Chapter 4 OUTLINE OF THE CONSTRUCTION SITES

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4.1 Samsen Compound

Samsen Compound of RID is situated west of the center of Bangkok and surrounded by residential and commercial areas. The site facing the Chao Phraya River includes Main Building for RID's Head Office and other related facilities within the Compound.

The Compound gets submerged once or twice for about two or three hours at the time of the spring tide between September and November. The flooding water usually comes up to as high as 30 cm above the road surface in the compound. The level of the ground floor of the existing main building is elevated approximately 1.8 meter from the roads. In designing the new facilities, due consideration must be paid to south-west winds associated with rain during the monsoon season.

For details of each facility in Samsen Compound and its level, please see Overall Site Plan.

Location: Samsen Road, Bangkok 10300

Area: Approximately 7 hectares

Soil Conditions: Borings were made at eight locations in the area of the present Main Building adjacent to the proposed site. For the profiles showing soil condition, please refer to Appendices. Seven of them were drilled to a depth of about 20 m from the existing ground level, and the other to about 30 m. Though there were slight variations, the outcome of the borings basically shows a uniform soil trend. The top soil down to one meter or so is composed of clay. A soft clay layer partly comprising shells and finesands underlies the top soil, extending from 2 m to 16 m in depth. Between 16 m and 21 m is a solid clay layer of considerable hardness. The soil at the depth of 21.5 m and below is a fine grain sand layer

with an N value of higher than 50. This layer, therefore, is regarded as one that can provide the foundation for the planned Samsen Center.

Water Supply: Water for use in the Compound is supplied by city water. The water main in the Compound is buried about 30 cm below the pavement in front of (i.e. south of) the existing Main Building and the site for the proposed building.

The existing water main pipe, 4 inches in diameter, has a capacity sufficient to meet the additional water requirements for the planned new building; therefore, a branch pipe shall be tapped from the water main (Fig. 4-1(a)).

Electric Power: Electric power is supplied by the Metropolitan Electrical Authority (M.E.A.) to outdoor transformers installed in the Samsen Compound by three phase, 50 Hz., 11 kV underground cables. Location of the transformer nearby the site and the existing cable lines are as shown in Fig. 4-1(b). Secondary cable from the transformer to the planned Samsen Center building shall be overhead. All power distribution lines within the Samsen Compound is under the supervision of RID.

Telephone: The existing switchboard is installed in the Radio Communication Building and exchange key-board services for the entire Samsen Compound are rendered by two telephone operators. The present extention lines are fully occupied and there is no extra lines. Expansion of the present switchboard is required for the planned new Samsen Center building and RID has applied expansion of the present switchboard capacity, 5 lines of direct call, to Telephone Organization of Thailand (T.O.T.). Although an underground cable containing 100 lines are installed from the main

switchboard at Radio Communication Building to the proposed site, a separate new service cable should be installed for the planned Center building.

The existing switchboard is as follows:

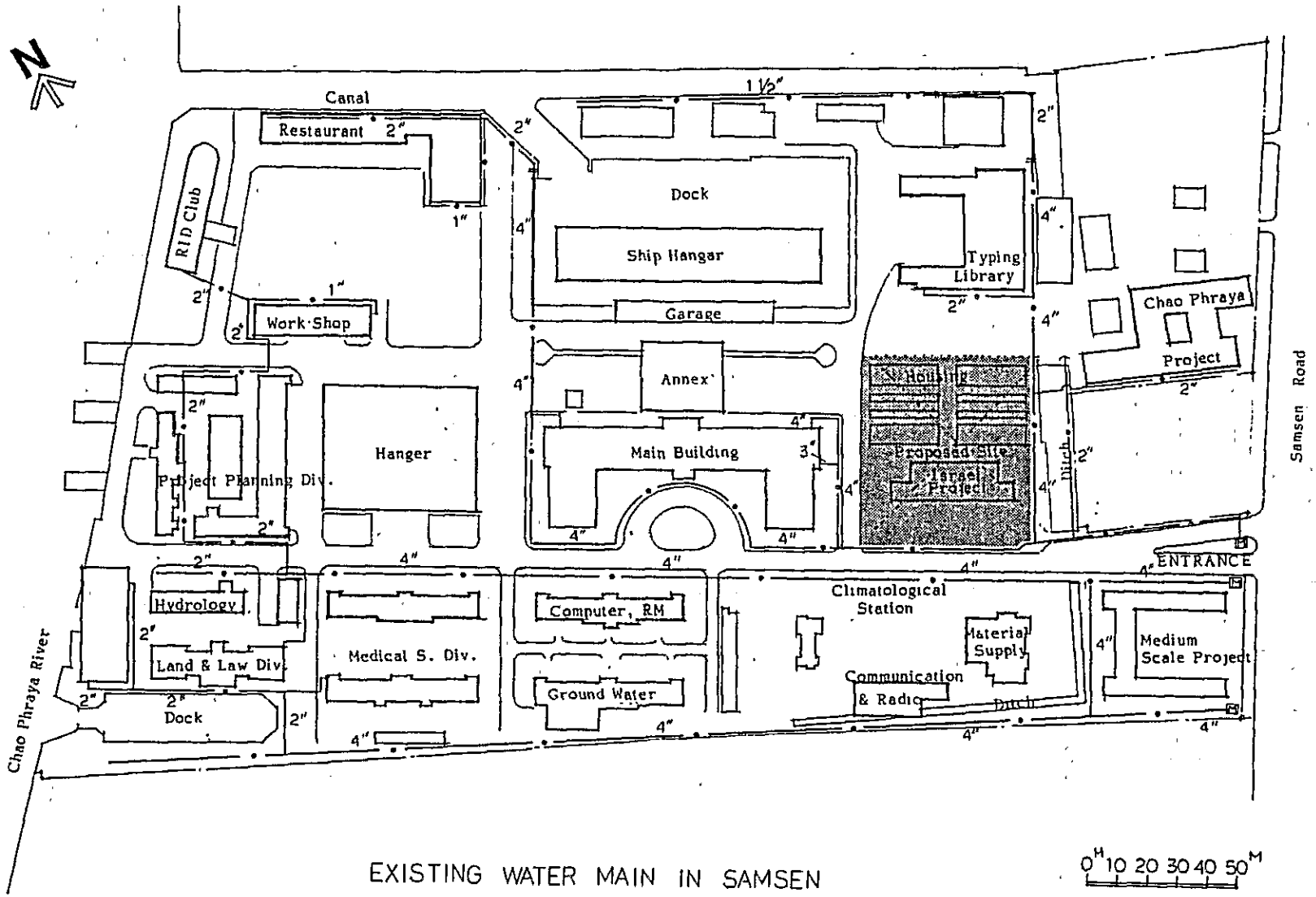
Manufacturer/Model	OKI/AC-250
Extension	300 lines

Proposed Site: The proposed site is located approximately at the center of Samsen Compound in adjacency to the east side of Main Building.

Residences for RID's personnel and an Israeli project office currently occupy the area expected for the site. The Japanese party has been informed that it was agreed among the concerned parties in a meeting held in March 1983 that the transfer of these facilities would take place in the coming October 1983 or earlier.

The main road of Samsen Compound runs along the southern end of the proposed site. This road is lined with a row of tall palm trees. A ditch runs along the east side of the site. Also on the east side of the site there is one of the three guy wires supporting an antenna tower located south of the site. Some measures will have to be taken about the facility, including a possible removal and transfer.

For details of the site, such as general layout, height, altitude and shape of the land, please refer to the Site Plan as shown in Fig. 4-1(c).



EXISTING WATER MAIN IN SAMSEN

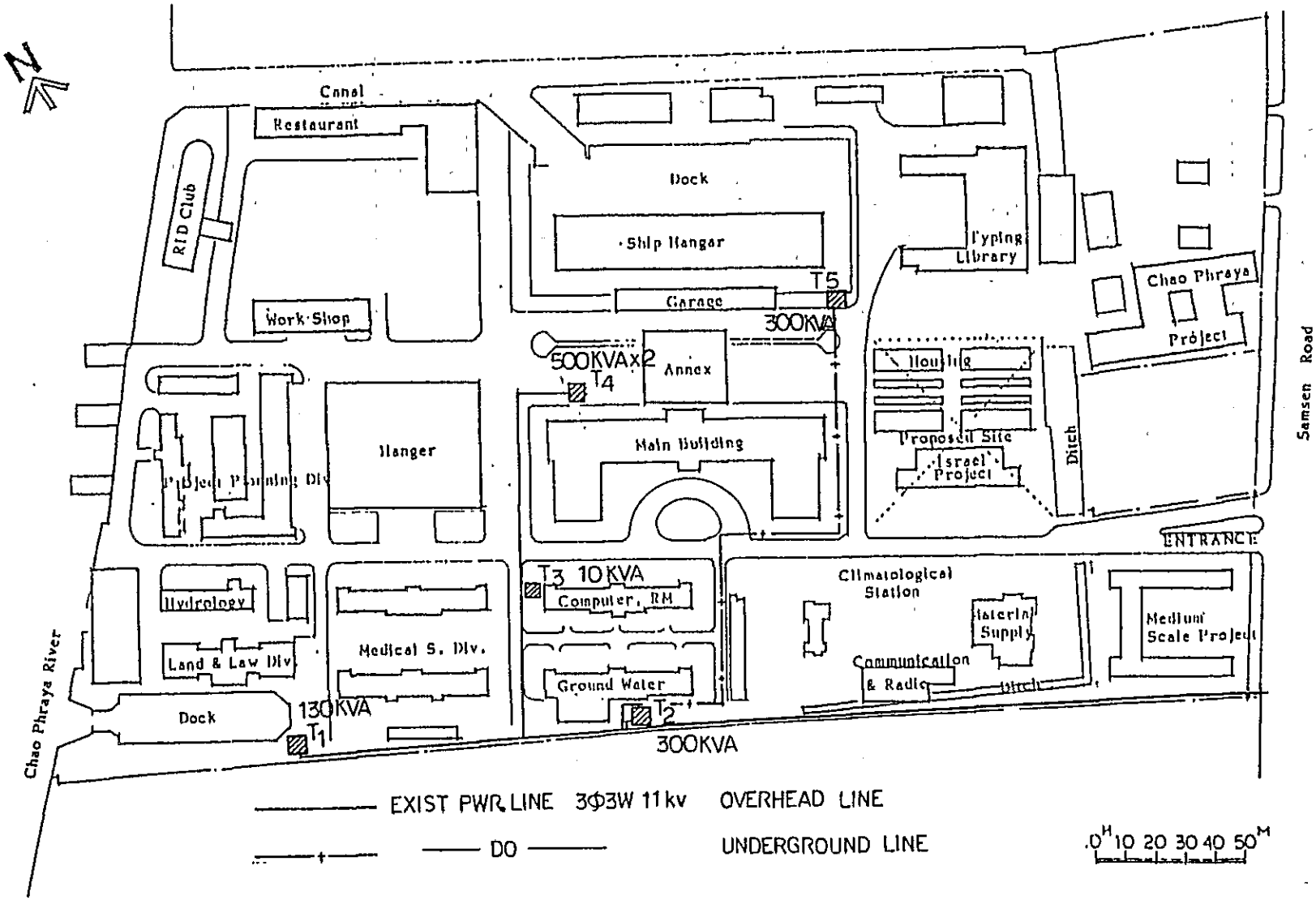
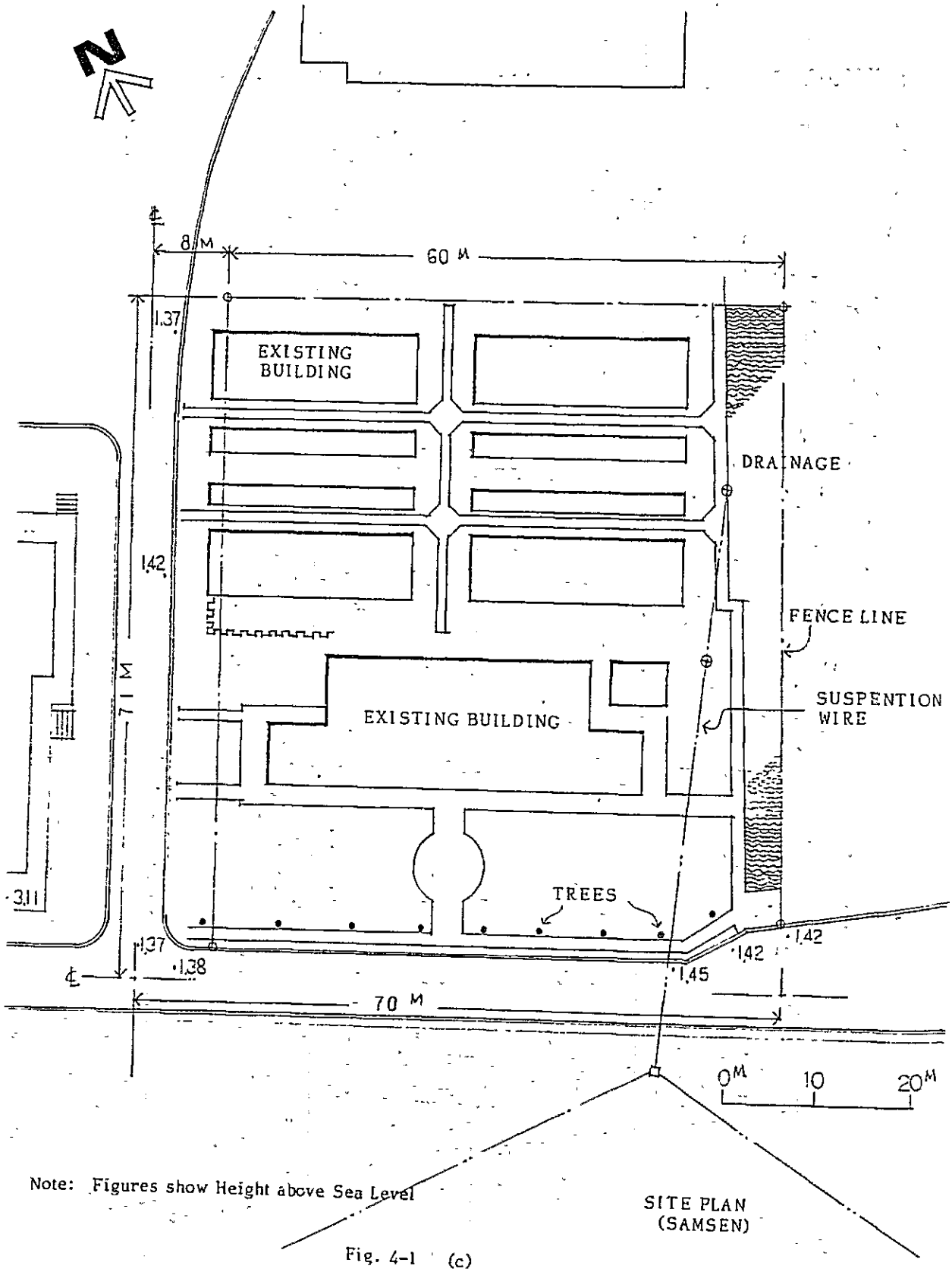


Fig. 4-1 (b) EXISTING POWER & TELEPHONE LINES (SAMSEN COMPOUND)



Note: Figures show Height above Sea Level

SITE PLAN (SAMSEN)

Fig. 4-1 (c)

4.2 Pakret Compound

Pakret Compound is located about 17 km north of Samsen Compound, and is also faced with the Chao Phraya River. Within the vast compound area which encompasses several roads there are various facilities of RID including the Main Office Building, workshops, construction equipment yard, temple, hospital, schools and residences.

Rikishas (man-pulled carts) are used as the principal means of transportation within the compound. The floors of the buildings in the Compound are conspicuously subsided due to the general subsidence of ground in the area. Water for use in the compound is supplied from wells.

Location: Pakret Nonthaburi

Area: Approximately 200 ha.

Soil Conditions:

Though not in the complex of Research and Laboratory Division, a total of 11 borings have been conducted in the area of the office buildings of Pakret Compound. The depths of the borings and the obtained results varied from one boring to another; however, it can be generally concluded as follows:

A soft clay layer is found down to 4 m from the ground level. Between the depths of 4 m and 10 m the soil is extremely soft clay. Slightly harder clay is then found between 10 m and 16 m. The soil lower than 16 m, or at some places 20 m deep, the soil is composed of hard sand layers.

Although it is considered that the sand layer around the depth of 22 m may provide a supporting layer for the planned building, a final conclusion shall be reached after borings at site are done, because the currently available data show substantial variations.

Water Supply:

(1) The water supply to Pakret

Compound does not depend on city water but is provided by ground water pumped up to a 250 t. tank elevated to a height of 25 m.

(2) The capacity of the deep-well pump is 1,320 GPM. Since motor capacity is large enough, it is possible to obtain more water by extending the present depth of 48 m to 100 m.

(3) Water control

1) This pump is in operation between 05:00 and 12:00, and then shuts off water supply for one hour till 13:00 in order to supply water to an elevated tank solely used by the hospital. From 13:00 through 22:00, the pump comes back into operation for general water supply.

2) Another deep-well pump of slightly smaller size and a tank are being used to make up for a supply shortage in the residential district in the evening. This operation keeps the water pressure from dropping to an unbearable level during the peak time, from 16:30 to 22:00.

3) Apart from these pumps, Pakret Compound has yet another pump room at the river bank of the Chao Phraya River to pump up river water essentially for sprinkling the trees and lawns. In an emergency, however, the water supply can be switched to the water main with a simple switchover operation of the valve(s).

4) The water supply appears sufficient at the moment, however, an increase in the number of deep-well pumps beyond the current level is not recommended because it is expected to result in an aggravation of land subsidence.

5) A water main of a 4-inch diameter is buried under the road that runs along the northern end of the site of Research and Laboratory Division building. Another water main of an 8-inch diameter is buried under the road just south of the same site (Fig. 4-2(a)).

Electric Power: Electric power is supplied by M.E.A. from the existing high tension power transmission line near at the Gate 2 of Pakret Compound as shown in Fig. 4-2(b) and (c). RID installed same hightension 11 kV power main branched from M.E.A.'s along the main road from the Gate 2 under RID's responsibility. Voltage is stepped down at the transformer "A", 150 m far from the site as shown on the drawing to

6.9 kV and the power is distributed to another service transformers "D" (75 kVA × 2) installed in the site of Research and Laboratory Division between Soil Engineering and Soil Science buildings. Further stepped down to 230 V electric power is transmitted to respective buildings. According to RID's long range plan the existing 6.9 kV lines shall be shifted to 11 kV time to time when required, so the specifications for the receiving facility of the newly built building should be meet with those requirements. In addition to the distribution capability of M.E.A. RID has their own emergency diesel generators with the total capacity of 2,000 kVA. Power demand for the new project is estimated as 300 kVA in total.

Telephone: The existing switch board is installed in Central Service building. The switch board has now 5 extra extension lines only. RID applys expansion of 5 lines of direct call lines to T.O.T. at present. Detail of the existing switch board is as follows:

Manufacturer/Model	OKI/AC-250
Switchboard Capacity	20 lines
Extension	300 lines

Proposed Site: All of the facilities for Research and Laboratory Center, Soil Engineering Test Laboratory, and Hydraulic Model Test Hangar shall be constructed within the site of the existing Research and Laboratory Division. For the shape, levels and current conditions of the site, please refer to the attached Site Plan. The levels of the existing hydraulic facilities and canals in the site are approximately 50 to 60 cm lower than those of the surrounding roads (Fig. 4-2(d)).

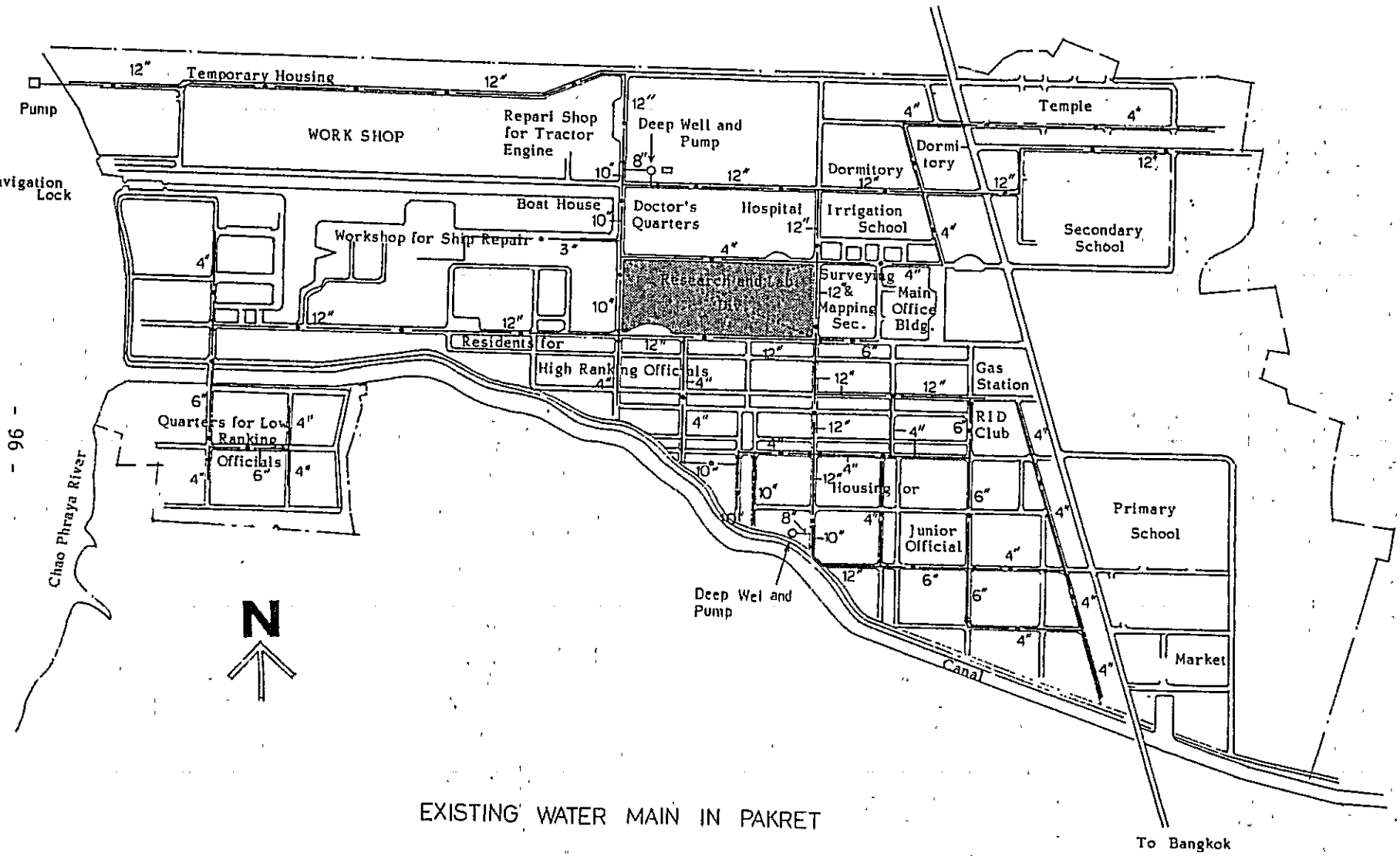

Pump
Navigation Lock
Temporary Housing
WORK SHOP
Repari Shop for Tractor Engine
Deep Well and Pump
Boat House
Workshop for Ship Repair
Doctor's Quarters
Hospital
Irrigation School
Temple
Dormitory
Dormitory
Secondary School
Research and Lab
Surveying & Mapping Sec.
Main Office Bldg.
Residents for High Ranking Officials
Gas Station
RID Club
Quarters for Low Ranking Officials
Housing for Junior Official
Primary School
Market
Deep Well and Pump
Canal
Chao Phraya River
N
To Bangkok
EXISTING WATER MAIN IN PAKRET
0 10 20 40 M

Fig. 4-2 (a)

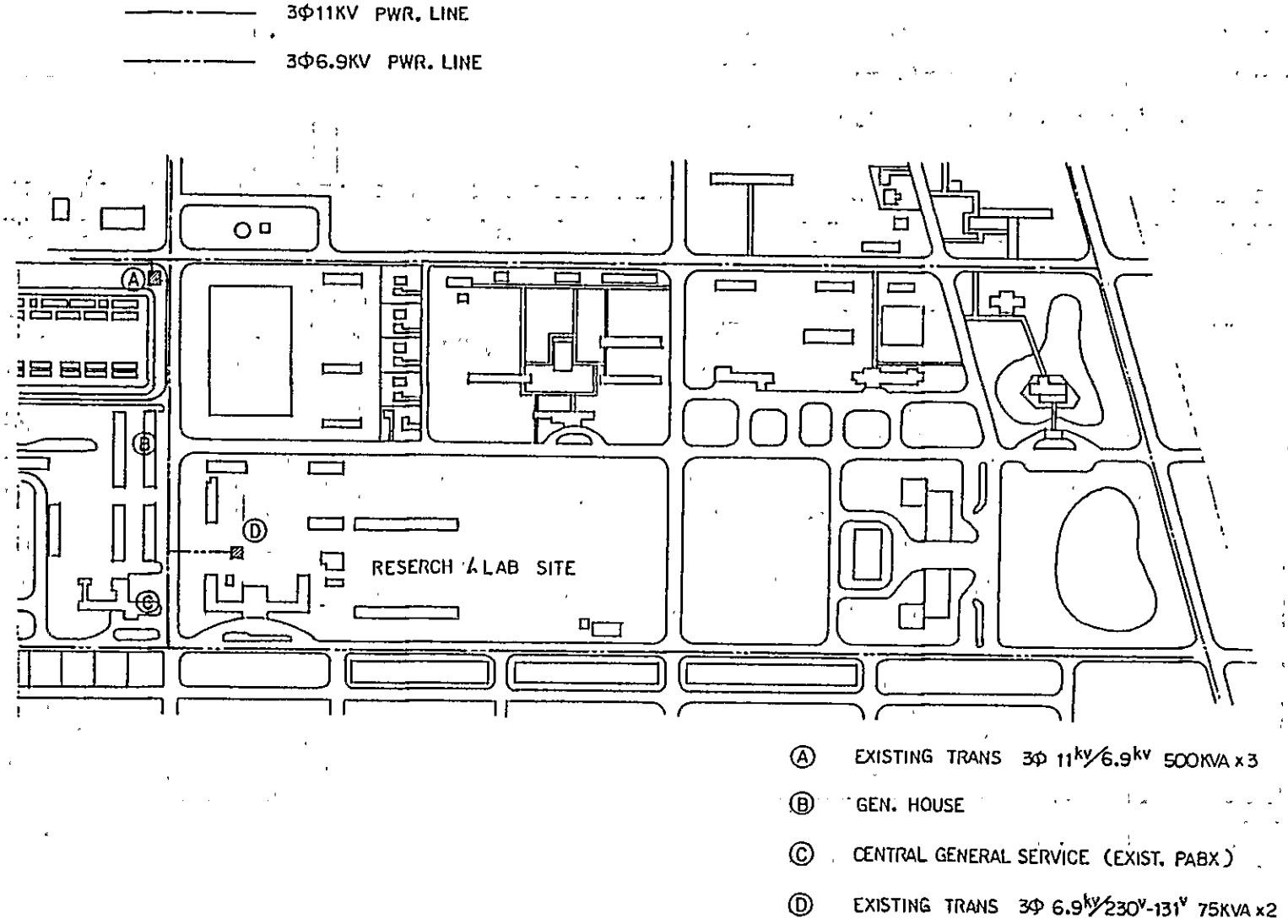


Fig. 4-2 (b) EXISTING POWER LINE (PAKRET)

