactured but its qualities and quantities are not adequate enough.

a) Switches and Fixtures

Locally fabricated "European type" fuse boxes, switches, wall receptacles, lamps and lighting fixtures do not meet Japanese standard.

b) Electrical Conduit

Two local manufactures of rigid electrical conduit are Tan-Cuong and Tran-Thi-Nhu-Phu.

c) Incandescent Lamp

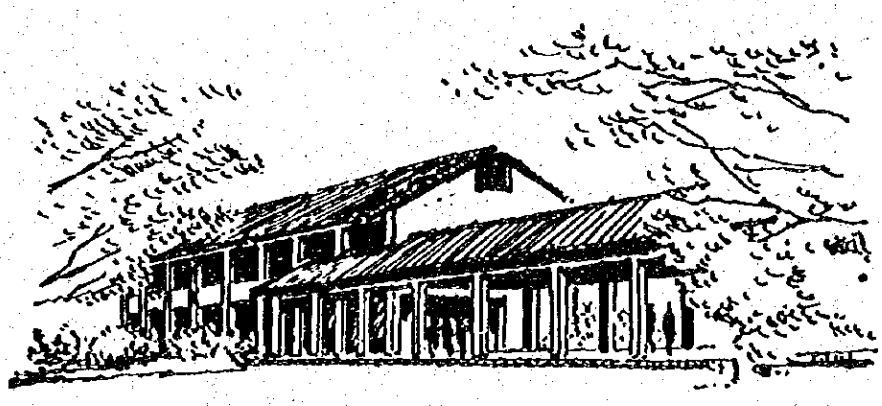
The two local manufacturers of incandescent lamps are Coteco and Vielecco.

d) Fluorescent Lamp

The predominate manufactures of fluorescent lamps are Poinsard and Vegret.

iii) Plumbing, Mechanical Products

These products are imported and only some products, such as P.V.C. pipes and concrete pipes can be available locally. Plumbing Accessories can be produced locally but not advisable to adopt for project. Pumps, Air-Conditioning equipment, fan,most of these depend on import.



PROPOSED ENTRANCE

LOCAL MATERIAL UNIT PRICE

Can-Tho Dec. 10, 1974

Item	Description	Unit	Price VN $	Remarks
Sand	for Concrete	m^3	1,300.-	at Site
Crush Stone 25m/m	Nui Sap	"	4,800,-	"
" 40m/m	"	"	4,300.-	"
Gravel 100m/m	"	"	3,500.-	"
Hollow Brick	95 x 95 x 190 (m/m)	piece	14.-	"
Brick	40 x 95 x 190 "	"	13.-	"
Cement Tile	200 x 200 x 20 "	m^2	2,300.-	"
Concrete Block	4" x 8" x 16"	piece	110.-	Saigon
	8" x 8" x 16"	"	165.-	
Cement	Ha Tien	bag	3,200.-	at Market
White Cement	Japanese	"	4,000.-	"
Smoothed Terrazzo		m^2	6,700.-	W/Labor
" Base	H 100m/m	m	2,500.-	"
Wood (Structural)	Yao	m^3	130,000.-	at Market
"	Taolao	"	170,000.-	"
Nail	30m/m	kg	410.-	Market Price
"	50 ~ 70m/m	"	440.-	
Steel Wire	10#	"	450.-	"
Gasoline		ℓ	237.-	"
Light Oil		ℓ	127.-	"
Oil		ℓ	280 ~ 350.-	"
Electricity		kw	61.-	"
Water		m^3	51.-	"
Oxygen Gas	6.5m^3 bombe	bombe	2,700.-	"
Acetylene Gas	4m^3 "	"	8,000.-	"
Propane Gas	50k "	"	13,000.-	"
"	12k "	"	3,300.-	"

5 – 2 LABOR SKILL AND WAGE

Generally, labor situation reflects the present condition of Vietnam, and shows the obvious shortage of engineers and skilled labor. At the construction site, female, oldmen, minors and unskilled labor are the majority. This situation, together with the shortage of construction machinery, affect to the period of construction.

The attached wage list shows very rough idea for workers salary.

5 – 3 CONSTRUCTION EQUIPMENT

VECCO which is semi-government corporation lease the construction equipment which was disposed by U.S. Army. Can-Tho branch office own the following equipments but it is nesessary to check the maintenance condition and its capability before starting the project sonstruction.

MACHINERY OF VECCO

CRANES	SOIL STABILIZERS
EARTH MOVENS	WELDERS
TRACTORS	FORKLIFTS
FRONT END LOADER	COMPACTION EQUIPMENTS
TRENCHERS	ASPHALT MACHINES
MOTOR GRADERS	CONCRETE EQUIPMENTS
AIR COMPRESSORS	PILE HAMMERS
TRAILERS	GENERATORS
BATCH PLANTS	

LOCAL LABOR WAGE

			Can-Tho Dec.1974 V.N. $
1.	Surveying Engineer	Monthly	60,000.-
2.	" (Assistant)	Daily (eight hours)	1,800.-
3.	Carpenter (Manager)	"	2,000.-
4.	"	"	1,500.-
5.	Plasterer (Manager)	"	2,000.-
6.	"	"	1,500.-
7.	Steel Assembler (Manager)	"	2,000.-
8.	"	"	1,500.-
9.	Welder	"	1,600.-
10.	Electrician (Manager)	"	2,000.-
11.	"	"	1,600.-
12.	Un-skilled Labor (Manager)	"	1,200.-
13.	" -male	"	900.-
14.	" -female	"	750.-
15.	Fireman	" 1,200 ~	
16.	Plumber (Manager)	" 2,500 ~	
17.	"	" 1,500 ~	2,000.-
18.	Heavy-machine Operator	" 1,500 ~	2,000.-
19.	Mechanician	" 1,500 ~	1,800.-
20.	Driver	" 1,500 ~	1,800.-
21.	Interpreter	Monthly	80,000.-
22.	Office Clerk -male	"	60,000.-
23.	" -female	"	30,000.-
24.	Typist	"	35,000.-
25.	Nurse	"	35,000.-
26.	Cook	"	55,000.-
27.	"	"	30,000.-
28.	Maid	"	15,000.-

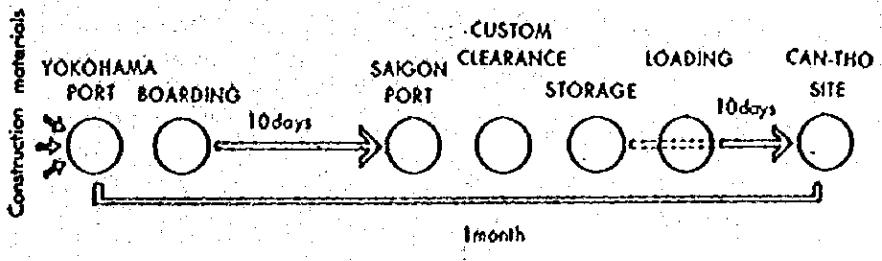
5 – 4 TRANSPORTATION OF MATERIALS

As mentioned in this report, except few things supplied in Can-Tho city, most of the materials and products will be transported from Saigon or other countries. The material produced in Saigon, the supplier usually deliver the material to site, the road condition from Saigon to Can-Tho will be the only problem. The import material and products from Japan, for example, as you can see in diagram, the transportation has to be as follow. The packed materials collected in Yokohama port, loaded on boat and takes 10 days by direct freight to Saigon port. At Saigon port, it takes certain days for tax clearance and again loaded on track and deliver to the site. It takes about 10 days from Saigon port to the site so that total one month has to be considered as delivery time from Yokohama to site. The construction period will be affected by the delivery time of materials so that following two items has to be considered by Authorities.

i) Smooth clearance at Saigon port for import materials.

ii) Top priority treatment for using the ferry boat from Saigon to Can-Tho.

The transportation fee from Saigon to Can-Tho will vary in accordance with the weight, volume and number of package and roughly US 25 $/ton has to be considered as expense from Saigon to Can-Tho.



5 – 5 TAX EXEMPTION AND CONTRABAND

For the construction of this project, following two taxes affect to the total construction cost.

i) Import tax

All the import material, products and construction equipment are the property liable for taxation. Since many materials and products specially for Plumbing, Mechanical and Electrical work depend on the import material, proportion of tax to total construction cost will share the high proportion.

ii) Taxation and duties

In construction project, the contractor is required to pay production taxes, trade license taxes, registration tax and reconstruction tax. Roughly these taxes share about 10% of total construction cost.

Above two taxes affect to the budget of construction cost, more detail survey have to be carried out to find the possible way to reduce those.

The survey for the prohibition of import materials and products were not carried out this time, but we were told quite many items are listed in this so that this has to be studied in next survey.

6. FACULTY OF AGRICULTURE MASTERPLAN

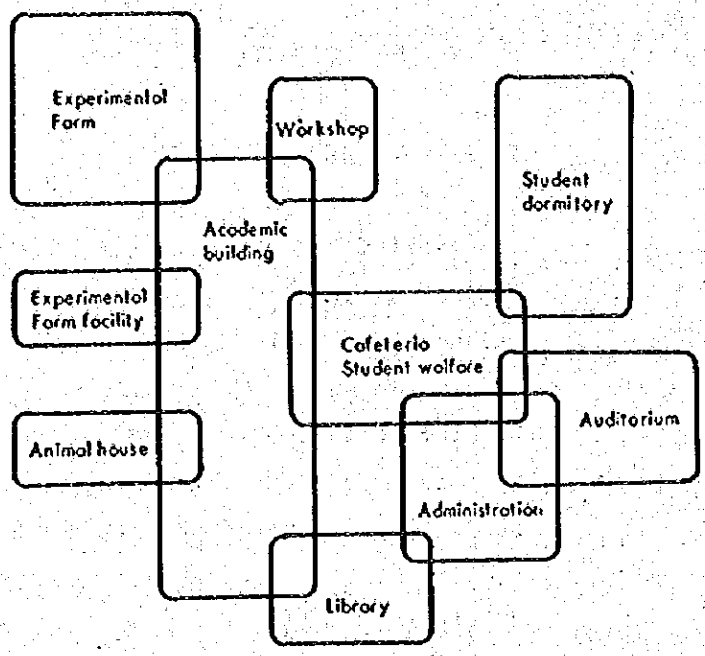
6 – 1 BASIC DATA

It is not possible to separate the planning or architectural concept of a University from the basic educational concepts held by the faculty and administration. For educational concept of this project we refered Can-Tho University General Information and development outlook and basic data for the architectural planning is also shown in the report,"The Construction Proposal of the Faculty of Agriculture, University of Can-Tho". The result shown in this report is, therefore, based on above two reports and the study and information obtained during the survey. Following section present the basic concept of the Masterplan, necessary facilities, scope of the construction and Schematic planning of the faculty of Agriculture and intend to provide the basic guide line for the preliminary design.

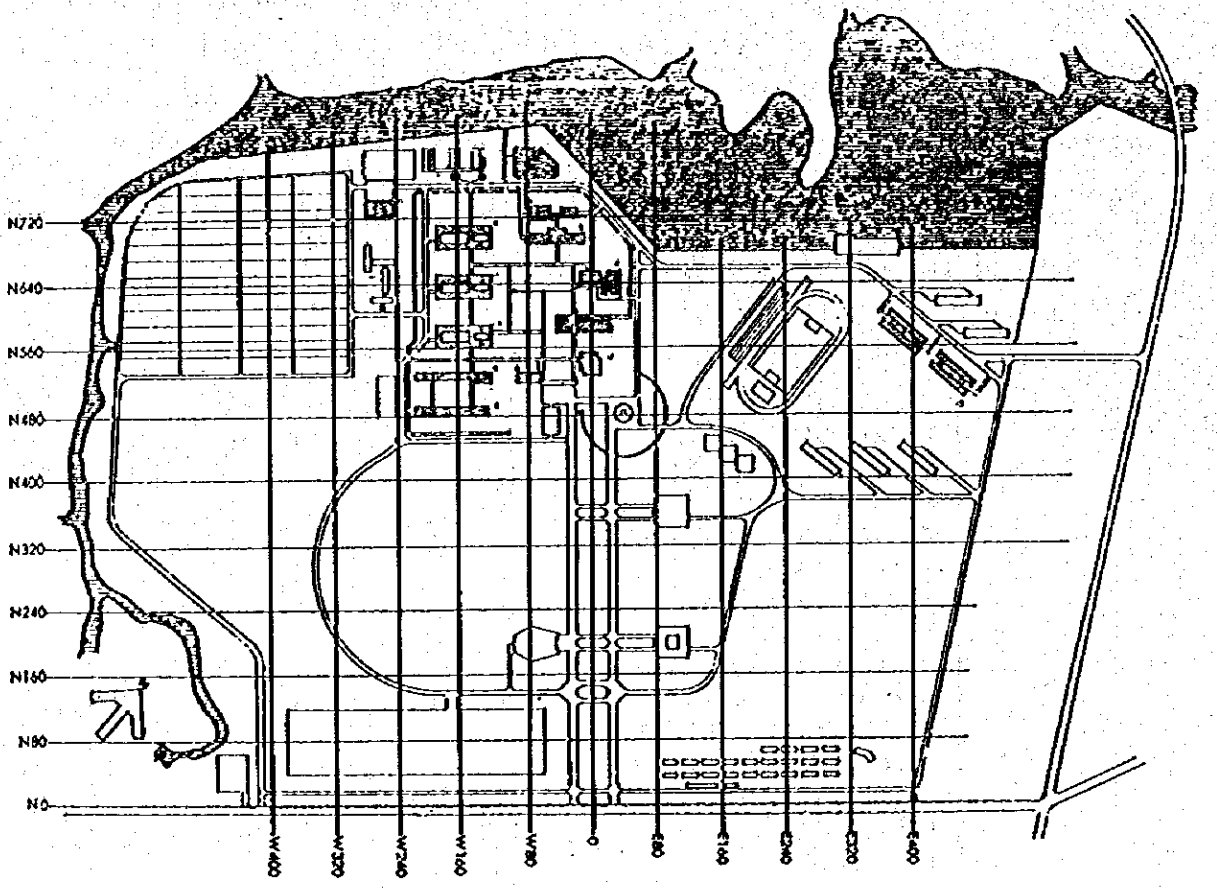
6 – 2 FACILITY AND FLOOR AREA

The necessary facilities for the Faculty of Agriculture in Cai-Khe Campus have already proposed in the report mentioned. During the survey in Vietnam, many discussions were held with the faculty dean, professors and campus Architect, and confirmed the necessary facilities as follows. The floor area for each building has also settled, however, at the advance stage of this project, floor area of the buildings, slight changes will be allowed in accordance with the planning of facilities.

	PRERIMINARY
AGRONOMY	2,722M²
EXPERIMENTAL FARM	760M²
ANIMAL HUSBANDRY	2,722M²
ANIMAL HOUSE	784M²
AGRI. ENGINEERING	2,064M²
MACH. WORK SHOP	400M²
AGRI ECONOMICS & LIBRARY	2,042M²
CLASS ROOMS	1,999M²
ADMINISTRATION	744M²
CAFETERIA & STUDENT CENTER	1,182M²
AGRI. CHEMISTRY	2,722M²
SMALL AUDITORIUM	785M²
DORMITORY	2,427M²
DORMITORY	2,427M²
OPEN CORRIDOR	600M²
TOTAL	24,380M²



ZONING



CAMPUS GRID

6 – 3 ZONING

The relationship between one space use and another proposed by University has .arefully analyzed and studied. The figure shown herewith shows the linkages between the spaces. Experimental farm facility, Animal house, Workshop and experimental farm have close relation with the academic space, and Library Cafeteria and Student Center has overall connections to the facilities. The proposed layout of facilities from Can-Tho University correspond to the relationship of spaces, except the dormitory. The proposed location of dormitory is far from the rest of facilities, the question was raised how to manage the meal service to the student.

On this point, Can-Tho University has already plan to provide the Student cafeteria serve to the student in the dormitory in the dormitory area. This cafeteria will serve not only for Faculty of Agriculture students but also for other faculties' students.

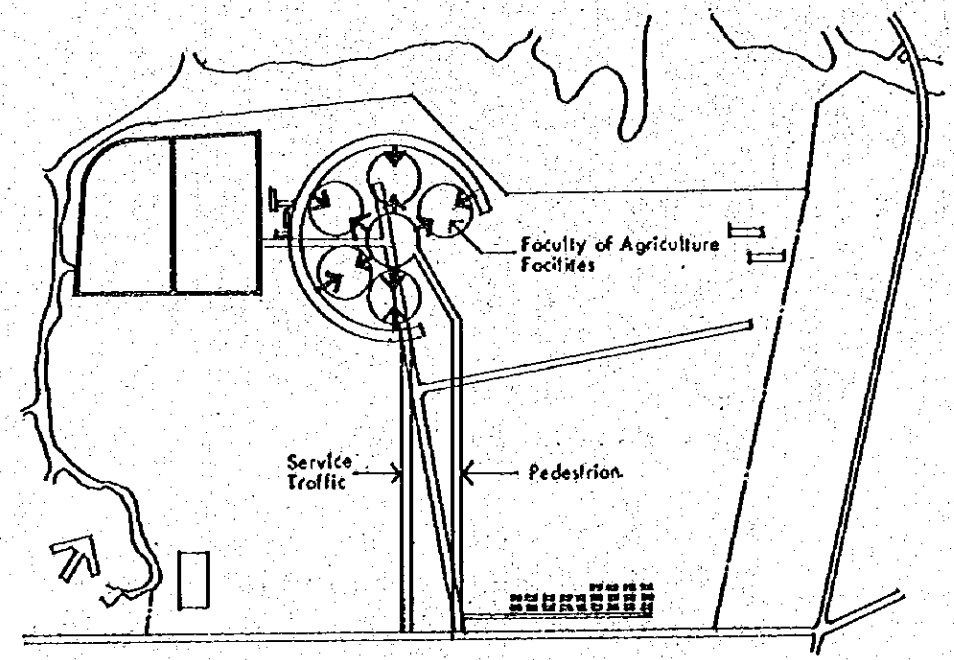
Student cafeteria, Library, Auditorium, and Administration have to be planned to locate in the center of the faculty of Agriculture even after the future expansion of facilities.

6 – 4 CAMPUS GRID

Since Can-Tho University has plan to built the other faculty facility in the Cai-Khe Campus in the future, the datum line and campus grid were planned to use as basic guide line. The datum line was set at the center of proposed main campus road and the south boundary line along the road. The unit grid was planned 8 m x 8 m and 40 m x 40 m grid was set at Cai-Khe site. By this means, the every building will be plot on this grid and the position will be cleary called out.

6 – 5 CIRCULATION

There are three types of circulation. Those are by student staff and service. The student who will attend to this campus will use the bus, motorcycle, bicycle, and "cycle". The staff will use also bus, motorcycle, bicycle and automobile. The service which will provide all necessary supply and disposal of campus will be by mainly automobile. Basic concept of this campus is to prohibit the automobile and motorcycle at the main gate of campus so that all the road is basically for the pedestrian and keep the campus quiet and in the academic atmosphere. For the automobile used for service and other necessary traffic, the service road is planned to circulate from the outside of facilities not to disturb the concept.



CIRCULATION

6 – 6 FACILITIES LAYOUT AND CONSTRUCTION PHASE

Proposed master plan was revised in accordance with the result of survey analysis and new proposed master plan was provided.

i) The nesessary facilities of Faculty of Agriculture were planned around the center court which will be the space of student activity off study and laboratory work. The entrance to faculty is clearly recognized from the main road of campus and lead the student staff and guest into the objective place.