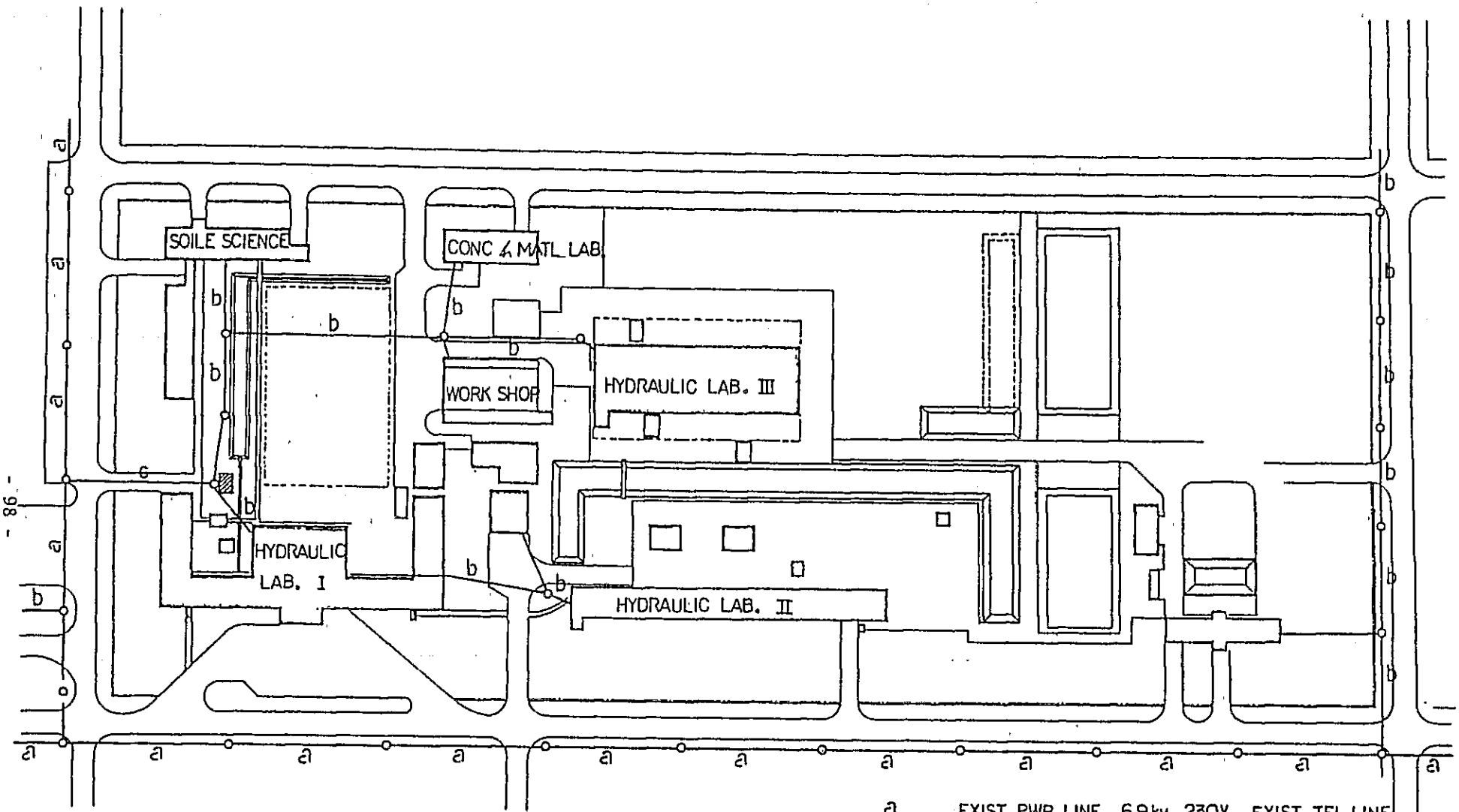
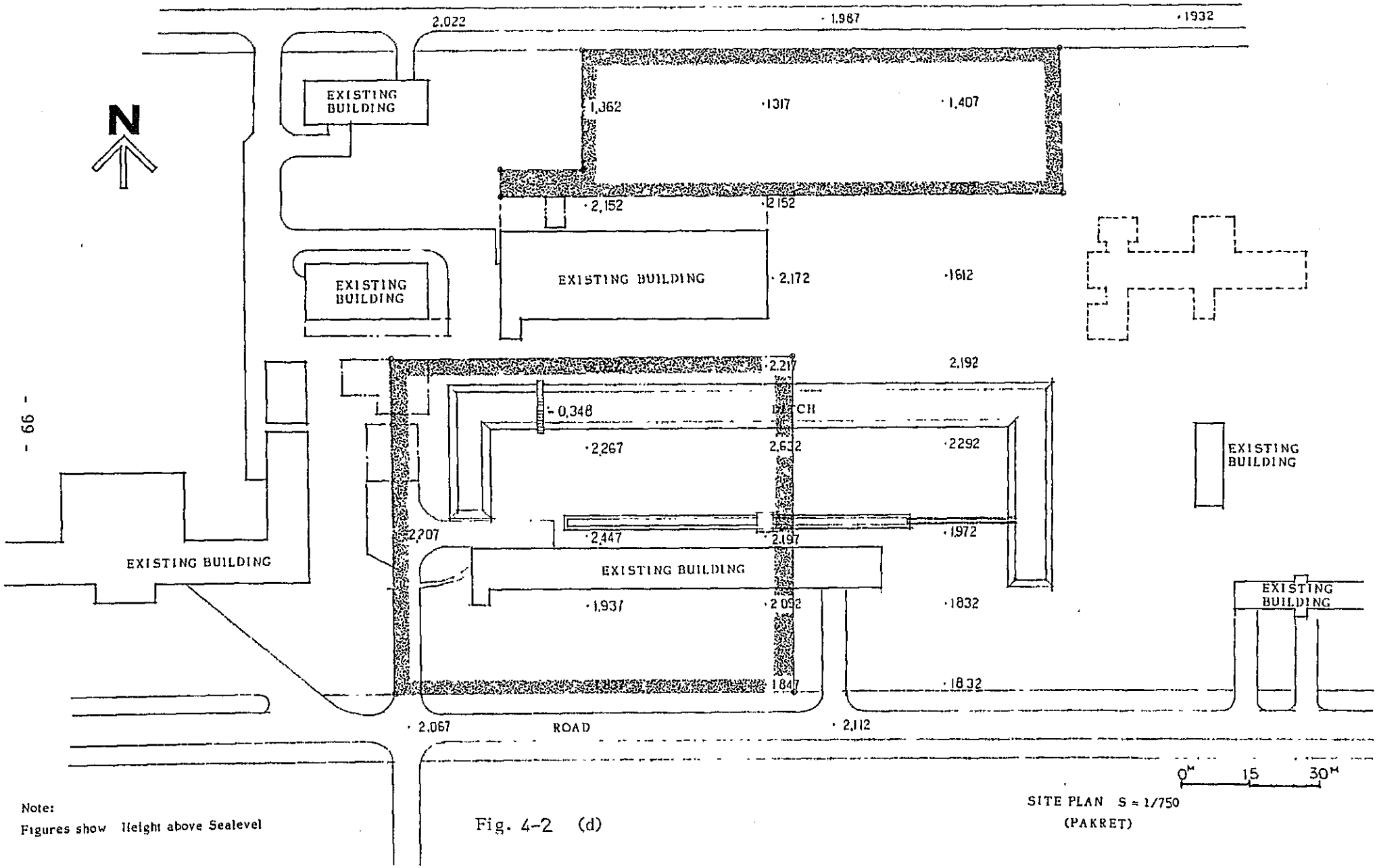


Fig. 4-2 (C) EXISTING POWER & TELEPHONE LINES AT RESEARCH & LABORATORY SITE (Taken)



Note:
Figures show Height above Sealevel

Fig. 4-2 (d)

SITE PLAN S = 1/750
(PAKRET)

Chapter 5 BASIC DESIGN

Chapter 5 BASIC DESIGN

5.1 Basic Policies

Policies for the basic design are as follows:

(1) Energy costs and maintenance costs shall be minimized.

(2) Construction costs of both Japanese side and Thai side shall be minimized keeping and adequate level of function and quality of the buildings and its incidental facilities.

(3) Climatic conditions in Thailand shall be taken into consideration so that adequate ventilation and heat insulation shall be kept.

(4) Location of existing facilities in both Samsen and Pakret compound shall be given due consideration so as to prevent not only troubles during construction but also functional problems or underutilization of the established facilities.

(5) Rooms and equipment shall be laid out so that maximum flexible use can be obtained.

(6) Security against pillage shall be taken into consideration.

(7) Construction period shall be checked in the course of designing so that the work can be finished within the period set by the grant aid system.

(8) Equipment shall be selected taking the maintenance into full consideration.

(9) Taking efficient land utilization in the Samsen compound which is already overcrowded into consideration, a compact floor plan shall be adopted and a multi-layer structure shall be introduced within limits not to impair the function and safety so that the allowance of land for the future extension of buildings could be left at the maximum.

(10) The way of life and custom of Thai people shall be reflected in the design.

5.2 Blocks and Plot Plan

5.2.1 Samsen Center

The proposed site of the Samsen Center is situated north of the main road near the entrance gate in the Compound. The planned building is expected to play an important role in the general appearance of the Compound, because of its location and height which will be taller than the existing main building.

The Samsen Compound has an area of approximately 7 ha. and is already crowded with various facilities. As for the proposed site too, the construction of the Center cannot take place until the existing facilities have been relocated elsewhere. In view of the overcrowdedness in the Compound, the Thai side has requested the Japanese study team members to formulate a building plan which allows for full utilization of land and future extension.

For these reasons, it would be most plausible to plan the building as compact as possible and locate it along the southernmost end of the site. The site plan has been drawn up accordingly.

The arrangement of the building shall be made along the east-west axis in order to exclude the solar heat. This arrangement is considered appropriate also from a viewpoint of balance and harmony with the rest of the buildings in the Compound, most of which are built on the east-west axis.

5.2.2 Research & Laboratory Center, Soil Engineering Test Laboratory, and Hydraulic Model Test Hangar (Pakret)

After demolishing the superannuated building, new buildings will be constructed in the proposed site. As is the case with the Samsen Compound, the arrangement of the new buildings shall be made along the east-west axis.

Under the initial plan, the facilities for Soil Engineering Laboratory was planned in one building, which was also to include Managing Support Section and training facilities. And another separate building was planned to house Hydraulic Model Test Hangar and its

related laboratories. However, after a series of studies need to separate the Test Rooms of Soil Engineering Laboratory from the other rooms came to be recognized as the former was found to be a cause of considerable noise and dust. Further since the Study Room for Hydraulic Engineers does not necessarily have to be located in Hydraulic Model Test Hangar, it is believed reasonable to place the Study Rooms for both Soil Engineering and Hydraulic Laboratory sections in one building, in which Managing Support Section and training facilities will be also housed. Such a building has been planned and it is to be referred to as Research and Laboratory Center. Apart from this, two other separate buildings, respectively named, Soil Engineering Test Laboratory and Hydraulic Model Test Hangar, have been planned. Therefore, under the current plan, there is a total of three buildings to be constructed in the proposed site.

To provide an ample space for ease of transporting test samples into the facility, the Soil Engineering Test Laboratory building shall be of shape compressed along the east-west axis.

The site for Hydraulic Model Test Hangar is situated north of the existing Hangar. A water reservoir for experiments and its Pump Room should be located west of the planned Hangar while a substantial vacant area is to be reserved on the southern part of the site for future construction of outdoor test facilities as it is considered the ideal location for this purpose.

5.3 Building Plan

5.3.1 Floor Plan

(1) Samsen Center

A floor plan of central corridor type is adopted for the building of Samsen Center with its core offset to one side. This particular floor plan has been adopted in part because the building has to be made as compact as possible for the reason of better utilization of the limited land space, and also because the possibility of future extension toward the north was taken into account. Though it is true that a building with a central corridor is somewhat disadvantageous with respect to ventilation, the present plan as a whole is considered the

most feasible since the disadvantage could be offset by 1) the facts that a good part of this building will be airconditioned, and that the central corridor type is advantageous in airconditioned, and that the central corridor type is advantageous in airconditioning, and 2) that, if due attention is paid to thermal insulation and the ventilation of the non-airconditioned rooms at the stage of Detail Design, the disadvantage of the type will be reduced to the extent that it will not present any problem.

In view of the efficient utilization of land, the Thai side requested that the planned building shall allow the future addition of an extra floor on the top floor. The request is considered to be reasonable and has been incorporated in the current plan. In an effort to balance between the requirement of land utilization and the plan of each floor, it has been concluded that the building shall be a five-story building.

With regard to the arrangement of rooms, that of Lecture Hall became the most crucial factor in the course of planning. Eventually, Lecture Hall has been placed on the top floor--5th floor--mainly becacse of its structural design which requires a long span. This facility was originally planned on the second floor in such a way that a part of it protruded from the building toward north. However, this idea was later abandoned as is contrary to the policy of efficient land utilization. There was one problem resulting from the present arrangement of Lecture Hall on the fifth floor, that is, the evacuation of a large number of audiences who are not well oriented to the plan of the building at the time of a fire. Since the requirements of the current local building regulations are not elaborate enough to provide necessary precautions against such an event, the plan of fire escape stairs has been based on the requirements provided for in the Japanese Building Standard Law and Tokyo Metropolitan Safety Code. As to the arrangement of the other rooms, the plan proposed by the study team strove to arrive at the best configuration in terms of the functions and characteristics of each room, and it was approved by the Thai side as appropriate.

The plan of the public space is as follows:

Lavatories:

The number of toilet stools and urinals required on each of the office floors upto the third floor has been calculated on the basis of the number of people working in the offices, and those for the fourth and fifth floors were determined so as to meet the requirements from Lecture Hall and the training facilities.

Kitchenette:

From local habit, there is no need to install any facilities for this purpose on the office floors. However, since Lecture Hall is expected to serve also as a reception room, a Kitchenette suitable for that purpose is installed on the fifth floor.

Broom Closet:

A broom closet/storage is installed on each floor so that is can provide a temporary storage space for trash collected on that floor as well as a storage space for brooms and mops. Each broom closet will be equipped with a slop sink.

Stairs:

Two indoor stairs and an outdoor stair are planned. These have been planned in accordance with the requirements provided for under the above-mentioned Japanese regulations.

Elevators:

Two elevators with a carrying capacity of 17 people each and with a speed of 90 m/min. shall be installed. This plan is based on the followings, taking one floor extension on the top floor into consideration:

- The number of occupants on the third floor and up is assumed to be 80 per cent of the maximum capacity of 690 people, i.e. 550.

The average number of passengers:

$r = 17 \times 0.8 = 13$ passengers

The average distance to cover:

$S = 3.7\ m \times 4 + 4\ m = 18.8\ m$

The number of floors where the elevators are to stop above 2 F:

$n = 4$

- Round Trip Time:

$RTT = 2\ S/V + AT = 2 \times 18.8/1.5 + 60 = 85$ sec.

- Carryign Capacity in a 5 minute period:

$CC = 300 \times r/RTT = 300 \times 13/85$ sec. = 46 people/elevator

- Carrying Rate in a 5 minute period:

CR = (number of elevator) × CC/(number of occupants in the bldg.)

$= 2 \times 46/550 = 16.7\%$

- Average Operation Intervals:

AOI = RTT/No. of elevators = 85/2 = 42.5 sec.

Recommended CR for 5 minute and AOI for government office buildings in Thailand are considered to be less than 18% and more than 45/sec. respectively. Therefore this plan is appropriate.

(2) Research and Laboratory Center

Housed in Research and Laboratory Center are the Study Rooms of the Soil Engineering, Hydraulic and Concrete and Materials groups as well as the office of Management Support Section, Library, training-related rooms, a conference room and so forth.

As to the floor plan of this building, a central corridor type is recommended for the same reason as the case of the Samsen Center. From a viewpoint of construciton cost as well as functional convenience of the building, a two-story structure is considered most desirable. The current plan has been designed accordingly.

The Study Rooms mentioned above has been located on the first floor of the building as the activity there requires close communications with the respective test laboratories in separate buildings. The other rooms have been arranged in places , which are believed to serve best for their respective functions.

The plan of the lavatory on the second floor has been drawn up so as to meet the requirements of a large number of male trainees.

(3) Soil Engineering Test Laboratory (Pakret)

This building consists of Test Rooms, Storages for test equipment, Test Sample Rooms, Preparation Rooms, etc.

A single story structure is desirable for this building because a large amount of test samples will be brought in and out of it. In formulating the floor plan, special regard was paid firstly to ventilation and sun shading, and secondly to the length of the building along east-west axis. If the length is too long along the east-west axis, it would be inconvenient, because the distances between rooms become long. It sould also be taken into account the fact that if the building is too long in this direction it will not leave much parking space at the western end of the building.

A service yard has been arranged on the north side of the building, and the rooms where soil samples will be brought in and out have been planned in such a way as to face the yard. All Test Rooms are of same size, which has been determined by the requirement from training rather than from the layout of test equipment.

(4) Hydraulic Model Test Hangar

Four 15 M × 20 M Experiment Areas are required in the present plan. It has been decided that the arrangement of Experiment Areas shall be planned along the pipe line of water for experiment use, and further that the Areas are to be arranged side by side in parallel. To meet requirements arising from various experiments in a flexible manner, the Hangar shall be of a single-span structure with no columns inside. The new Hangar has been arranged along east-west axis to be in parallel to the existing Hangar. A water supply pipe will be installed on the ground north of the building while an outdoor drainage canal will be constructed south of the same building. For the transportation of materials, a service road will also be constructed south of the building. This access road has been so arranged as to serve an outdoor experiment area as well which is included in the future plan. A

Storage for experiment equipment and an Assistants' Room have been located near the existing Hangar so that they could serve the needs of both Hangars. For convenience in maintenance, an elevated tank for experiment water will be installed on the roof of this building.

5.3.2 Elevation nd Section

(1) Shading and ventilation

In regard to shading of the Samsen Center and Pakret Research and Laboratory Center buildings, outdoor suspension louvers are so designed as for sunbeam almost not to fall directly upon openings, such as windows, on both south and north side walls both at summer and at winter solstices based on the shadow angle calculation in Bangkok. For the openings of the both east and west side walls exterior and interior louvers are so arranged as to protect direct sunbeam.

It is difficult that the soil Engineering Test Laboratory and Hydraulic Mode Test Hangar bukldings are installed vertical louvers, so horizontal louvers shall be installed at the end of protruding eaves to protect direct sunbeam between 08:00 A.M. and 16:00 P.M. both at summer and at winter solstices.

Heat insulation materials are to be installed on the both east and west side exterior walls of rooms like offices where always somebody in working.

Mostly pannel glasses are fixed in the transoms and natural ventilation air is taken through the windows below transams normally. Through our survey for the past time it is observed that in this country people prefers this kind of arrangement because people can feel draught air with the skin. Although this phenomenon is different from out practice in Japan, it seems to us that this arrangement should be appropriate in Thailand.

In the non-airconditioned rooms, the ventilation around the central corridor will be maintained as much as possible through vertical grilles or louvers installed on the upper part of walls as well as on the lower part of them. Further, the windows and other

openings in the staircases will be made as large as possible to let the air in the central corridor flow effectively.

(2) Samsen Center

The level of the first floor of the existing Main Building is raised about 1.8 meters above the road surface at the zero point tentatively set for the current planning work (hereinafter called 'road surface') to avoid possible submergence during the rainy season, in which the Chao Phraya river sometimes floods the site. The floor level of the proposed building is planned to be the same as the existing Main Building.

The general height of the ceilings will be 3 meters above the floor, which is about the lowest limit in most of the local buildings. The standard interval between the office floors will be 3.7 meters. The ceiling height of non-airconditioned rooms should be not less than 3 meters. It is desirable to design a higher ceiling as far as structurally possible because the higher the ceiling, the more comfortable it is in the local climate.

For the possible addition of the sixth floor in the future, the roof top of the building shall be of flat concrete slab covered with corrugated asbests sheet roof.

Balcony is planned to be installed on the north and south side walls of the building, where the outdoor auxiliary units of the air conditioners will be installed. Louvers for shading sunbeam have been incorporated in the design of the balconies, which will accentuate the appearance of the building. In so doing, the esthetic balance and harmony with the existing Main Building has been also taken into account.

Since the sixth floor is expected to be added over the fifth floor except above the roof of Lecture Hall, it has posed the problem in determining the architectural design of the building. As a solution, the eaves on the fifth floor have been emphasized to the extent that the design of the portion to be added in the furture can be treated independently.

Meanwhile, there is a plan to construct at the local cost a connecting corridor between the existing Main Building and the Center. It is to be noted that a plan for tis pereparatory work should be carried out in Detail Design Phase.

(3) Research and Laboratory Center (Pakret)

The level of the first floor will be raised 1.2 meters from the road surface for dampproofing. The design principles of the section and exterior elevation of this building are the same as those for the Samsen Center since the both share a common type of floor plan and functions.

(4) Soil Engineering Test Laboratory (Pakret)

The level of the first floor of this building will be only 0.3 meter higher than the road surface. It is necessary to keep the floor level at this height for ease of transportation of soil samples to and from the service yard located outside the building.

This building is planned as a single story structure with a pitched roof covered with corrugated asbestos sheets. Because of the space available under the roof which allows a greater flexibility in ceiling height, the height of the roof has been designed to be as low as possible for the reason of construction cost. Basically the ceiling of Test Rooms will be 3.2 meters in height while higher ceilings can be installed where required. Storage will be installed with no ceiling.

The architectural design of the building will be characterized by the relatively protruding eaves.

(5) Hydraulic Model Test Hangar (Pakret)

The floor level of Hangar will be 0.3 meter higher than the road surface. In view of the traffic of vehicles from the service road south of the building, it is necessary to raise the service road to be the same level as the floor level, thereby leaving no gap in height between the two.

The Hangar is presently planned to have a pitched roof with corrugated asbestos sheets. The lower end of the truss has been set at 6 meters above the floor. Because people should work on experiment devices of which maximum height is expected around 4 meters. No cranes will be installed.

The climate here does not require any windows nor walls on the north and south sides of the Hangar; however, some louvers shall be installed to shade the sunbeam.

5.3.3 Structure

(1) Structural outline

Building name	Structural outline	Pile
Samsen Center	5 storied reinforced concrete building 2 additional stories to be constructed (7 storied) in future One portion of roof is of steel framed structure	Prestressed spun concrete pile approx. 23 m (11.5 m x 2)
Pakret Research and Laboratory Center	2 storied reinforced concrete building Roof of steel frame with concrete eaves	Prestressed spun concrete pile approx. 23m (11.5 m x 2)
Pakret Soil Engineering Test Laboratory	1 storied reinforced concrete building Roof of steel frame with concrete eaves	Prestressed spun concrete pile approx. 23 m (11.5 m x 2)
Pakret Hydraulic Model Test Hangar	1 storied and partly 2 storied reinforced concrete building Roof of steel frame with concrete eaves	Prestressed spun concrete pile approx. 23 m (11.5 m x 2)

(2) Structural planning

1) Superstructure

The main factors for choicing the structural system and method are as follows:

o the building's use, size and grade

o local construction circumstances and materials

o construction period

o cost

o maintenance after completion and durability

Because of the fact that it is possible to secure standardized concrete and reinforcing bars locally but wideflange shapes for construction are imported, reinforced concrete construction is employed as the common sonstruction method.

The main structure of each building in this project is to be a reinforced concrete structure on account of the above mentioned reasons and the local construction circumstances, thus the structural function of the building can be fully satisfied. And applying this practiced method should not cause any trouble on the execution of construction and the construction period, so that the construction costs should remain minimal.

The external walls of the building shall be of brick masonry in accordance with the local constructuion methods. The inner walls shall be partition walls made of wood or board in order that the building may be lighter in weight and that there amy be flexibility of the inner space.

2) Substructure

The pile foundations shall be set into the bearing layer of fine sand which, according to the boring logs, is found approximately 22 ∿ 23 meters below the ground surface.

The allowable piple bearing capacity shall be reduced on account of the negative skin friction force causing by the ground subsidence which occurs in all areas of Bangkok.

Prestressed spun concrete piles with one welding joint shall be used, taking the required length and mehtod of driving into acocunt.

At the Samsen Center, as the axial force of each pillar is great, large diameter piles should be used.

3) Structural design standards

The loads on buildings shall be in accordance with the Bye-Laws of the Bangkok Metropolis. The methods of calculation shall be in accordance with the elastic theory. The Building Standard Laws of Japan and various standards of the Architectural Institute of Japan shall be complementarily used for calculating the strength of any structural members of buildings.

4) Materials and their allowable stresses

Allowable unit stresses of materials are specified in Chapter 6: "Strength of materials and loads" of the Bye-Laws of the Bangkok Metropolis. But according to the exceptional article 47, values given below, which are the same values as those in Japan, shall be used on condition that materials have quality conforming to the specifications below or material strengths can be testified with evidence of material tests according to ASTM or JIS.

Table 5-3-3(a)

Materials	Standards	Allowable unit stress (kg/cm2)			Yield Strength (kg/cm2)
		Compression	Tensile	Shear	
Concrete	Fc=210kg/cm2 (four week age compressive strength)	70		7	
Reinforcing bar	SR24 (JIS, TIS)	1600	1600		2400
	SD30 (JIS, TIS)	2000	2000		3000
Structural steel	SS41 (JIS, ASTM)	1600	1600	900	2400

5) Loads

1) Dead loads

- o concrete 2.3 T/m^3
- o reinforced concrete 2.4 T/m^3
- o mortar 2.0 T/m^3
- o structural steel 7.85 T/m^3
- o brick 1.9 T/m^3

2) Live loads

- o In accordance with the By-Laws of the Bangkok Metropolis.

The live loads given below are to be used in designing floor slabs, beams, columns, girders, footings and piles.

Samsen Center	Pakret			Live Load
	Research and and Laboratory Center	Soil Engineering Test Laboratory	Hydraulic Test Hangar	
Roof	Roof	Roof	Roof	50
Concrete roof (1) and eaves	Concrete roof and eaves	Concrete roof and eaves	Concrete roof and eaves	100
Office, Researcher's room, Lecture room, Hall, Corridor, Stairs, W.C.	Office, Study room, Researcher's room, Lecture room, Hall, Corridor, Stairs, W.C.		Assistants room, Stairs	300
Library, Conference room, Copying service room, A/V studio, Concrete roof(2)*	Library, Conference room,	Laboratory, preparation room, Corridor		400
Data storage, Storage, Computer room, Machine room, Filling room	Storage	Storage	Storage	500
Book stocking room (Library)			Model test hangar	600

*- The live load of the concrete rool (2) is increased in consideration of the extension.

3) Wind loads

In accordance with the Bye-Laws of the Bangkok Metropolis.

$p = Cq$ p = Normal wind pressure (kg/m^2)

q = Basic wind pressure (kg/m^2)

Refer to the Table 5-3-3(b)

c = Shape coefficient

Refer to the Figure 5-3-3

Table 5-3-3(b)

Height of. Buidling (m)	Basic .Wind Pressure (kg/m2)
0 - 10	50
10 - 20	80
20 - 40	120

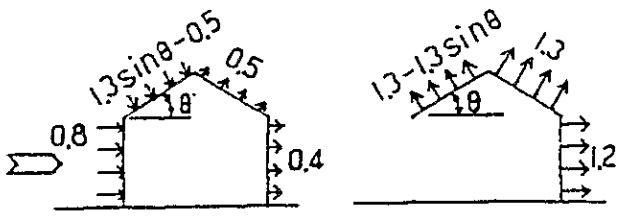


Fig. 5-3-3

5.3.4 Finish Schedule

The major exterior finish and interior finish of major rooms are planned as follows:

(1) Exterior finish

1) Samsen Center

Wall	:	Mortar and Paint
Eaves	:	Exposed Concrete and Paint
Roof	:	Corrugated Asbestos Sheet on Steel and Wooden Framing
Door & Window	:	Aluminum door and Sash

2) Research/Lab. Center & Soil Engineering Test Lab.

Wall	:	Mortar and Paint
Eaves	:	Exposed Concrete and Paint
Roof	:	Corrugated Asbestos Sheet on Steel Framing
Door & Window	:	Aluminum Door and Sash

3) Hydraulic Model Test Hangar

Wall	:	Corrugated Asbestos Sheet on Steel Framing
Roof	:	- ditto -
Door & Window	:	Aluminum door and Sash

(2) Interior Finish

1) Samsen Center

Name of Room	Floor	Wall	Ceiling	Remarks
Director's Rm.	Vinyl Tile	Plywood (Teak)	Acoustic Board	
Chief's Rm.	Ditto	Plywood Mortar + Paint	Ditto	
Office	Ditto	Plywood Mortar + Paint	Ditto	
Researcher's Rm.	Ditto	Ditto	Ditto	
Lecture Rm.	Vinyl Tile	Ditto	Ditto	
Lecture Hall	Ditto	Plywood (Teak)	Ditto	
A-V Training Rm.	Ditto	Plywood Mortar + Paint	Ditto	
Lecturer's Rm.	Ditto	Ditto	Ditto	
Computer machine Rm.	Free Access Floor + Vinyl Tile	Ditto	Ditto	Heat Insulation
Library	Vinyl Tile	Ditto	Ditto	
Entrance Hall	Polished Terrazzo	Ditto	Ditto	
Corridor	Ditto	Ditto	Ditto	
Staircase	Ditto	Mortar + Paint	(Mortar) Paint	
W.C.	Mosaic Tile	Semi-porcelain Tile	(Asbestos Cement Sheet) Paint	
Pantry	Ditto	Ditto	Ditto	

2) Research & Lab. Center & Soil Engineering Test Lab. (Pakret)

Name of Room	Floor	Wall	Ceiling	Remarks
Director's Rm.	Vinyl Tile	Plywood (Teak)	Acoustic Board	
Chief's Rm.	Ditto	Plywood + Paint Mortar	Ditto	
Office	Ditto	Ditto	Ditto	
Laboratory	Ditto	Ditto	Ditto	
Researcher's Rm.	Ditto	Ditto	Ditto	
Lecture Rm.	Ditto	Ditto	Ditto	
Library	Ditto	Ditto	Ditto	
Lecturer's Rm.	Vinyl Tile	Ditto	Ditto	
Conference Rm.	Ditto	Ditto	Ditto	
Laboratory	Polished Terrazzo	Ditto	(Gypsum Board) Paint	
Assistant's Rm.	Ditto	Ditto	Ditto	
Preparation Rm.	Ditto	Ditto	Ditto	
Storage	Mortar	Ditto	Ditto	
Entrance Hall	Polished Terrazzo	Ditto	Acoustic Board	
Corridor	Ditto	Ditto	Ditto	
Staircase	Ditto	Ditto	Mortar + Paint	
W.C.	Mosaic Tile	Semi-porcelain Tile	Asbestos Cement sheet Paint	

3) Hydraulic Model Test Hangar (Pakret)

Name of Room	Floor	Wall	Ceiling	Remarks
In-door Model Test Hangar	Concrete Trowelled Finish	Asbestos Cement Sheet + Paint	Corrugated Asbestos Sheet	
Assistants Rm.	Vinyl Tile	Mortar + Paint	Acoustic Board	
W.C.	Mosaic Tile	Semi-porcelain Tile	Asbestos Cement Sheet + Paint	
Equipment Stg.	Mortar	Mortar + Paint	Exposed Concrete + Paint	

5.4 Incidental Facilities Plan

5.4.1 Plan of Plumbing Work

(1) Water supply

(A) Water supply for building

Water mains of sufficient capacities are located in the proximity of the proposed sites of both the Samsen Compound and Pakret Compound. In both cases, a branch pipe to be installed by local cost upto the peripheral of the site shall be extended further to a receiving tank before being pumped up to an elevated tank, from which water is supplied to each point of use by gravity. Galvanized steel pipes shall be used for all the pipes employed in the planned facilities. A flow diagram of the supply system is given below:

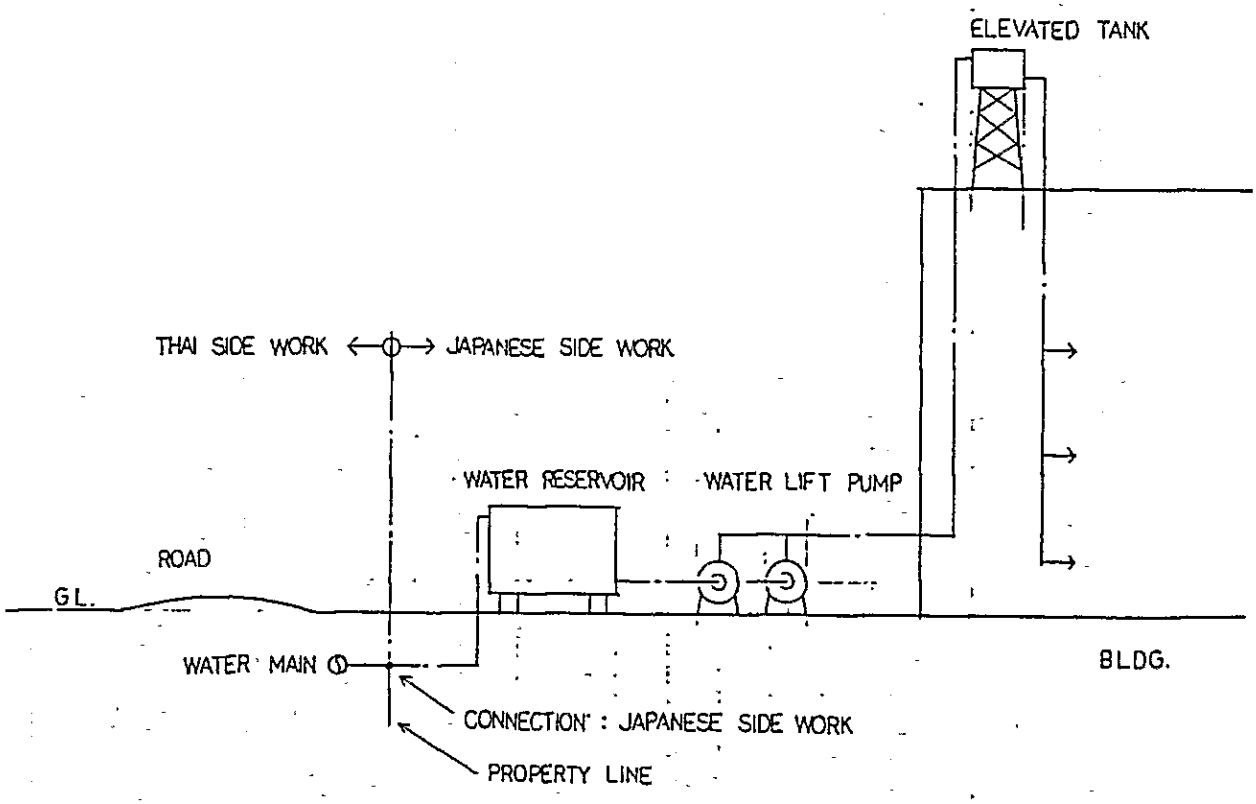


Fig. 5-4-1- (a)

The amount of water supplied is planned as below:

o Samsen Compound

Samsen Center:

Personnel	158 x 100 l/day.head	=	15,800 l/day
Trainees	190 x 80 l/day.head	=	15,200 l/day
	Total	=	31,000 l/day

o Pakret Compound

Research and Laboratory Center:

Personnel	68 x 100 l/day.head	=	6,800 l/day
Trainess	80 x 80 l/day.head	=	6,400 l/day
	Total	=	13,200 l/day

Soil Engineering Test Laboratory:

Personnel	13 x 100 l/day.head	=	1,300 l/day
Test	13 x 80 l/day.head	=	1,040 l/day
	Total	=	2,340 l/day

Hydraulic Model Test Hangar:

Personnel	20 x 100 l/day.head	=	2,000 l/day
Test	20 x 80 l/day.head	=	1,600 l/day
	Total	=	3,600 l/day

The specifications of each facility is as shown below. The capacity of the receiving tanks refers to that which they are capable of storing in one day.