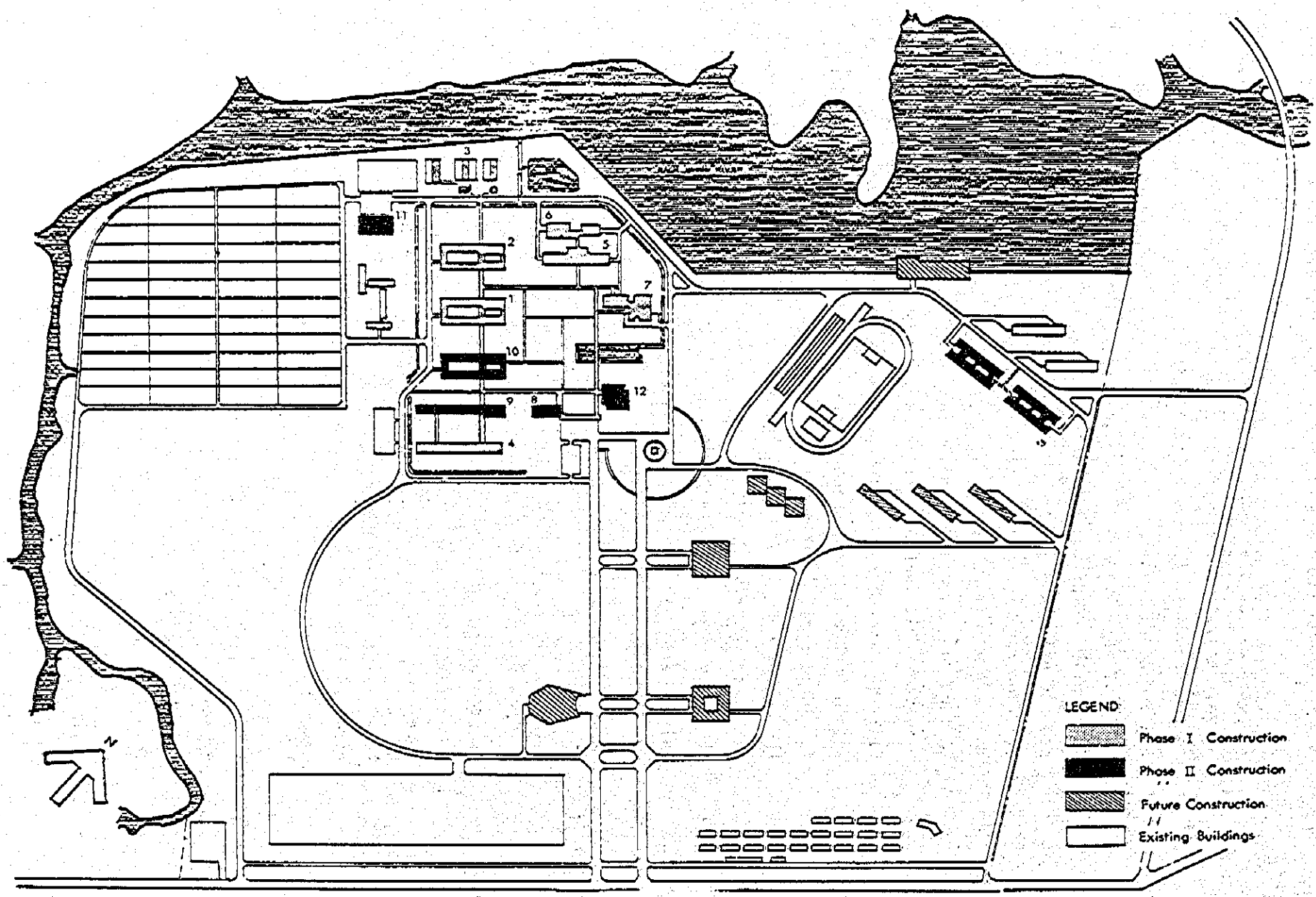
ii) From the entrance of Faculty, people will be able to go easily to the academic building, library, cafeteria, or auditorium through the covered way which will be also used as main energy service supply rout even in the rainy season.

iii) The space which has strong linkage will be placed close enough each other and space which will create the noise and odor is placed apart farther from center space. The space which has the strong connection to all facilities will be locate close from the center part of Faculty. For example, cafeteria is adjoin to the center court and riverside where best vista will be obtained.

iv) Dormitory is planned in the residential zone in the east part of the site.

These facilities are possible to be built in the several stages but Can-Tho University is proposing to complete in the two stages in accordance with the necessity of space. Followings are proposed facilities which will be built in the first and second stage. As for construction wise it is advisable to complete the pile work in the first stage, otherwise the pile work which will be constructed in the second stage may disturbe the laboratory work and class work because of its vibration and noise.

Stage I	Stage II
Agronomy	Administration
Animal Husbandry	Agric. Econnomics and Library
Animal House	Agric. Chemistry
Class Room	Experimental Farm Facility
Agric. Engineering	Small Auditorium
Machinery Workshop	Student Dormitory
Cafeteria and Student center	



CONSTRUCTION PHASE

6 – 7 EXPANSION

In accordance with the extensiveness of academic field of study, the physical facility also has to be expanded. Present master plan of Cai-Khe campus prepared by Can-Tho University shows the space for Agriculture future expansion toward the south of proposed site of Faculty of Agriculture. Future expansion of Faculty of Agriculture, therefore, will be added at the south side of the Class Room building and joined by the covered way but still possible to keep the original function of master plan.

6-8 SITE RECLAMATION

The level of existing site of Faculty of Agriculture is not flat and some area need the backfill to elevate the ground level. It is recommended to set the level of site above the flooding level in rainy season which is somewhere around TN 1.946. Ground level around the facility will be therefore planned to elevate the level of TN 1.946 + 20 cm and open corridor and first floor of building will be set above this level. The earth to elevate the site will be obtain from the excavation of open channel, fish pond, and lagoon.

6 – 9 STRUCTURAL PLANNING

i) Framing Plan

South Vietnam is located off the circum-pan-pacific earthquake belt and almost free from earthquakes. It is seldom struck by typhoons, has so far the maximum instantaneous wind velocity recorded has been 30.9 meters per second, and consequently the intensity of lateral forces action upon buildings is markedly low when compared with that in Japan. This gives a considerable freedom in the design of building frames and in the case of a building having four stories or more, the provision of a special frame capable of resisting horizontal forces is not required, and a frame consisting of columns and beams is sufficient to withstand vertical and horizontal forces.

On the project site, weak ground continues down to a level about 30 meters below ground level and no apparent bearing stratum is observed at levels lower than that. If the building is to be constructed on such ground, uneven settlement will occur. Therefore, it is necessary to provide the expansion joints between the buildings, and the building must be constructed consistently with the same type of foundations and piling method. With regard to its plan, a building nearly rectangular or square and free from many vertical projections is recommended and, with regard to elevation, a building consisting of a 2-storied part on one side and a 3-storied part on the other thus varying in height should be avoided as far as it is practicable. The use of finishing materials having least possible weight is also one of the conditions essential to the building.

Taking into consideration the two facts that the horizontal force acting on the building is small and the ground is extremely weak, the arrangement of columns in a 4-meter grid is considered best with respect to frame strength and economy.

ii) Structural Design Criteria

South Vietnam has no codes that govern structural calculations, and all calculating methods are left to qualified engineers.

In the structurel calculation of the Faculty of Agriculture Building, the following points should preferably be taken into consideration:

a) Values of external forces and assumed loads should be determined from local weather, geography, subsoil conditions and the use of the building.

b) Allowable stress intensities of Japanese structural materials should be in conformaity to the values set forth in the Architectural Institute of Japan Codes and those of local structural materials should be determined with consideration given to variations in quality.

c) Calculation of frame stresses and cross-sections should be made in accordance with the methods defined in the Architectural Institute of Japan Codes.

iii) External forces and loads acting on the building

a) Dead load of the building

Weights of all finishing and structural materials should be included.

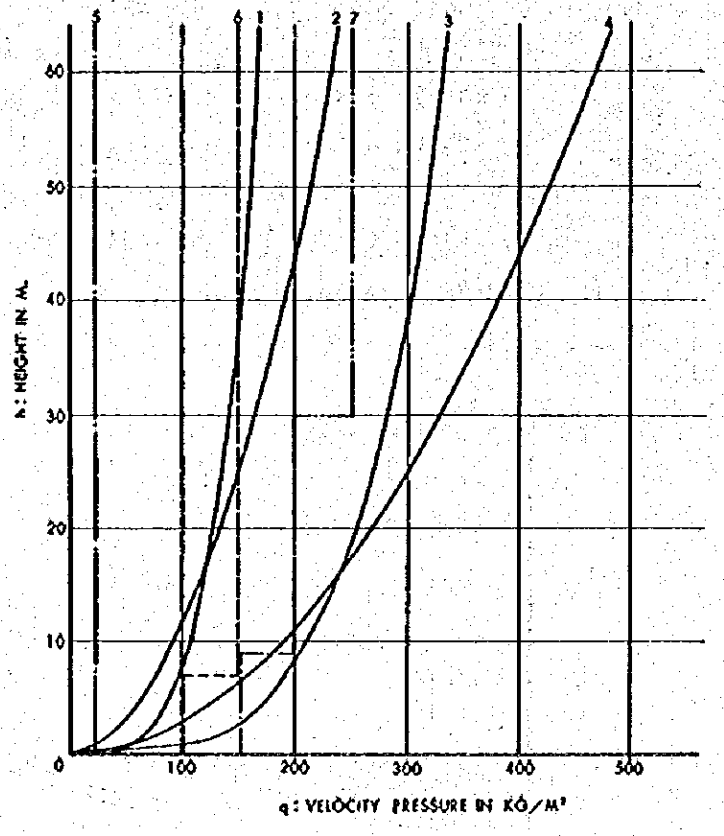
b) Live loads

In any case, the values defined in Japanese Standard should be employed for all live loads, except that values that meet the actual conditions of the rooms for special usages such as laboratory, workshop, animal house, etc. should be determined. For major rooms, the live load values defined in the Japanese Standard and the American National Standard are as given in the following table.

(Kg/m^2)

Room	Enforcement Order		American National Standard
	Slab	Column, beam, foundation	
Class room	230	210	195.3
Corridor	360	330	488.0
Office	300	180	244.0
Auditorium	300	270	488.0
Dormitory	180	130	195.3
Stairway	360	330	488.0

1. VIETNAM :
   $q = 60\sqrt{h}$ FOR TALL BUILDING
2. VIETNAM :
   $q = 30\sqrt{h}$ FOR LOW BUILDING
3. JAPAN :
   $q = 120\sqrt{h}$ FOR TALL BUILDING
4. JAPAN :
   $q = 60\sqrt{h}$ FOR LOW BUILDING
5. INDONESIA : $q = 25$
6. BANGKOK : $q = 100$ TO 150
7. PHILPPINES : $q = 150$ TO 250



WIND PRESSURE

c) Wind pressure

According to the 1950 - 1971 records of the Meteorological Observatory, the maximum wind velocities of 51 knots (26.3m/s) in Saigon and 60 knots (30.9m/s) in Khanh-Hung were registered. The typhoon approach diagram plotted in the 1948 - 1957 period reveals that typhoon or tropical depression struck the Can-Tho area in 1948, 1950 and 1956, or at the rate of three typhoons in every ten years. Taking into consideration of designing the Faculty of Agriculture Building against the values recorded in the past twenty years, it is condidered reasonable that allowance be made for the maximum wind velocity of 40m/s. It is considered proper that the velocity distribution of wind pressure acting on a low-rise building should be proportional to root 4 of the wind velocity and, in the case of a high-rise building such as elevated water tank, that should be proportional to root 8.

Assuming that the atmospheric pressure "H" at the time of a typhoon striking is equal to 720mm and the temperature "t" is equal to 23°C, the density of the air will equal 0.115Kg.sec^2/m^4. Replacing this value in the equation of the above mentioned velocity distribution, $q=0.058(40\sqrt[4]{\frac{h}{10}})^2=29.3\sqrt{h}$ for a low-rise building and $q=0.058(40\sqrt[8]{\frac{h}{10}})^2=52.2\sqrt[4]{h}$ for a high-rise building.

For design wind pressure, adoption of the equation $q=30\sqrt{h}$ for a low-rise building and $q=60\sqrt[4]{h}$ for a high-rise building is considered reasonable. For information, the following diagram shows the wind pressures in vicinity countries of South Vietnam, such as Thailand, Indonesia, the Philippines and Japan. The wind pressures in these vicinity countries are considerably small when compared with that in Japan.

d) Earthquake

South Vietnam does not belong to the circum-pan-Pacific earthquake belt and no record has been taken on earthquake which affect to the building, so that it is not necessary to consider the earthquake as the structural design factor.

iv) Fundation and Pile

Wood piles and concrete piles are common pile for building construction and for bridge and heavy structure construction the

steel piles are seldom used. Common structure in Vietnam is R.C. frame an hollow brick is used for wall and partition. Therefore, the independent footing is suitable for the type of fundation. The footing for the share wall type structure, the continuous footing will be more suitable. Both types of footings have to be supported by piles.

a) Bearing capacity of wood pile

Using tram wood pile average diameter 8 cm ϕ, 5 m long. Since tram wood piles would decay if exposed to wet-and dry cycles, it is advisable to keep them permanently under water, with the pile top at 1.5 m below ground surface. The allowable bearing of simple tram wood pile is:

$$Ra = \frac{1}{fa} \times \frac{1}{2} \times qu \cdot 3.14 \cdot D \cdot L$$

$$= \frac{1}{3} \times \frac{1}{2} \times 0.2 \times 3.14 \times 8 \times 500'$$

$$= 419 \text{ Kg/pile}$$

fa: safe factor
qu: unconfined compressive strength
D: diameter
L: length

b) Concrete pile

Using 25 x 25 cm reinforced concrete pile, 12 m long. The allowable bearing capacity per pile is:

$$Ra = \frac{1}{3} \times \frac{1}{2} \times 0.2 \times 4 \times 25 \times 1150 = 3833 \text{ Kg/pile}$$

c) Concrete pile

Using 35 x 35 cm 39 m long pile with three joints.

Bearing capacity per pile is calculated in end bearing, frictional resistance, and concrete strength. The pile strength is:

$$Ra = fc \times 35 \times 35$$

$$= 0.075 \times 35 \times 35$$

$$= 92 \text{ t/pile}$$

fc = allowable concrete strength

Reduction by joints and pile proportion

$$Ra' = 92.0 \times [1 - 2 \times 0.05 - (\frac{36}{35} - 0.60)] = 43.4 \text{ t/pile}$$

$$Ru = 30 \text{ NAP} = 30 \times 30 \times 0.35^2 = 110 \text{ t} \quad \text{.....End bearing}$$

$$Rfn = \frac{1}{2} \times 3.92 \times 4 \times 0.35 \times 22.5 = 61.7 \text{ t} \quad \text{.....Negative friction}$$

$$Rf = \frac{1}{2} \times 9.48 \times 4 \times 0.35 \times (25 - 22.5) = 16.6 \quad \text{..Positive friction}$$

$$Ra' + Rfn = 43.4 + 61.7 = 105.1 \text{ t} < 2 Ra$$

$$\frac{1}{1.2}(Ru + Rf) = \frac{1}{1.2}(110 + 16.6) = 105,5 > Ra' + Rfn$$

Where as the inflection point Ln = 0.9 x 25 = 22.5 m, qu above that point is 3.92 t/m^2 and below that point 9.48 t/m^2

Therefore, from above figures, the allowable bearing capacity per pile is 43.4 t/pile.

The pile for the project is planned to use this 39 m long pile and wood pile will be used only for light construction.

v) Structural Materials and Construction Methods

Selection of structural materials depends on the scale, construction and usage of the bulding, qualities of local materials, local supply capacity, construction methods, shipping terms of materials from Japan and prices. In general, however, acquisition of local quality materials in large quantities is considered difficult.

For the Faculty of Agriculture Building, the structural materials described in the following paragraphs are considered to meet the local conditions.

a) Concrete

A batching plant should be provided on site by which weighing, proportioning and mixing of concrete materials are performed. With the design compressive strength of concrete aimed at F=180Kg/cm^2, the actual compressive strength of concrete mixed should be F= 225Kg/cm^2 or higher at 28 days taking into account a construction error of about 45Kg/cm^2, due to the reasons that concrete materials must be mixed on site and local fine aggregate contains some earth. Coarse aggregate should be of local crushed stone, and cement should be of Japanese origin.

Since the site is located in the high-temperature zone, concrete should be of stiff consistency so as to prevent the cracking of concrete in its initial hardening period, the slump being restricted to 10 - 15cm. Addition of retarder to concrete is recommended.

b) Reinforcing steel bars

There are two reinforcing steel bar making works of substantial sizes located in the vicinity of Saigon, all the products are of

reclaimed bars having poor quality, hence the bars of Japanese origin are recommended.
As concrete to be used will not be of high compressive strength and most cross-sections will be determined from permanent vertical stresses, it is considered appropriate that main reinforcement be of SD30 and temperature reinforcement SD30 or SR24.

c) Structural steel
Unless a large-span frame, structural steel to be used should be of SS41 processed or prefabricated in Japan. The frames system should be simply assembled by bolting at site.

d) Piles
From the viewpoints of strength and economy, the piles should be of reinforced concrete made at site. Piles must be driven to a depth below ground level of about 39 meters. Assuming that three sectional piles each 13 meters long are used, and use of shop-fabricated metal joint is recommended taking into consideration the perfect transmission of stresses, the prevention of buckling and the construction progress speed. Piles should be rectangular in section so as to increase in friction. Dimensions of piles should be 35cm x 35cm, as standard pile.

For structures of small scale and minor underground structures, local train piles of 8cm in diameter and 8- 10 meters in length will be sufficient.

6-10 MATERIALS PLANNING

As a result of the study on the local building materials described in the preceding paragraph 5-1, the following materials are recommended for use in the Faculty of Agriculture Building.

1) Exterior Wall

a) Washed terrazzo finish
This method is widely practiced in South Vietnam and local plasterer are well familiar therewith. Washed terrazzo is easy to maintain for long period as well as relatively low in cost.

Therefore, this should be used as standard exterior wall finishing.

b) Corrugated asbestos cement board

For exterior walls of the workshop and the buildings annexed to the farm, the use of corrugated asbestos cement board is considered best with respect to the interior conditions and cost.

ii) Roof

In South Vietnam, roof tiles and corrugated asbestos cement boards are produced in mass and the supply thereof is stable. Hence either of the two materials should be used for roofing material. Facilities requiring a large frame on the animal house of simple construction can be provided with asbestos cement board, and class rooms buildings with roof tile.

iii) Floor

The use of four types of material is recommended in accordance with the room conditions.

a) Exposed concrete

Floors in the workshop, animal house and the laboratory of the Faculty of Agricultural Engineering should be provided with exposed concrete (steel-trowel finish) so as to permit traffic of heavy materials.

b) Cement tile

Cement tile should be used for floors of public corridors, offices, library and many other rooms.

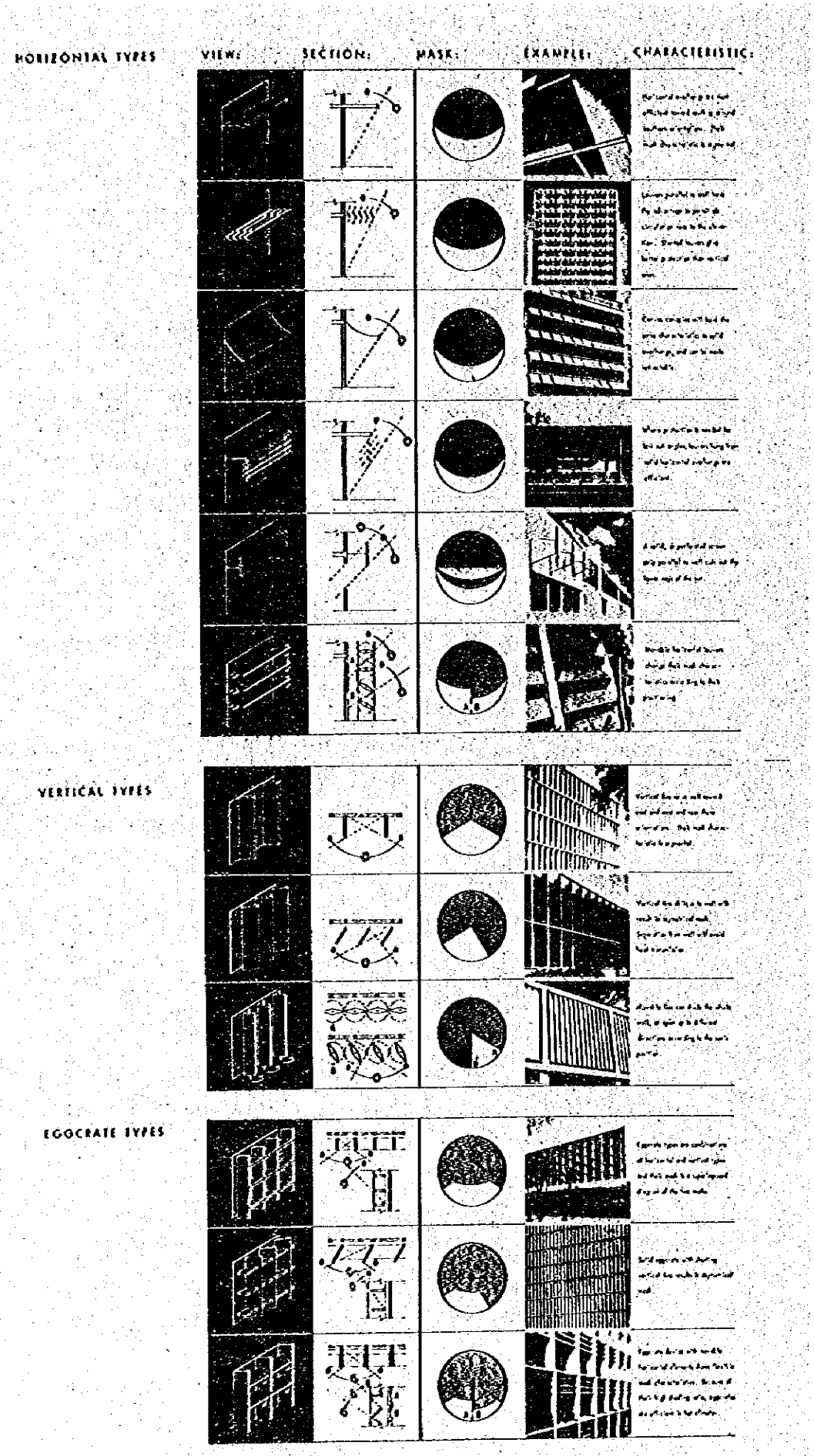
c) Terrazzo (polished on site)

Part of laboratory's floor, toilets and halls should be cast with terfazzo to be polished on site.

d) Vinyl sheet of Japanese origin should be used in such rooms as laboratory, etc. where waterproofing treatment is required.

iv) Ceiling

Ceilings of laboratory, class rooms, professor rooms and offices should be applied with local asbestos cement board, then finished with paint. However, part of ceilings in large class rooms and auditorium where acoustic effects must be taken into consideration should be applied with mineral board. In order to increase heat-insulating performance, ceilings of constant-temperature rooms such as rooms required to be air-conditioned should be applied with heat-insulating material in addition to the mineral board.