Building	Receiving Tank	Elevated Tank	Pump Capacity (Capcity x Head x No.)
S.C.	30.0cu.m.	3.0cu.m.	300 1/min x 40M x 2
R.L.C.	15.0cu.m.	2.0cu.m.	200 1/min x 25M x 2
S.E.T.L.	3.0cu.m.	1.0cu.m.	100 1/min x 15M 2
H.M.T.H.	3,0cu.m.	1.0cu.m.	100 1/min x 20M x 2

Note: S.C. : Samsen Center
R.L.C. : Research and Laboratory Center
S.E.T.L. : Soil Engineering Test Laboratory
H.M.T.H. : Hydraulic Model Test Hangar

(B) Water supply for test purposes

Hydraulic Model Test Hangar in the Pakret Compound is to be built for studying the hydraulic characteristics of irrigational structures by the use of scale models.

As these tests require a large amount of water supply, the Hangar shall be euquipped with a reservoir, water pumps, elevated water tank, supply pipe, and a drainage canal with a flow rate adjusting device and sand sedimentation function. Galvinized steel pipes shall be used for piping in the system.

The flow diagram of the system and specifications are given below:

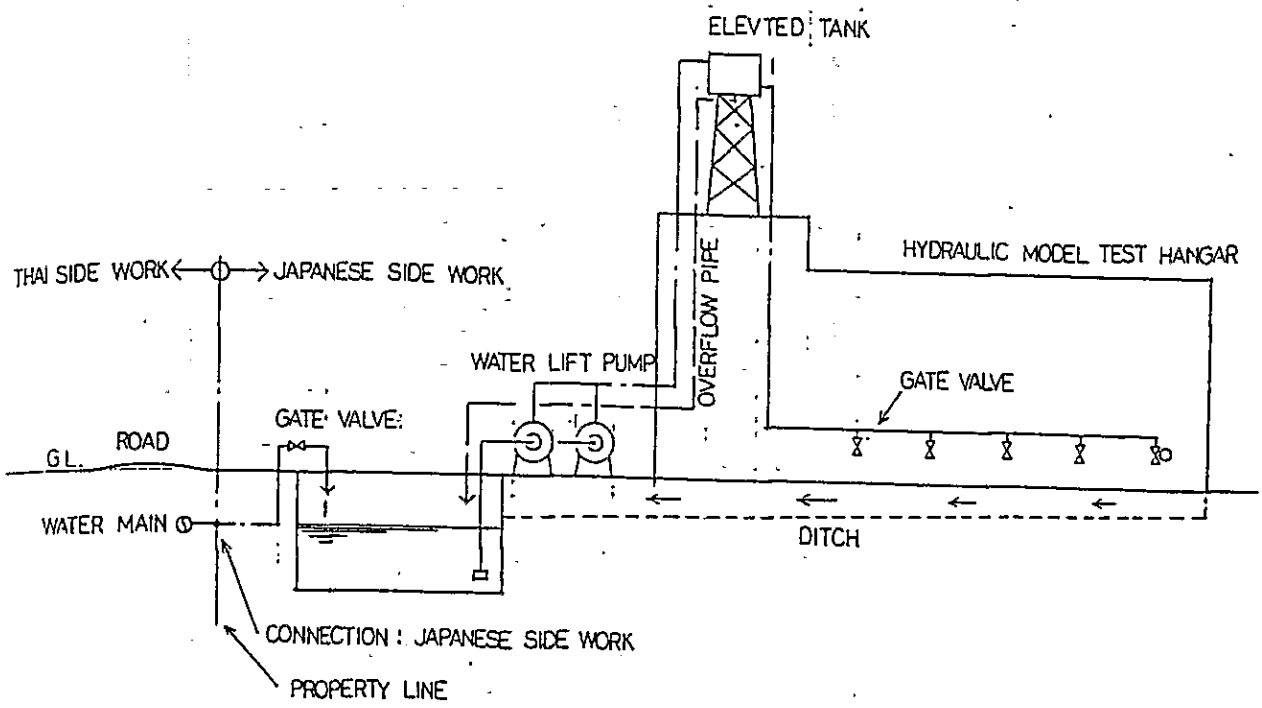


Fig. 5-4-1-(b)

Specifications of Devices:

o Water Pumps (including Control Panel and a set of accessories)

Centrifugal pumps 4.5 cu.m./min x 12 m. x 15 Kw x 2
(Double-side suction)

o Pipe size of pumps	250 m.m. x 9.0 cu.m./min. (max.)
o Size of supply pipe	400 m.m. x 9.0 cu.m./min. (max.)
o Size of overflow pipe	350 m.m. x 4.5 cu.m./min. (max.)
o Storage capacity	200 cu.m. (200% of the total capacity of the recirculation system)
o Elevated water tank	5.0 m x 5.0 m x 1.0 m high (mounted on a steel structure)
o Gate valves	400 m.m. x 5
o Flow control valve (electrical)	250 m.m. x 1

The elevated tank employed in the present system shall have the following structure to keep the pressure in the piping system at a constant level.

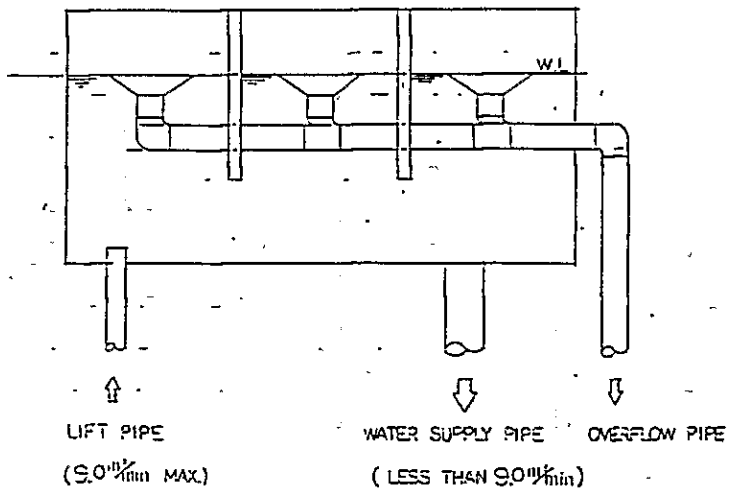


Fig. 5-4-1-(c)

(2) Drainage system

(A) Sewerage

Soil water and waste water shall be discharged separately; after being processed in an aeration tank (BOD lower than 90 ppm), soil water shall merge with waste water, then finally sent into a permeation tank. Sceptic tanks shall be installed in each building and lavatory. In this system, cast iron shall be used for soil pipes, and galvanized steel pipes for the rest of the pipes.

The system flow diagram is given below.

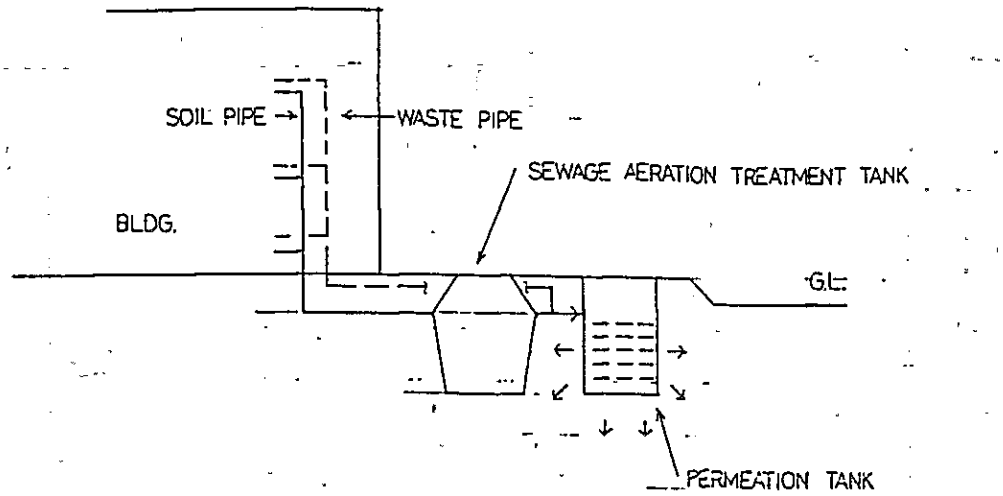


Fig. 5-4-1-(d)

The number of septic tanks installed in each building and their capacities are as follows:

- o S.C. tank for 100 persons x 4
- o R.L.C. tank for 15 x 1 and for 50 x 1
- o S.E.T.L. tank for 15 x 1
- o H.M.T.H. tank for 22 x 1

(B) Drainage of Hydraulic Test

Waste test water discharged from Research and Laboratory Building and Soil Engineering Test Laboratory is subject to a processing by seepage in the site. Waste water from the latter goes through a sedimentation process prior to final discharge.

Galvanized steel pipes shall be used for this system.

(3) Sanitary fixtures

Sanitary fixtures and sets of necessary metal fittings shall be installed. The sanitary fixtures shall be procured locally while the metal fittings will be supplied from Japan.

The number of sanitary fixtures to be installed in each building is as follows:

	Water Closet	Urinals	Wash Basins	Slop Sinks
S.C.	28	19	28	4
R.L.C.	10	8	10	1
W.E.T.L.	3	2	3	1
H.M.T.H.	2	1	2	0

(4) Fire fighting equipment

As a means of self protection, each floor shall be equipped with dry powder extinguishers at intervals of approximately every 20 meters of walking distance.

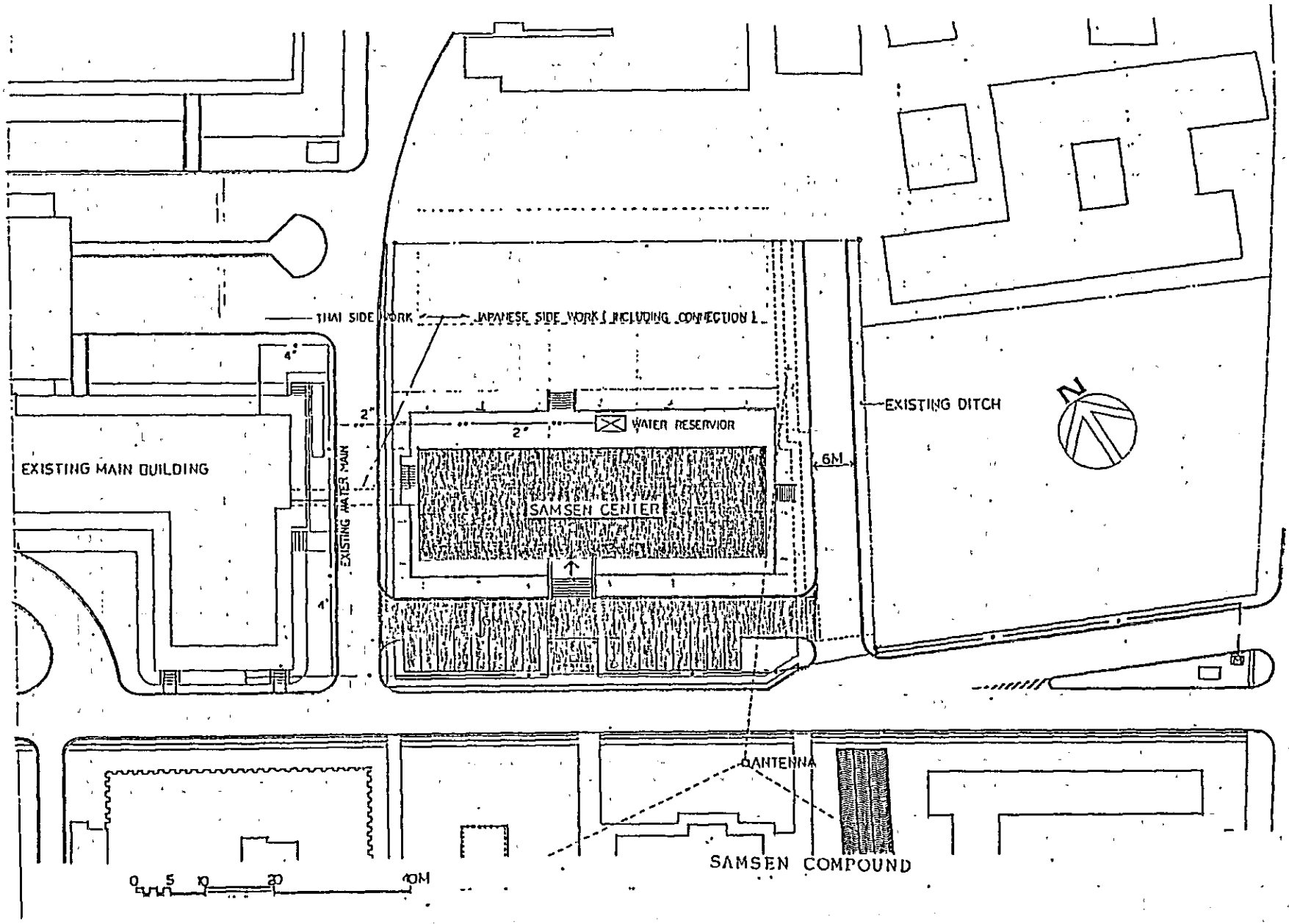


Fig. 5-4-1 (e) Boundary Condition of Water Supply (Samsen)

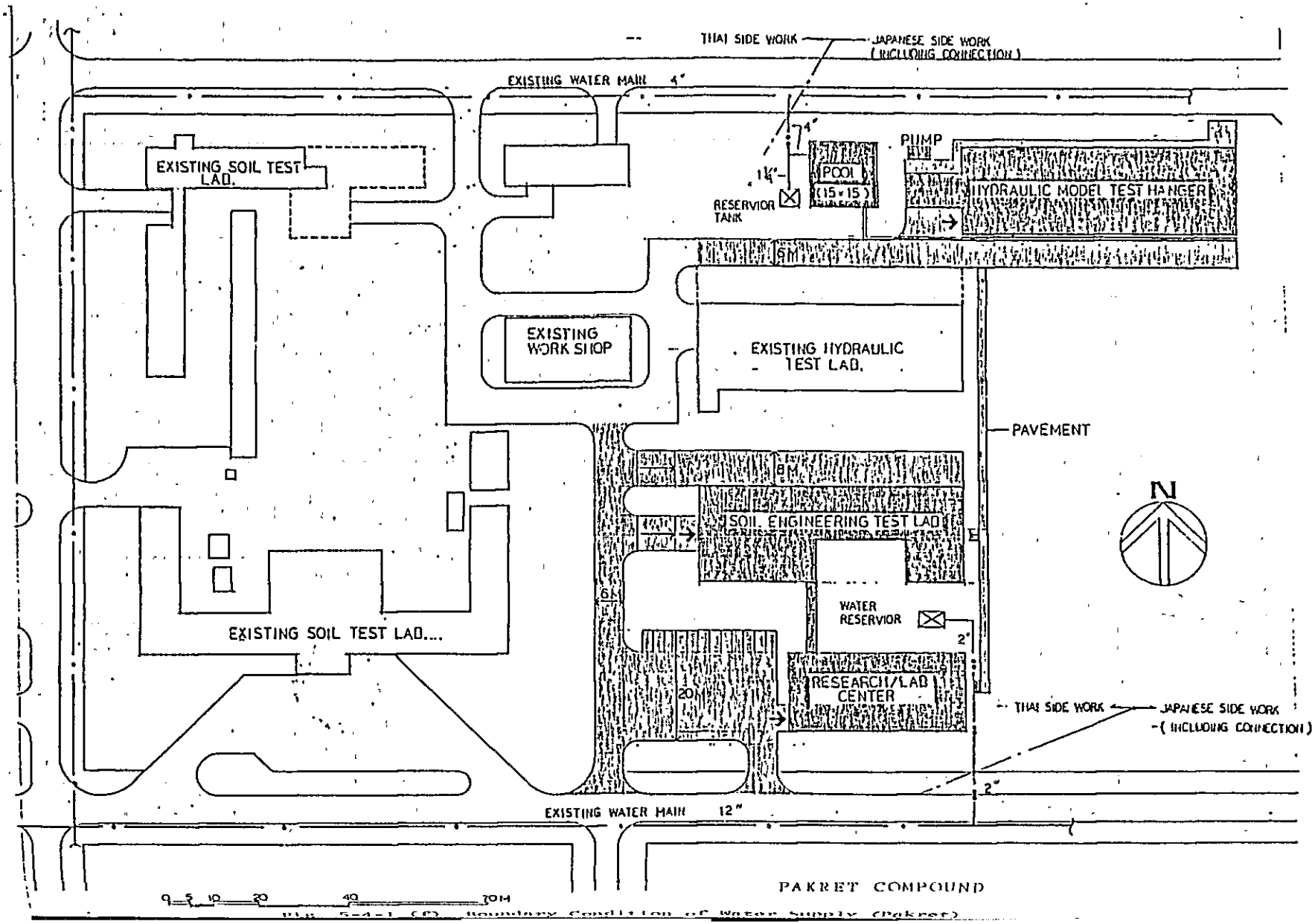


Fig. 5-4-1 (2) Boundary Condition of Water Supply (Pakret)

5.4.2 Air-conditioning and Ventilation Systems

The climate of the areas where the proposed sites are located is subject to generally high temperature and humidity.

The records of the average annual temperature in the Samsen Compound for the past 9 years indicate a very high level of 28.5° centigrade and that of the Pakret Compound for the last 5 years is even higher than that, 28.9° centigrade.

The average annual relative humidity at the both Compounds also registers high levels of 70% to 80%.

(1) For air conditioning purposes, a separate-type air-cooled package unit shall be installed in each room. THe operation and control of the units shall be performed on individual units. The air conditioners to be installed are as shown below:

Model & (Capacity)	Samsen Compound	Pakret Compound	Total
AC-1 (4,000 Kcal/H)	94 units	32 units	126
AC-2 (2,800 Kcal/H)	9	13	22
AC-3 (2,100 Kcal/H)	0	4	13

The following are the rooms where these air conditioners are to be installed:

Table 5-4-2 Rooms Air-conditioned

A. Samsen Center

1. Office of IEC Director

1) Office of Director

Director's Room
Secretary's Room
Conference Room

2) Management Support Section

Chief's Room

3) Inspection & Monitoring Section

Chief's Room
Office

4) Library

Reading Room (Library)
Chief's Room
Office
Book Stocking Room

5) Technical Training Branch

Chief's Room
Lecture Hall
Lecturers' Room
A/V Training Room
A/V Studio

6) Rooms for visiting Specialists

5 Researcher's Rooms
1 Large Research's Room

2. Engineering Development Division

1) Office of Director

Director's Room
Secretary's Room
Conference Room

2) Engineering Information Service Section

Chief's Room
Office
Data Storage I
Information Room

3) Criteria Development Section

Chief's Room
Office

4) Systems Engineering Section

Chief's Room
Office
Operators' Room
Data Energy Room
Computer Machine Room

5) Special Engineering Service Section

Chief's Room
Office

3. Common Use Facilities

1) Seminar/Conference Room

B. Research & Laboratory Center

1) Office of Director
   Director's Room

2) Management Support Section
   Chief's Room

3) Technical Training Branch
   Lecturer's Room

4) Library
   Reading Room

5) Common User Room
   Conference Room
   Data Analysis Room

6) Rooms for Visiting Specialist
   Researcher's Rooms

7) Soil Engineering Lab. Section
   Chief's Room
   Study Room

8) Hydraulic Lab. Section
   Chief's Room
   Study Room

9) Concrete & Material Lab. Section
   Chief's Room
   Study Room

C. Soil Engineering Test Laboratory

Lab. I

Lab. II

Lab. IV

Undisturbed Sample Room

Undisturbed Sample Preparation Room

(2) The ventilation of the planned facilities shall basically depend on natural ventilation, however, ventilators shall be installed in the walls of air conditioned rooms as they tend to become ill-ventilated because of the sealing required for air conditioning. Ventilation fan shall be installed in test lavatories as well.

Samsen Compound	Wall Fan	80 units
	Ceiling Fan	10 "
Pakret Compound	Wall Fan	40 "
	Ceiling Fan	9 "

5.4.3 Electrical Plan

(1) Samsen Center

1) Receiving and distribution system

A high tension cable shall be drawn in from the leading-in pole near the peripheral of the site to Electric Room, where an oil-immersed transformer and low tension switchboard are to be installed. The protection of the transformer shall be provided with a power fuse.

Primary voltage	3 phase 3 wires 11 KV 50 Hz
Secondary voltage	3 phase 4 wires 230/132 V
Transformer capacity	Approximately 300 KVA

2) Feeders system

The wiring from the low tension switchboard in Electric Room to each panelboard and power control panel shall be executed via cables.

Lighting & outlet loads	Approx. 180 KVA
Power loads	Approx. 200 KVA

3) Lighting system

Fluorescent lamps will provide the main source of lighting while the following points shall be taken into consideration:

- o Those lighting fixtures located near the windows shall be subject to local switching independent of the rest of the lighting fixtures.
- o In view of the request by the Thai side as well as local conditions, the intensity of illumination shall be as follows:

Major rooms	Intensity
Offices, Laboratories, Library	350 lux (at Fl + 800 m.m.)
Lecture Hall	350 lux (")
Conference Rooms	300 lux (")
Storage Rooms, etc.	150 lux (Fl. Level)
Corridors, Hallways, etc.	150 lux (")

4) Telephone system

Conduits extending from the building to the perimeter of the site shall be buried in the ground to house lead-in cables for telephone. A Main Distribution Frame (MDF) shall be installed on the ground floor of the Samsen Center. At the same time, the work shall include the installation of terminal boards and extension telephones together with piping and wiring for them.

Locations to install telephones:

- o Each office and researcher's room
- o Offices of Chiefs and Directors
- o LIbrary, etc.

Total approximately 35 locations

5) Public address system

For public paging purposes, necessary devices shall be installed in Management Support Section and Receiption Counter on the ground floor.

6) Emergency alarm system

Each floor shall be equipped with emergency push buttons and alarm bells for use in an emergency, and a display panel shall be installed in Management Support Section.

7) Others

Other systems under plan include the following:

- o Power wiring system
- o Community TV receiving system
- o Interphone system
- o Lightning protection system

(2) Research & Laboratory Center (Pakret)

1) Receiving and distribution system

A high tension cable shall be led in from a leading in pole at the perimeter of the site to the transformer located at the eastern side of Research and Laboratory Center. This transformer shall commonly serve Research and Laboratory, Soil Engineering Test Laboratory, and Hydraulic Model Test Hangar. A low tension switchboard to be placed in Research and Laboratory Center shall also distribute power to the other two buildings. As no large capacity loads are required for the test facilities in Hydraulic Model Test Hangar, 200 V should be sufficient for the voltage on the secondary side.

Primary voltage	3 phase 3 wires 11 KV 50 Hz
Secondary voltage	3 phase 4 wires 230/132 V
Transformer capacity	Approximately 300 KVA

2) Feeders system

The wiring from the indoor low tension switchboard to the other buildings and other facilities in Research and Laboratory Center shall be of cable works.

Lighting & outlet load	Approx. 180 KVA
Power loads	Approx. 200 KVA

3) Lighting system

The lighting system shall be similar to that of the Samsen Center.

4) Telephone system

The necessary work shall include piping between the outdoor telephone facility and the indoor MDF, piping and wiring upto telephones in each room, and installation of extension telephones.

Locations to install telephones:

- o Total of 14 locations including offices, etc.
  (16 locations in total at the three buildings)

5) Public address system

A common public address system shall be used in Research and Laboratory Center, Soil Engineering Test Laboratory, and Hydraulic Model Test Hangar. Devices necessary for this purpose shall be installed at the office of Management Support Section in the building of Research and Laboratory Center.

6) Emergency alarm system

This system shall be similar to that in the Samsen Center.

&) Others

The following systems shall be considered:

- o Power wiring system
- o Community TV receiving system
- o Lightning protection system

(3) Soil ENgineering Test Laboratory (Pakret)

1) Feeders system

An underground cable shall be drawn in from the indoor switchboard in Research and Laboratory Center.

Lighting and outlet loads	Approx. 50 KVA
Power loads	Approx. 50 KVA

2) LIghting system

This system shall be similar to that of Samsen Center.

3) Telephone system

THe necessary work involves the piping, wiring for the telephones to be installed in the offices of laboratory researchers and engineers, and installation of extension telephones.

4) Public address system

Loudspeakers shall be installed in the corridors. An amplifier shall be located in Research and Laboratory Center, and it will be possible to page therefrom.

5) Interphone system

Interphones shall be installed for communications between the rooms.

o Type of interphones	2-way interphone
o Locations	7 places

6) Others

The following shall be considered:

o Power wiring system
o Emergency alarm system

(4) Hydraulic Model Test Hangar (Pakret)

1) Feeders system

An underground cable shall be drawn in from the indoor switchboard in Research and Laboratory Center.

Lighting and outlet loads	Approx. 40 KVA
Power loads	Approx. 40 KVA

2) Lighting system

Lighting in the offices shall be provided mainly by fluorescent lamps and in the In-door Model Test Hangar by mercury lamps. Electric shock insect killers will also be installed at a few locations outside the building as lighting of mercury lamps is likely to attract insects at night.

Room	Intensity
Offices	350 lux (at Fl + 800)
Storage Rooms	150 lux (Fl. Level)
In-door Model Test Hangar	140 lux (")

3) Telephone system

The telephone system for this building requires piping and wiring form Research and Laboratory Center to the offices of researchers and engineers as well as the installation of extension telephones.

4) Public address system

Loudspeakers shall be installed in researchers' and engineers' offices and Test Rooms. Paging in the Hangar will be possible from Research and Laboratory Center where the amplifier for the public address system is located.

5) Others

The installation of the following shall be considered:

o Power wiring system

(5) Spare parts

Any spare parts deemed not easily available in the Thai market would possible by furnished.

(6) Connection Diagram of Receiving and Substation System

The planned receiving and substation system is as shown in the connection diagram (Fig. 5-4-3-(a)). Transformers shall be protected by power fuse.

Legend:

PT	Potential transformer
CT	Current transformer
UVR	Undervoltage relay
OVR	Overvoltage relay
OCR	Overcurrent relay
VS	Voltmeter switch

AS	Amperemeter switch
V	Alternating current voltmeter
A	Alternating current amperemeter
WH	Watt-hour meter
W	Watt meter
PF	Power-factor meter
MCB	Lowvoltage circuit breaker

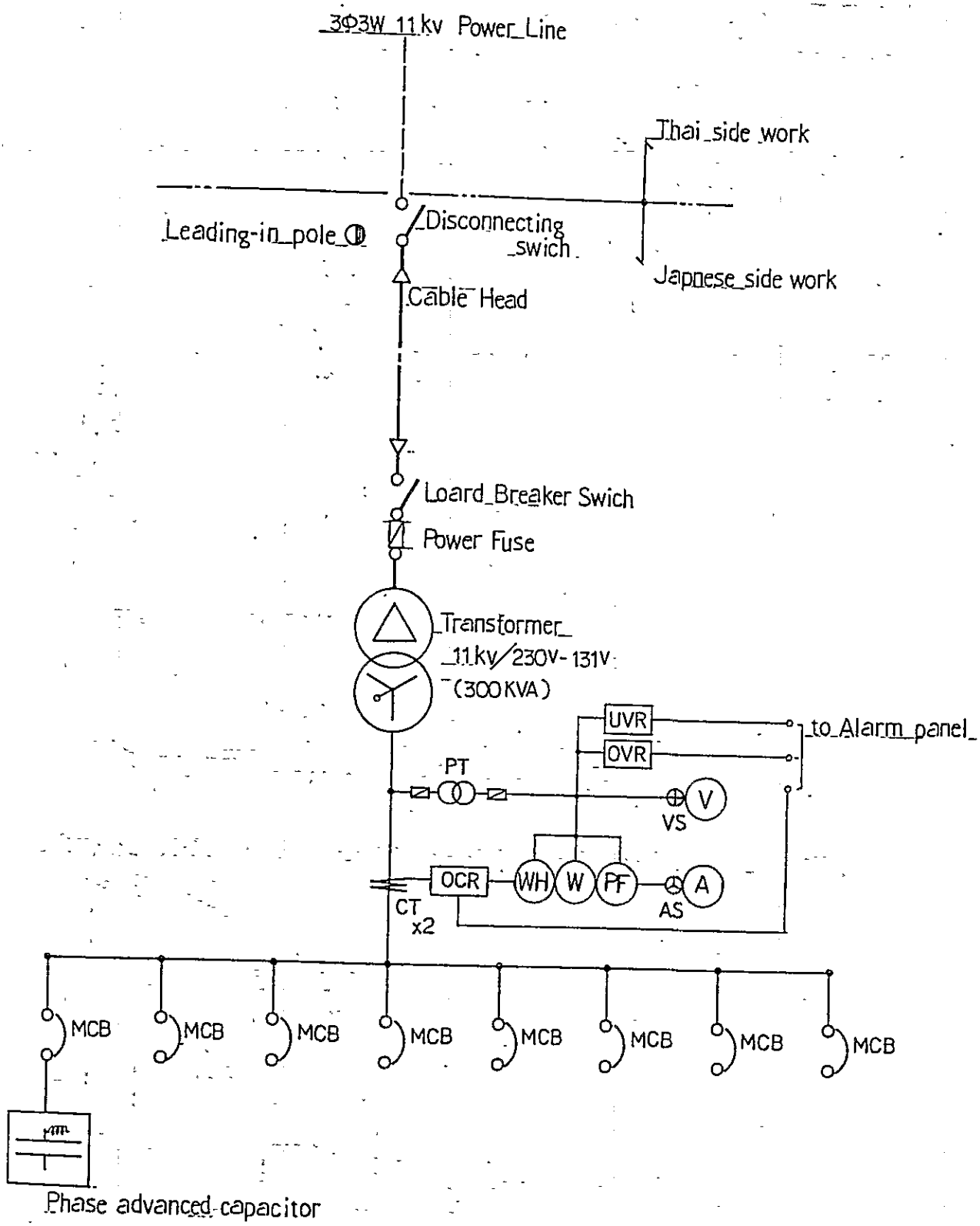


Fig. 5-4-3 (a) Connection Diagram of Receiving and Substation System

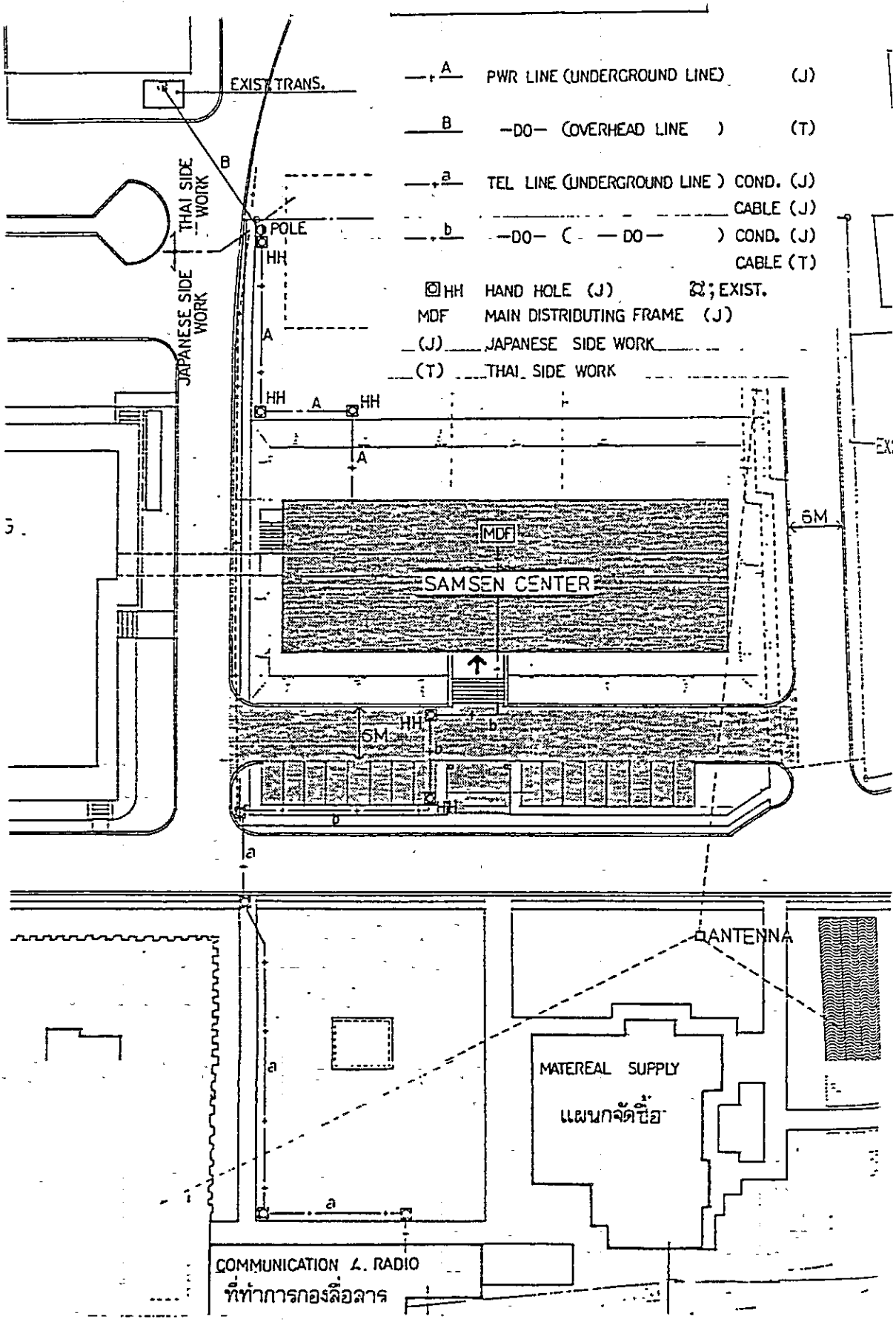


Fig. 5-4-3 (b) Boundary Condition of Incoming Power Line and Telephone Line (Samsen)

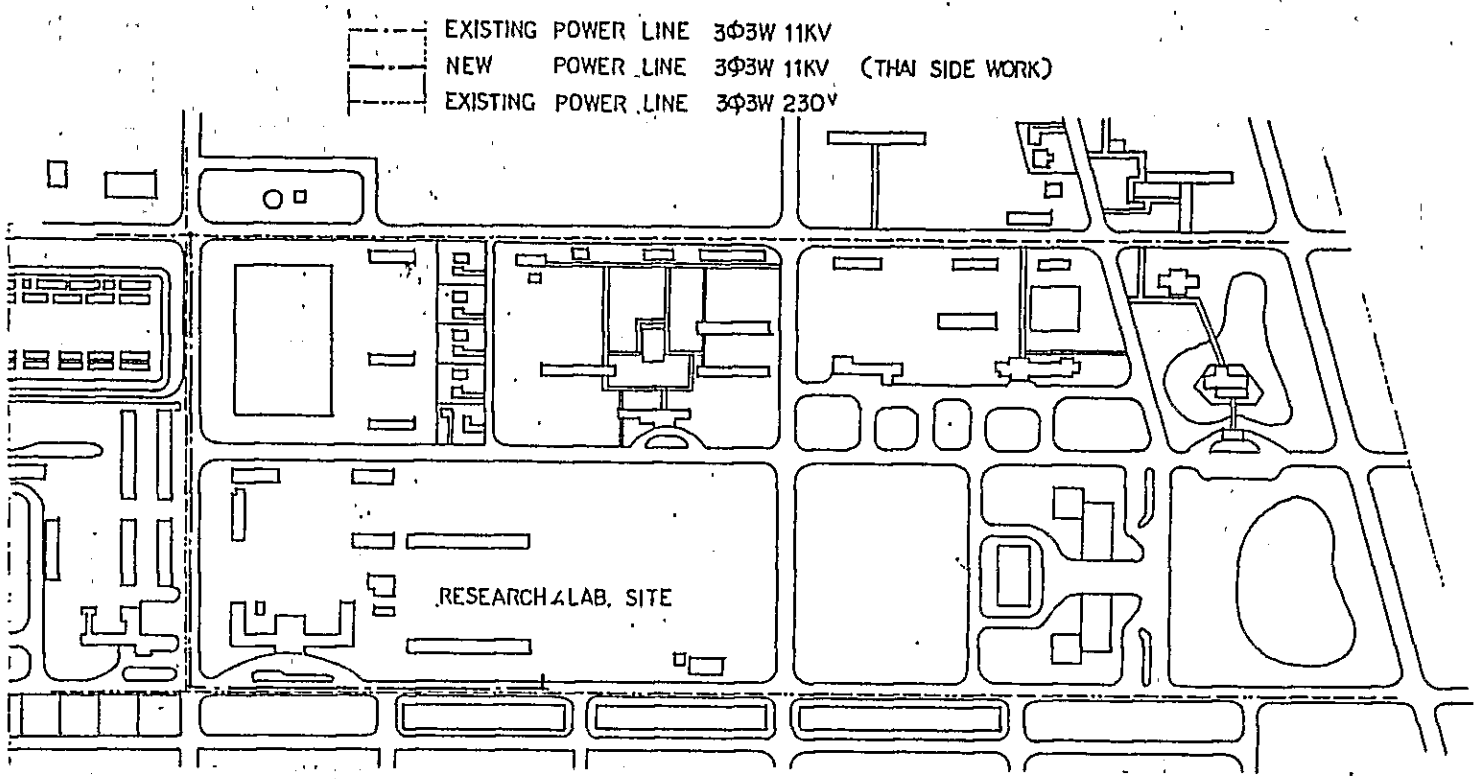


Fig. 5-4-3 (c) Boundary Condition of Incoming Power Line (Pakret)

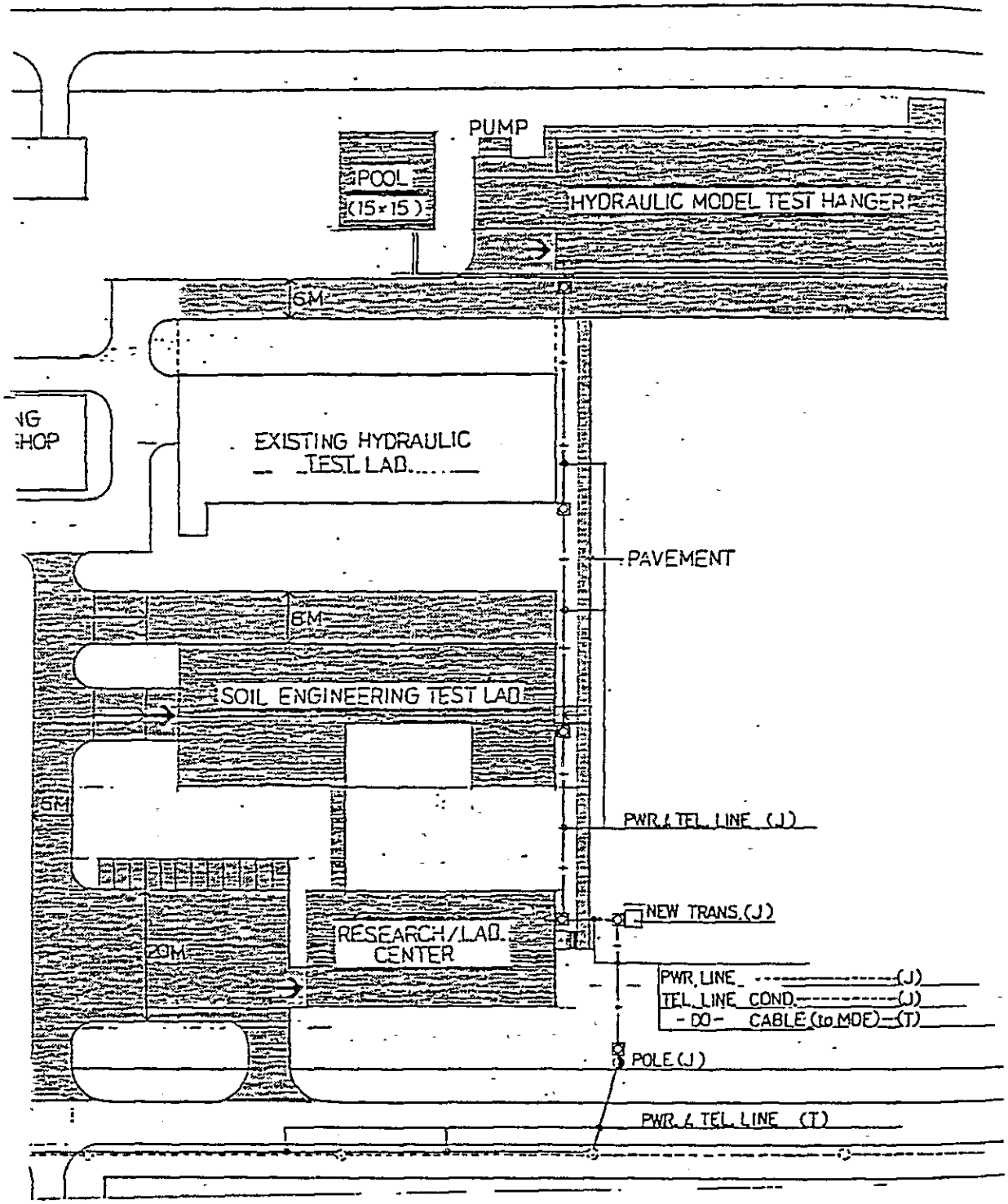


Fig. 5-4-3 (d) Boundary Condition of Incoming Power Line and Telephone Line (Pakret)

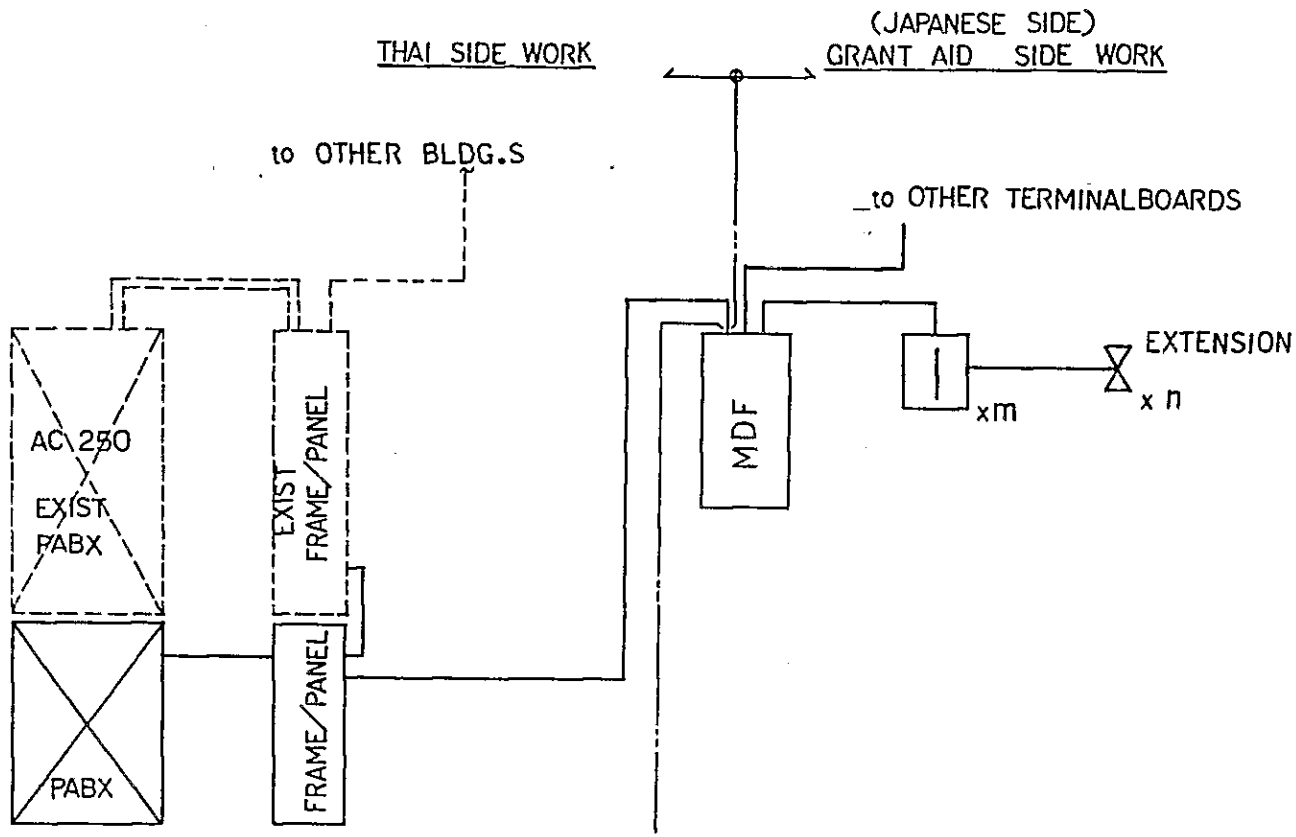


Fig. 5-4-3 (e) Boundary Condition of Private Automatic Branch Exchanger (P.A.B.X.) System

5.5 Equipment Plan

As the result of research and study, the equipment required in each room is itemized, classified in each category with their quantities and specifications, as follows:

5.5.1 Equipment for training (Samsen & Pakret)

Note: (P) shows rooms located in Pakret

No.	Description	Q'ty	Room
1.	35 mm slide projector (Projection lamp; halogen lamp 250 w) (Projection lens; 75 - 100 mm) (W/synchronized sound taperecorder)	3	A/V Studio Lecture Hall
2.	Over head projector (O.H.P.) (Projection lamp: halogen lamp 650 w)	5	- DO. -
3.	16 mm movie projector (Projection lamp: halogen lamp 250 w W/remote con. unit)	1	A/V Studio
4.	16 mm movie projector (Projection lamp; halogen lamp 250 w)	1	Lecture Rm. -2 (P)
5.	Video projector (100 inch)	1	A/V Studio
6.	Video recorder	1	- DO. -
7.	Portable video recorder	3	A/V Studio Lecture Rm. -2 (P)
8.	Episcope	1	A/V Studio
9.	Screen (size 210 x 210 mm)	2	Lecture Rm. -2 (P) A/V Training Rm.
10.	Screen (size 240 x 180 mm)	1	Lecture Hall
11.	Screen for O.H.P. (size 180 x 180 mm W/triped)	5	
12.	Amplifier set	3	A/V Studio Lecture Hall Lecture Rm. -2 (P)

No.	Description	Q'ty	Room
13.	A/V mixing console	1	A/V Studio
14.	Remote control console (for amplifier and projector)	2	A/V Training Rm. Lecture Hall
15.	Automatic Colour-slide processor (size of originals; from 71 x 105 mm to 284 x 420 mm)	1	A/V Studio
16.	Transparency maker, O.H.P. (stage size; 236 x 204 mm)	1	- DO. -
17.	Video editing system, including		- DO. -
	Editing control unit	1	
	Video switch	1	
	Colour telop unit	1	
	Colour monitor TV	2	
	Video recorder	2	
	Console	1	
18.	Video recording system, including		A-V Studio
	Colour camera	1	
	Portable video recorder	1	
	Battery charger & battery	1	
	Dynamic microphon	1	
	Tripod w/dolly	1	
	Carring case	1	
19.	Word processor (Thai, memory 64 KBT)	1	Small Lecture Rm. -1
20.	Typewriter (Thai and English)	5	Small Lecture Rm. -1 Management Suport Section

5.5.2 Equipment for Engineering Development (Samsen & Pakret)

No.	Description	Q'ty	Room
1.	Microfilm camera (maximum lens covering area at 1:30 reduction; 960 x 1,350 mm)	1	Eng. Information Service Section
2.	Power source unit for microfilm camera	1	- DO. -
3.	Automatic microfilm processor	1	- DO. -
4.	Microfiche camera processor (film size; 105 x 148.75 mm microfiche)	1	- DO. -
5.	Water supply unit for the above processors	2	- DO. -
6.	Microfilm reader (film; microfiche and microfilm) (screen size; 300 x 420 mm)	1	- DO. -
7.	Microfilm reader-printer (film; microfiche and microfilm) (printing size; A3, A4, B4, B5)	2	- DO. -
8.	Printing equipment set, including Plate making machine	1	Copy Service Center
	Printing machine (paper size: 305 x 432 mm)	1	- DO. -
	Cutter (max. cutting thikness: 50 mm)	1	- DO. -
	Binding machine (max. size 430 x 275 mm) (min. size 125 x 100 mm)	1	- DO. -
9.	Photo copying machine (paper size; A3, A4, B4, B5) (copying multiplier; 100%, 80%, 70%) (W/sorter)	2	- DO. - Copying Service (P)
10.	Photo copying machine (paper size; A3, A4, B4, B5) (copying multiplier; 100%)	1	Copying Service Center
11.	Diazo duplicator (paper size: max. A1)	2	- DO. - Copying Service Rm. (P)

No.	Description	Q'ty	Room
12.	Facsimile (recording paper size; A4, B4) (main scaning density; 8 dot/mm)	2	Eng. Information Service Sec. Data Analysis Rm. (P)
13.	Dark room sets for development	1	Dark Rm.
14.	Camera sets		
	35 mm camera (Nikon F3 equivalent)	1	- DO. -
	Finder	1	- DO. -
	Zoom lens (36 - 72 mm)	1	- DO. -
	- ditto - (70 - 210 mm)	1	- DO. -
	Electric Flash	1	- DO. -
	tripod	1	- DO. -

5.5.3 Equipment for Technical Calculation (Samsen)

No.	Description	Q'ty	Room
1.	Minicomputer system		
	C.P.U., including CPU IMB 2 x Disk Disk 121MB & 10MB	1	Computer Machine Rm.
	Floppy disk	1	- DO. -
	Second UNIBUS adapter	1	- DO. -
	Expansion cabinet	1	- DO. -
	Expansion box	1	- DO. -
	2-SU backplane	1	- DO. -
	Magnetic tape 1600BPI	1	- DO. -
	Line printer 300 LPM	1	- DO. -
	Lette writer 240 CPS	1	- DO. -
	Inter face	1	- DO. -
	Video display terminal 12"	5	Data Entry Rm.
	Modem cable (100 feet)	5	
	Software FORTRAN, BASIC	1	Computer Machine Rm.
	Plotter A0 size	1	- DO. -
	Controller	1	- DO. -
	Digitizer A0 size	1	- DO. -
	Graphic display 12"	1	- DO. -

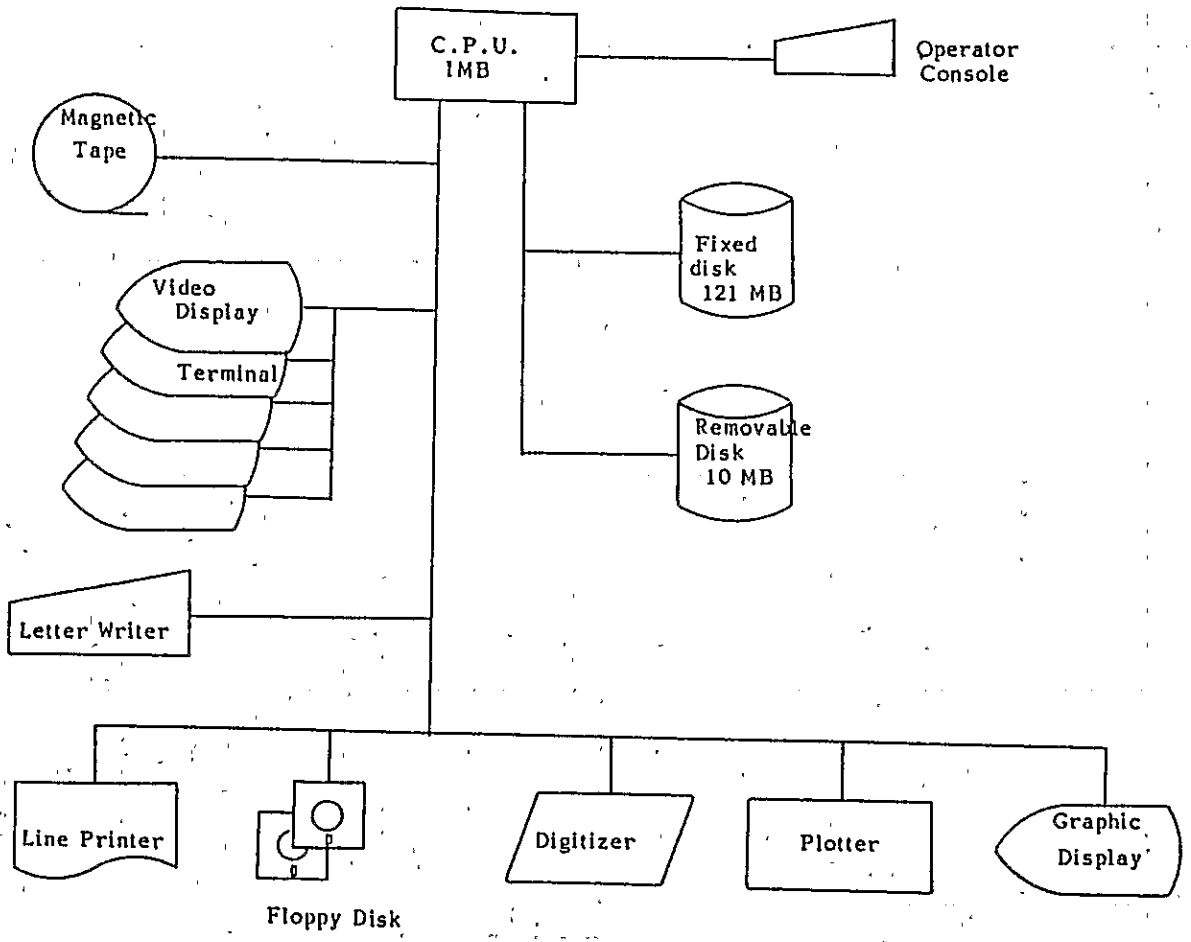


Fig. 5-5-3 System Diagram

5.5.4 Equipment for Soil Test (Pakret)

No.	Description	Q'ty	Room
1.	Triaxial test apparatus (specimen size; ϕ35, ϕ50 mm) (loading capacity; 300 kg)	1	Lab. -4
2.	X-Y recorder for above (recording width; 180 by 250 mm) (recording pen; 3 pens)	1	- DO. -
3.	X-T recorder for above (recording width; 250 mm) (recording pen; 3 pens)	1	- DO. -
4.	Calculating recording unconfined compression test apparatus (applied speciemen size; ϕ35 by 80 mm and ϕ50 by 120 mm)	1	- DO. -
5.	Light weight unconfined compression test apparatus (applied speciemen size; ϕ60 x 50 mm)	1	- DO. -
6.	Elastic ring load transducers (determination capacity; 50, 100, 200, 300, 500, 1000 kgf)	1	- DO. -
7.	Dial displacement transducers 9measuring range; 10, 20, 50 mm)	1	- DO. -
8.	Transducer amplifiers (measuring range; ±20,000 x 10^{-6} strain)	3	- DO. -
9.	Consolidometer (speciemen size: ϕ60 x 20 mm) (loading capacity 0.05 - 12.8 kgf/cm^2)	1	Lab. -3
10.	Large direct shear apparatus (shearing load; 3,000 kgf)	1	- DO. -
11.	Improved direct shear apparatus (shearing load; 200 kgf)	1	- DO. -
12.	X-Y recorder for above (recording width; 180 by 250 mm) (recording pen; 300 pens)	1	- DO. -

No.	Description	Q'ty	Room
13.	Consoil-percolation test apparatus (specimen size; ϕ200 x 75 mm) (loading capacity 5,000 kgf)	1	Lab. -1
14.	Variable head permeability test apparatus (specimen size; ϕ100 x 127 mm)	1	- DO. -
15.	Constant head permeability test apparatus (specimen size; ϕ100 x 127 mm)	1	- DO. -
16.	Simplified vacuum suction device (motor driven type)	1	- DO. -
17.	ASTM compaction test machine set (specimen size; ϕ4", ϕ6")	1	- DO. -
18.	Standard mechanical soil compactor (specimen size; ϕ4", ϕ6")	1	- DO. -
19.	Motorized CBR test apparatus (loading rate; 1 mm/min.) (loading capacity; 5,000 kgf)	1	- DO. -
20.	Field CBR test apparatus (loading capacity; 5,000 kgf)	1	- DO. -
21.	Vibrating sieve shaker (sieves size; ϕ200, ϕ150 mm)	1	Lab. -2
22.	Sieve set (sieve size; ϕ200 x 60 mm) (W/12 sieves with a pen and cover)	2	- DO. -
23.	Automatic hydrometer jar bath (inside dimensions; 160 x 900 x 360 mm)	1	- DO. -
24.	Hydrometer jar (capacity; 1000 ml)	10	- DO. -
25.	Bouyoucos hydrometer (scale range; 0.995 - 1.050 1)	5	- DO. -
26.	Mechanical stirring apparatus (10,000 r.p.m. under no load)	1	- DO. -
27.	Liquide limit test set (JIS type)	1	- DO. -