Examples of various types of shading devices.

6-11 DESIGN FACTOR

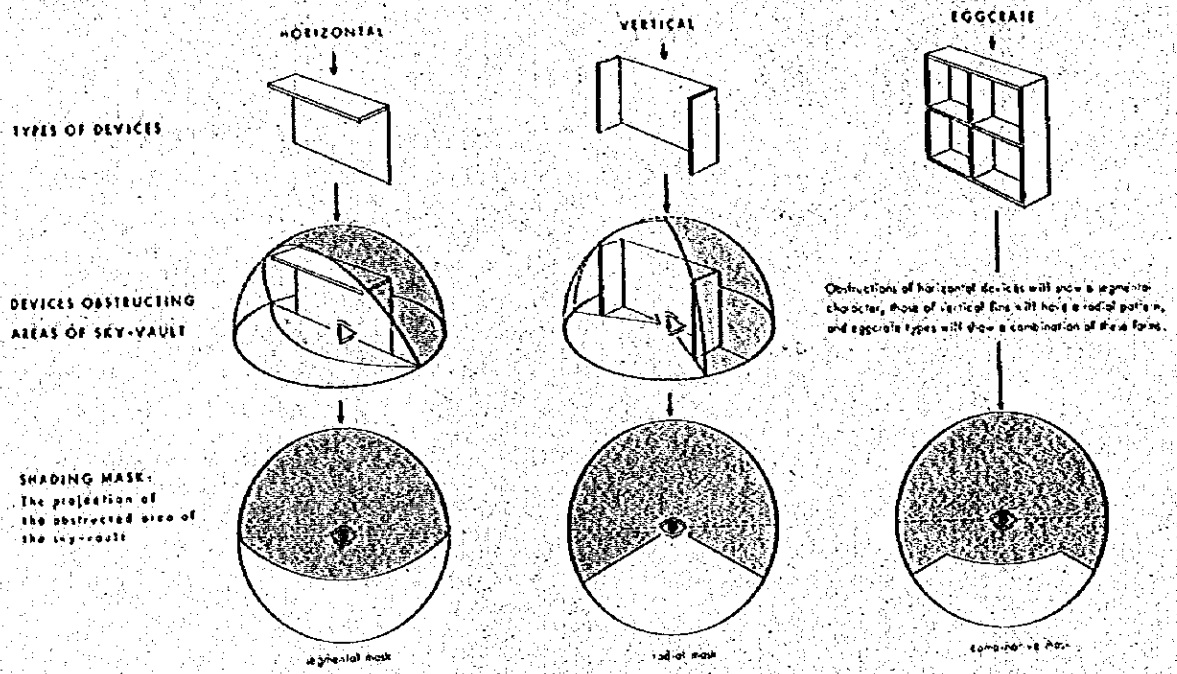
In view of the climatic conditions described in paragraph 6-9, the sunshine and ventilation will specifically form the important factors to produce comfortable room environment, in planning the respective buildings of this Project. With consideration given to the facts that the basic aim of the Can-Tho University is to "leave nature in its existing state" and that the provision of air-conditioning system is restricted to necessary laboratories from the viewpoint of maintenance cost, the planning of the buildings should be carried out in an architectural method taking into account the disposition of the sunshine and ventilation.

1) Sunshine

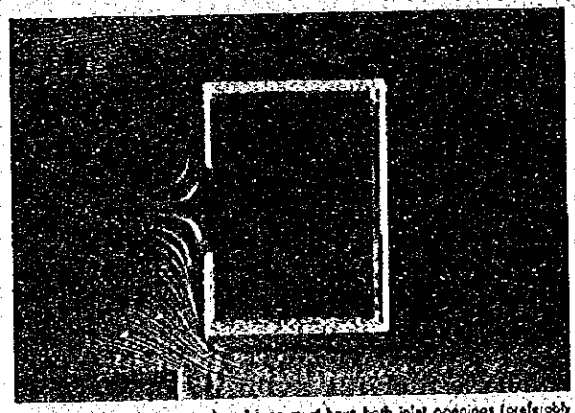
Roof and exterior wall surfaces, particularly openings of rooms, will be affected markedly by the solar radiation described in paragraph 3-2. In order to prevent the radiant heat of the exterior surface of room caused by solar radiation directly to the roof surface, two concepts can be envisaged: (1) the roof surface be provided with heat-insulating material to enhance the heat-insulating effects and (2) the underside of the roof surface be provided with air space, by which ventilation prevents the radiation of heat to the ceiling surface. In South Vietnam, flat-roofs are in most cases constructed of asphalt layer overlaid with prefabricated concrete panel or asbestos cement board so as to provide air space therebetween and avoid solar radiation from affecting the roof slab directly.

The use of hollow bricks on the wall surface is as a matter of course an effective means, and, in general, openings are provided with canopy or louver. Although blind and heat-absorbing glass are also effectiver for the prevention of solar radiation, they are inadequate with respect to ventilation. There are three types of canopy and louver envisaged as shown on the drawings.

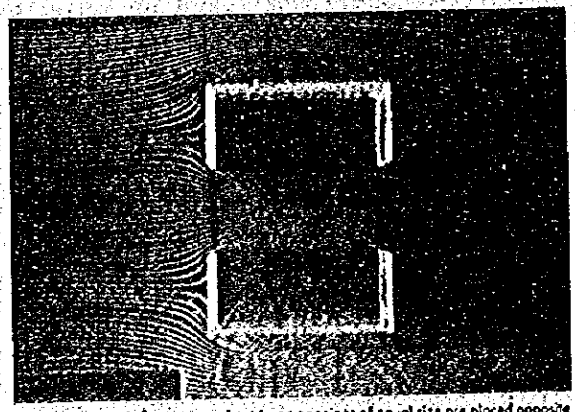
In cases the buildings are arranged along the east-west axis and the openings face the noeth and south, horizontal canopies are effective as shown. However, in the arrangement of the Faculty of Agriculture Building, the use of vertical louver in combination of horizontal canopy is most desirable. For reference, effects type



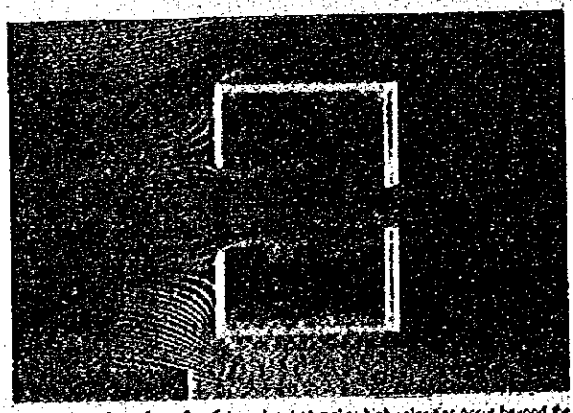
BASIC TYPES OF SHADING DEVICES AND THEIR PROJECTIONS



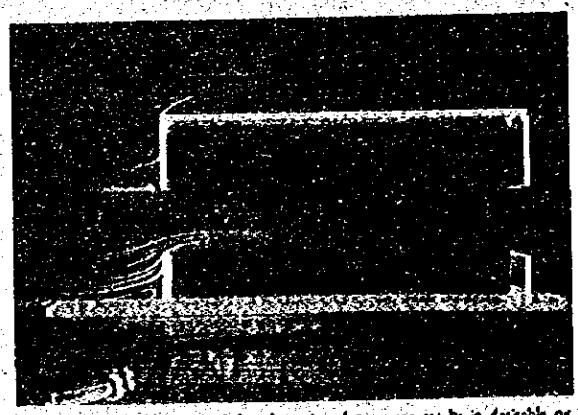
To receive air movements a house must have both inlet openings (preferably where the ram pressure is positive) and outlet openings (on negative, or suction areas). Here, as outlet is missing, no airflow occurs in the building.



Maximum air flow occurs where large openings of equal size are placed opposite of each other. Note the considerable amount of flow with slightly higher speeds than that of the outside.



Large inlet with small outlet combination makes high velocities occur beyond the building, therefore its cooling effect is lost.



Overhang with slot equalizing the external pressures results in desirable air flow pattern.

AIR FLOW PATTERNS

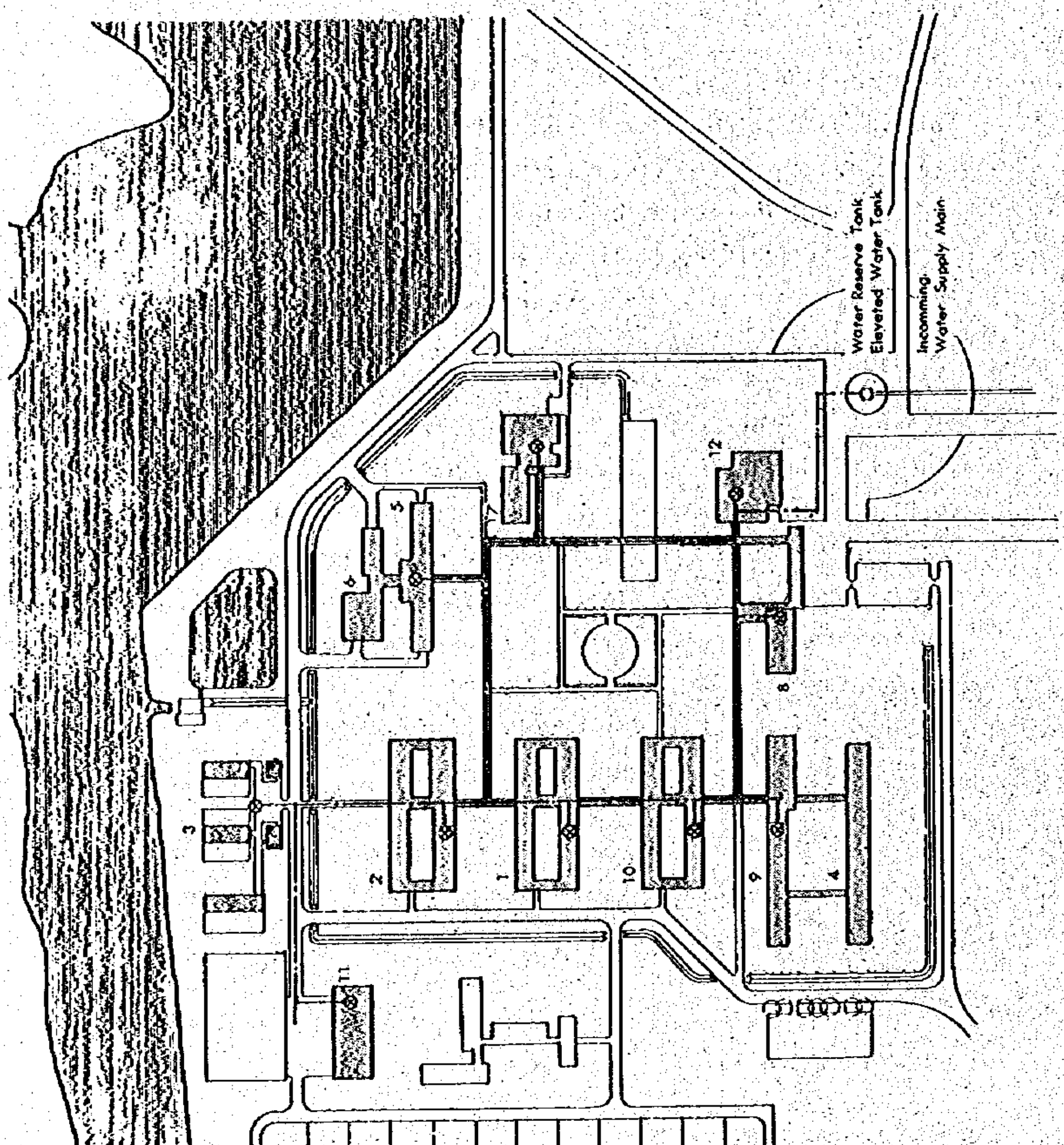
of louvers are given in the drawing. Refer to the solar radiation curve.

ii) Ventilation

For rooms in which natural ventilation is to be performed, outdoor conditions (high temperature and humidity) are themselves the room conditions. Therefore, creation of comfortable room environment is very difficult to realize. Fortunately, either tropical monsoon or trade wind blows from the west-south or north-east, so this wind may be admitted into the rooms so as to approximate the room condition to the comfortable temperature conditions sensible by man. For this reason, as large openings as possible should preferably be provided so that the building be of the construction to permit easy passage of the wind. This should be envisaged with consideration given to the problems on the sunshine and rainfall discribed previously. Also, sufficient consideration should be given in the arrangement of individual rooms of laboratories because noise and odor will be involved. The following photo gives the effects of sizes and locations of openings over ventilation.

iii) Floor level

As already mentioned in section 4-7, to avoid the flooded condition above the floor level in rainy season, the lowest floor level of Faculty of Agriculture shall be higher than the level of temporary road. For this reason, the floor of building raized from the existing ground level and space between floor and ground will be used as maintenance space for the piping of laboratory class room.



WATER SUPPLY SYSTEM

6-12 PLUMBING SYSTEM PLAN

i) Water Supply System

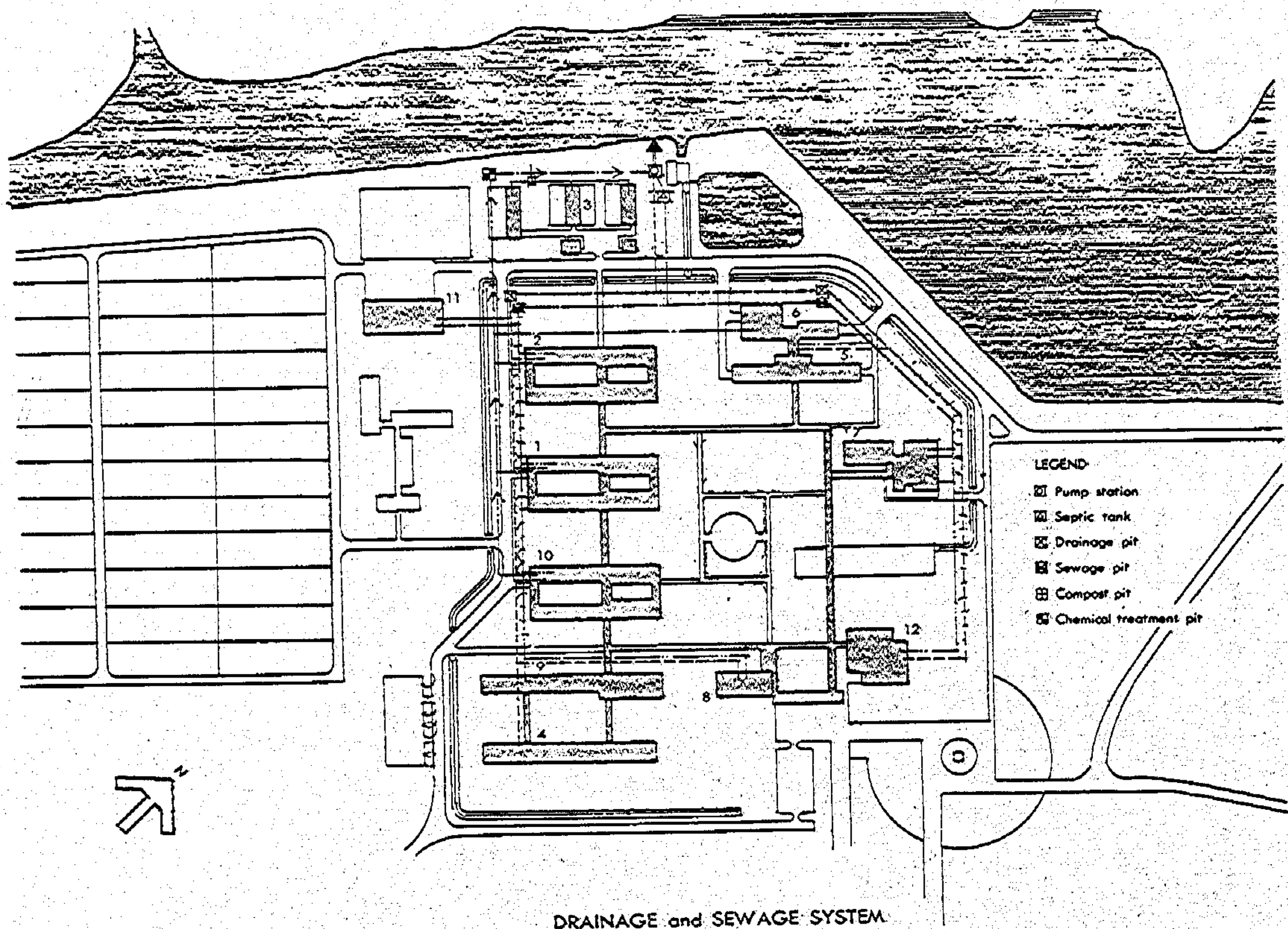
In this Project, low-rise buildings are arranged at several places on a vast premise (Approx. 40 hectares). In the case of such a block plan, there can be envisaged, as a means of water supply, several systems such as gravity supply by means of elevated water tank, the pump running system and pressure tank system. Of these systems, the elevated water tank system is considered best for this Project with respect to easy maintenance, stability of water supply in volume and pressure. Taking into consideration the stoppage of electric and water distribution, a water storage tank of a one-day supply capacity should be provided on the campus. Water will be pumped up from the water storage tank to an elevated water tank of about 30 meters high, then from which to the respective buildings by gravity. Water distribution pipelines to the buildings should be of the loop type taking into account the stability of water supply in volume. It is recommended that the lift pump should be of 3-stage operation so as to effect electrical savings.

In order to cope with failure of the lift pump, the provision of one (1) stand-by lift pump is recommended. Since piping materials and valves are not available in South Vietnam, these materials should be all imported.

In consideration of the construction practice levels both manually and mechanically, adoption of polyvinyl steel lining pipes, which are generally used as water supply pipes for large-scale buildings in Japan, will be very difficult, so it is recommended that galvanized steel pipes and cast iron pipes both for water supply use be employed. Water distribution loop lines to the respective buildings will be installed by utilizing the covered way.

ii) Hot-Water Supply System

Requested from the Can-Tho University, hot-water system for experimental use in individual laboratories are schemed hereunder. The employment of central hot-water distribution system is not so adequate taking into consideration the consumption of hot water, maintenance cost, installation cost, running cost,



DRAINAGE and SEWAGE SYSTEM

Accordingly, instantaneous gas water heater should be provided wherever necessary so as to individually supply hot water as required.

iii) Drainage System

In planning the drainage system, emphasis should be laid so as to permit the respective buildings to function fully. In whole, it is considered adequate that interior drain lines be comprised of three systems; miscellaneous drainage, sewage and experimental drainage: and four systems for exterior drain lines; rainwater, miscellaneous draing , sewage and experimenral drainage. Except for centrifugal concrete pipes, piping materials used should be of imported products. Although centrifugal concrete pipes of local origin are low in accuracy, the use of these local pipes is preferred taking into consideration shipping cost.

a) Sewage drain plan

Interior sewage lines should be effected with cast iron pipes generally used in South Vietnam. Local workmen are familiar with installation of these pipes. Centrifugal concrete pipes of local origin should be used for exterior sewage lines, which will be connected to a septic tank. If sewage were led to the septic tank at natural slope, the septic tank would have to be installed below the ground surface at a depth more than reasonable, and this would be a problem with respect to economy and maintenance. Therefore, with the exception of students' dormitory, sewage should be led to the septic tank through different two lines, with storage tank provided respectivelly, then pumped up.

b) Miscellaneous drainage drain plan

From the viewpoint of durability, the use of galvanized steel pipes for interior miscellaneous drain lines is recommended. Centrifugal concrete pipes should be used for exterior lines. Similarly to sewage lines and with the exception of students' dormitory, drainage should be led to drain pits through different two lines, then pumped up to discharge into the river.

c) Rainwater drain plan

Rainwater from individual buildings should be drained in the open ditch provided at the perimeter of the buildings, then led to the rainwater drain main. Through this drain main, the rainwater shoud be collected in a collecting tank, pumped up to discharge into the river.

d) Drainage from laboratories

Drainage from lavoratories should be handled absolutely independent of other drainages, since it contains tested chemicals, etc. With consideration given to corrosion, piping materials to be installed indoors should preferably be of rigid polyvinyl chloride pipes and those for outdoor use should be of centrifugal concrete pipes.

iv) Sanitary Fixtures

With the exception of Vietnamese closet bowls used by students, all sanitary fixtures should preferably be of imported products. Insofar as provision of sanitary fixtures, except for student closet bowls mentioned above, is made in conformity to the types of sanitary fixtures used currently by Japanese universities, there will be no problem.

v) Sewage Treatment System

In Japan, a septic tank of mechanical aeration type is sufficient for the buildings of these scales under consideration. In South Vietnam, however, not a single large-scale mechanical aeration type septic tank is provided. In this connection, therefore, adopted of such a septic tank will be a problem with respect to maintenance of the tank and its appurtenances, inspection and replenishment of parts. For the most part, septic tanks of French type are used in South Vietnam and most treated water is allowed to infiltrate into the underground. It is therefore recommended that sewage be treated independently in a septic tank (capacity: 600 - 800 persons) conforming to the requirements of JIS Standards. Treated water, after sterilization, should be pumped up to discharge into the river.

vi) Drainage Treatment System - Laboratory

Drainage from laboratories will contain organic and inorganic matters harmful to man, livestock and the crops. Therefore, as the river into which the drainage from laboratories is discharged is the source of daily water for residents, the drainage must be pretreated. It is considered best with respect to maintenance and control that drainage be neutralized simply and diluted, then collected in one (1) treatment tank. Drainage systems for laboratories in which RI will be used are not included in this Project,

and a RI treatment tank will be envisaged as a future plan.

vii) Pressurized Water Supply Pipelines

Pressurized water supply pipelines are planned to be installed in the workshop of the Faculty of Agricultural Chemicals Engineering Building. Considering in what state the workshop will be used, it is recommended that a pressure tank be provided in the building, and the water distributed by pumping. (Pressure tank is subject to a pressure fluctuation of 1 to 1.5 Kg/cm^2).

viii) Gas Supply System

Butane gas will be used for this system. In consideration of piping cost and easy maintenance, it is recommended that butane gas tank and pipelines be provided in individual buildings so as to facilitate maintenance.

6—13 AIR-CONDITIONING AND VENTILATING SYSTEM PLAN

1) Air-Conditioning System

a) Design conditions

Hottest season in South Vietnam comes in the March-May period with the peak in April. Climatic measurements taken of Can-Tho during 1937-1940 and 1962-1971 recorded absolute maximum temperature in 40°C and humidity in 100%. For design conditions, 34.3°C (mean value of April maximum temperatures), 37.0°C (mean value of maximum 40°C) and mean humidity 77.7% should be adopted. For this purpose, the peak solar radiation (at horizontal plane) of 922 $Kcal/m^2$ per hour shoul be adopted.

In this Project, air-conditioning system to be provided for rooms, will not serve man, but for experimental use or protect experimental equipment. Therefore, interior temperature and humidity conditions should be planned as follows.

1) Constant-temperature room and Microfilm custody room ..... 20°C ± 2°C RH 50 - 60%
2) Seed room ..... 10°C ± 2°C RH 50 - 60%

c) Air-conditioning method

In this Project, the Can-Tho University has no intention to have the whole of the buildings air-conditioned, but natural ventilation be employed for the most part. Therefore, such rooms as are

inevitably required to be air-conditioned should be so effected with air-conditioner, reciprocating type chiller or window cooler, but these equipment should be of the types easy to be maintained. However, large turbo chiller may be a problem with respect to maintenance and operation control. In view of these points, employment of such an air-conditioning system as is simplest in maintenance and operation is recommended. As interior temperature and humidity conditions in the rooms planned to be air-conditioned are identical to those in the constant-temperature room of individual laboratories and the microfilm custody room of the library building, the same method of air-conditioning may be envisaged. On the contrary, setting of the seed room's temperature and humidity conditions is regorous, i.e. 10°C and 50 - 60% respectively,

b) Interior temperature and humidity conditions

so different air-conditioning method must be planned. In summary, the constant-temperature room and the microfilm custody room should be air-conditioned by means of low-temperature package air-conditioning unit, and the seed room by reciprocating type chiller and cooler unit. Concerning the cooling method by means of air compressor, it is recommended that the cooling method by means of a cooling tower be employed, with respect to mechanical stability and control performance.

ii) Ventilating System

Testing rooms, toilets, kitchens and equipment rooms are required to be ventilated. The results of our research reveals that most existing buildings in South Vietnam have their interior ventilation depended on natural ventilation. Adoption of mechanical ventilation at large will not be so appropriate with respect to electric charges and maintenance cost. Therefore, mechanical ventilation should be planned only where harmful to man or where offensive smells are generated. From the foregoing, it is recommended that only draft chambers, instantaneous gas water heaters and toilets should be exhausted by forced-ventilation.

iii) Air Supply and Suction Pipelines

For the purposes of making various tests, the laboratory buildings are required to be provided with air supply and suction pipelines. In principle, individual laboratory buildings should be provided with air compressor and suction pump, which should be connected to the respective testing tables by means of copper piping.

6-14 ELECTRICAL SYSTEM PLAN

In the construction of the Faculty of Agriculture Building, two electrical systems should be provided; (1) a main electrical system required for the entire Faculty of Agriculture campus and (2) a general electrical system required by individual buildings.

1) Main System

a) Substation

A substation for exclusive use by the Faculty of Agriculture shoul should be provided on its campus, therby dropping the 15,000 volts distributed by Vietnam Power Company to a low voltage of 380/220 volts 3-phase 4-wire system, and distributing it to the respective buildings. Any building (s) requiring 110 volts for testing equipment should be provided with transformers in that building to drop 380 volts to 110 volts for distribution to individual equipment.

b) Generator

1) A generator as an emergency power source should be provided for power supply to such equipment as will be interrupted of their functions upon stoppage of commercial power source supplied by Vietnam Power Company.

2) Outline of generator

° Voltage: 380/220 V 3-phase 4-wire

° Output : 150 KVA

° Place of installation: Workshop building and generator room

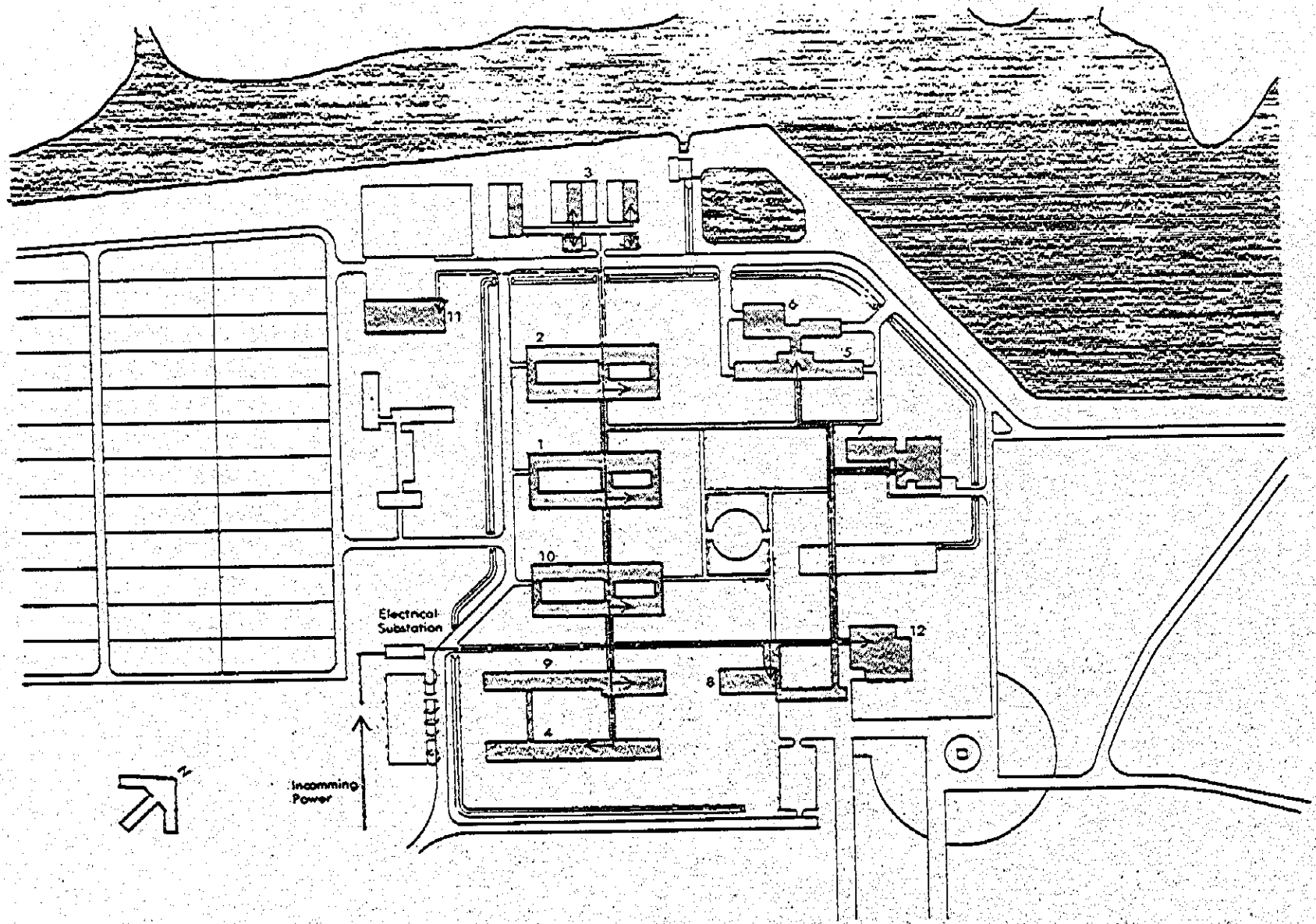
c) Mains

1) Power mains

Low-voltage mains should be provided in between the substation and individual buildings, through connecting corridors between buildings. For buildings not connected with corridor, mains should be installed in the air or buried underground.

2) Telephone mains

Mains should be installed for distance from the telephone exchange room of the Administration Building to the extension telephones of individual buildings, through connecting corridors or in the air or underground, similarly to paragraph (a) above.



ELECTRICAL POWER SUPPLY SYSTEM

d) Telephone exchange

1) In order to effect intercommunication between individual buildings on the Faculty of Agriculture campus and that with the outside, a telephone exchange should be provided. Presently the telephone exchange is planned to be provided in the telephone exchange room of the Administration Building, and therefore extension wiring should be installed from this room to individual buildings.

2) Exchange equipment

° Exchange unit: Cross bar type automatic exchange unit
° B board: Desk-set type without plug
° Supply equipment: Rectifier, battery and enclosed type cubicle
° MDF: Main terminal block for wiring
° Extension telephone set: Dial switch type

3) Trunk line and extension line

According to the result of research and agreement made with the Can-Tho University, about five trunk lines will be provided and the total of about sixty extension circuits will be provided in major rooms with the exception of general class rooms of individual buildings on the campus.

ii) Electric System - General

a) Power system

Supply source and control panels (3-phase 3-wire 380 V) will be provided for motors of air-conditioning units, fans, pumps, and other electric-driven equipment. For wiring, 600 V vinyl-sheathed conductor should be installed in metal conduit. Switcheds to be used for control panels should be of NFB and MNFB. Voltmeters, ammeters and capacitors will be provided.

b) Lighting system

1) Fluorescent lamps should be used as illumination source. Depending on the use of buildings, incandescent lamps and fluorescent mercury lamps should be used. These lighting fixtures will be rated at singlephase 220 volts in conformity to local codes.

2) Intensity of illumination for major rooms

° Library, office, etc.: 350 lux
° Dining hall and game room: 300 lux
° Auditorium: 200 lux
° Corridor and hall: 100 - 150 lux.
° Warehouse and equipment store: 50 - 100 lux

3) Receptacle

Depending on the loads to which receptacles are to be connected are to be connected and on purposes, receptacles should be classified into those to be used for experiments and other special loads and those of plug type, taking into account voltages and current values. Single-phase 220 volts should be adopted for general use and single-phase 110 volts for testing equipment. General rooms should be equipped with receptacles as follows:

- Rooms of length between 1 and 2 spans: 2 - 4 places
- Rooms of length between 2 and 4 spans: 4 - 6 places

However, laboratories should be equipped with receptacles in such a manner as to meet the requirements of testing tables and equipment.

c) Distribution board

Common distribution board will be provided over a certain range so as to cover general lighting, receptacles and load. In laboratories, a distribution board should be provided in each room. Switches to be equipped in distribution boards should be of NFB.

d) Telephone piping

Telephone piping will be installed in individual buildings by means of metal conduits. In general, all outlets should be of wall-mounted type.

e) Broadcasting system

The two student laboratories (large type) of the Faculty of Agriculture Building and the two large lecture rooms of the Class-Room Building should be provided independently with a broadcasting system.

f) Interphone system

Interphone sustem will be provided between inside and outside the Administration Building.

g) Fire alarm system

In consideration of cost and maintenance, fire alarm system will not be of automatic operation, but equipped with manual signal transmitters and bells in each building so as to effect alarm upon

occurrence of a fire.

h) Lightning arrester system

The Library Building and two student dormitories will be equipped with air terminal.

i) Stage lighting system

For lectures, simple lighting equipment will be provided to illuminate the stage area of the Auditorium. Such equipment should be of ON-OFF type.

j) Stage sound system

The hall of the Auditorium having about 550 seats will be provided with a sound system.

k) Exterior structures and utilities

iii) Exterior lighting system

The provision of outdoor lamps on the campus is recommended.

6-15 FIRE PROTECTION

There is no comparative regulation for the fire protection in Vietnam. However, the equipment for the fire protection has to be considered for the protection of people and facilities. For this project, it is essential to provide the easy escape from the building at the planning stage. In Japan, it is required to provide automatic fire alarm system for school building but to apply the same system to Vietnam school building does not meet the local situation because of the maintenance condition. Therefore, for this project, manual operate alram system will be adapted and fire cabinet will be located at the center part of the building floor so as to cover the whole building in case of fire. External fire hydrant will be also provided for the same purpose wherever necessary.

6-16 EXTERNAL WORK PLANNING

The critical condition of this site is the drainage of the surface water in the rainy season. The standard method of drainage is to set the concrete pipe into underground and use the gravity to discharge the water to the river. But the ground level of site

is not high enough to give the necessary slope to the pipe line, in addition, the unstable condition of soil which might affect to the pipeline, so that open ditch was planned to be provided around the project site. At the junction between the open ditch and the river, gate will be provided and controle the water level of the open ditch. The soil excavated from this ditch at the construction, will be used for the backfill to the lower part of site so as to elevate the ground level.

6-17 SCOPE OF CONSTRUCTION

To complete the necessary physical facilities for the Faculty of Agriculture, the following works will be involved.

i) Cai-Khe campus work

Since the proposed Faculty of Agriculture locate at the north end of the campus and the farthest from main road, the road for both pedestrian and service traffic, water supply main, power supply cable, and telephone cable have to be constructed for the proposed project. These works will be planned not only for the proposed project but also for the future Faculties' facilities and will be completed by Can-Tho University in accordance with master-plan.

ii) Fundamental work

In the Faculty of Agriculture site, site reclamation, water supply main, septic tank, sewage treatment tank, electrical power supply main, telephone main, service road and walk way, openditch, these works have to be constructed in the first stage of construction. These works shall not be constructed in different stage since without these works, the faculties facilities will not function.

iii) Building work

This work includes Architectural, Air-Conditioning & Ventilation, Plumbing, and Electrical works.

iv) External work

Road paving, walk way paving, fense, planting and other landscaping works are included.

v) Covered way work

Because of unstable surface soil condition and grade of local labour skill, the covered way is planned to be used as main rout of services such as water supply, electrical power supply and telephone instead of setting those service pipes and cables into underground. This system will provide the easy way of maintenance in future. Also this covered way will help the people to walk to the different building in the rainy season and good sun shade in dry season.

vi) Equipment work

Only fixed equipment, laboratory testing counter and draft chamber are included in this work. Other fixed equipment on building such as black boad, sign boad, projectors and fixed seat at Auditorium and large class rooms, book stacks for library and lockers for shower room are included.