No.	Description	Q'ty	Room
28.	Plastic limit test set (size; 300 x 400 x 6 mm)	1	Lab. -2
29.	Shrinkage limit test set (JIS type)	1	- DO. -
30.	Ion exchange apparatus (purification capacity; 19 l/hr.)	1	- DO. -
31.	Electric oven (inner size; 100 x 75 x 60 cm)	1	- DO. -
32.	Triple beam balance (capacity; 311g, sensitivity; 0.01g)	1	- DO. -
33.	Triple beam balance (capacity; 2610g, sensitivity; 0.1g)	1	- DO. -
34.	Table balance (capacity; 100g, 500g, 1 kg, 5 kg)	1	- DO. -
35.	Table platform scale (capacity; 10 kg, 20 kg)	1 set	- DO. -
36.	Platform scale (capacity; 50 kg, 100 kg)	1 set	- DO. -
37.	Direct reading single pan (capacity; 200 g, graduation; 0.1 mg)	1	- DO. -
38.	Equipment for physical test set evaporation dish porecelain (30), beaker (10), tray (20), spatula (5), filler (2), iron pestle & mortar (2), sprayer (1)	1	- DO. -
39.	Trafficability test apparatus (capacity; 100 kgf)	1	Out Door Equip. Storage
40.	Plate bearing test set (capacity; 5,000 kgf)	1	- DO. -
41.	Cone penetrometer (capacity; 100 kgf)	1	- DO. -
42.	Hand auger set (size; ϕ10 cm)	1	- DO. -
43.	Plate bearing test set for structural foundation test (capacity; 25,000 kgf)	1	- DO. -

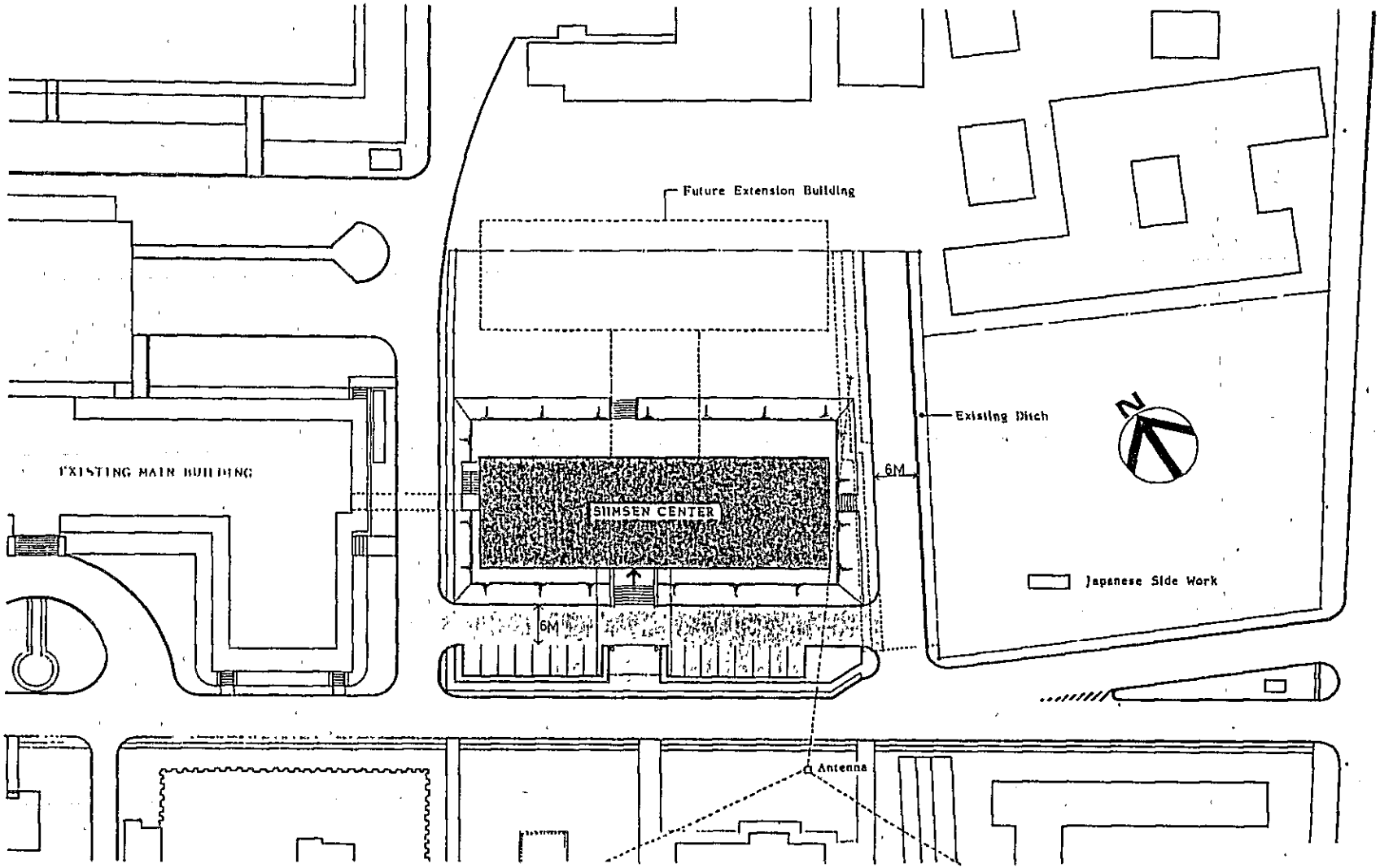
No.	Description	Q'ty	Room
44.	BS sand cylinder apparatus (capacity; 3 l)	1	- DO. -
45.	Modified horizontal sample extruder (specimen size; ϕ75 x 1000 mm)	1	- DO. -

5.5.5 Equipment for Hydraulic Model Test (Pakret)

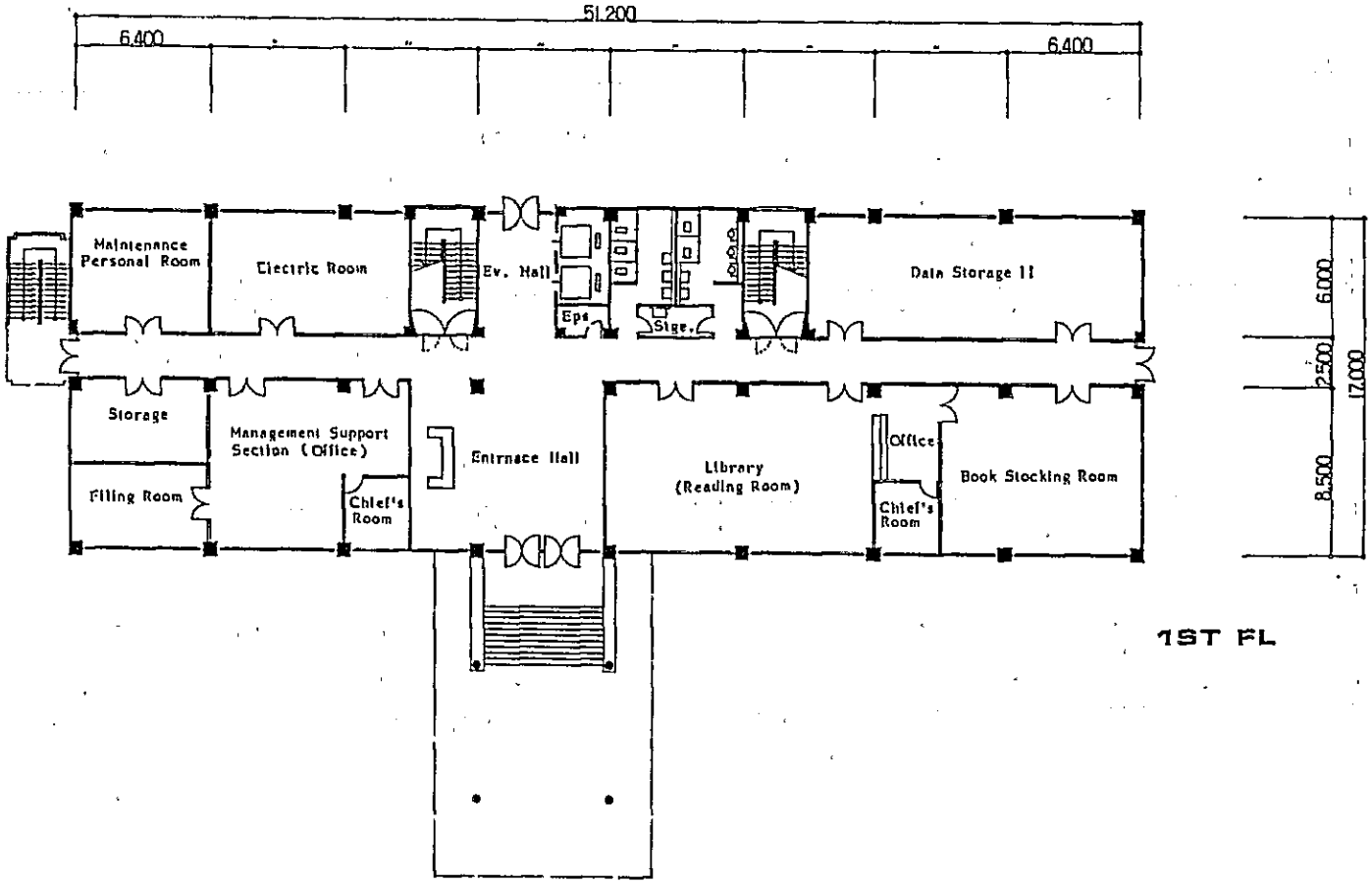
No.	Description	Q'ty	Room
1.	Electric wood planer (16 inch)	1	Equipment Storage (Hydraulic Test Hangar)
2.	Circular saw, metal use	1	- DO. -
3.	Band saw, wood use	1	- DO. -
4.	Drilling machine, bench boring	1	- DO. -
5.	Arc welding machine	1	- DO. -
6.	Abrasive cut-off wheel, portable	1	- DO. -
7.	Hoist, manual	1	- DO. -
8.	Point gauge for hydraulic test (variable range; 600 mm) (W/fine adjustable unit)	2	- DO. -
9.	Current meter (screw type) (measuring range; 3 - 150 cm) (W/electric calculator)	1	- DO. -
10.	Pitot tube, manometer (total length; 440 mm) (reading scale 500 - 0 - 500 mm)	2	- DO. -
11.	C-clamp, with screw (50 mm)	20	- DO. -
12.	Level	1	- DO. -
13.	Drafting machine	1	Study Rm. (Hydraulic Model Test Hangar)
14.	Inclinable variable open cannel (500 x 500 x 17,000) (triangular weirs, square weirs, water tank capacity, weir, sluice gate, Parshall flume)	1	In-door Model Test Hangar
15.	Camera 35 mm (Nikon F3 equivalent)	2	Study Rm. (Hydraulic Model Test Hangar.)

No.	Description	Q'ty	Room
16.	Enlarger	1	Study Rm. (Hydraulic Test Hangar)
17.	Developing Equipment	1	- DO. -
18.	Equipment for movie & screen	1	- DO. -
19.	Micro-computer (CPU 64 KB dot printer, color display, floppy disk)	1	- DO. -
20.	Programmable calculator	2	- DO. -

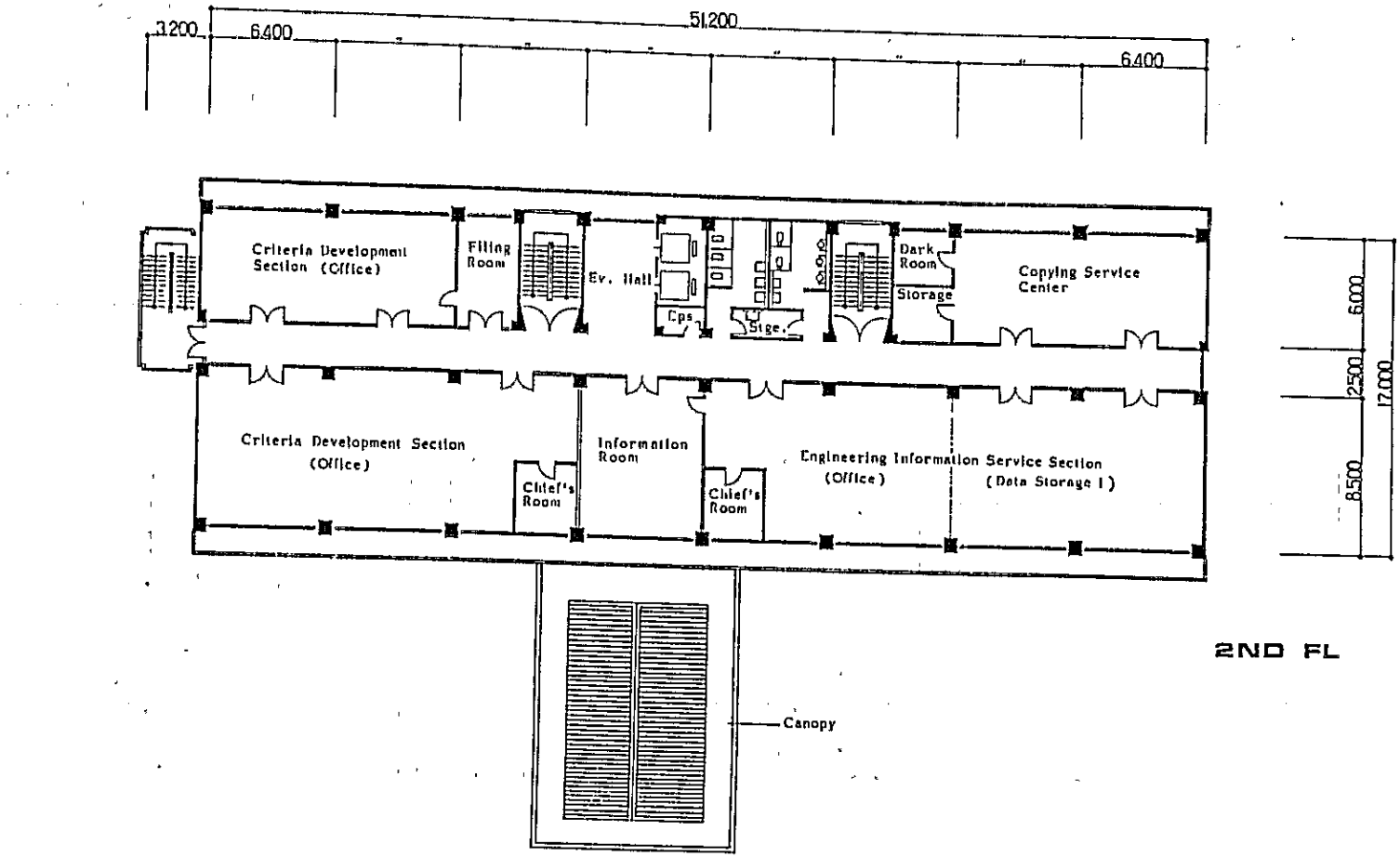
5—6 Basic Design Drawings

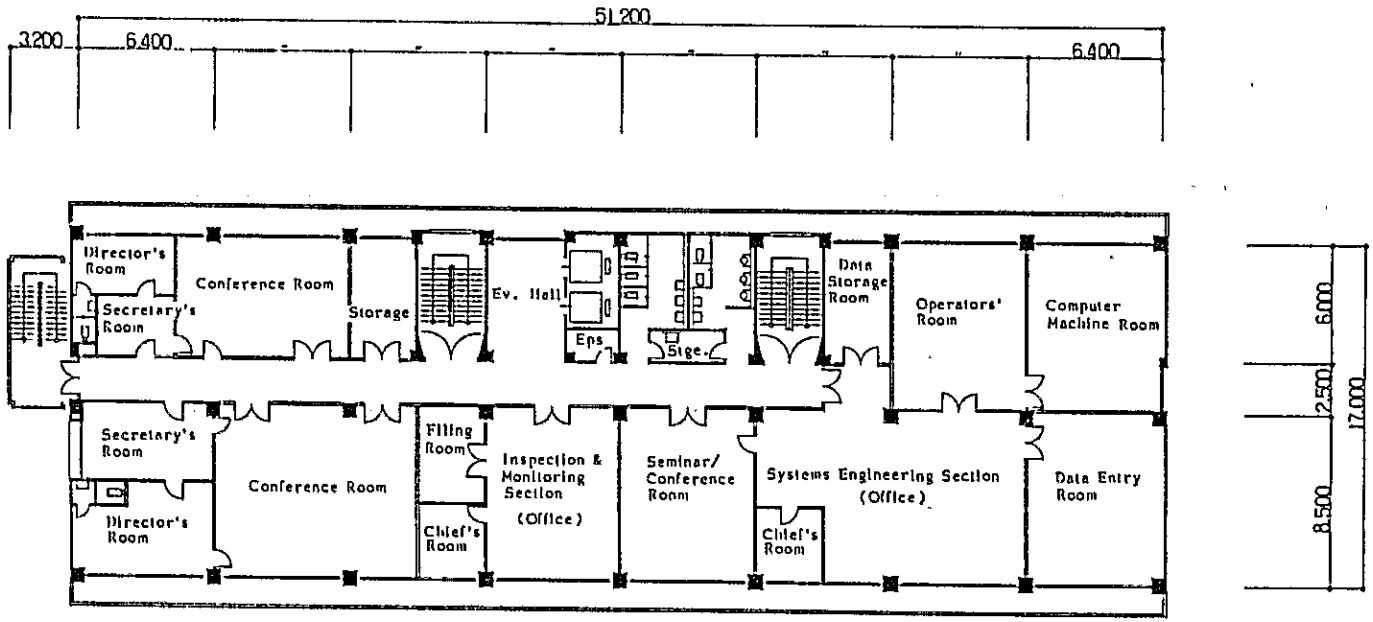


SAMSEN PLOT PLAN 1



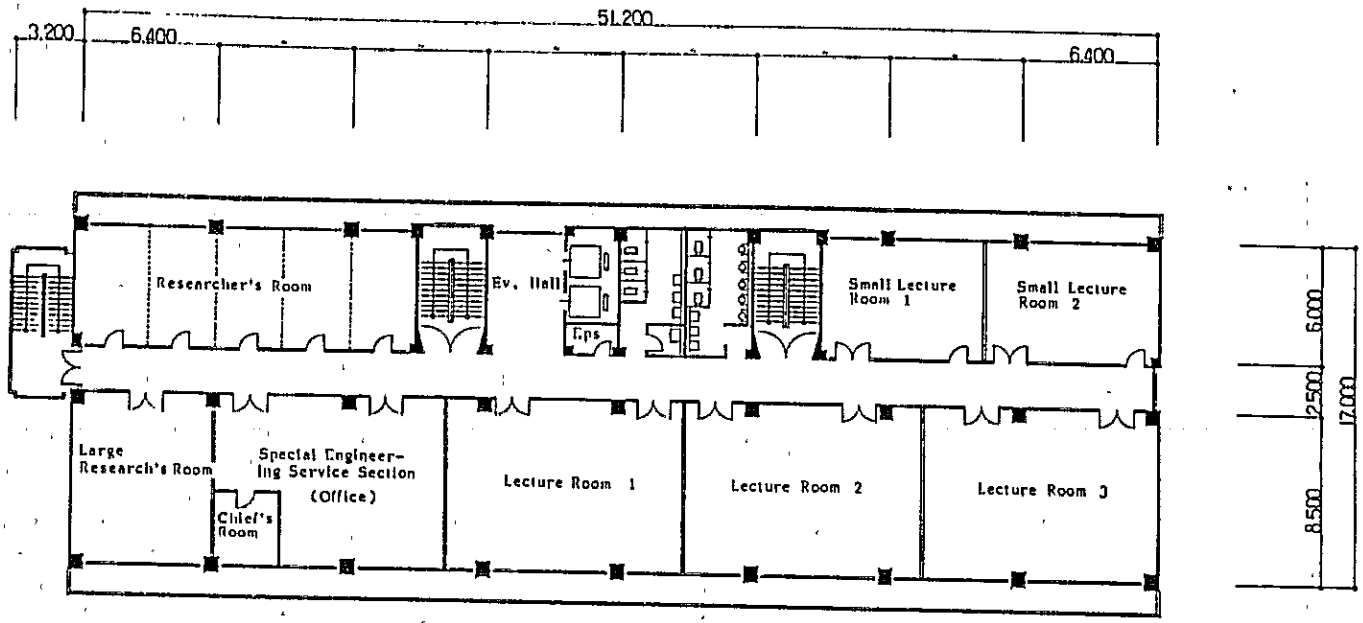
SAMSEN CENTER PLAN 2


3200
6400
51200
6400
Criteria Development Section (Office)
Filing Room
Ev. Hall
Cps.
Stge.
Dark Room
Storage
Copying Service Center
Criteria Development Section (Office)
Chief's Room
Information Room
Chief's Room
Engineering Information Service Section (Office)
(Data Storage I)
Canopy
6000
2500
8500
17000
2ND FL
0
5
10
20M