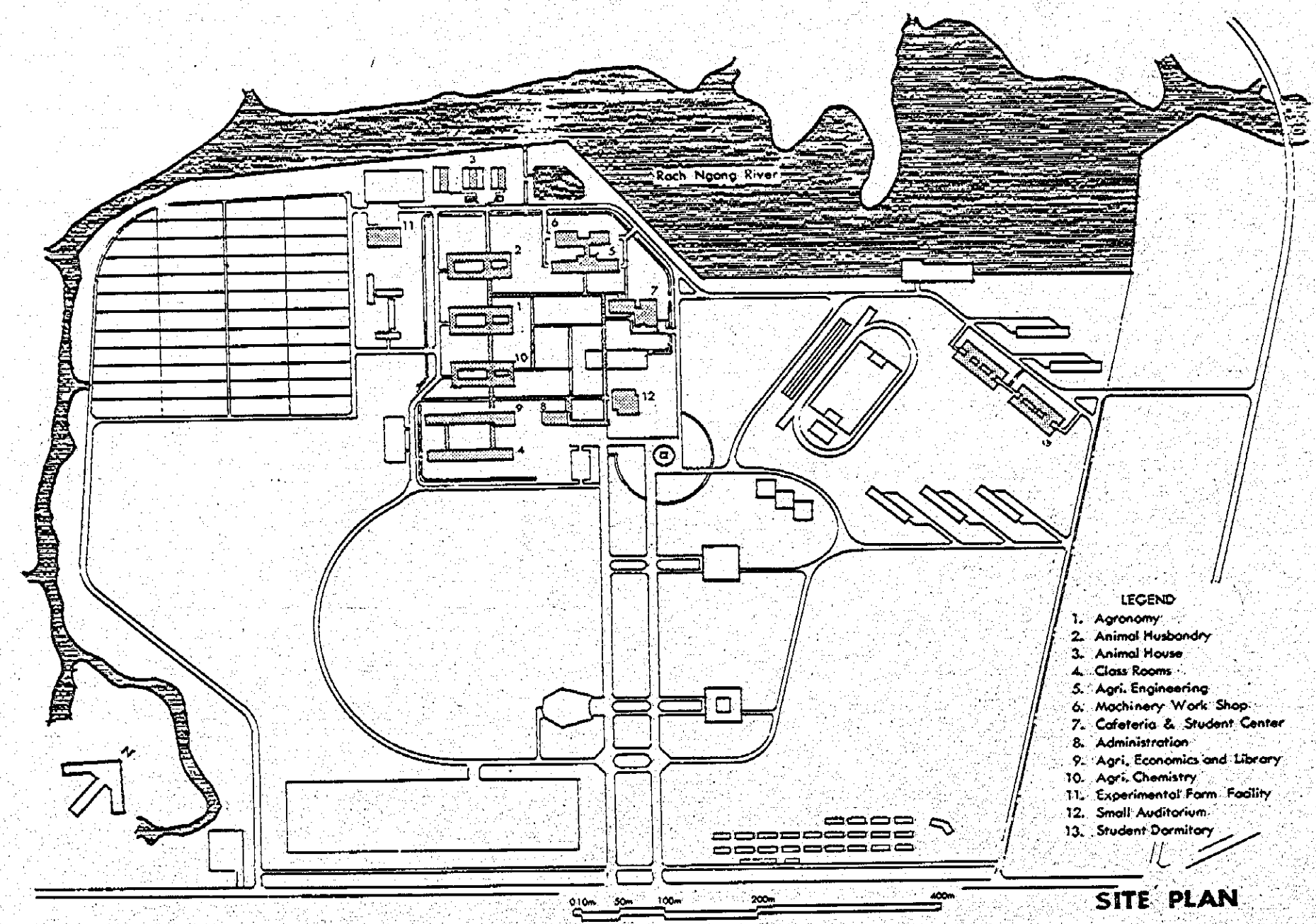
ENTRANCE TO FACULTY

7. SCHEMATIC DESIGN

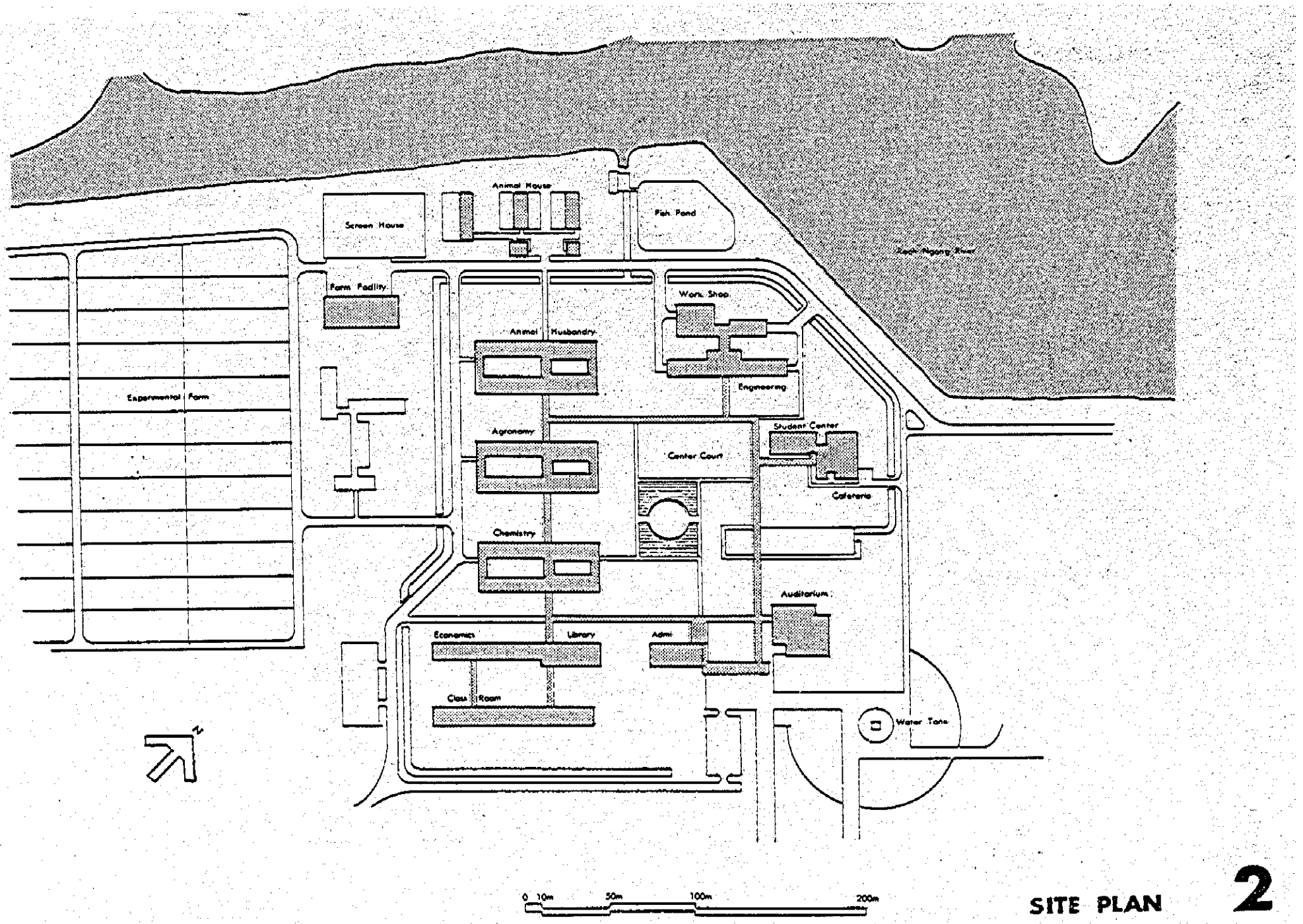
In accordance with the study described in the previous section and meeting with the Can-Tho University staffs, the schematic design of the Faculty Agriculture has been prepared. This proposed plans include necessary facilities for the Faculty of Agriculture, however, more detail has to be cleared in the advance stage of this project. Therefore, additional survey is recommended to prepare the document for the construction.

LIST OF DRAWING

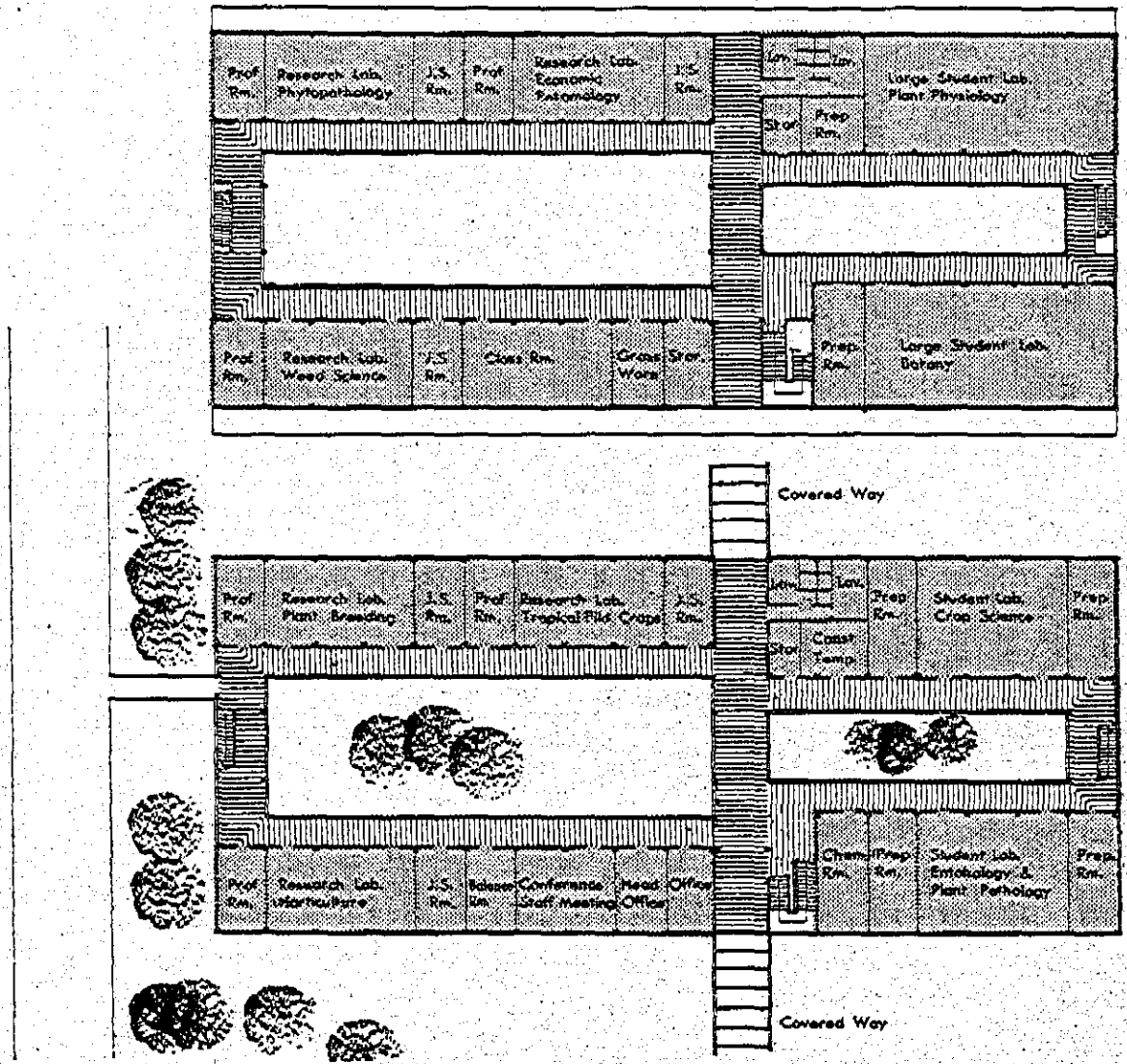
DRW No	BUILDING NAME	DRAWING TITLE
1	CAI-KE CUMPUS	SITE PLAN
2	FACULTY OF AGRICULTURE	PLOT PLAN
3	AGRONOMY	PLAN 1F& 2F
4	ANIMAL HUSBANDRY	PLAN 1F & 2F
5	AGRI. CHEMISTRY	PLAN 1F & 2F
6	"	ELEVATION
7	"	SECTION
8	ANIMAL HOUSE	PLAN ELEVATION
9	AGRI. ECONOMICS & LIBRARY CLASS ROOM	PLAN 1F
10	"	PLAN 2F
11	"	ELEVATION
12	"	SECTION
13	AGRI. ENGINEERING AND MACHINARY WORK SHOP	PLAN 1F
14	"	PLAN 2F
15	"	ELEVATION
16	"	SECTION
17	CAFETERIA AND STUDENT CENTER	PLAN 1F & 2F
18	"	ELEVATION SECTION
19	ADMINISTRATION AND SMALL AUDITORIUM	PLAN 1F
20	"	PLAN 2F
21	"	ELEVATION
22	"	SECTION
23	EXPERIMENTAL FARM FACILITY	PLAN ELEVATION SECTION
24	STUDENT DORMITORY	PLAN 1F 2F & 3F
25	"	ELEVATION SECTION
26	FLOOR AREA TABULATION	


Rach Ngong River
LEGEND
1. Agronomy
2. Animal Husbandry
3. Animal House
4. Class Rooms
5. Agri. Engineering
6. Machinery Work Shop
7. Cafeteria & Student Center
8. Administration
9. Agri. Economics and Library
10. Agri. Chemistry
11. Experimental Farm Facility
12. Small Auditorium
13. Student Dormitory
N
0 10m 50m 100m 200m 400m

SITE PLAN 1


Animal House
Screen House
Fish Pond
Farm Facility
Work Shop
Animal Husbandry
Experimental Farm
Engineering
Student Center
Agronomy
Center Court
Cafeteria
Chemistry
Auditorium
Economics
Library
Admi
Class Room
Water Tank
0 10m 50m 100m 200m

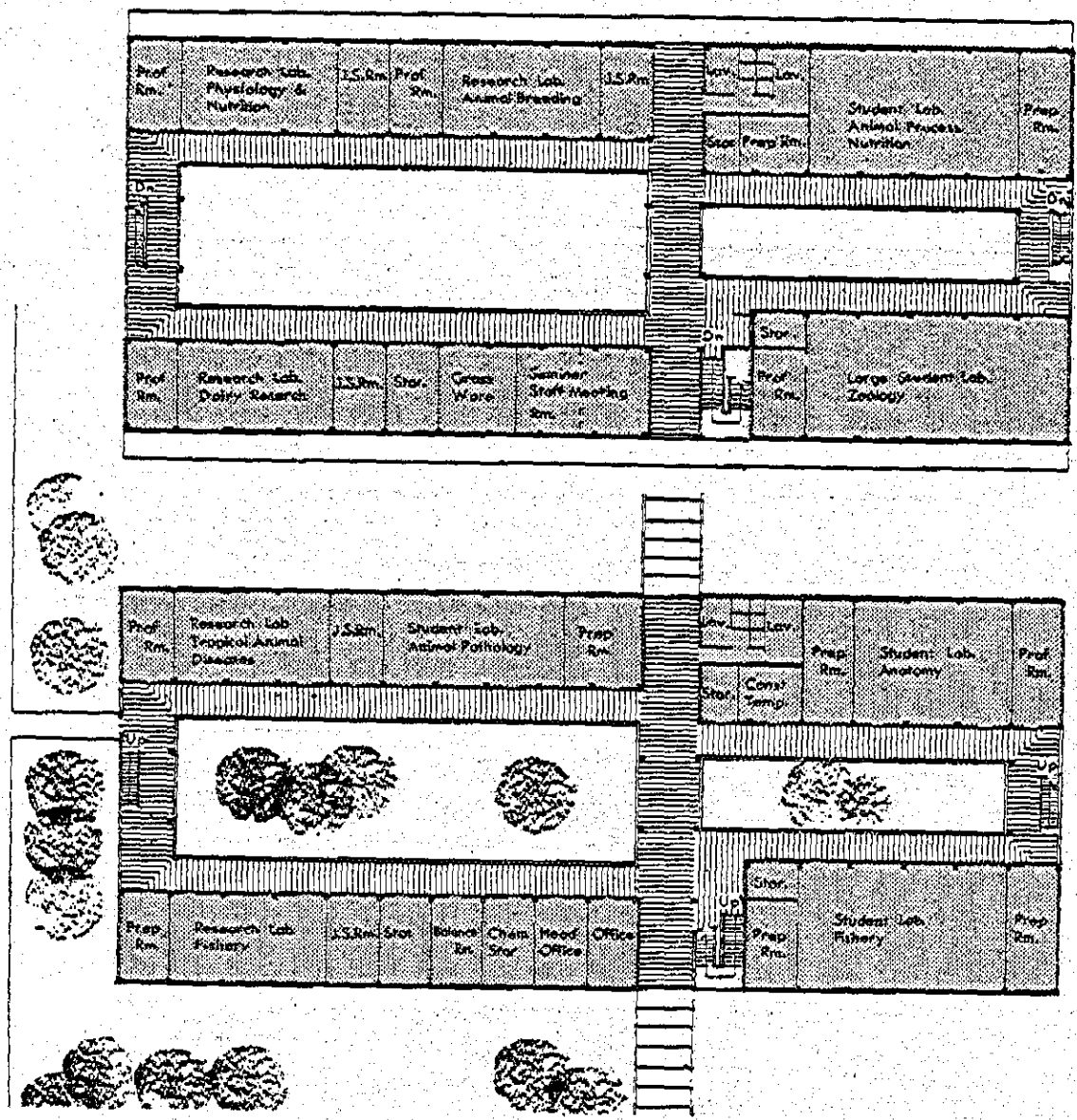
SITE PLAN **2**



2ND FLOOR PLAN

1ST FLOOR PLAN

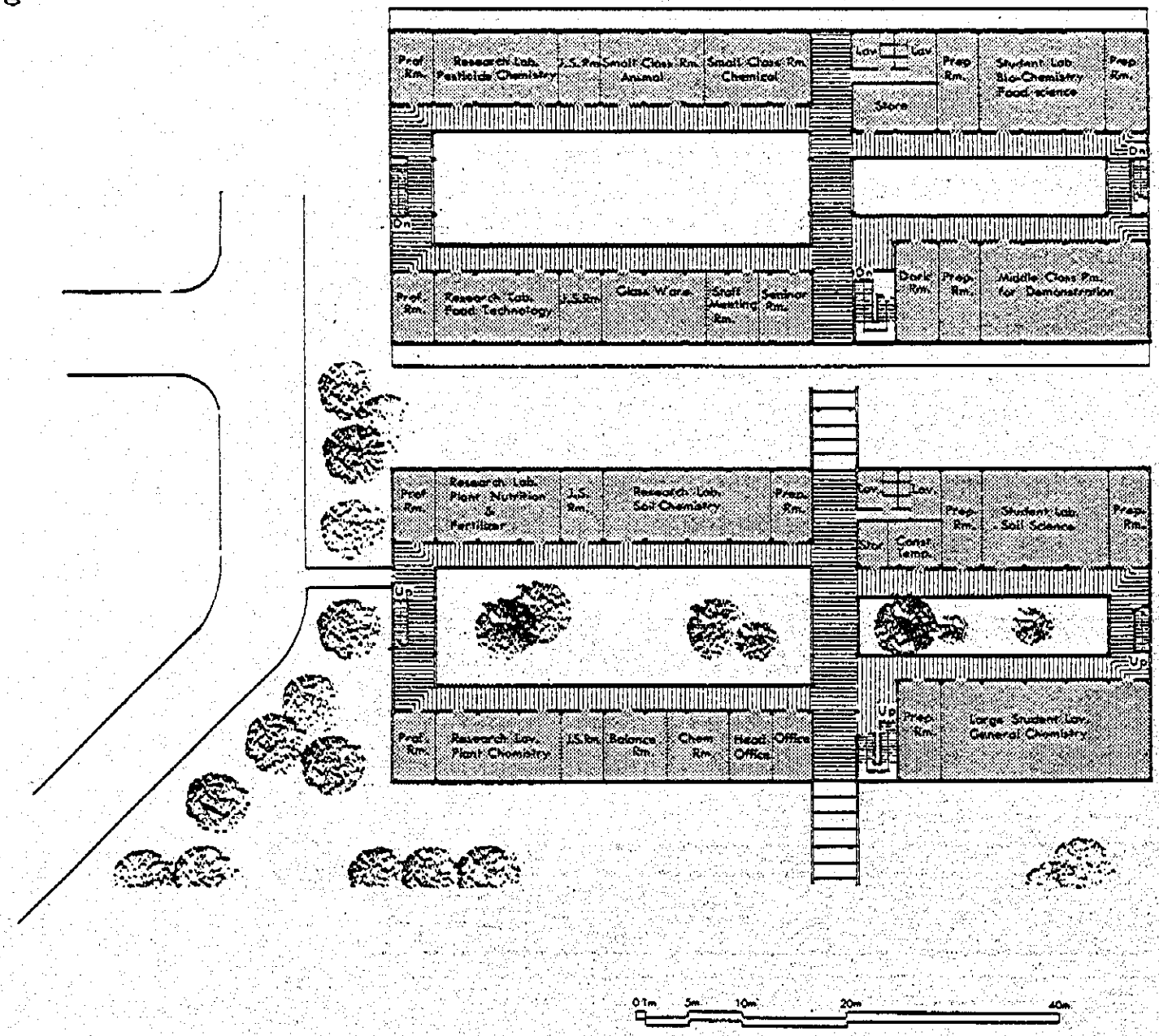
AGRONOMY 3



2ND FLOOR PLAN

1ST FLOOR PLAN

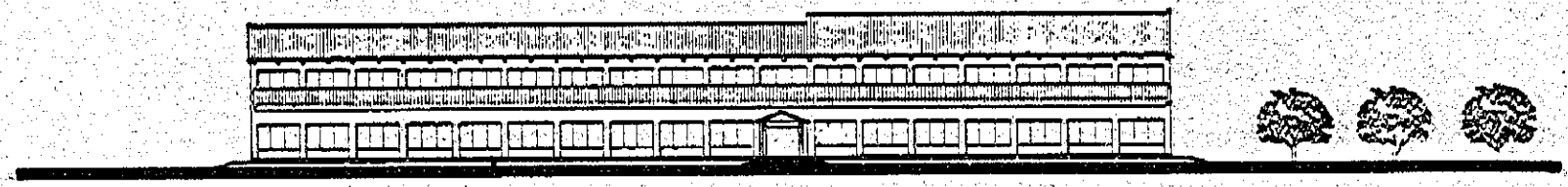
ANIMAL HUSBANDRY 4



2ND FLOOR PLAN

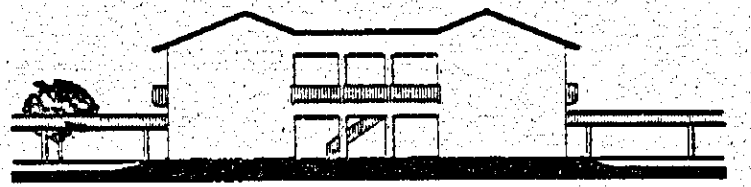
1ST FLOOR PLAN

AGRL. CHEMISTRY **5**

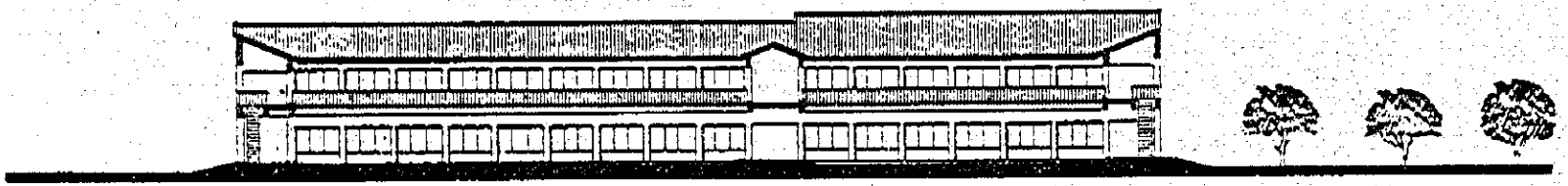


SOUTH ELEVATION

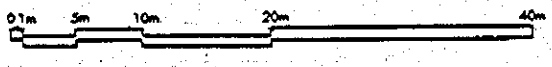
WEST ELEVATION



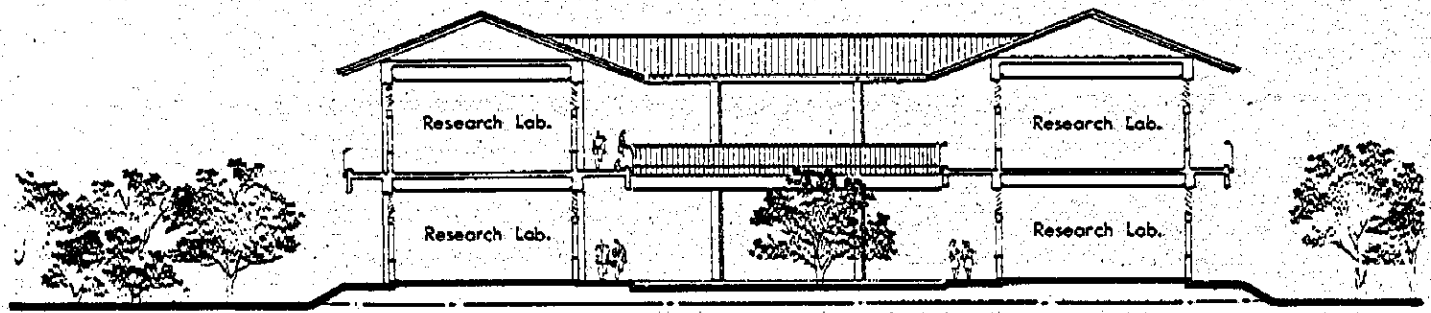
EAST ELEVATION



SOUTH ELEVATION FROM PATIO

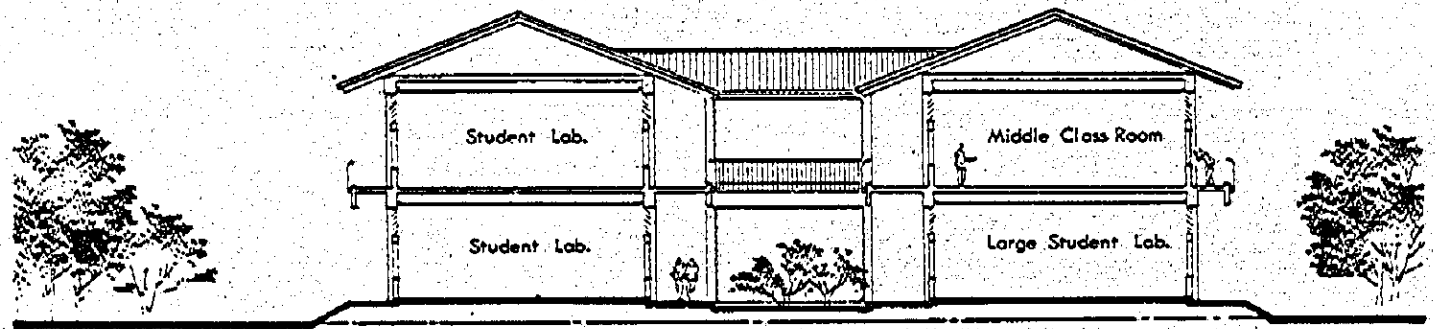


LABORATORY BUILD **6**



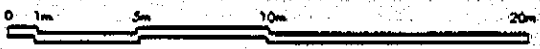
SECTION 1

RESERCH LABORATORIES

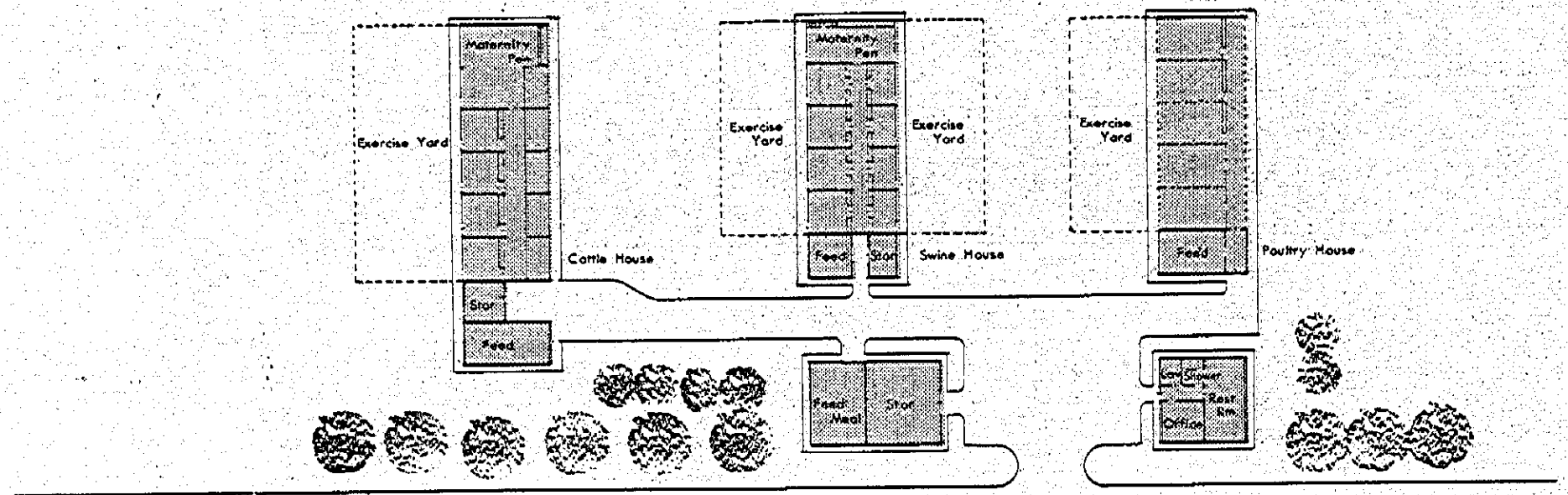


SECTION 2

STUDENT LABORATORIES

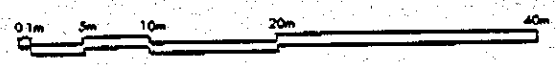


LABORATORY BUILD. TYPICAL SECTION **7**

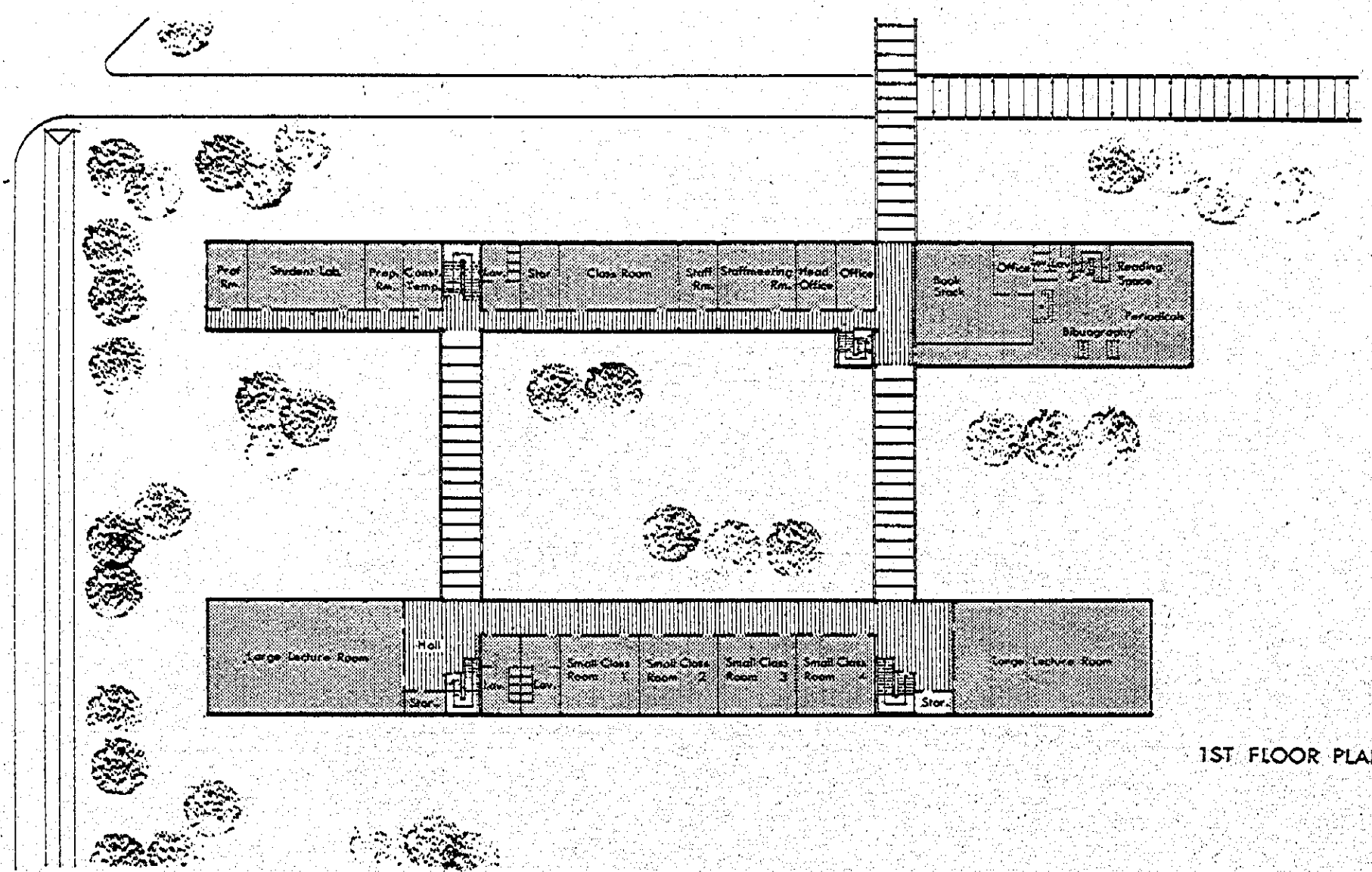


1ST FLOOR PLAN

SOUTH ELEVATION



ANIMAL HOUSES 8

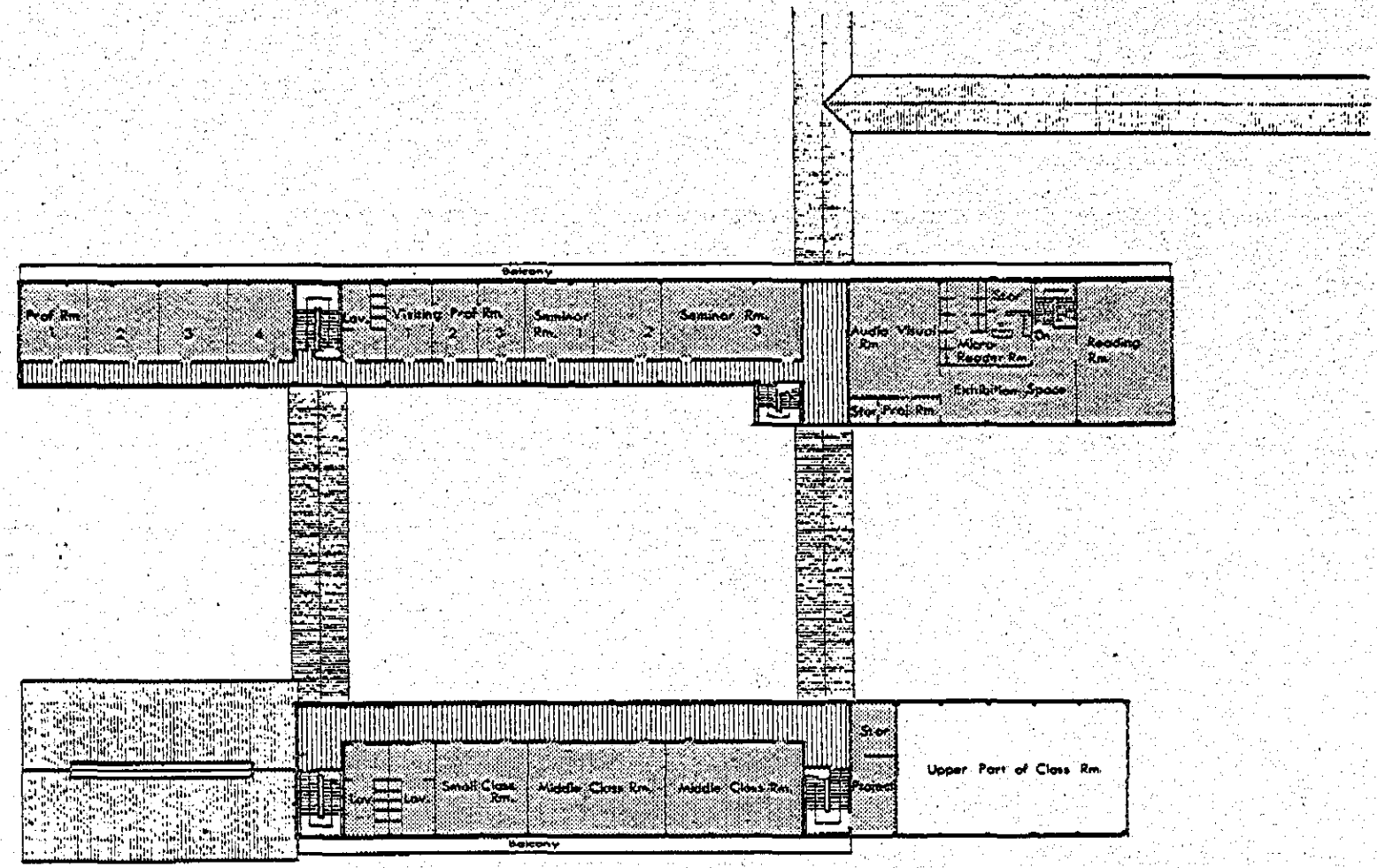


1ST FLOOR PLAN

0 1m 5m 10m 20m 40m

CLASS ROOMS AGRI. ECONOMICS AND LIBRARY

9

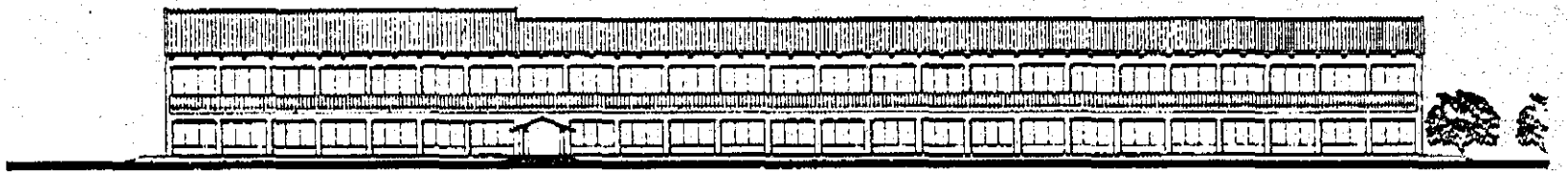


2ND FLOOR PLAN

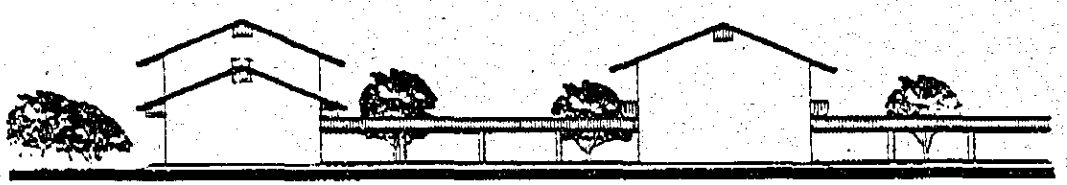
0·1m 5m 10m 20m 40m

CLASS ROOMS AGRI. ECONOMICS AND LIBRARY

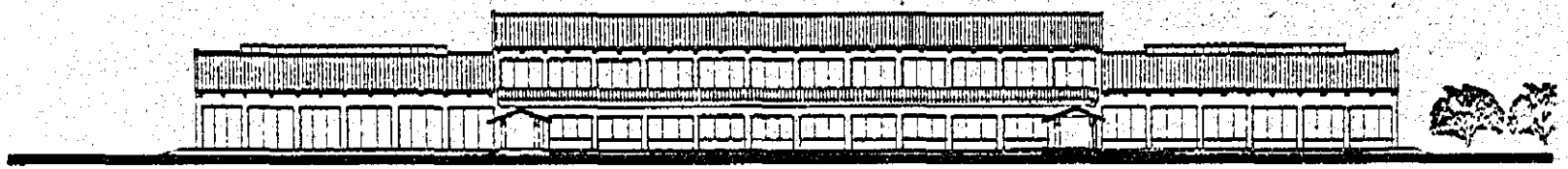
10



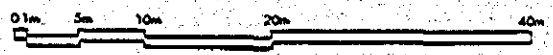
NORTH ELEVATION



EAST ELEVATION

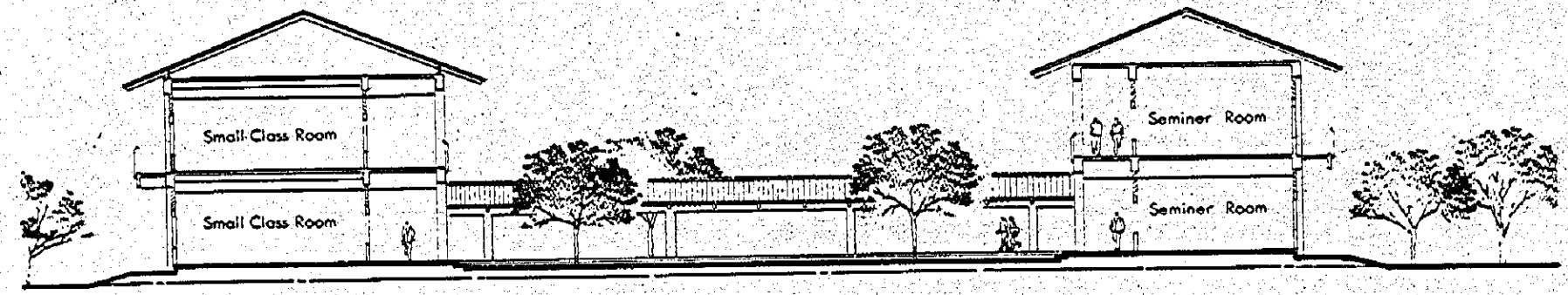


NORTH ELEVATION FROM PATIO



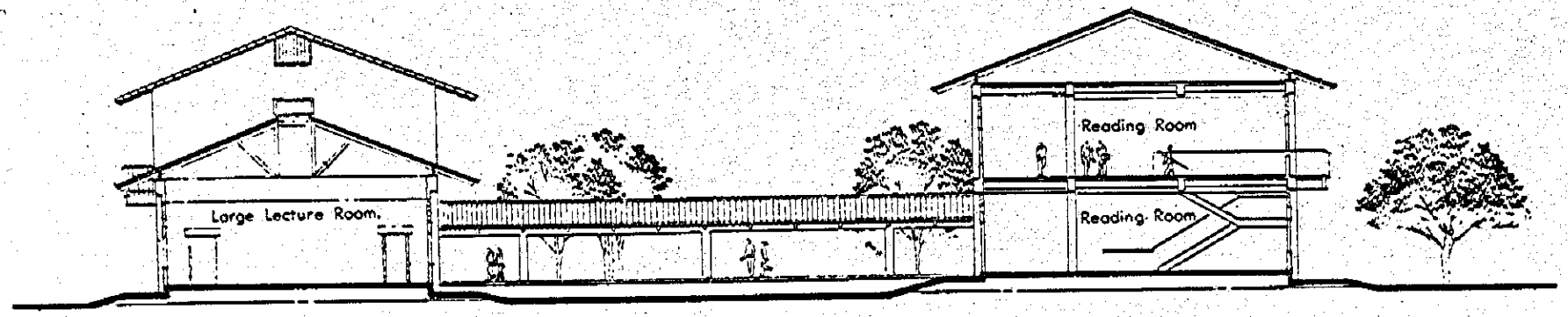
CLASS ROOMS AGRI. ECONOMICS & LIBRARY

11



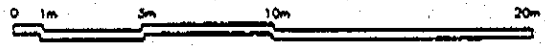
SECTION 1

CLASS ROOMS & ECONOMICS



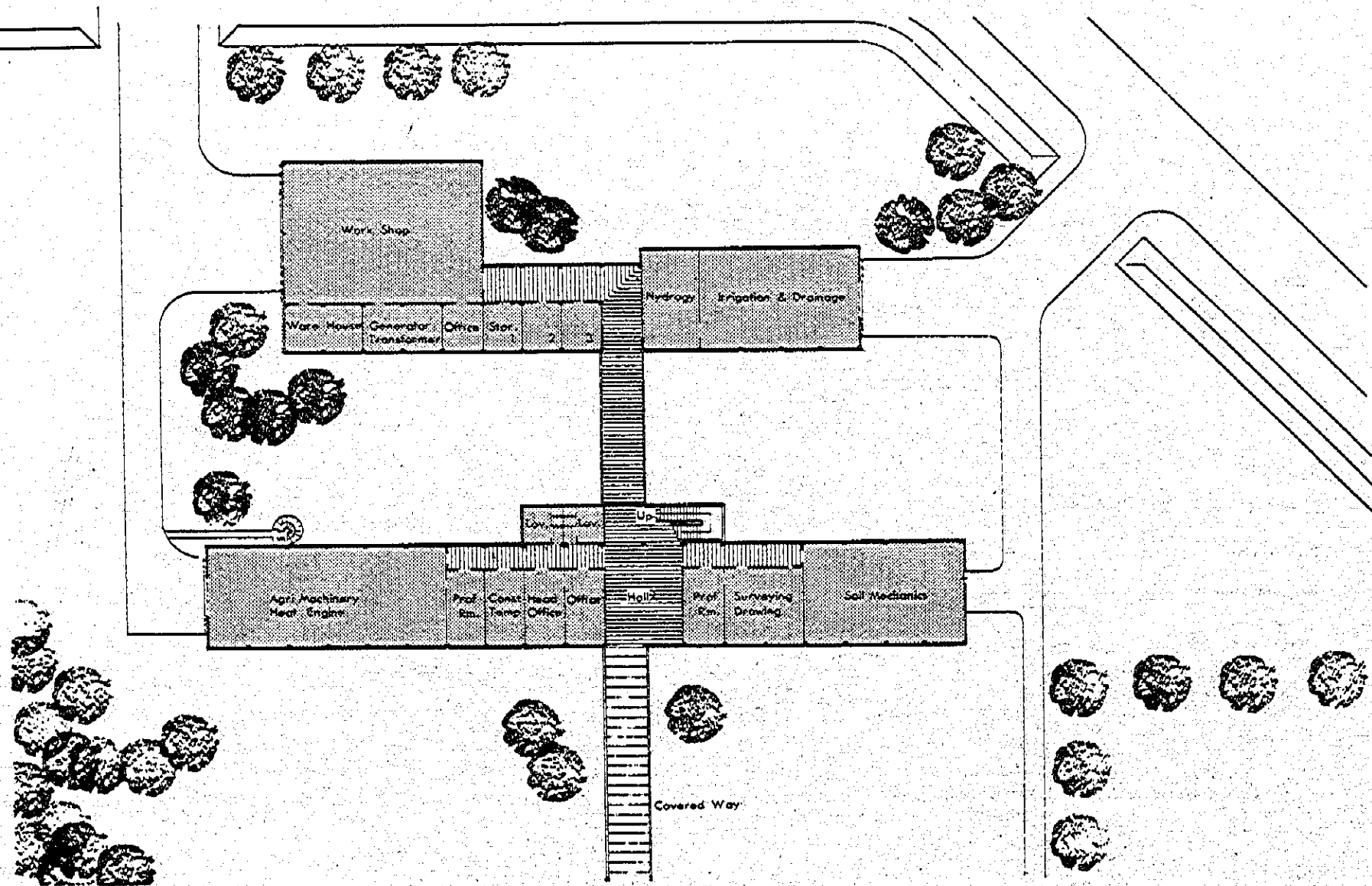
SECTION 2

LECTURE ROOMS & LIBRARY