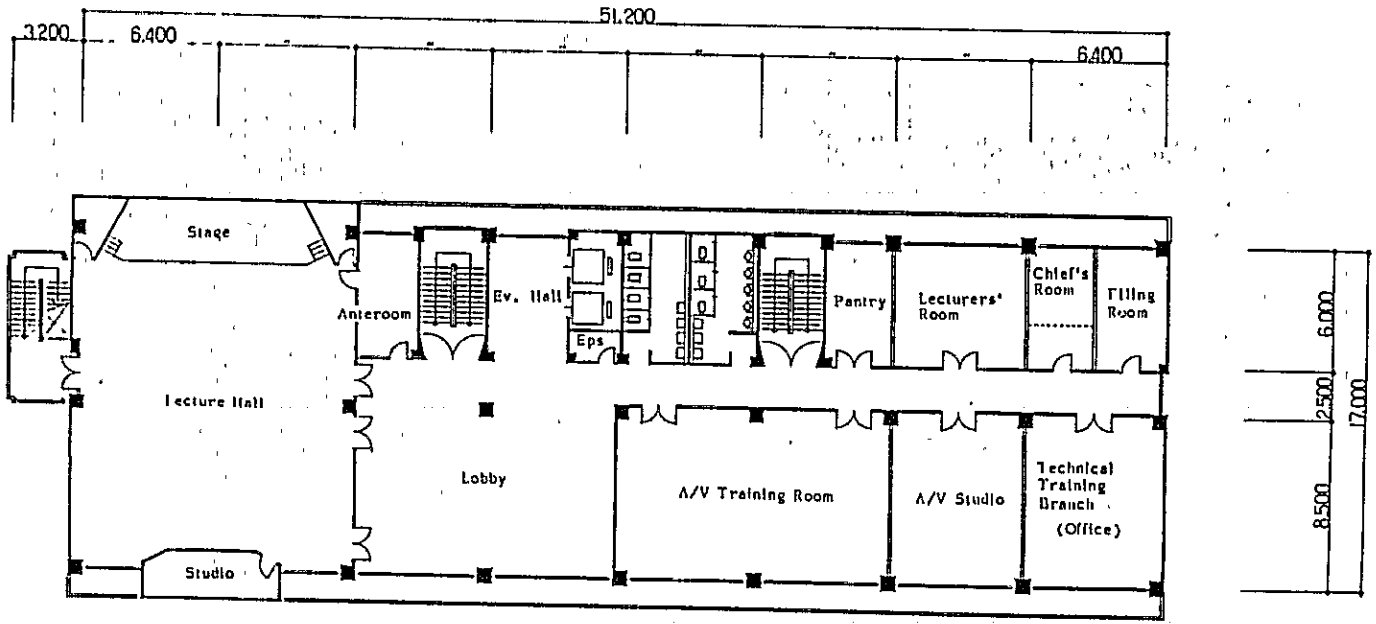
3RD FL

0 5 10 20M



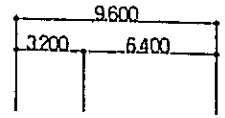
4TH FL

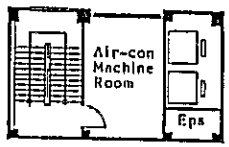
0 5 10 20M



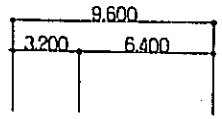
5TH FL

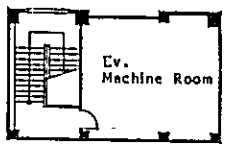
0 5 10 20M

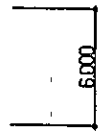




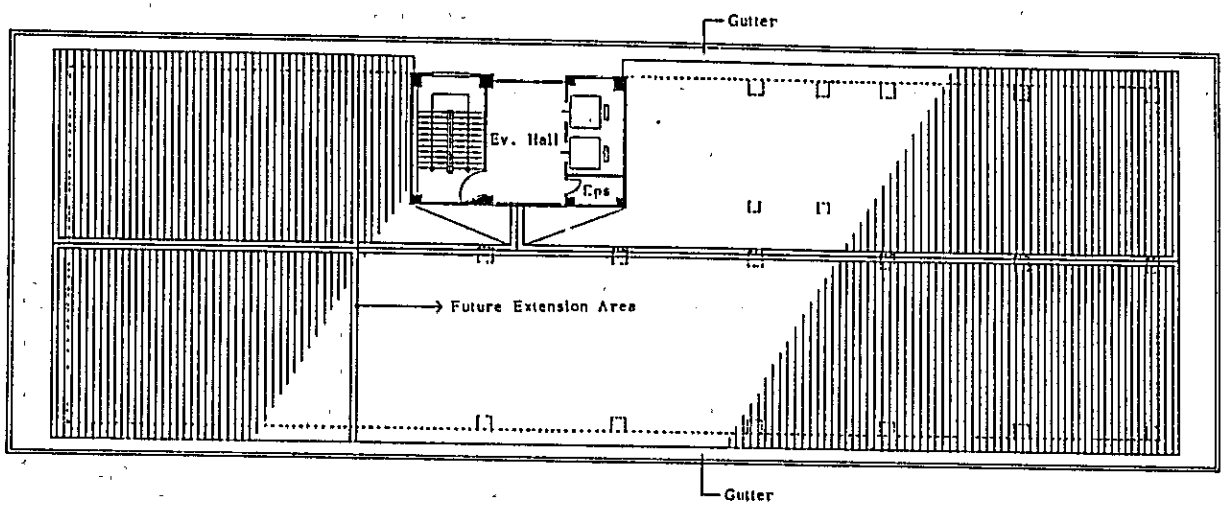
PH2ND



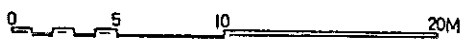


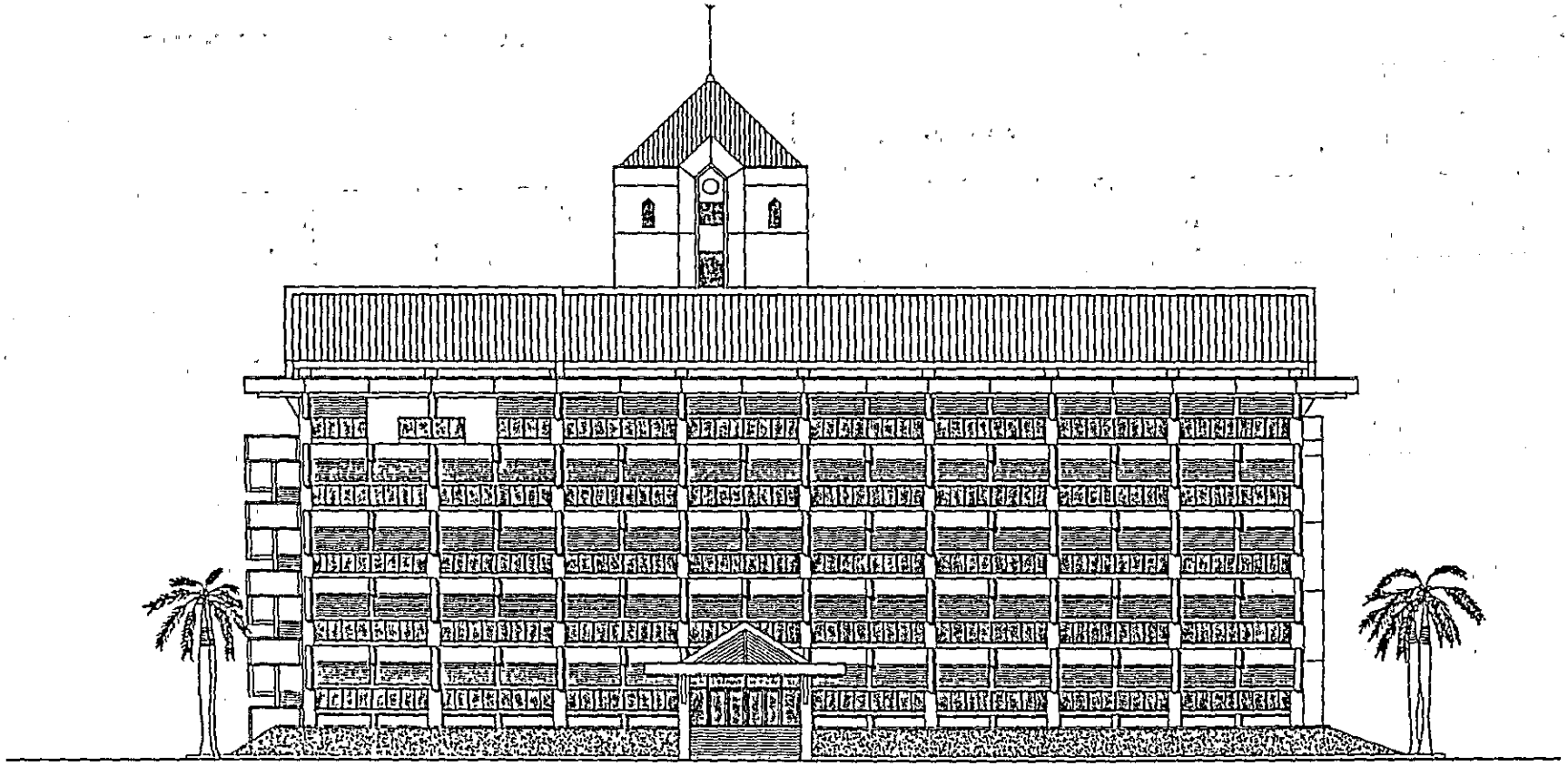


PH3RD



PH1ST FL

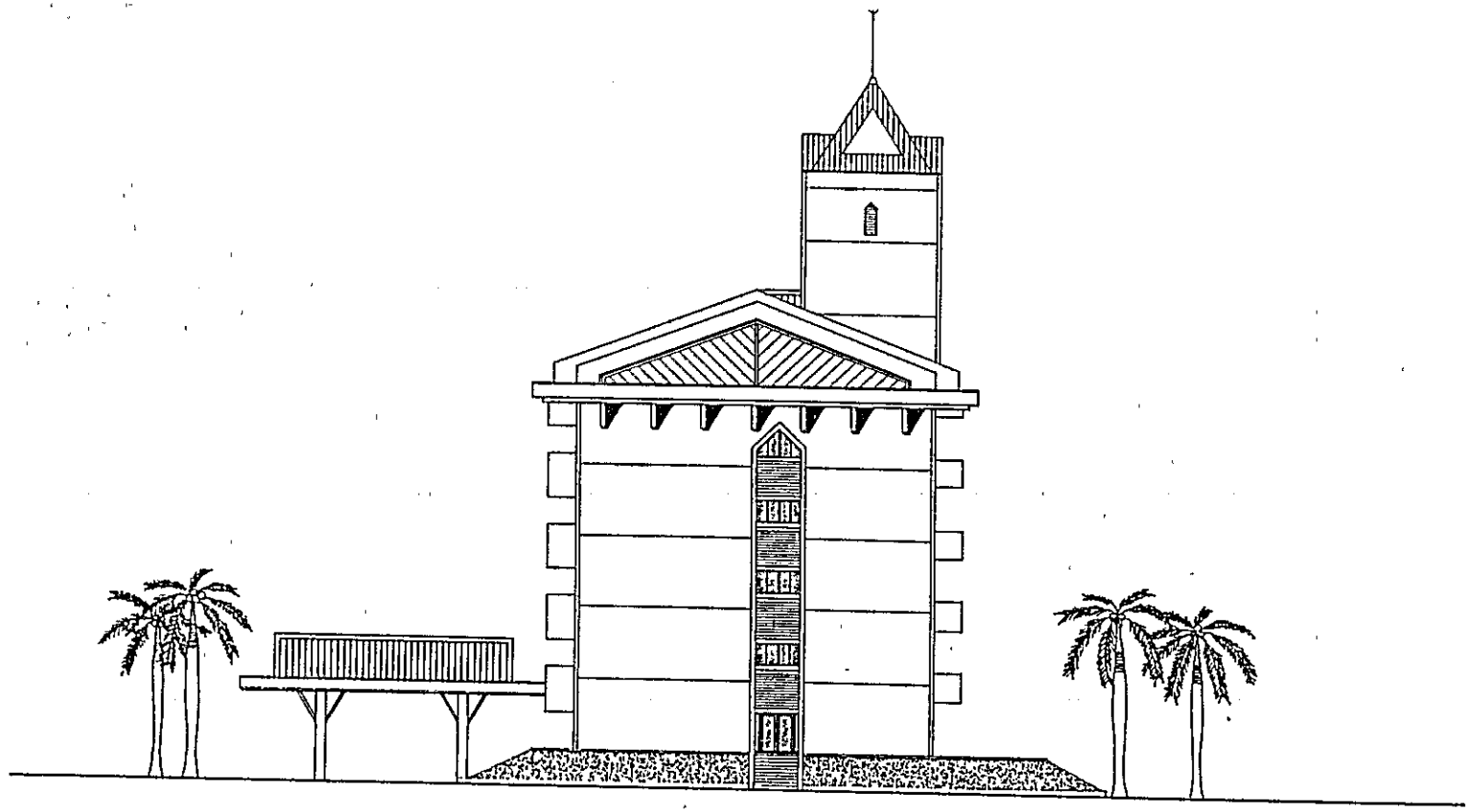




SOUTH ELEVATION

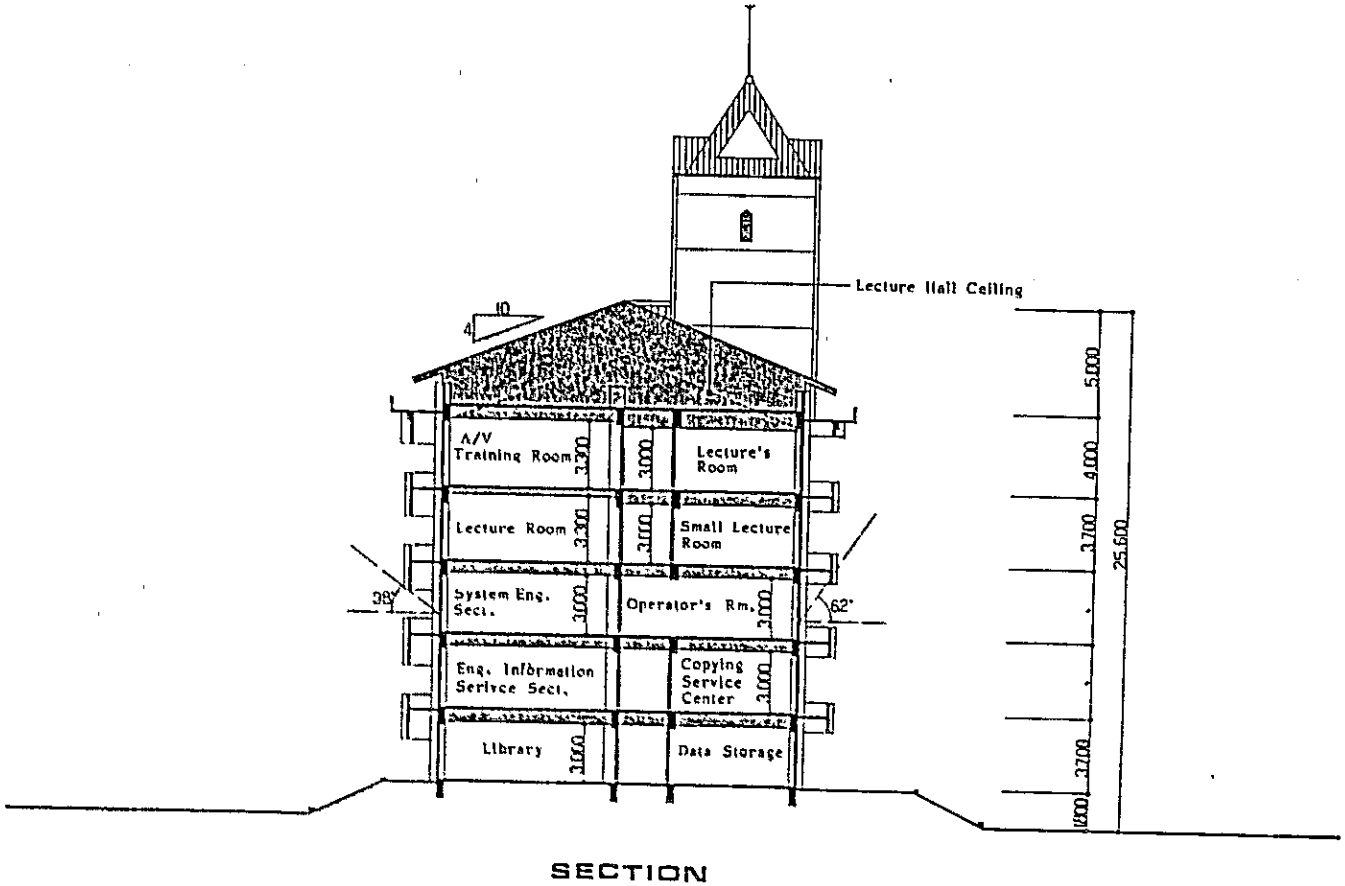
0 5 10 20M

SAMSEN CENTER 8



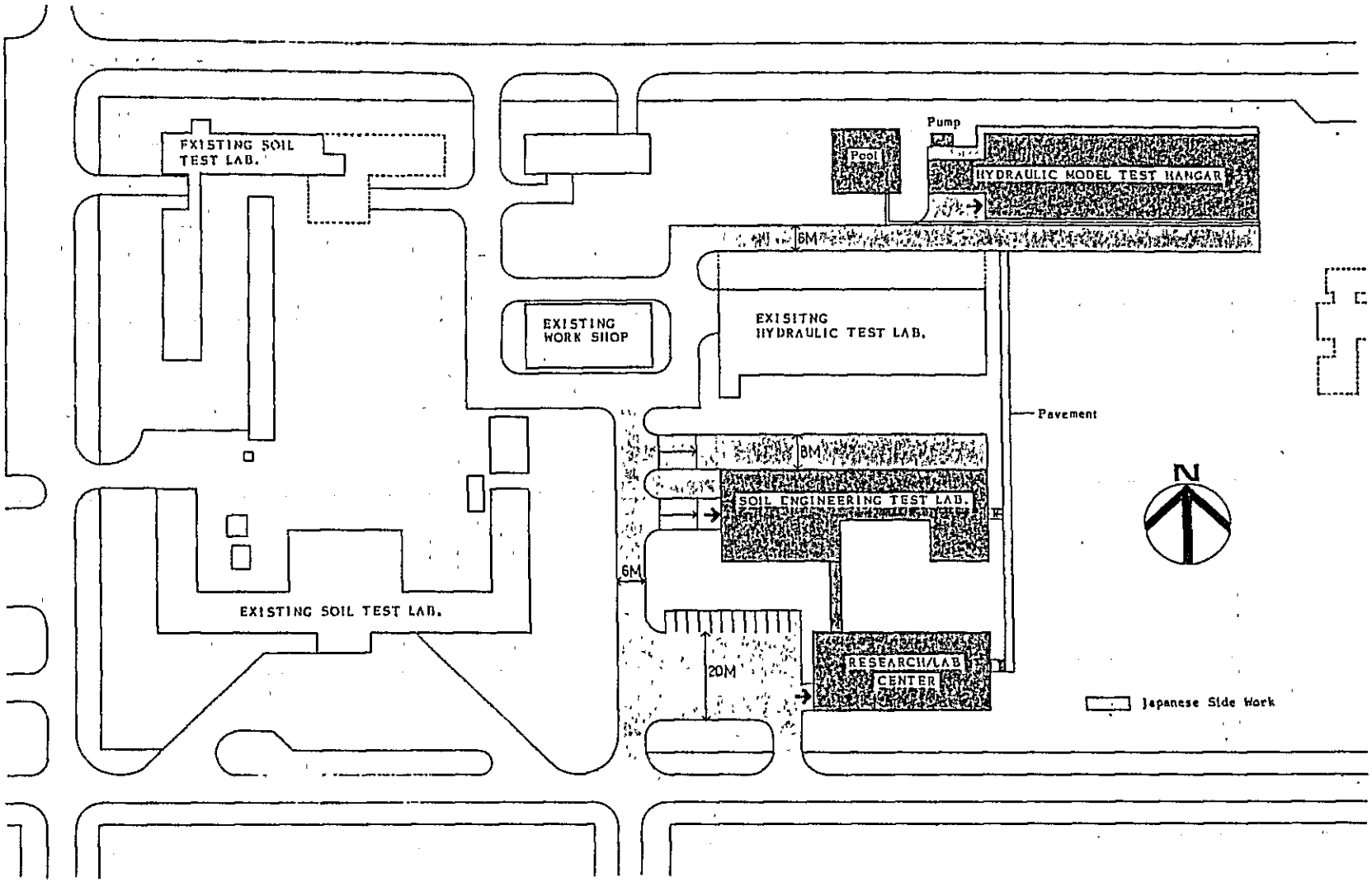
EAST ELEVATION

0 5 10 20M

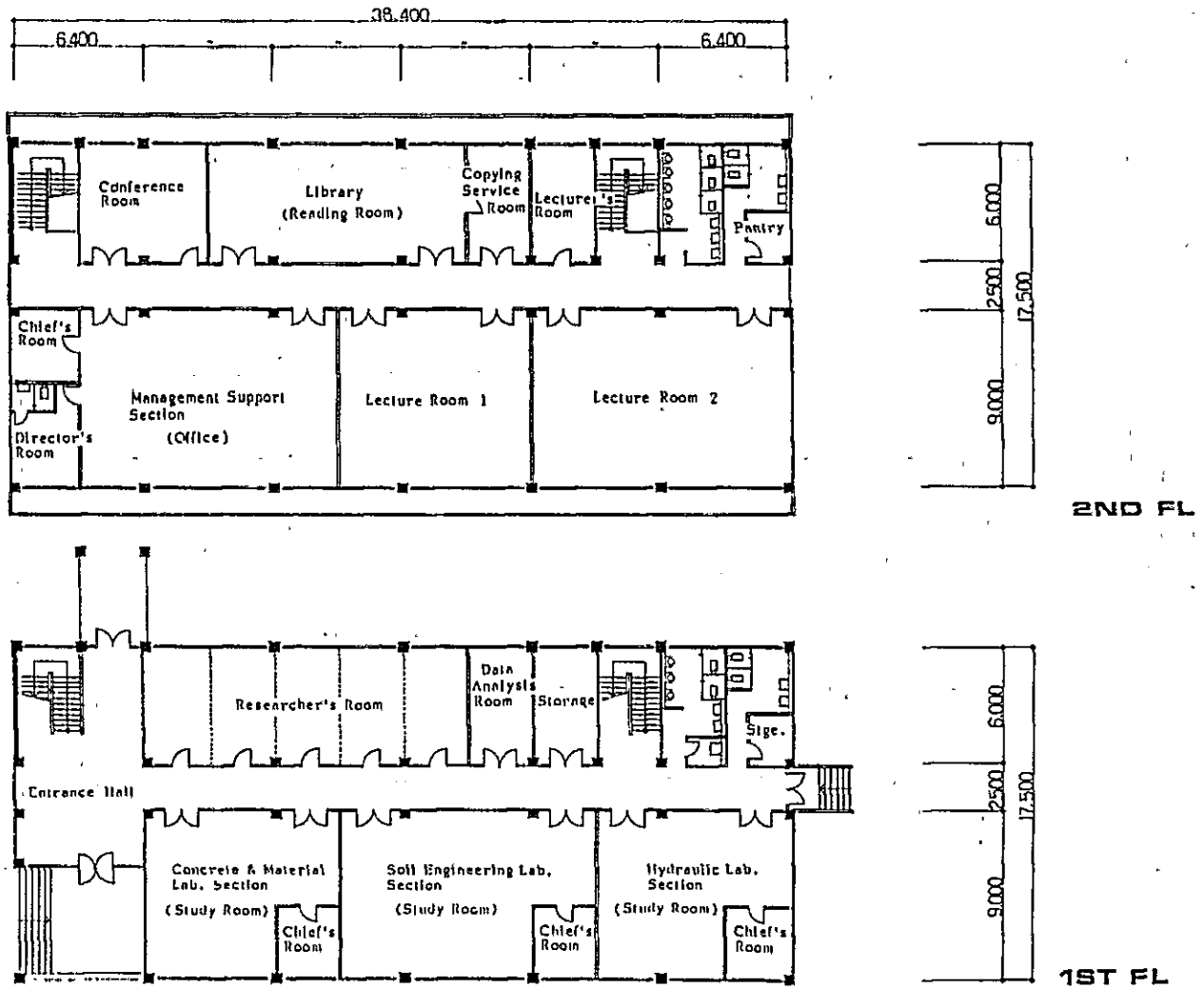

Lecture Hall Ceiling
10
4
A/V Training Room
3300
3000
Lecture's Room
Lecture Room
3300
3000
Small Lecture Room
38°
System Eng. Sect.
3000
Operator's Rm.
3000
62°
Eng. Information Serivce Sect.
Copying Service Center
3000
Library
3000
Data Storage
5000
4000
3700
25600
3700
1600

SECTION


0
5
10
20M

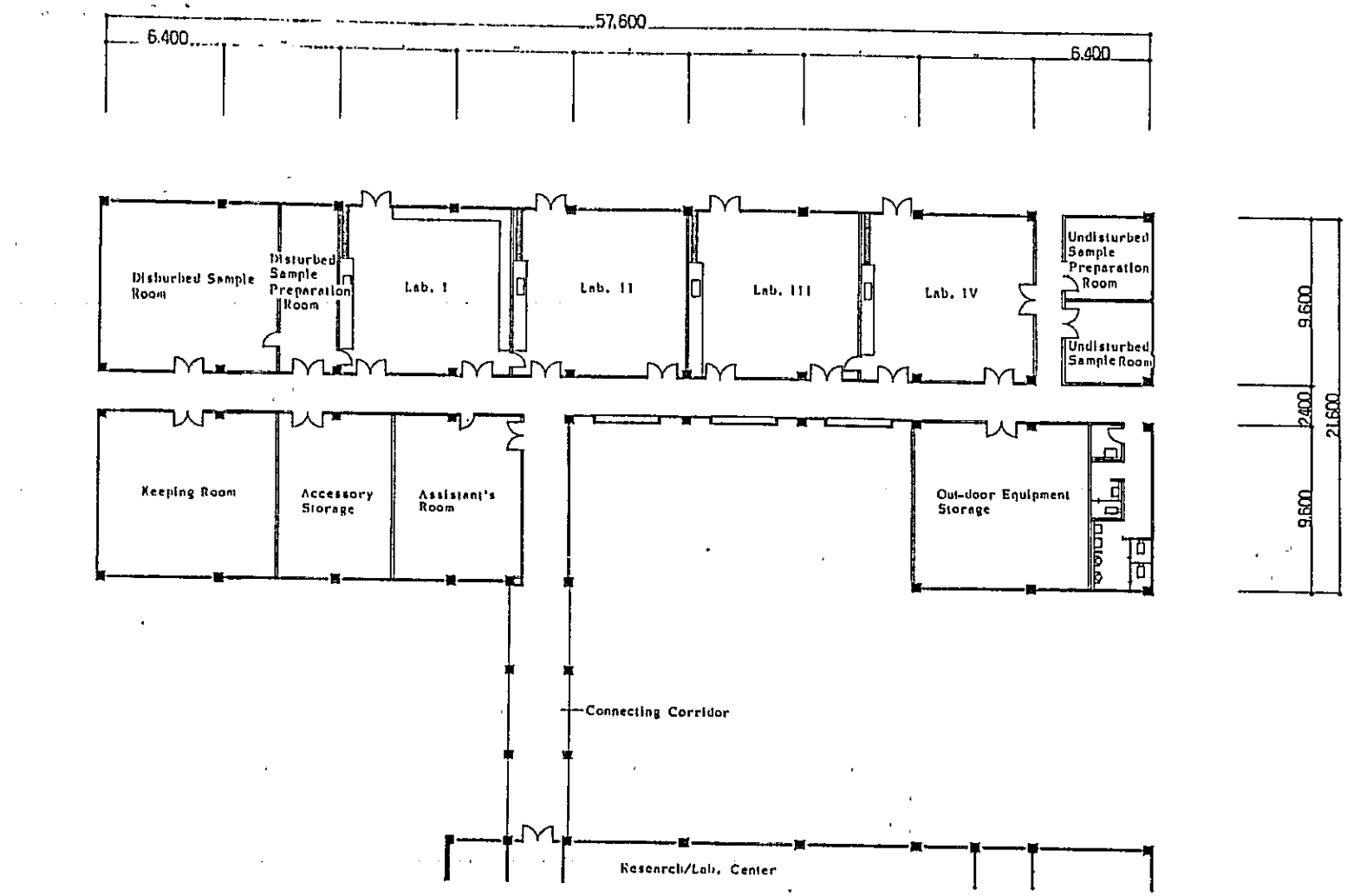


PAKRET PLOT PLAN 11

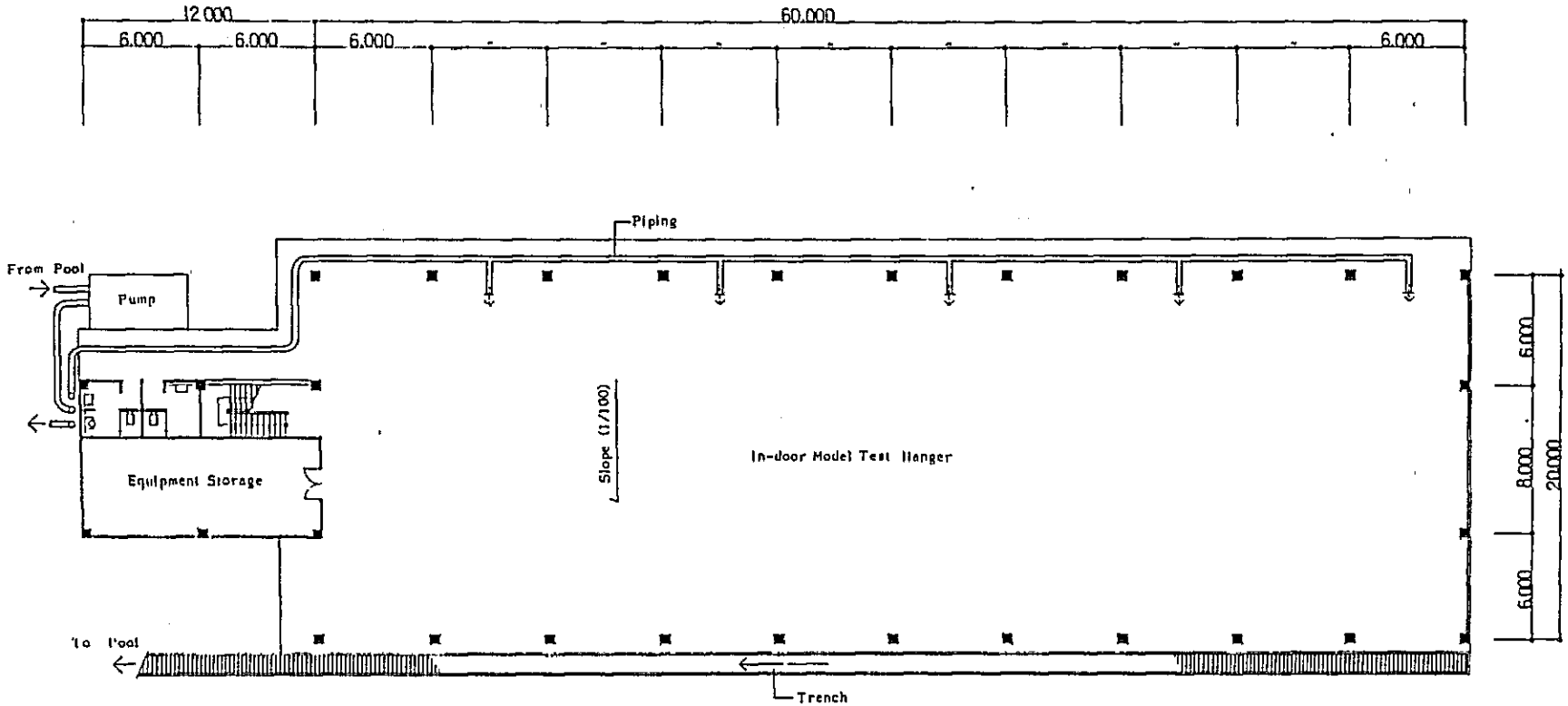


0 5 10 20M

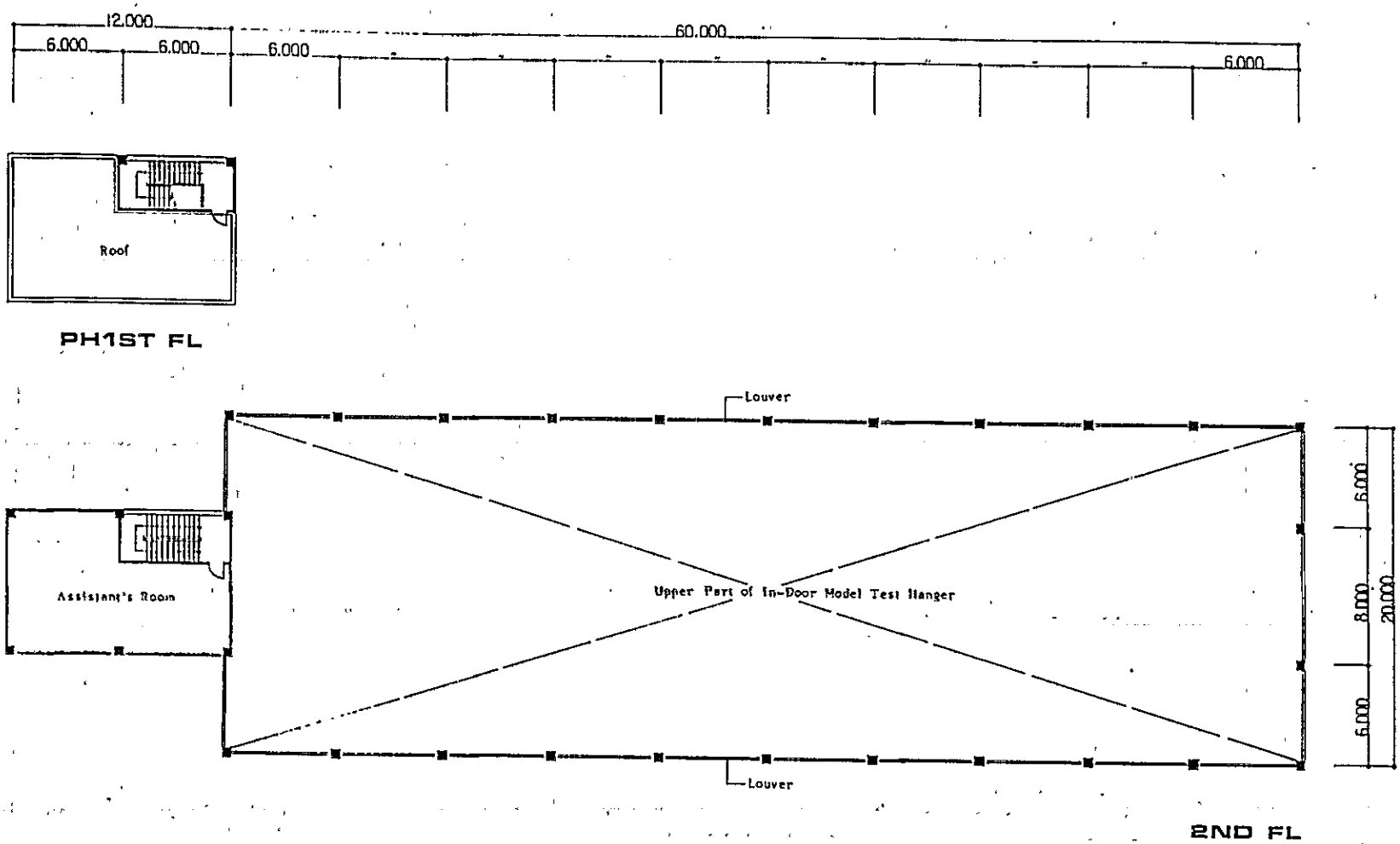
RESEARCH & LAB. CENTER PLAN 12

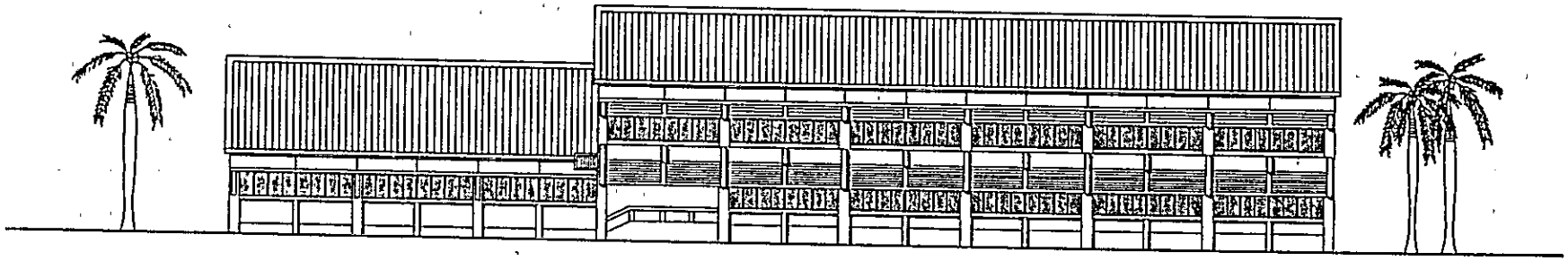


SOIL ENG. TEST LAB. PLAN 13

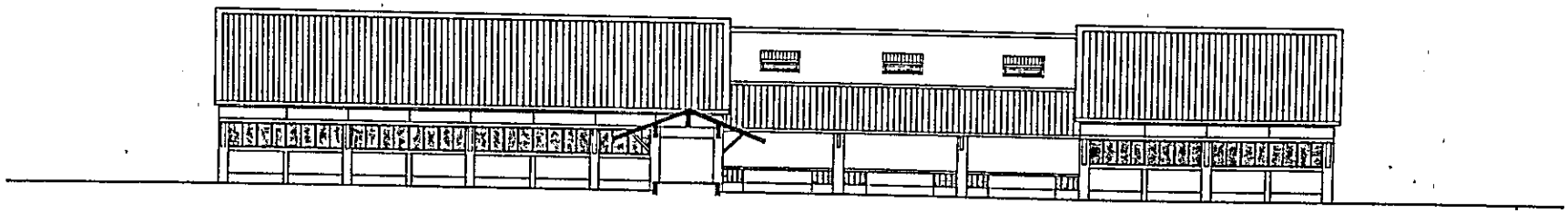


HYDRAULIC MODEL TSET HANGAR PLAN 14


12.000
6.000
6.000
6.000
60.000
6.000
Roof
PH1ST FL
Louver
Assistant's Room
Upper Part of In-Door Model Test Hanger
Louver
6.000
8.000
6.000
20.000
2ND FL
0
5
10
20M