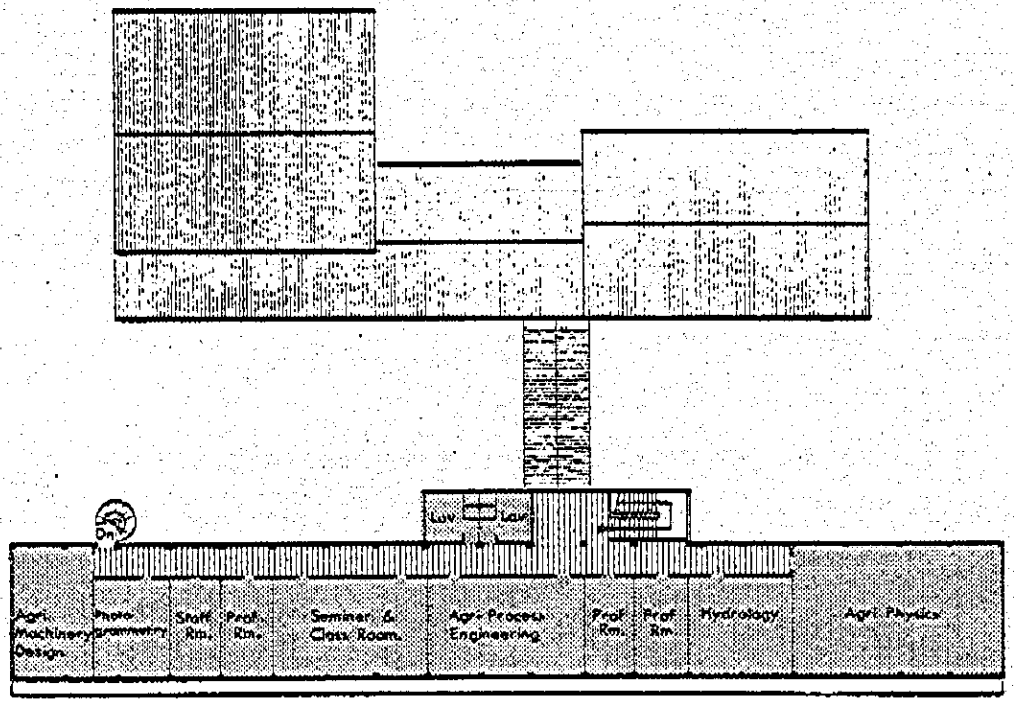


CLASS ROOMS AGRI. ECONOMICS & LIBRARY

12



AGRI. ENGINEERING & WORK SHOP 13

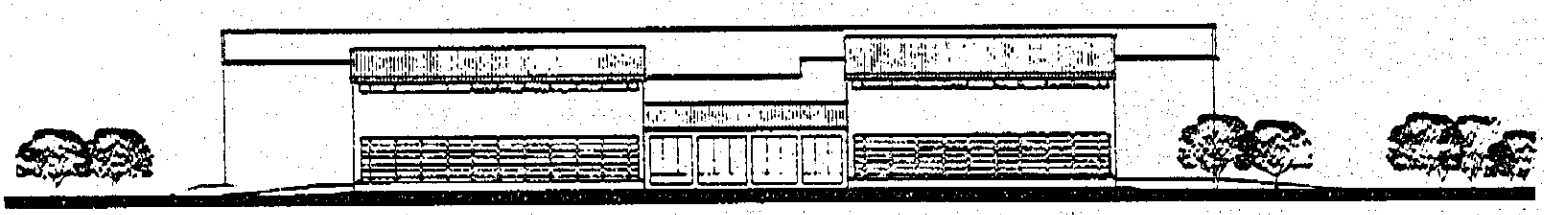


2ND FLOOR PLAN

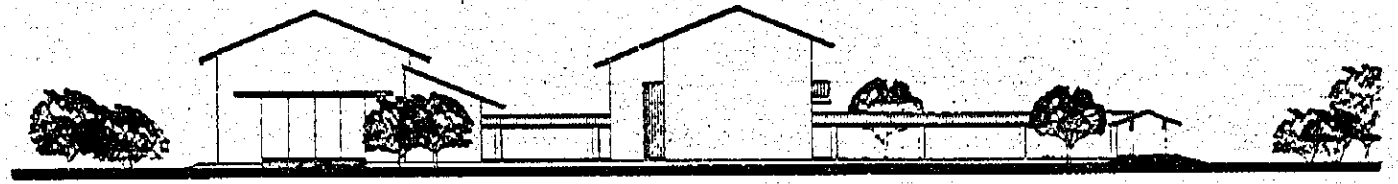
0·1m 5m 10m 20m 40m

AGRI. ENGINEERING & MACHINERY WORK SHOP

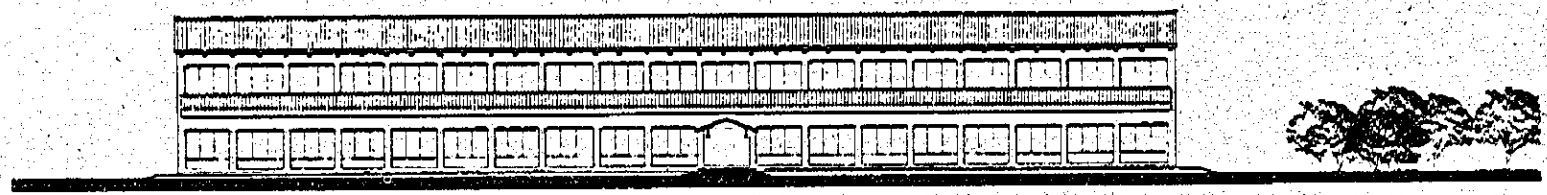
14



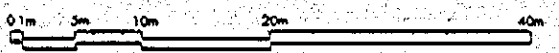
NORTH ELEVATION



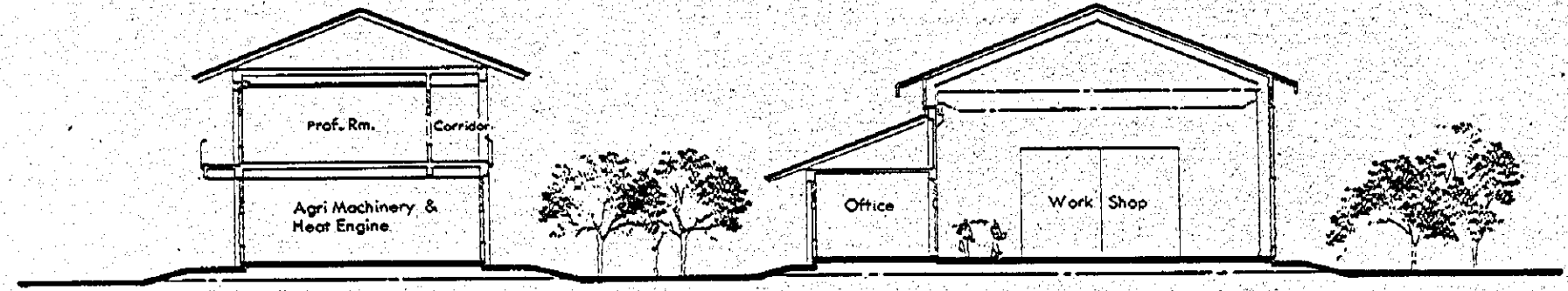
WEST ELEVATION



SOUTH ELEVATION

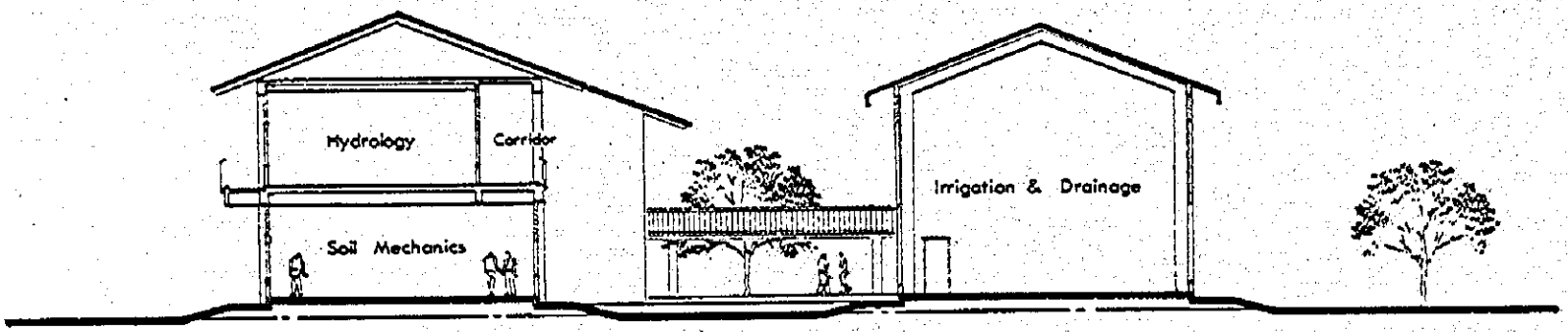


AGRI. ENGINEERING & WORK SHOP 15



SECTION 1

AGRI. MACHINERY & WORK SHOP

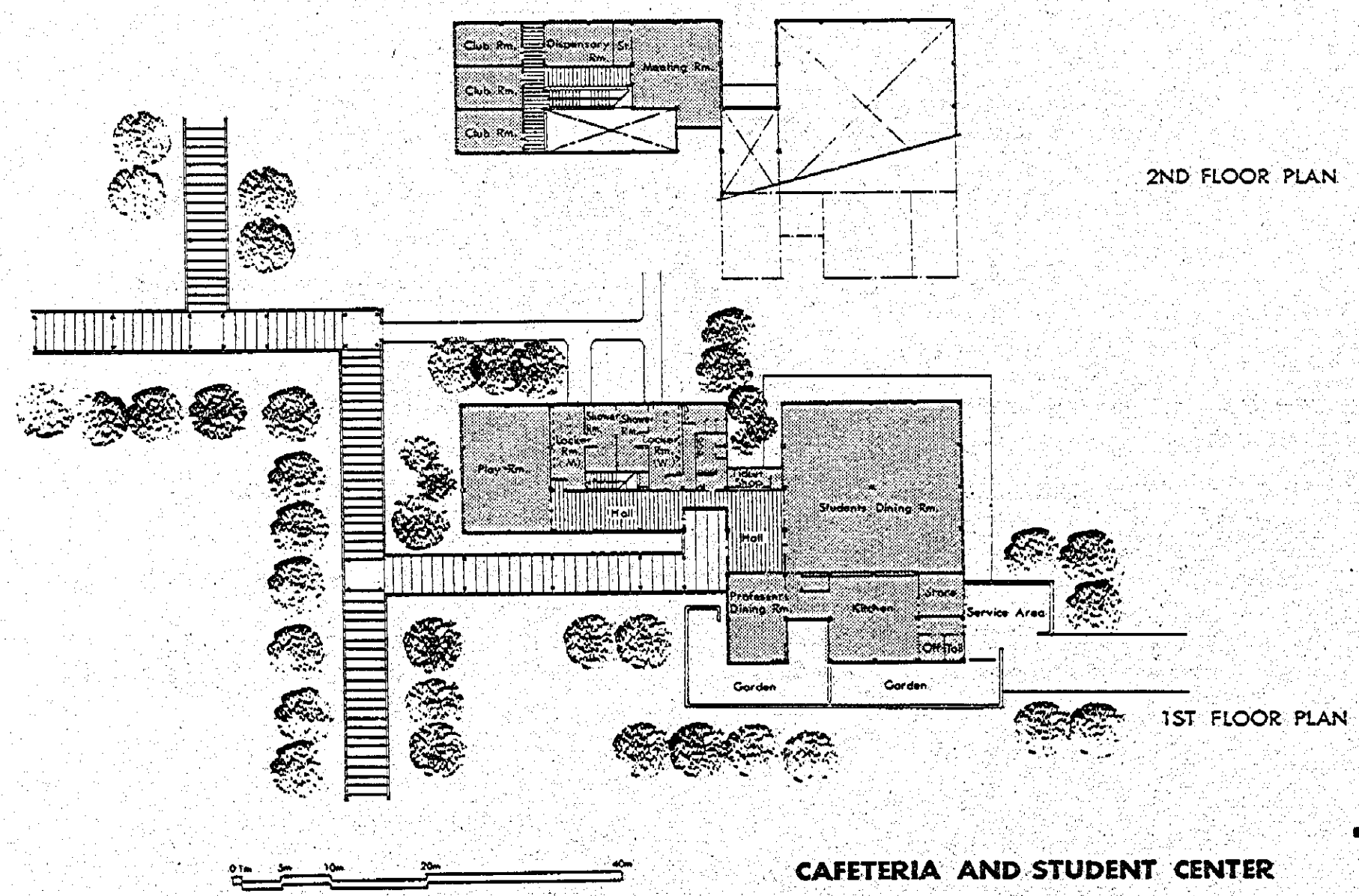


SECTION 2

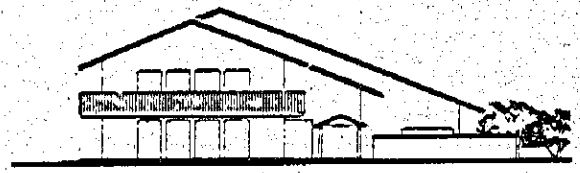
SOIL MECHANICS. IRRIGATION & DRAINAGE

0 1m 5m 10m 20m

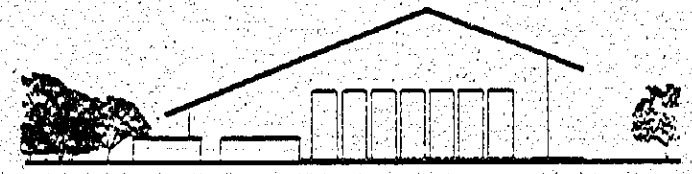
AGRI. ENGINEERING & WORK SHOP 16



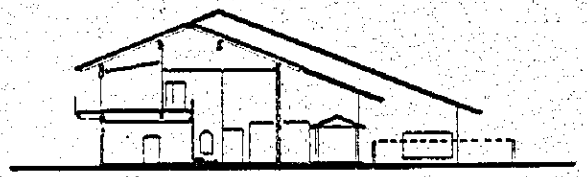
CAFETERIA AND STUDENT CENTER 17



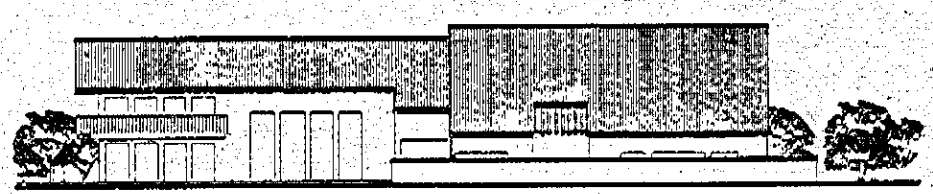
WEST ELEVATION



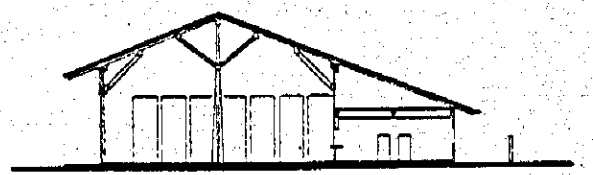
EAST ELEVATION



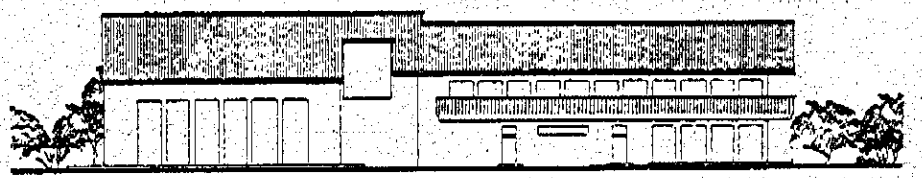
SECTION



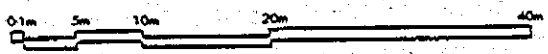
SOUTH ELEVATION



SECTION

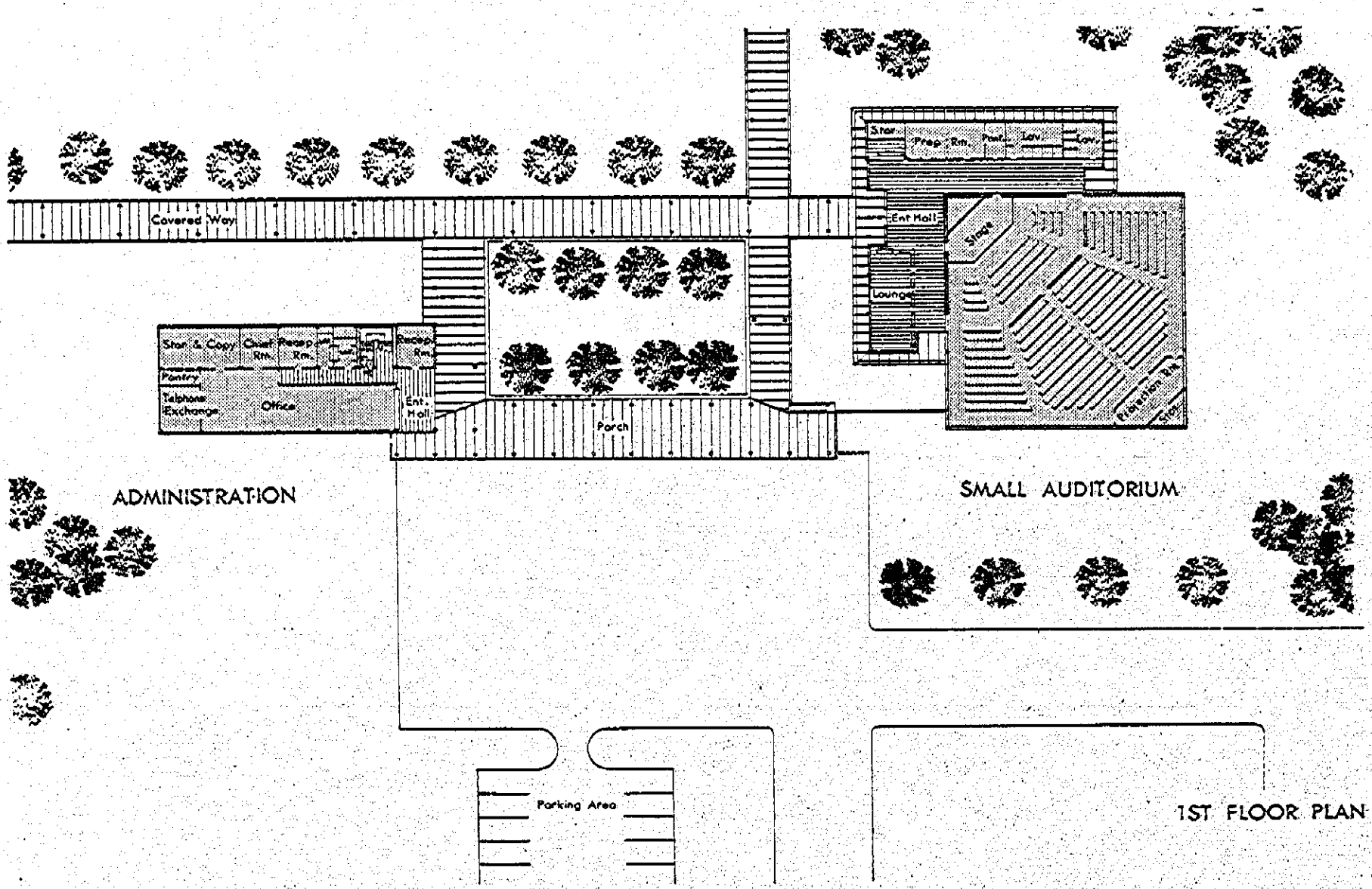


NORTH ELEVATION



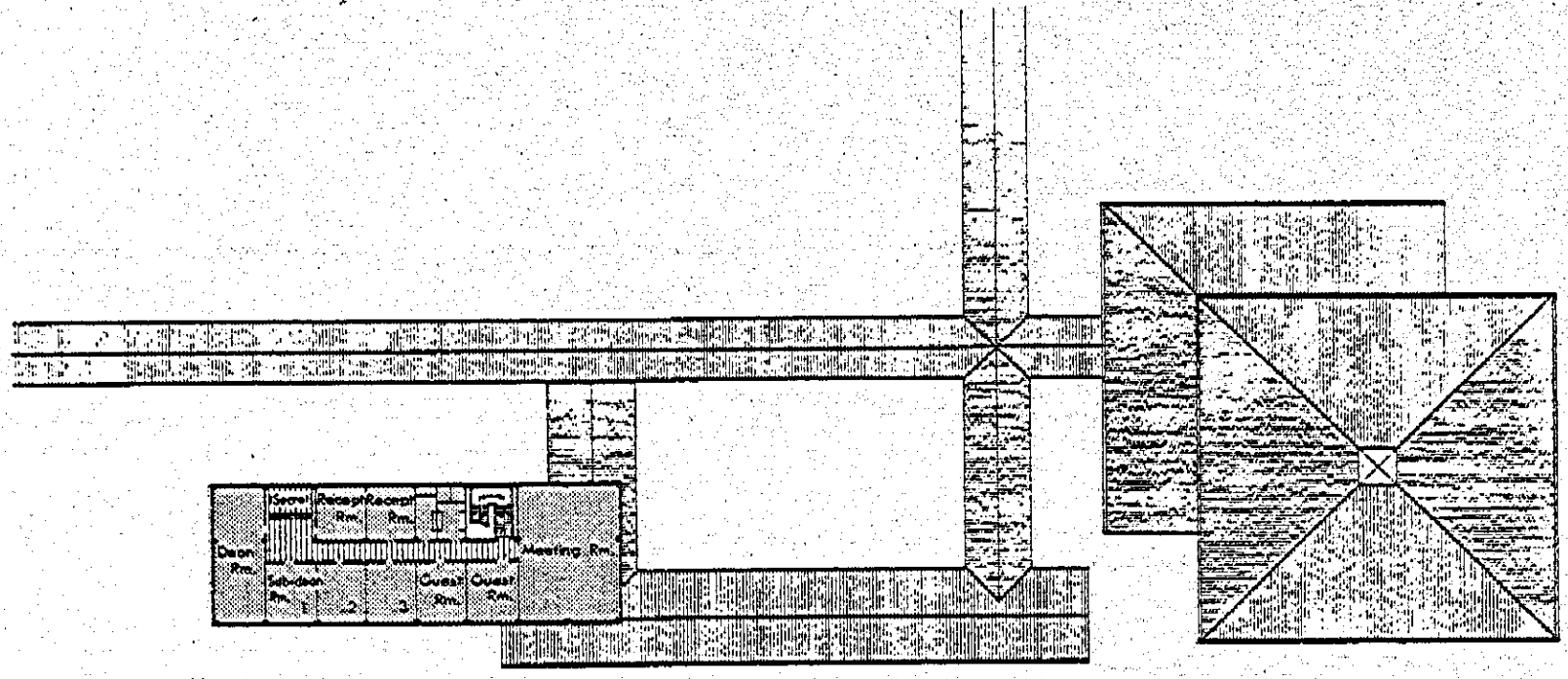
CAFETERIA AND STUDENT CENTER

18



ADMINISTRATION & SMALL AUDITORIUM

19



ADMINISTRATION

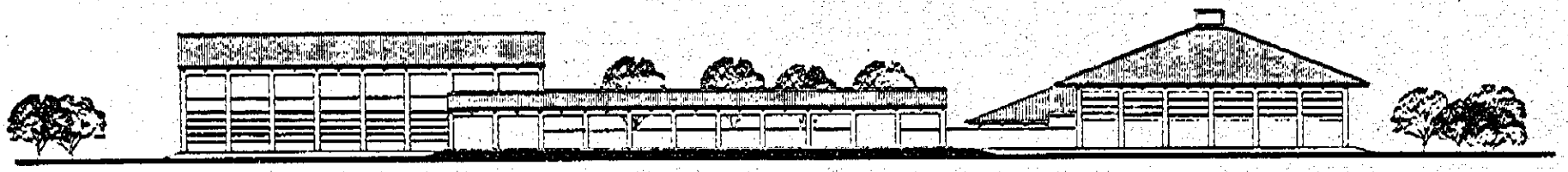
SMALL AUDITORIUM

2ND FLOOR PLAN

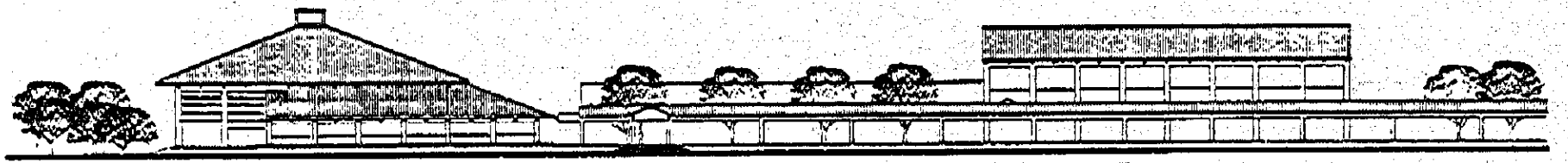
0 1m 5m 10m 20m 40m

ADMINISTRATION & SMALL AUDITORIUM

20

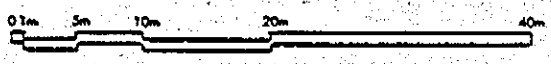


SOUTH ELEVATION



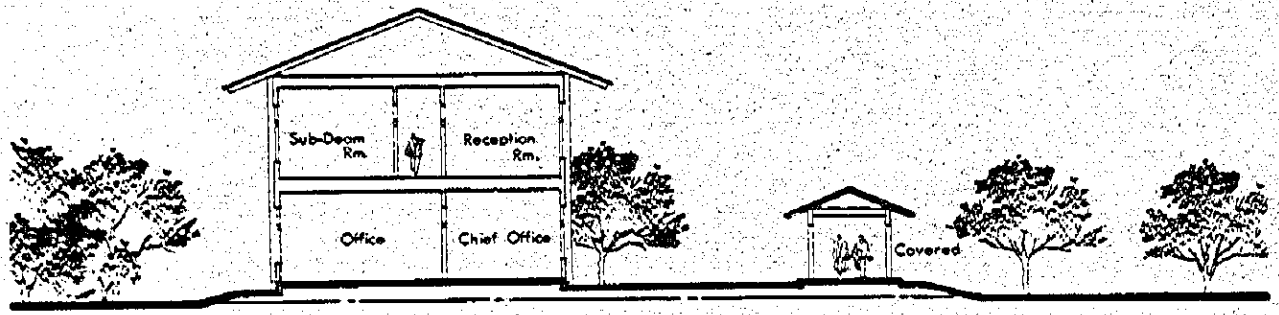
NORTH ELEVATION

EAST ELEVATION

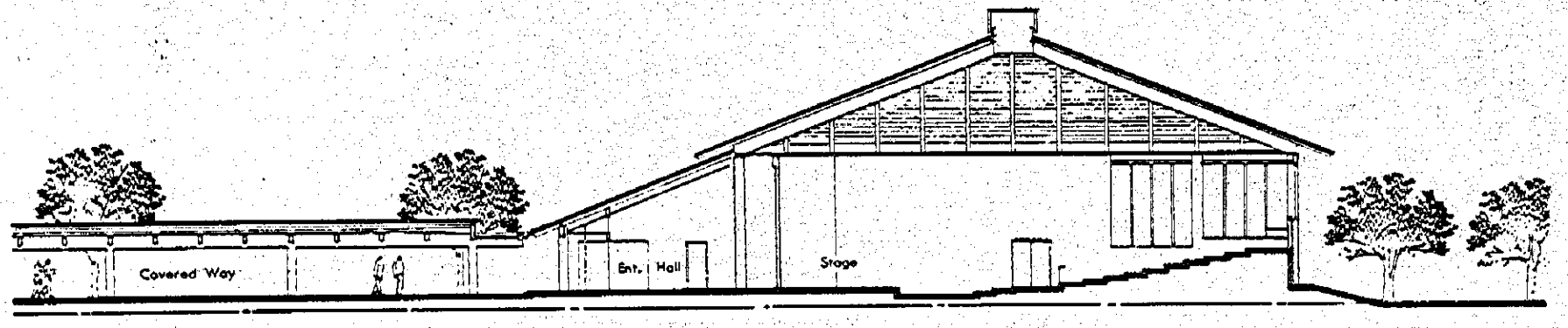