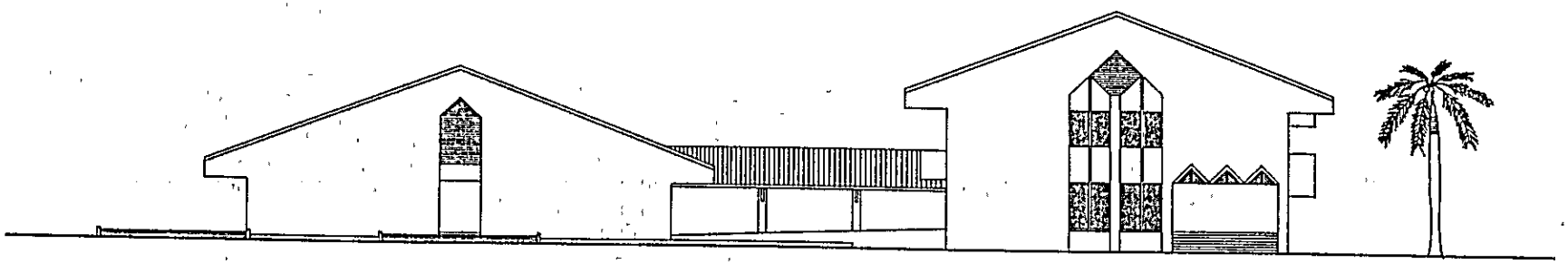
SOUTH ELEVATION



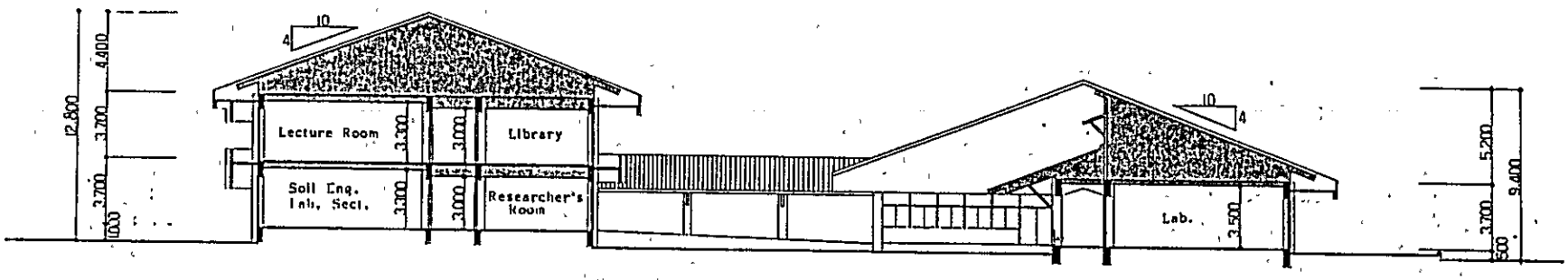
SOUTH ELEVATION

0 5 10 20M

RESEARCH & LAB. CENTER
SOIL GINEERING TEST LAB. 16

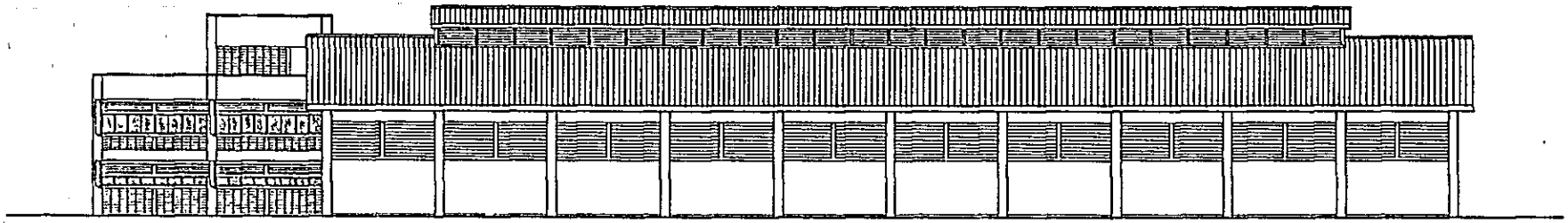


WEST ELEVATION



SECTION

0 5 10 20M



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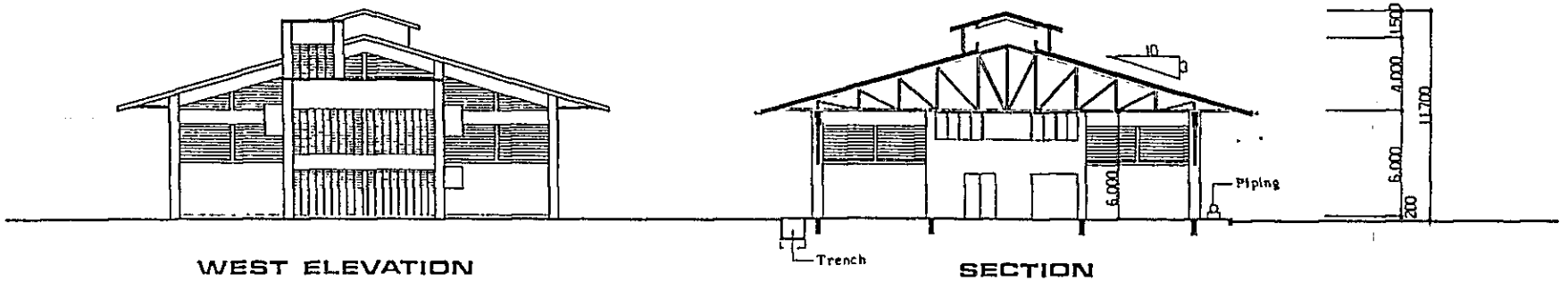


WEST ELEVATION

SECTION

0 5 10 20M

HYDRAULIC MODEL TEST HANGAR

18

Chapter 6 EXECUTION PLAN OF THE CONSTRUCTION PROJECT

Chapter 6 EXECUTION PLAN OF THE CONSTRUCTION PROJECT

6.1 Organization for Establishment

The practical work for the establishment of the Center is to be carried out by Chief Civil Engineer through the meetings of the senior officers of RID's related devisions, which will be responsible for the budgeting and the establishment of the Center's organizational structure.

Prior to the construction of the facilities, adhoc organization will be formed to manage day-to-day work. Its organization chart is shown on the following page.

Consultant Contract, Construction Contract, B/A and A/P (See 6.2. Procedures) for the execution of construction as well as their Amendments shall be made under the signature of Director General of RID on behalf of the government of Thailand. Other matters than these provided for in the contracts of this project may be executed under the signature of Chief Civil Engineer on behalf of Director General of RID.

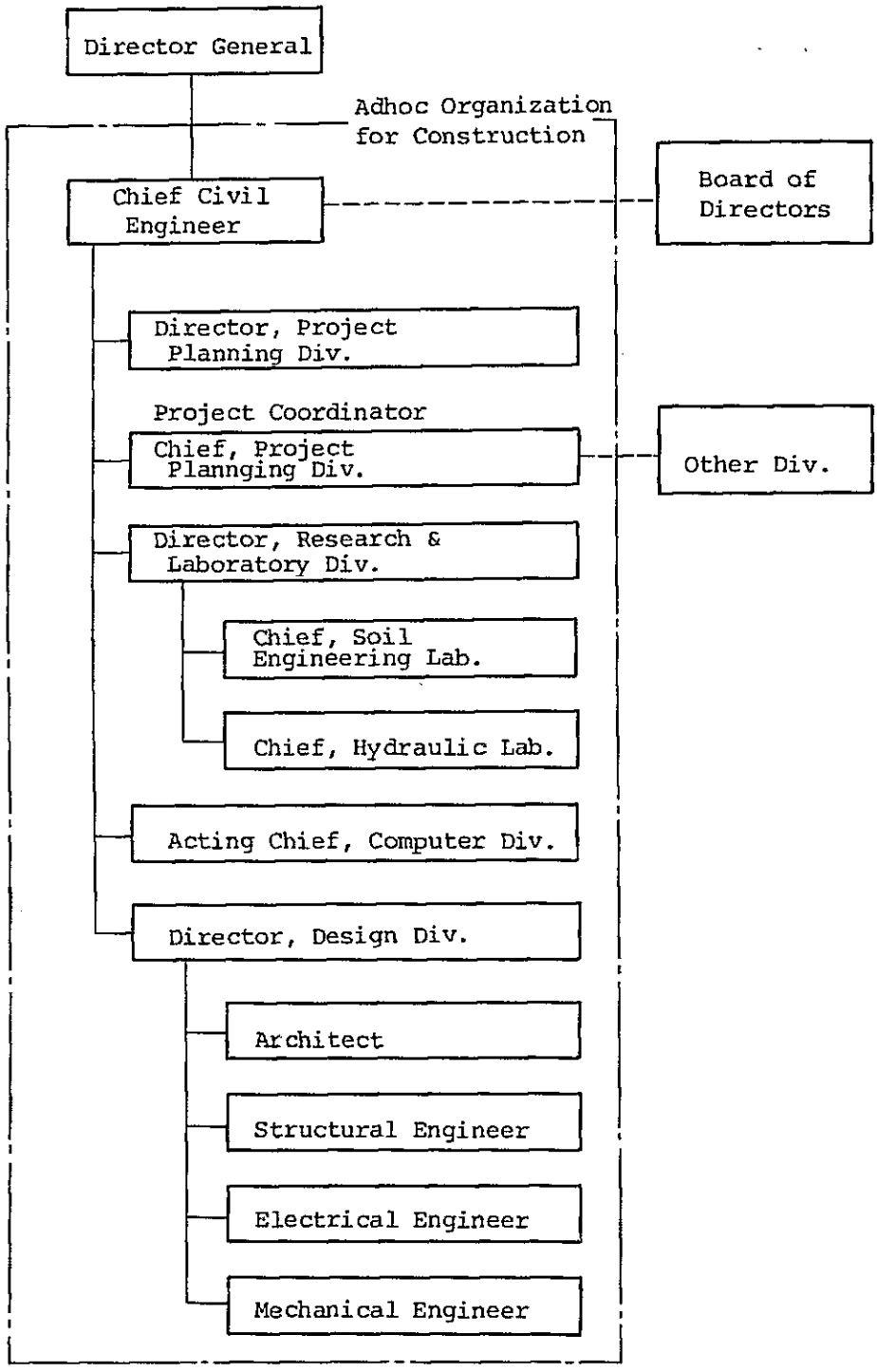


Fig. 6-1 Adhoc Organization for Construction

6.2 Procedure

Based on a Exchange of Note (E/N) for this project, the government of Thailand (as far as this project is concerned, it is construed that Director General of RID is authorized to represent the government of the Kingdom of Thailand; therefore, the government and Director General of RID shall be synonymous and interchangeable in this chapter) shall execute the detail design and construction work entering into contracts with a consultant and a contractor of Japan in order to carry out the portion of construction and the equipment purchase whose costs are borne by the government of Japan.

Prior to the above-mentioned contracts, a Banking Arrangement (B/A) shall be made between the government of Thailand or its Designated Authority (hereinafter also called the government of Thailand) and a Japanese foreign exchange bank to open an account to be used for the settlement of payment of the contract prices. The contract amount provided for in the Consultant Contract and Construction Contract shall be settled on the basis of the Authorization to Pay (hereinafter referred to as A/P), which, for each Contract, the government of Thailand will issue to the Japanese foreign exchange bank which the government has made B/A with. It is to be noted that both the Consultant and Construction Contracts and their amendments shall come into effect only after their verifications being made by the government of Japan.

The Consultant shall work out detail design and prepare drawings, literatures and documents necessary for bidding and Construction Contract. Also, it shall perform, on behalf of the government of Thailand, necessary services such as bidding to select a contractor, while it shall also be responsible for supervision of the construction work.

The contractor, under the supervision of the Consultant, shall execute the portion of the construction work and the purchase and installation of the equipment for which the Japanese government will bear the cost.

Both of the above-mentioned Contracts shall be enforced in accordance with the terms of the E/N and the established practices of the Japanese grant aid system.

In order to ensure that the portion of the construction covered by the Japanese grant will be executed by the above-mentioned contractor timely and efficiently, and further to implement the project, the government of Thailand shall take necessary measures and execute a portion of work required at its own expense at appropriate pace and timing (See 6.3). Further, it shall take necessary measures in accordance with the provisions of the E/N to assist the consultant and the contractor on their services.

The procedure described above is represented in a concise way as the following tabulation:

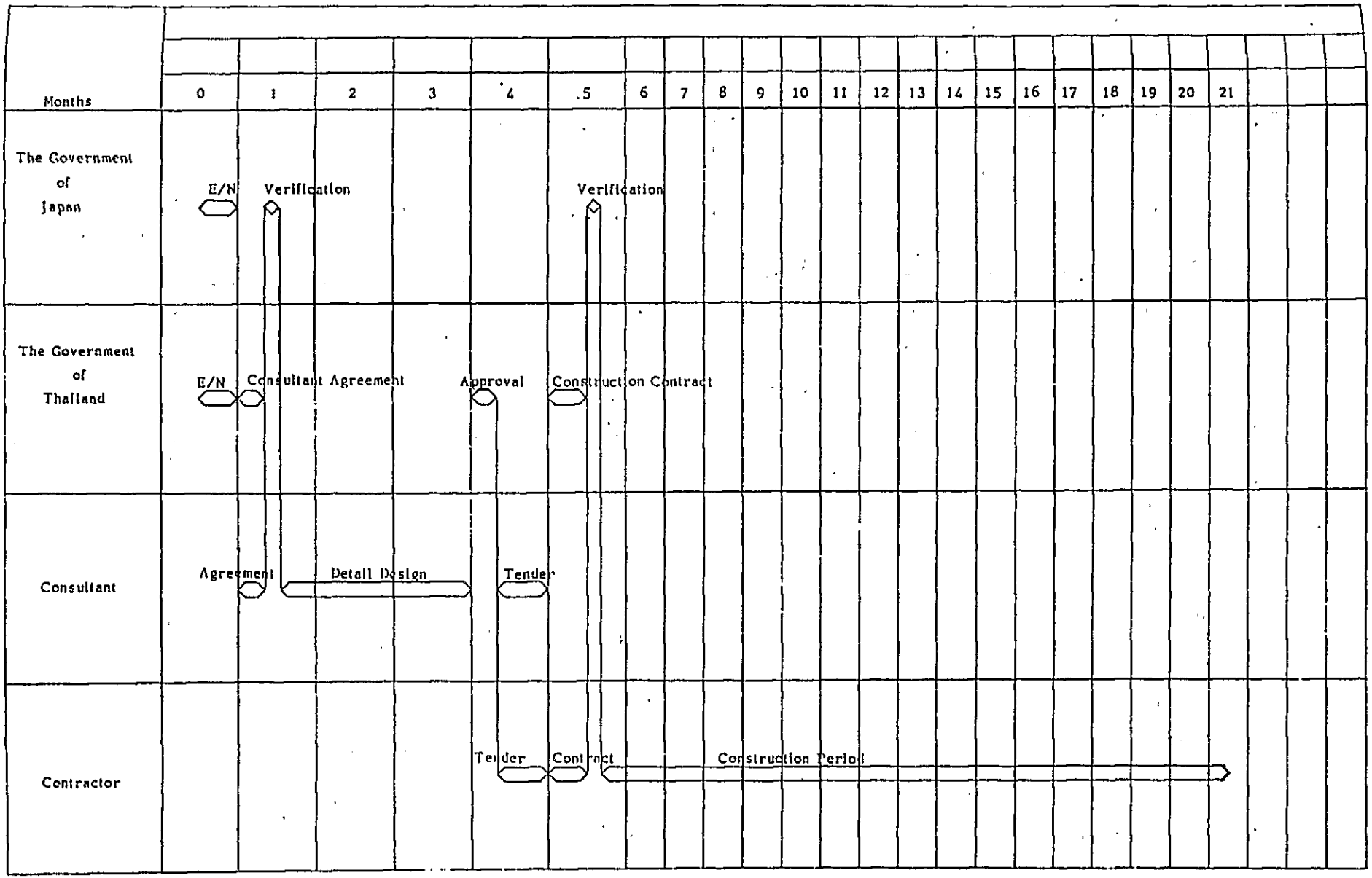


Fig. 6-2 Tentative Overall Construction Schedule

6.3 Necessary Measures and Thai Side Expenditure

6.3.1 Necessary Measures

The grant is used for the purchase of the products and services for the construction of the buildings and the supply of the equipment listed below:

(1) Buildings described in Chapter 5 as;

1) Samsen Center
2) Research Center in Pakret
3) Soil Test Laboratory
4) Hydraulic Model Test Hangar

(2) Equipment described in Chapter 5.

The government of Thailand implements the project. Necessary measures to be taken by both governments are as follows:

Items	Grant	Thai side
1. To secure lands for buildings (the sites)		*
2. To demolish the existing buildings and to reclaim, fill and level the sites		*
3. To construct the parking lots	*	
4. To construct the roads		
1) Within the sites	*	
2) Outside the sites		*
5. Transportation to the sites for materials for the buildings which will be borne by the Grant	*	
6. To provide facilities for distribution of electricity, water supply, drainage and other incidental facilities		
1) Electricity		
a) The distributing lines to the sites		*
b) The drop wiring and internal wiring within the sites	*	
c) The main circuit breakers and transformers	*	

Items	Grant	Thai side
2) Water supply		
a) The city water distribution mains to the sites		*
b) The supply system within the sites (receiving and elevated tanks)	*	
3) Gas System within the buildings	*	
4) Telephone system		
a) The telephone truck lines to the main distribution frame/ panels (MDF) of the buildings	*	
b) The MDFs and the extension after the frame/panels		
5) Furniture and equipment		
a) Equipment as listed in Chapter 5 and its transportation and installation	*	
b) The other furniture and equipment than the above		*
7. To provide necessary data and information to a Japanese Consultant and a Contractor for the engineering services and construction		*
8. To bear the following commissions to a Japanese foreign exchange bank for the banking services based upon the banking arrangement		
1) Advising commission of authorization to pay		*
2) Payment commission		*
9. To support and issue necessary documents for clearance at port of disembarkation in Thailand of imported materials for the construction and for the internal transportation thereof to the project site		*

Items	Grant	Thai side
10. To provide necessary documents to Japanese national concerned to exempt from duties, internal taxes and other fiscal levies which may be imposed in Thailand with respect to the supply of materials and services for construction		*
11. To maintain and use properly and effectively the facilities constructed and equipment for the center		*
12. To bear all the expenses other than those to be borne by the Grant		*

6.3.2 Thai Side Work and its Expenditure

Followings are the outline of the Thai side work and rough estimate of its costs. Totally 5,860,000 Baht are necessary.

Items and Outline of Work	Costs (Baht)
(1) Samsen	3,290,000
1) To demolish the existing building structures	220,000
(a) 10 blocks of one-storied wooden houses	
o Total floor area : 1,450 M^2	
2) To reclaim the canal and level the site	120,000
(a) Volume of filling material : 1,200 M^3	
3) To construct the road outside the site	290,000
(a) Road paved with asphalt	
o Road width : 6 M	
o Road length : 65 M	
(b) Drainage	
4) Electrical distribution lines to the site	40,000
(a) Length between the existing transformer and a leading-in pole : 20 M	
(b) Remodeling of the poles	

Items and Outline of Work		Costs (Baht)
5) Water supply main to the site		10,000
(a) Length of galvanized steel pipe (2")	: 10 M	
6) Telephone trunk lines to the main distribution frame/panel (MDF) and PABX system		520,000
(a) Increase of Private Automatic Branch Exchanger (P.A.B.X.) Circuit No.:100		
(b) Cable length between the P.A.B.X. and M.D.F.	: 130 M	
7) Furniture and equipment not covered by the Grant		2,000,000
8) Soil exploration		90,000
(a) Borings		
o Number of borings	: 6	
o Depth of borings	: 30 M	
(b) Standard penetration test at intervals of not more than 1.0 M		
(c) Laboratory soil test		
(d) Allowable bearing capacities of prestressed spun concrete piles shall be recommended		
o Pile diameter	: 450 MM, 500 MM and 600 MM	
(2) Pakret		2,570,000
1) To demolish the existing structures		390,000
(a) A one-storied building with slabs on grade and roof of steel frame		
o Floor area	: 370 M^2	
(b) Concrete slab on grade		
o Area	: 1,750 M^2	
(c) Other concrete structures		

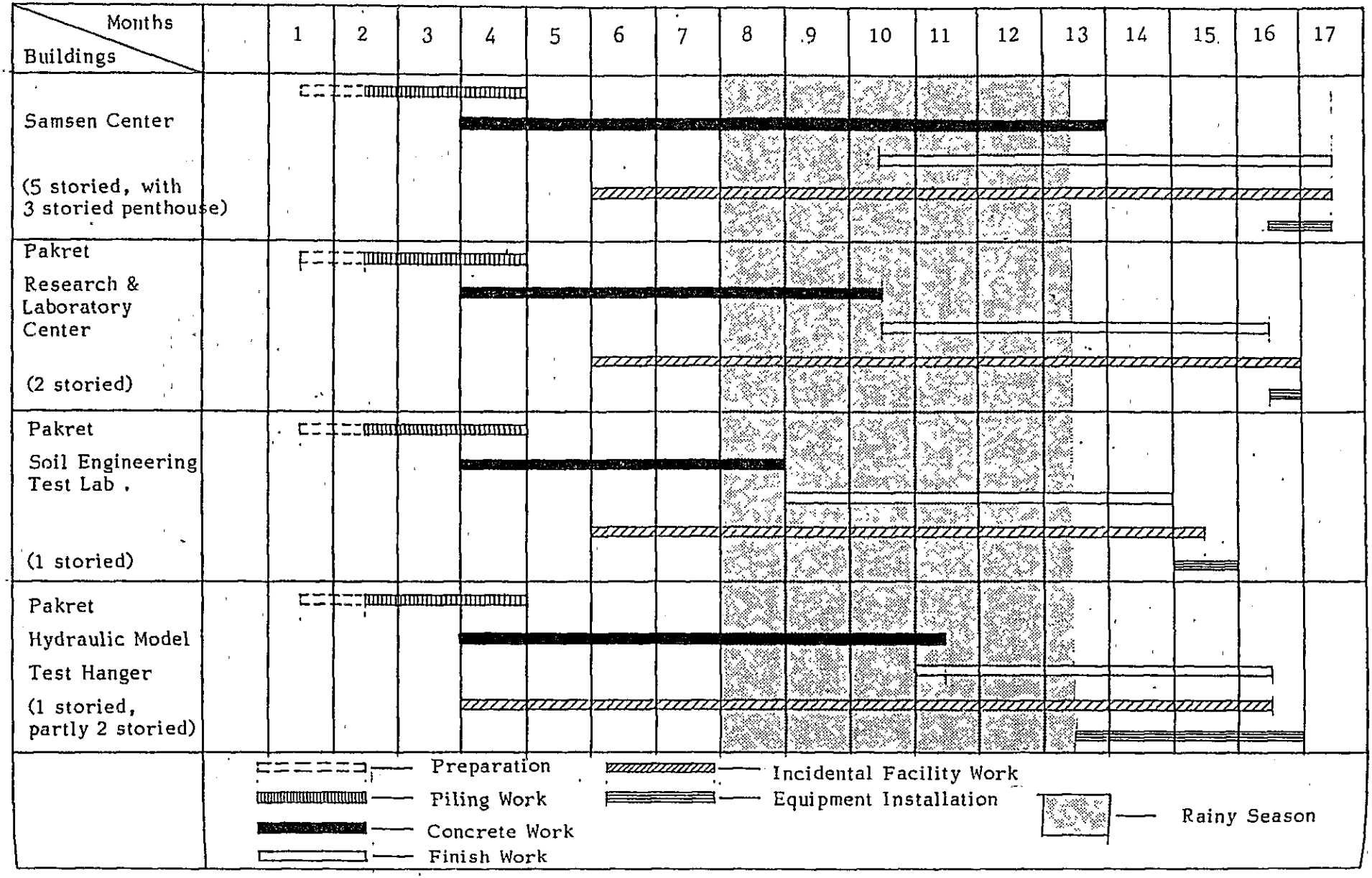
Items and Outline of Work		Costs (Baht)
2) To reclaim the canal and level the site		550,000
(a) Volume of filling material	: 5,500 M^3	
3) To construct the road outside the site		330,000
(a) Roads around the existing work shop		
o Area of pavement	: 670 M^2	
(b) Drainage		
4) Electrical distribution lines to the site		130,000
(a) Length between the existing 11 KV distribution lines and leading-in pole	: 600 M	
5) Water supply main to the site		10,000
(a) Length of galvanized steel pipe (2")	: 15 M	
(b) Other pipe (4")	: 5 M	
6) Telephone trunk lines to the main distribution frame/panel and PABX system		550,000
(a) Inclease of Private Automatic Branch Exchanger (P.A.B.X.) Circuit No.:100		
(b) Cable length between the P.A.B.X. and M.D.F.	: 130 M	
7) Furniture and equipment not covered by the Grant		400,000
8) Soil exploration		210,000
(a) Borings		
o Number of borings	: 14	
o Depth of borings	: 30 M	
(b) Standard penetration test at intervals of not more than 1.0 M		
(c) Laboratory soil test		

Items and Outline of Work		Costs (Baht)
(d) Allowable bearing capacities of prestressed spun concrete piles shall be recommended		
o Pile diameter	: 250 MM 300 MM and 350 MM	
(3) Total expenditure		5,860,000

Notes: 1) Costs for landscaping are not included.

2) Commissions to a Japanese foreign exchange bank are not included. These are to be decided by negotiation.

6-4 Construction Work Schedule



Chapter 7 REVIEW AND EVALUATION

Chapter 7 REVIEW AND EVALUATION

So far the general scope of the plan of this project has been given. Other aspects such as the proprieties, effects, timing and anticipated problems shall here be considered. Further, in order to evaluate the significance of the establishment of the Center, this chapter provides materials.

First, the creation of the Engineering Development Division, which was one of the main purposes of the establishment of the Centre, is regarded as being very timely.

The standardization of various technologies together with the simultaneous development of the engineering information service system could that alone constitute one independent project, which is essential for the technological independance of the country in this engineering field. The significance is highly evaluated not to mention the fruit and their effectiveness at the implementation.

In regard to the computer systems, the hardware plan were examined from various points and considered appropriate, and also it is very timely to install it now. RID has enough number of capable technical staff. Therefore, it is concluded that there is no problems anticipated on this matter.

The establishment of the Special Engineering Section is aiming at the reserch on new technology. Also the section will deal with high level technological problems taking place in project sites and to be solved urgentlu.

In order to deal with them, teams composed of qualified staff from various other sections will be organized and operate under the command of the staff of this section. Such operations have been done in some way in the past, so reserving a small number of core staff at the Centre does not present any new problems. The success of this section depends upon the technical and managerial ability of the core staff. The choice of personnel for this section should therefore be made with due consideration.

The establishment of this section will give a new momentum to the development of Thailand's own technology. So there should be a good research environment. In this respect, the installation of facilities as Researcher's Rooms for specially organized teams who will deal with project requiring high level technology is considered to be another significant aspect. It is possible for foreign experts to join these programs.

As to the training, the number of trainess is so large that the Department have to make great efforts to obtain the necessary budget to maintain the program. This very number reflects its necessity. Although the fulfillment of this program may be difficult in the first year, because of its considerably large amount of expenses which is roughly estimated to be mooe than 1.8 million Baht as shown in Chapter 3, efforts for the goals will have to be made with advancing years.

Difficulty is expected to collect trainees from project sites in the dry season when the sites are busy. Therefore the training may be concentrated in the rainy season, causing some changes in the training schedule. As a result, from the aspect of facilities, the schedule will probably be overloaded, so mass lectures in the Lecture Hall are expected.

Other than the core staff of the Center, lecturers will be chosen and supplied from divisions of RID. There ar no problems regarding their availability and ability.

In regard to Soil Engineering Laboratory, it is impossible even now to handle all test requests from project sites. It is also expected that new test demand for the work in the rainy season will be increased in the future. There is a strong urge to upgrade the capacility not only of personnel but also of equipment and facilities.

As to Hydraulic Laboratory, from Japan's technological viewpoint, there seems to be difference concerning to the attitude or way of response to the model test between Thai engineers including those in the planning and design sector and Japanese engineers. This seems to be related to the fact that the irrigation systems in Thailand have been

very large compared with those of Japan and have been developed introducing foreign technology. However, it is clear that, considering the future lines of development, more efficient use of the irrigation facilities and water resources will become necessary. In this plan, though testing is the main purposes, some emphasis should be placed on the training for the staff in the design sector in order to introduce related technologies more actively. For this purpose the multi-purpose channel model will be used effectively.

For the effective management of this Center, an organization which monitors and evaluates each section's activities and coordinates them to the needs of every sector in RID is considered to be necessary. For this purpose inspection and Monitoring Section was established under the Center Director. Unlike financial audit, the emphasis is placed on the coordination of each section's technical activities. The establishment of this organ is an unique characteristics of the planned Center. As for the effectiveness, uncertain factors are still left, however, getting staff capable of drawing out the organ's capabilities to the full, it is expected that the fruit of this Center will be doubled and the initial purpose of its establishment will be fulfilled.

The planned Center will be operated as an integral part of RID. Under the present organizational structure, divisions of RID are overseen by Deputy Director Generals who reports to the Director General. Among the Deputy Director Generals, there is Chief Civil Engineer, who will hold concurrently the Office of Director of the planned Center, as he has the closet relevance to the new post in terms of organizational functions of RID. The coordination between the new Center and the divisions of RID will be secured through the Board of Directors, while the center's Technical Training Branch will be directly coordinated with Personnel Division of RID.

In regard to operation expenditure, because the staff will be transfered to this Center from other divisions in RID, the administration expenditure in RID will not increase so much as a whole that it is neglected in this report. Further, the expenditure for the test and experiment of Research and Laboratory Division are borne by individual

development project. So, the said training costs and the maintenance and energy costs of the building and equipment are major two items of additional expenditure caused by the establishment of this Center..

As to the maintenance and energy costs, a rough estimation has been made as follows:

(Baht)

Items	Samsen	Pakret	Total
(1) Facility maintenance exps.	395,000	118,000	
o Building	70,000	60,000	
o Septic tank	64,000	19,000	
o Air conditioner	90,000	39,000	
o Elevator	171,000		
(2) Equipment maintenance exps.	880,000	50,000	
o Computer	870,000	40,000	
o Photo copying machine	10,000	10,000	
(3) Water, Power and Gas fee	1,062,000	653,000	
(4) Others	163,000	179,000	
(5) Total exps.	2,500,000	1,00,000	3,500,000

So far, a review has been made on the major component of this plan. From the standpoint of future technical cooperation of Japan, the establishment of this Center would mean the creation of a receiving core for technological transfers. Unlike the cooperations in the past with various independent sections, the extent of the transferred technology will be enlarged. In this respect, the establishment of this Center is highly evaluated with its timing as well.

Chapter 8 CONCLUSION AND RECOMMENDATION

Chapter 8 CONCLUSION AND RECOMMENDATION

It is concluded that the establishment of this Center is significant in the course of irrigation development for the implementation of policies and agricultural development in Thailand. In short, it aims to improve the RID's development capabilities necessary for the development projects hereafter expanding in area and increasing in number, establishing an organization and improving facilities for the systematic engineering development, research and testing and training, thus strengthening the engineering aspect of RID.