ADMINISTRATION & SMALL AUDITORIUM

21



ADMINISTRATION SECTION

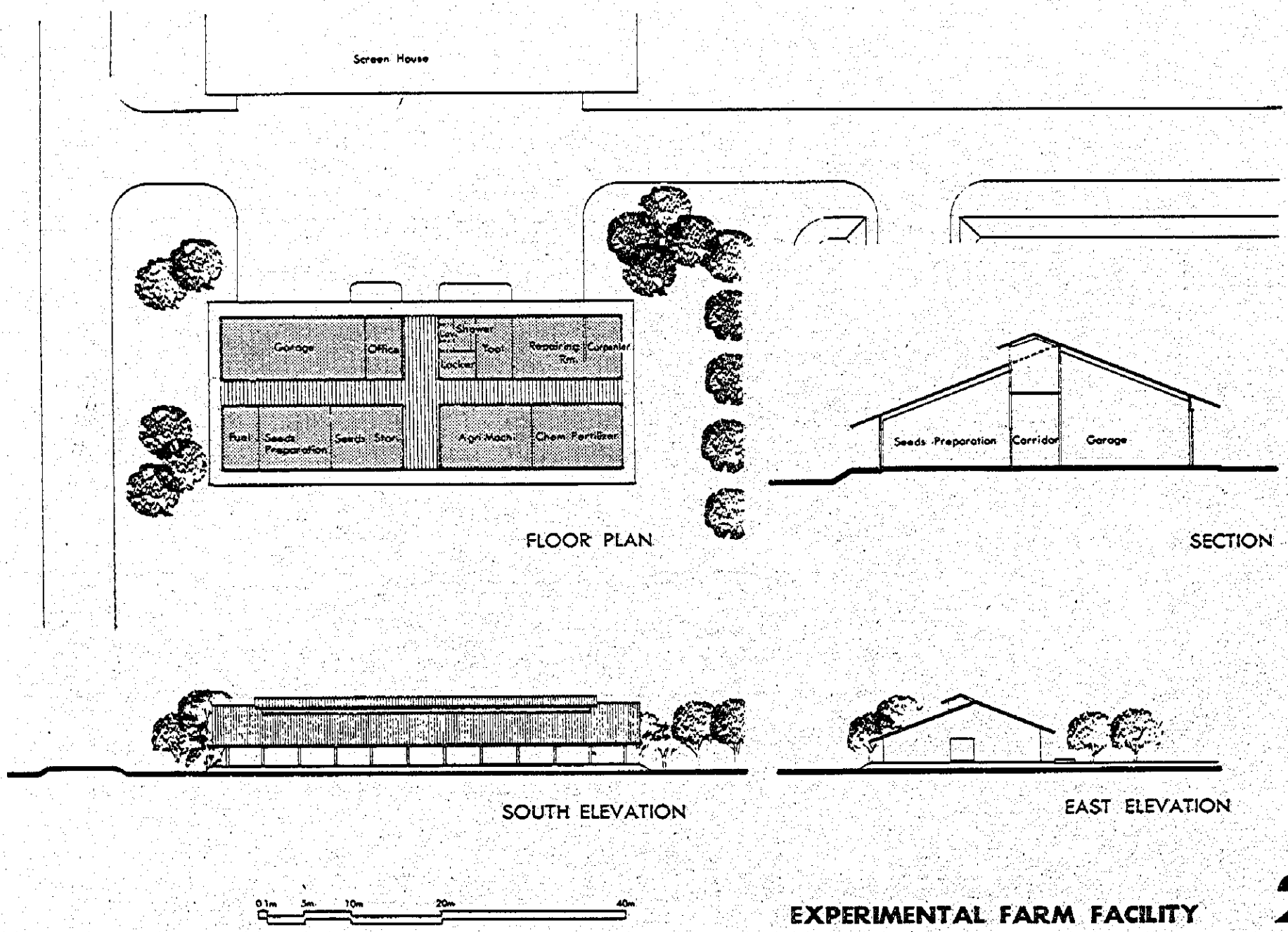


SMALL AUDITORIUM SECTION

0 1m 5m 10m 20m

ADMINISTRATION & SMALL AUDITORIUM

22



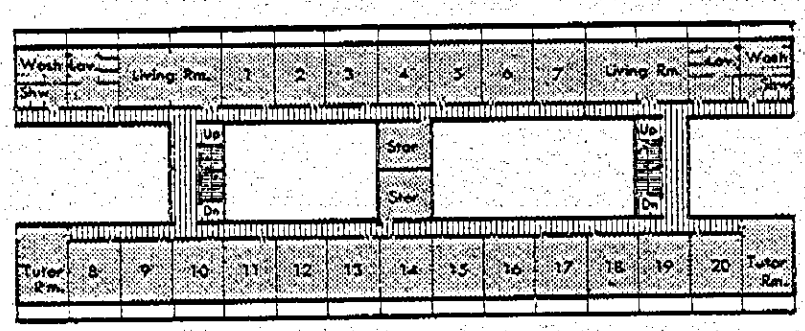
FLOOR PLAN

SECTION

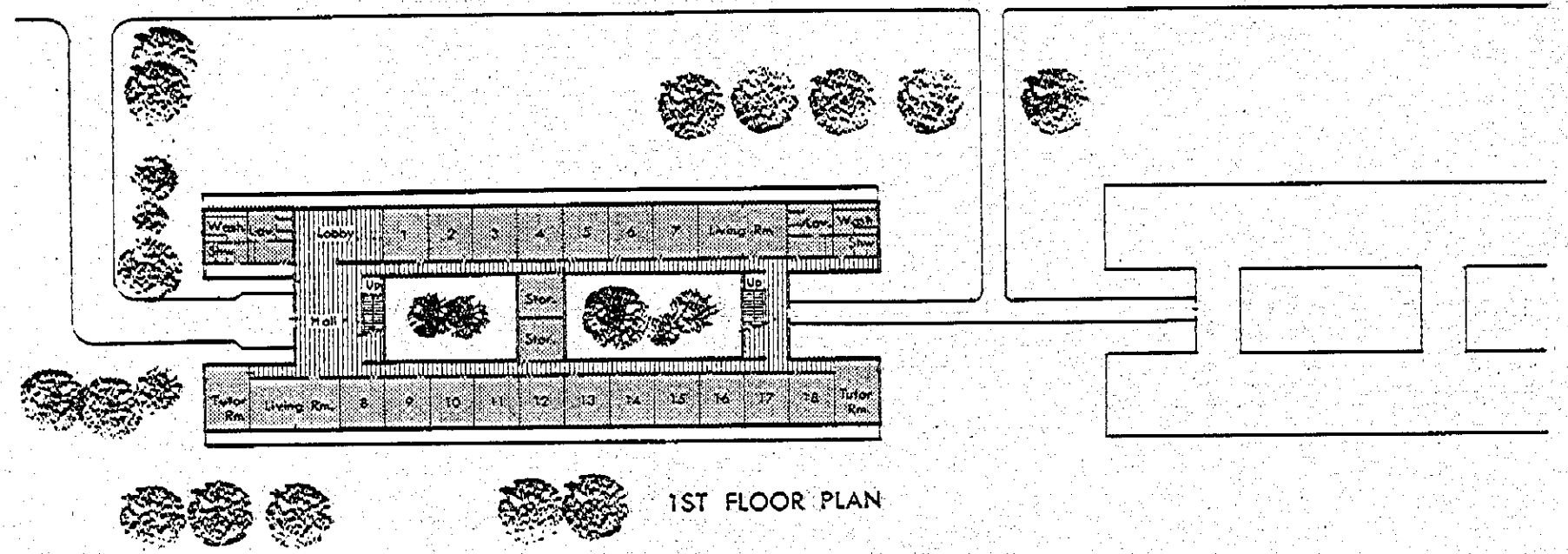
SOUTH ELEVATION

EAST ELEVATION

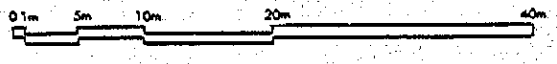
EXPERIMENTAL FARM FACILITY 23



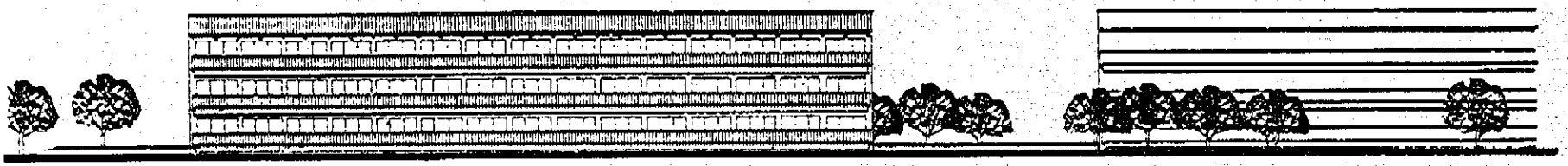
2ND & 3RD FLOOR PLAN



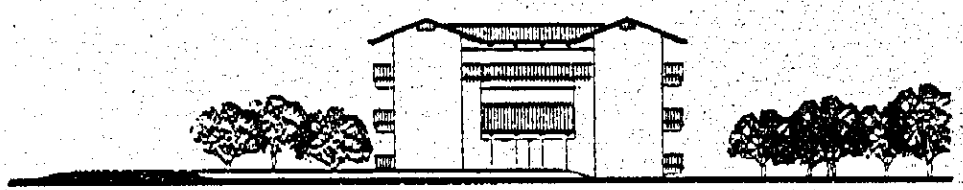
1ST FLOOR PLAN



STUDENT DORMITORY **24**

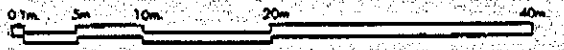


SOUTH ELEVATION



WEST ELEVATION

SECTION



STUDENT DORMITORY 25

FLOOR AREA TABULATION

FLOOR / BUILDING	1F AREA M²	2F AREA M²	3F AREA M²	TOTAL M²
1. AGRONOMY	1,361	1,361		2,722
2. ANIMAL HUSBANDRY	1,361	1,361		2,722
3. ANIMAL HOUSE	784			784
4. CLASS ROOM	1,152	624		1,776
5. AGRIC. ENGINEERING	1,176	809		1,985
6. MACHINERY WORKSHOP	400			400
7. CAFETERIA AND STUDENT CENTER	947	298		1,240
8. ADMINISTRATION	352	352		704
9. AGRIC. ECONOMICS LIBRARY	1,095	1,095		2,190
10. ARGIC CHEMISTRY	1,361	1,361		2,722
11. EXPERIMENTAL FARM FACILITY	752			752
12. SMALL AUDITORIUM	885			885
13. STUDENT DORMITORY	872	840	840	2,552
14. STUDENT DORMITORY	872	840	840	2,552
SUB TOTAL	13,370	8,936	1,680	23,986
OPEN CORRIDOR	1,980			1,980
GRAND TOTAL	15,350	8,936	1,680	25,966

8. CONCLUSION

The time to prepare this report was very limited so that there might be few items to which the survey is not throughgoing enough. We are sure, these information will be completed in the advance stage and hope this report may help the prompt promotion of the construction of Faculty of Agriculture facilities.