Through this survey and study, the plan was made clear. Various aspects were discussed from various angles. In conclusion, this plan is highly evaluated not only in its conformity to the policy and to the necessity but also in its propriety, effectiveness and timing.

For the establishment of the planned Center, further for the operation and maintenance of the Center, such local budgetary allocations are indispensable, approximately estimated as shown below:

(1)	Thai Side Work for the Construction	5,860 thousand of Baht
(2)	Training Cost, per annum	1,837 thousand of Baht
(3)	Maintenance and Energy Costs, per annum	3,500 thousand of Baht

As to the training, because of its considerably large amount of expences, some difficulties may be anticipated, which have to be coped with by the efforts of the people concerned.

Further, total of 302 personnel are required for the operation of the Center, which must be fulfilled also by their efforts.

The above is the conclusion. We expect that upon completion of the project the government of Thailand will made conscientious effort for the full utilization of these facilities towards closer relationships of the two countries.

APPENDICIES

Appendix I Basic Design Study (Phase I)

I-1 Minutes of Discussions

MINUTES OF DISCUSSIONS ON THE CONSTRUCTION PROJECT OF IRRIGATION ENGINEERING CENTER IN THE KINGDOM OF THAILAND

In response to the request made by the Government of the Kingdom of Thailand for grant aid of the establishment of Irrigation Engineering Center, (the Project), the Government of Japan through Japan International Cooperation Agency (JICA) has sent a mission to carry out the Basic Design Study (Phase I) on the Project from 1st to 8th December, 1982.

The mission held a series of discussions with relevant authorities of the Government of Thailand on the Project.

As a result of these discussions, both parties have agreed to recommend their respective governments and the authorities concerned to examine the major points of understanding reached between them attached herewith toward the realization of the Project.

8th Debember, 1982

Bangkok

西名定雄

Mr. Sadao NISHDE
Leader of the JICA Mission

Sunthorn Ruanglek

Mr. Sunthorn Ruanglek
Director General
Royal Irrigation Department

ATTACHEMENTS

1. The objective of the Project is to construct new buildings and install facilities as well as equipment for the Center to promote its activities as listed in Annex I, and further study on the Project will be made in the scope of study as listed in Annex II.

2. Royal Irrigation Department (RID) is executing agency for Thai government.

3. The proposed sites of the Project are in Samsen and Pakret within the compound of the RID.

4. The Japanese Mission will convey the desire of the Authorities Concerned to the Government of Japan that the latter will take necessary measures to cooperate in implementing the Project and provide the Government of Thailand with buildings, other facilities and equipment within the scope of Japan's Economic Cooperation Programme in Grant form.

5. Both Governments will take necessary measures such as those listed in Annex III in the course of implementing the Project on condition that Japanese Grant Aid would be extended.

Annex I

Major Activities of the Center

(1) To enhance training service for technical staff in irrigation development such as construction management, engineering development, project management etc., to cope with the innovation in technology and administrative complication of the project execution

(2) To extend technical information service : systematic collection, criteria development, processing and retrieval of technical documents and information for effecient utilization

(3) To encourage the research and laboratory activities in meeting with increasing requirement for the execution of the project

(4) To centralize the present scattered branch function to give unitary and more organic function

Annex II

Scope of the Basic Design Study(PhaseII)

1. Objectives of the Study

The objectives of the study is to prepare the most appropriate Basic Design Report for the Center based on the site survey and discussions between RID and Japanese Team. The Report should cover technical, operational and financial evaluation for the Project's appropriateness for consideration of the Japanese Grant assistance project.

2. Study Activities

(1) Confirmation of contents, function qualities etc. of required equipment facilities
(2) To set up Design Concept and to plan necessary space, sizes of the buildings
(3) To prepare architectual, structural, mechanical, electrical,water supply connecting and equipment plan together with the outline specifications for the Center
(4) To prepare the probable construction cost estimate, operating cost and construction term for the Center
(5) Collection of pertinent data and information
(6) To prepare the Final Report based on the above studies with evaluation of the project
(7) To evaluate benefits to irrigation development by the Center and recommend desirable staff allocation and operating program of the Center

3. Report

In accordance with survey analysis of collected informations and evaluation of technical, operational, and institutional matters, Basic Design Report is prepared after explanation and discussion of Draft Final Report.

Annex III

Table

Necessary measures to be taken by both governments

No.	Items	Japan	Thai
1.	To secure spaces of buildings		◎
2.	To clear , level and reclame the site		◎
3.	To construct the parking lot	◎	
4.	To construct the road		
	1) Within the site	◎	
	2) Outside the site		◎
5.	To construct the building which is composed as listed in Annex IV and Transportation for materials to the site	◎	
6.	To provide facilities for distribution of electricity, water supply, drainage and other incidental facilities		
	1) Electricity		
	a) The distributing line to the site		◎
	b) The drop wiring and internal wiring within the site	◎	
	c) The main circuit breaker and transformer	◎	
	2) Water Supply		
	a) The city water distribution main to the site		◎
	b) The supply system within the site (receiving and elevated tanks)	◎	
	3) Gas System within the Buildings	◎	
	4) Telephone System		
	a) The telephone truck line to the main distribution frame/panel (MDF) of the building		◎
	b) The MDF and the extension after the frame/panel	◎	
	5) Furnitures and Equipment		
	a) Furnitures for administration offices		◎
	b) Equipment as listed in Annex IV its transportation and installation	◎	
7.	To provide necessary data and information to a Japanese Consultants and a Contractor for the detailed engineering services and construction		◎

No.	Items	Japan	Thai
8.	To bear the following commissions to the Japanese foreign exchange bank for the banking services based upon the banking arrangement		
	1) Advising commission of authorization to pay		◎
	2) Payment commission		◎
9.	To support and issue necessary documents for clearance at port of disembarkation in Thailand of imported materials for the construction and the internal transportation thereof to the project site		◎
10.	To provide necessary documents with Japanese national concerned from duties, internal taxes and other fiscal levies which may be imposed in Thailand with respect to the supply of materials and services for construction		◎
11.	To maintain and use properly and effectively that facilities constructed and equipment for the Center		◎
12.	To bear all the expenses other than those to be borne by the Grant		◎

Annex IV

Major Facilities and Equipment

To support said activities in Annex I component of the Facilities and Equipment are as follows whose outline will be discussed and studied in the Basic Design Study Phase II.

Facilities

1. Engineering Center in Samsen
2. Laboratory in Pakret
3. Dam Hydraulic Model Test Hanger in Pakret

Equipment

1. Equipment for Training
2. Computor System
3. Equipment for Micro Photo
4. Equipment for Laboratories
5. Other necessary equipment

I-2 Organization of Study Team

Leader:	Mr. Sadao Nishide	Director General, Land Improvement Engineering Service Center, Tokyo Office, Ministry of Agriculture, Forestry & Fisheries (MAFF)
Member:	Mr. Tetsuro Miyazato (Irrigation Engineering)	Overseas Technical Cooperation Officer, International Cooperation Div., International Affairs Dept., Economic Affairs Bureau, MAFF
Member:	Mr. Shozo Matsuura (Project Coordination)	Basic Design Div., Grant Aid Dept., Japan International Cooperation Agency

I-3 List of Counterparts

RID

Mr. Boonthai Otaganonta	Chief Civil Engineer
Mr. Boonyok Vadhanaphuti	Director, Project Planning Div.
Mr. Jumsak Tejasen	Director, Research & Laboratory Div.
Mr. Shoombhaol Chaveesuk	Director, Design Div.
Mr. Suthi Songvoravit	Chief, Project Planning Div.
Mr. Nachara Jirapong	Camp Manager of Pakret Compound
Mr. Chamlong Yording	Chief Architect, Design Div.
Mr. Thanee Kheosipalard	Architect, Design Div.
Mr. Samart Chokkanapitark	Representative Division of Operation and Maintenance
Mr. Katsuhiko Kimura	Colombo Plan Expert, Project Planning Div.
Mr. Takeshi Miyazaki	Colombo Plan Expert, Design Div.

Appendix II Basic Design Study (Phase II)

II-1 Minutes of Discussions

Minutes of Discussions on the Project
For Construction of Irrigation Engineering Center,
· Royal Irrigation Department, Thailand

Japan International Cooperation Agency (JICA), an official agency of Technical Cooperation Programme of the Government, has sent a mission to carry out the Basic Design Study (Phase II) on the Project for construction of Irrigation Engineering Center (the Project) from 18th February to 12th March 1983.

The mission held a series of discussions with officials of Royal Irrigation Department (RID) on the establishment for Irrigation Engineering Center (the Center).

Among discussions, Japanese team stated that all of the necessary facilities and equipment for the Center will be presented in the study report, however probable grant aid could not always cover all of them, in this point, Japanese contribution by the grant aid will be explained at the time of presentation of draft final report, and the team also explained that Japanese side is showing reluctance in general to provide the computer system under the grant aid programme, whereas Thai side stressed that it should be covered by Japanese grant aid in consideration that it is a nucleus of the Center's function and indispensable for the various activities such as technical information services, engineering development and training of technical staff.

And both parties confirmed the following points for furthur necessary actions on the project.

1. The proposed organization plan for the Center is as Appendix I.
2. The major composition of facilities for the Center is as Appendix II.
3. Major work plan to attain the objectives of the Center is as Appendix III.

1st March, 1983
Bangkok

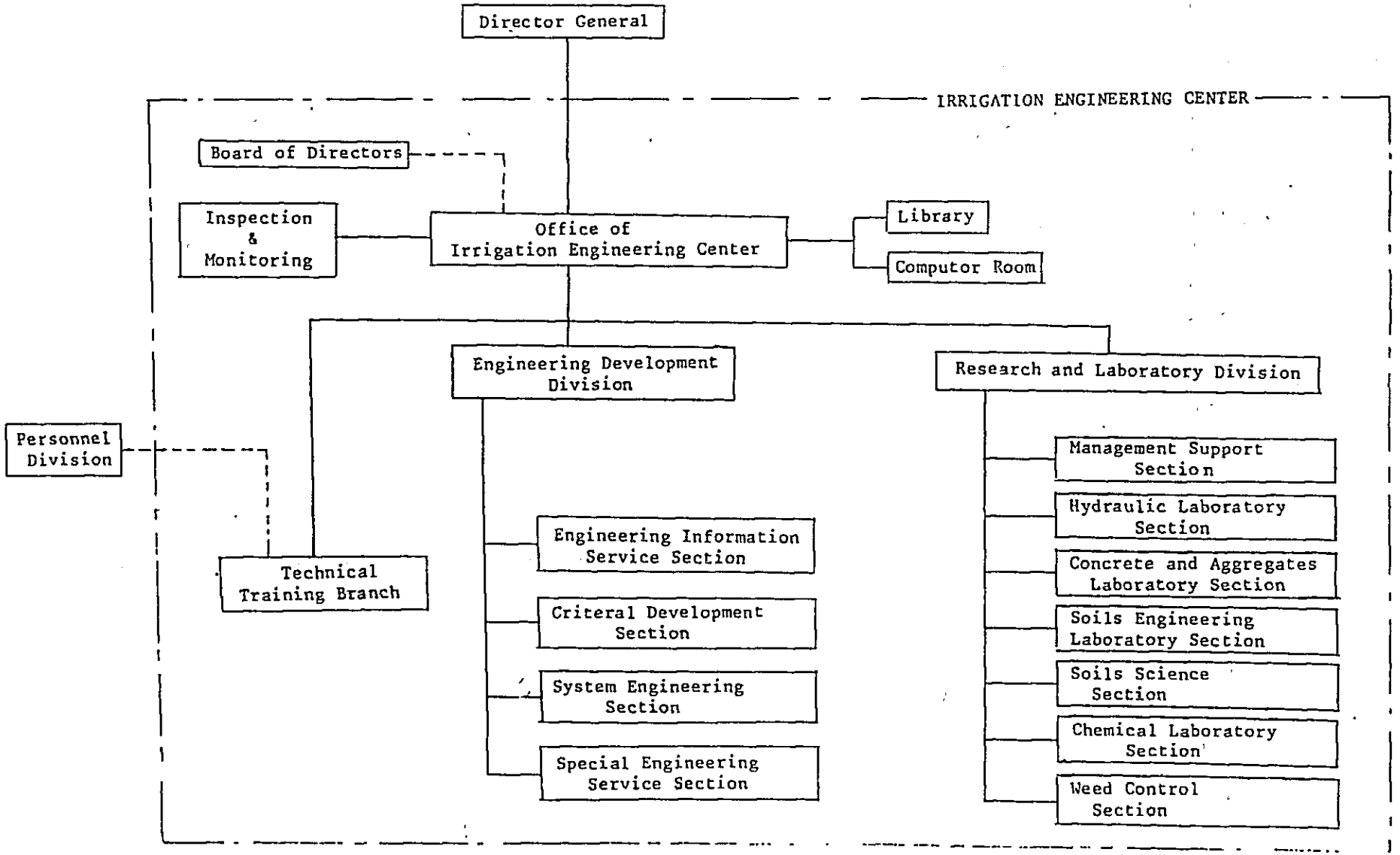
西出定雄

Mr. Sadao NISHIDE
Leader of the mission

Sunthorn Ruanglek.

Mr. Sunthorn Ruanglek
Director General
Royal Irrigation Department

PROPOSED ORGANIZATION PLAN FOR THE IRRIGATION ENGINEERING CENTER



Appendix II

Major Composition of Facilities

(The priority of each item is attached in alphabetical order taking into consideration if the funds available to the Center is limited)

I. Facilities of Samsen Compound

	(Priority)
Administrative Office	(A)
Audio-visual Room	(A)
Conference Room	(A)
Computor Room	(A)
Director's Room	(A)
Specialist's Room	(A)
Engineer's Room,Drafting Room	(A)
Instructor's Room	(B)
Lecture Room (S) (M) (L)	(A)
Line Printer X-Y Plotter Room	(A)
Micro-Photo Film Process Room	(A)
Meeting Room	(A)
Library	(A)

II. Facilities of Pakret Compound (Expansion Plan)

Soil Engineering Lab.	(A)
Soil Science Lab.	(C)
Chemistry Lab.	(C)
Weed Control Lab.	(C)
Concrete and Material Lab.	(C)
Hydraulic Lab.	(A)
Hydraulic Model Test Hanger	(B)
Dormitory	(C)

NB* Equipment necessary for each room is listed up in the study report with broad specification.

FUNCTION AND JOB DESCRIPTION OF DIVISIONS AND SECTIONS

Division/Section	Function and Job Description
1. OFFICE OF IRRIGATION ENGINEERING CENTER	1) Secretarial services for Board of Directors 2) Coordinator and liaison services to the IEC 3) Inspection & Monitoring for evaluation of projects, and research and development work within IEC from engineering and technical point view 4) Library services 5) Computer services for engineering 6) Preparation of training plan
2. ENGINEERING INFORMATION & CONTROL DIVISION	
a. Engineering Information Services Section	1) Collection and processing of existing engineering data and information 2) Retrieving and providing engineering information 3) Maintenance of retrieving system
b. Criteria Development Section	1) Preparation of criteria for : i. Planning ii. Design iii. Cost estimate iv. Specification v. Construction supervision 2) Preparation of standard design
c. System Engineering Section	1) Rearrangement and filing of the following basic data i. Meteorological data ii. Hydrological data iii. Cost estimate iv. Other basic data and information

Division/Section	Function and Job Description
	2) Development of system analysis i. Hydrological analysis ii. Hydraulics analysis iii. Sructural analysis iv. Cost analysis v. Other engineering analysis
d. Special Engineering Service Section	1) Study and develop the new technology 2) To solve urgent and high technical problem
3. RESEARCH AND LABORATORY DIVISION	1) In addition to current research activities following items are reinforced i. Quality control of earth embankment for large scale fill type dam ii. Hydraulic model test for spill way and intake iii. Utilization of computer for hydraulic model test
4. TECHNICAL TRAINING BRANCH	1) Preparation of implementation programmes and its implementation for: i. Basic Engineering Course (a) Irrigation & Drainage (b) Machinery (c) Surveying ii. Medium Course (a) Design and Cost Estimates (b) Mechanized Construction iii. Senior Course (a) Computer (b) Dam (c) Gate and Pump (d) Others

II-2 Organization of Study Team

Leader:	Mr. Sadao Nishide	Director General, Land Improvement Engineering Service Center, Tokyo Office, Ministry of Agriculture, Forestry & Fisheries (MAFF)
Member:	Mr. Kazumi Iwasaki (Irrigation Engineering)	Chief of Second Hydrology Div., Water Works Dept., National Research Institute of Agricultural Engineering, MAFF
Member:	Mr. Shozo Matsuura (Project Coordination)	Basic Design Div., Grant Aid Dept. Japan International Cooperation Agency
Member:	Mr. Eiichi Yabumae (Architectural Planning)	Ishimoto Architectural & Engineering Firm, Inc.
Member:	Mr. Akira Nakazawa (Building Design)	Ishimoto Architectural & Engineering Firm, Inc.
Member:	Mr. Yoshiki Umehara (Structural Engineering)	Ishimoto Architectural & Engineering Firm, Inc.
Member:	Mr. Shiro Watanabe (Mechanical Engineering)	Ishimoto Architectural & Engineering Firm, Inc.
Member:	Mr. Nobuhiko Befu (Electrical Engineering)	Ishimoto Architectural & Engineering Firm, Inc.
Member:	Mr. Kagetoshi Amano (Laboratory Planning)	Ishimoto Architectural & Engineering Firm, Inc. (Associate Professor, Farm Construction Laboratory, Dept. of Agriculture Engineering Tokyo Univ. of Agriculture)
Member:	Mr. Akira Kojima (Computor Engineering)	Ishimoto Architectural & Engineering Firm, Inc. (Nippon Koei Co., Ltd.)

II-3 List of Counterparts

Counterpart List for Irrigation Training Center Project

RID (20 Feb. - 12 Mar., 1983)

Mr. Sunthorn Ruanglek	Director General
Mr. Boonthai Otaganonta	Chief Civil Engineer
Mr. Boonyok Vadhanaphuti	Director, Project Planning Div.
Mr. Jumsak Tejasen	Director, Research & Laboratory Div.
Mr. Boonying Naviganantana	Director of Communication Div.
Mr. Suthap Tingsabhat	Director, Program Coordination and Budget Div.
Mr. Suthi Songvoravit	Chief, Project Planning Div.
Mr. Amput Sumboonnanota	Chief, Telecommunication Div.
Mr. Nachara Jirapong	Camp Manager of Pakret Compound
Mr. Chamlong Yording	Chief Architect, Design Div.
Mr. Anek Vichyakul	Chief, Dike and Ditch and Consolidation Branch
Mr. Arom Khumkomgool	Chief, Planning and Budget Div.
Mr. Charoon Kamolratana	Chief, Design Region 10 Branch
Mr. Vidhaya Samaharn	Chief, Hydraulic Lab., R/L Div.
Mr. Mondhien Kangsasitiam	Chief, Soil Lab. , R/L Div.
Mr. Kamthorn Sangkhavasi	Chief, Concrete Lab. , R/L Div.
Mr. Supot Promnarad	Acting Chief, Computer Div.
Mr. Thanee Kheosipalard	Architect, Design Div.
Mr. Kid Sriyalan	Electrical Engineer, Mechanical Div.

Mr. Katsuhiko Kimura	Colombo Plan Expert, Project Planning Div.
Mr. Takeshi Miyazaki	Colombo Plan Expert, Design Div.

Appendix III Draft Final Report Mission

III-1 Minutes of Discussions

MINUTES OF DISCUSSIONS

ON

THE DRAFT FINAL REPORT OF THE BASIC DESIGN STUDY OF
THE PROJECT FOR CONSTRUCTION OF IRRIGATION ENGINEERING CENTER
ROYAL IRRIGATION DEPARTMENT, THAILAND

Japan International Cooperation Agency (JICA), an official agency of technical cooperation programme of the Japanese Government, has sent a mission to Thailand from 20th to 29th April 1983 for the purpose of presenting and explaining the Draft Final Report of the Basic Design Study (the Report) on the project for construction of Irrigation Engineering Center, Royal Irrigation Department (the Project).

The mission held a series of discussions with officials of Royal Irrigation Department (RID) on the Report.

The main items which were discussed and confirmed the following points by both parties towards the finalization of the Study.

1. The Thai side principally approved the Report and appropriate alternations in design agreed during the discussions will be incorporated in the Final Report.
2. The Final Report will be submitted to the Government of Thailand by the end of June 1983.

Furthermore Thai side stressed that Japanese technical cooperation programme for the Center is needed for the purpose of smooth operation upon completion of the Project and Japanese side expressed that the desire of the Thai side will be conveied.

28th April 1983
Bangkok

Boonthai Otaganonta

Mr. Boonthai Otaganonta
Chief Engineer for Civil Engineering for Director General
Royal Irrigation Department

西 出 定 雄

Mr. Sadao NISHIDE
Leader of JICA Team

III-2 Organization of Mission

Leader :	Mr. Sadao Nishide	Director General, Land Improvement Engineering Service Center, Tokyo Office, Ministry of Agriculture, Forestry & Fisheries (MAFF)
Member :	Mr. Shozo Matsuura (Project Coordination)	Basic Design Div., Grant Aid Dept., Japan International Cooperation Agency
Member :	Mr. Eiichi Yabumae (Architectural Planning)	Ishimoto Architectural & Engineering Firm, Inc.
Member :	Mr. Kagetoshi Amano (Laboratory Planning)	Ishimoto Architectural & Engineering Firm, Inc. (Associate Professor, Farm Construction Laboratory, Dept. of Agriculture Engineering, Tokyo Univ. of Agriculture)
Member :	Mr. Akira Kojima (Computer Engineering)	Ishimoto Architectural & Engineering Firm, Inc. (Nippon Koei Co., Ltd.)

III-3 List of Counterparts

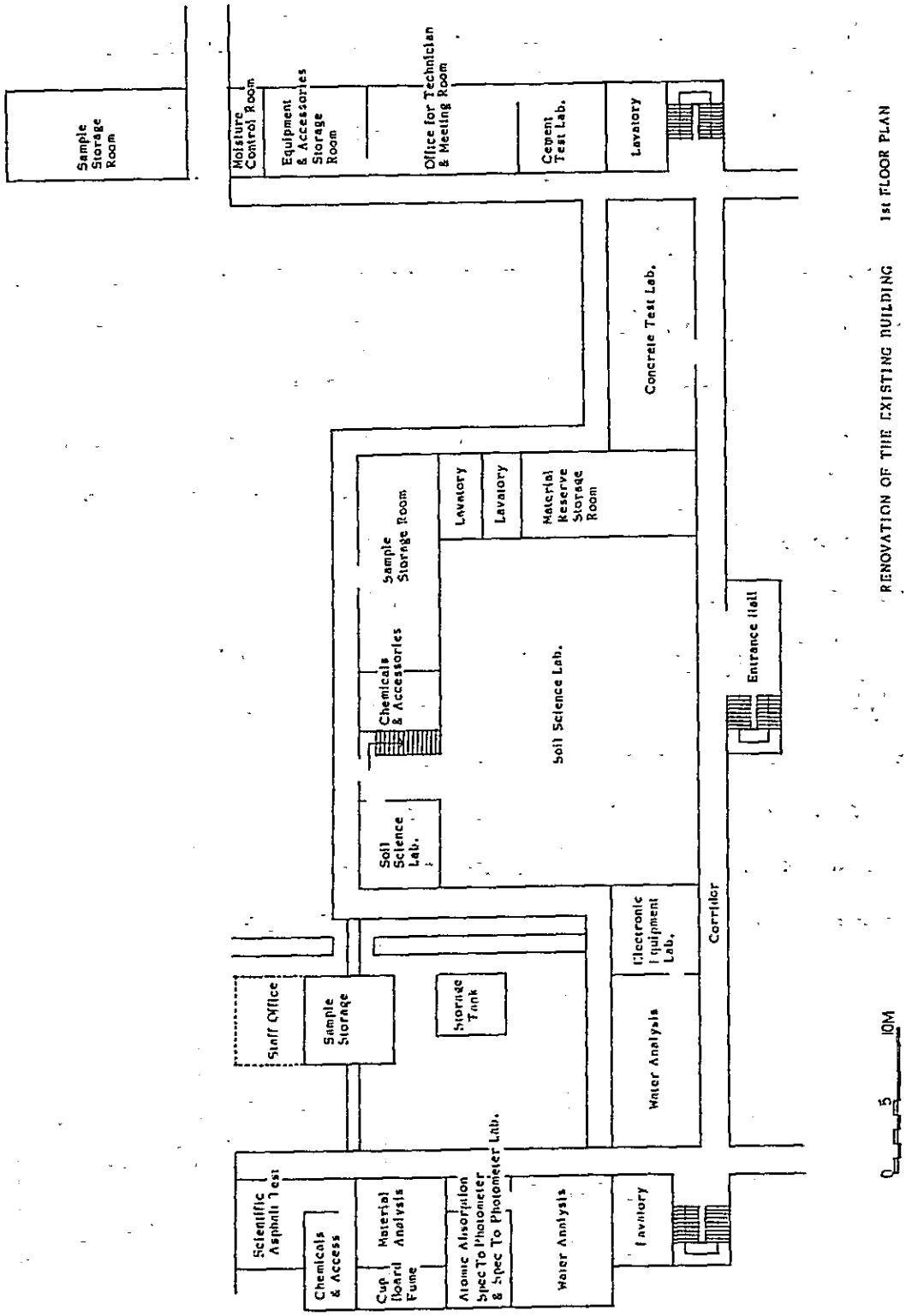
List of Counter Parts (Final Report)

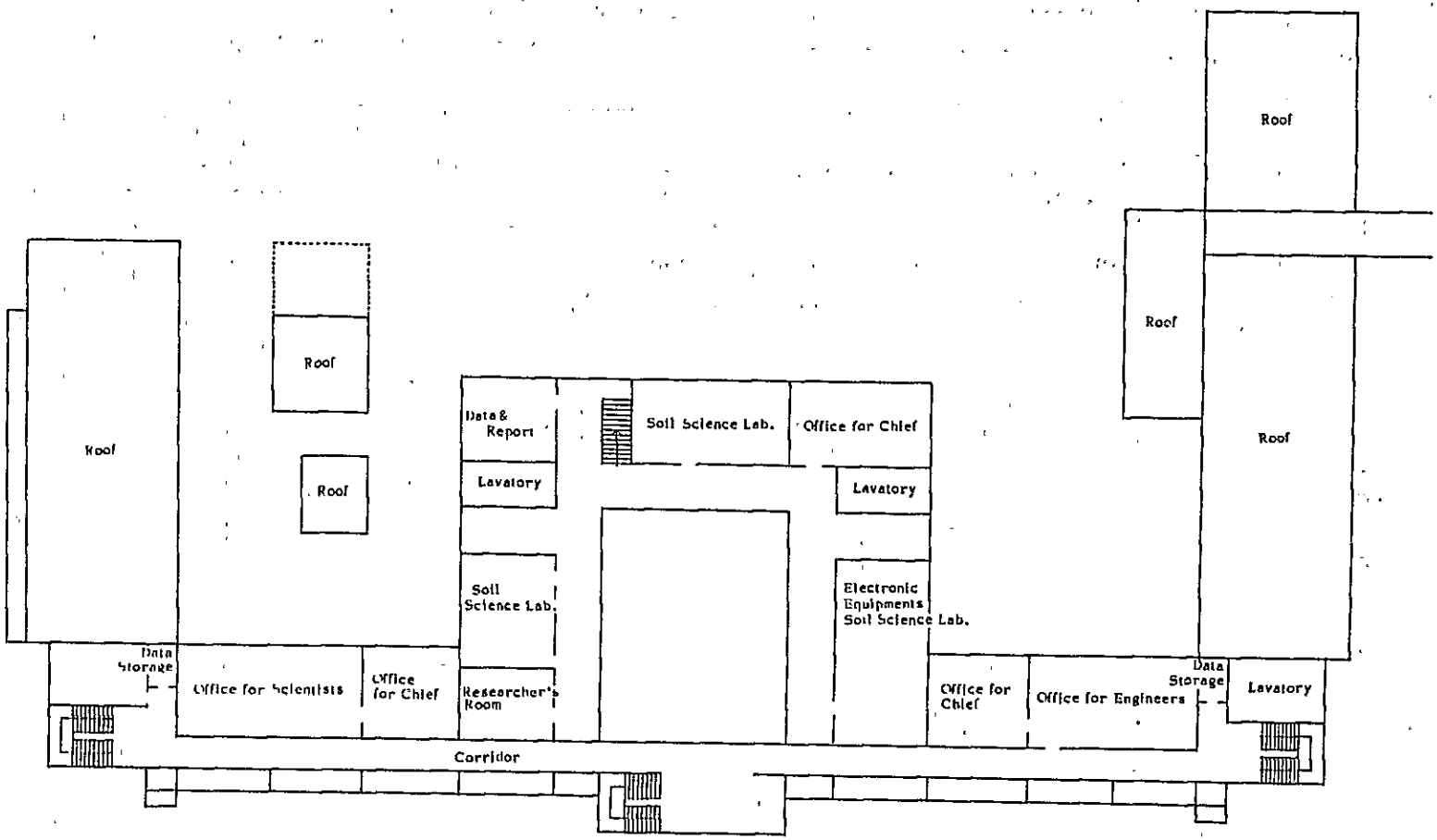
Counterpart List for Irrigation Engineering Center Project

RID Convention Room 26 April, 1983

Mr. Boonthai Otaganonta	Chief Engineer for Civil Engineering
Mr. Boonyok Vadhanaphuti	Director, Project Planning Div.
Mr. Jumsak Tejasen	Director, Research + Lab., Div.
Mr. Suthep Tingsabpat	Director, Program + Budjet Div.
	Acting Director, Hydrology Div.
Mr. Shoombhol Chaveesuk	Director, Design Div.
Mr. Prabhansak Bhengbhon	Director, Engineering Training Unit.
Mr. Suthi Songvoravit	Chief of Policy Branch
Mr. Vidhaya Samaharn	Chief of Hydraulic Lab.
Mr. Sirirat Temiyanond	Chief of Programming Branch
Mr. Thanee Kheosipalard	Architect
Mr. Katsuhiko KIMURA	Colombo Plan Expert
Mr. Takeshi MIYAZAKI	Colombo Plan Expert

Appendix IV Remodeling Plan of the Existing Main Building

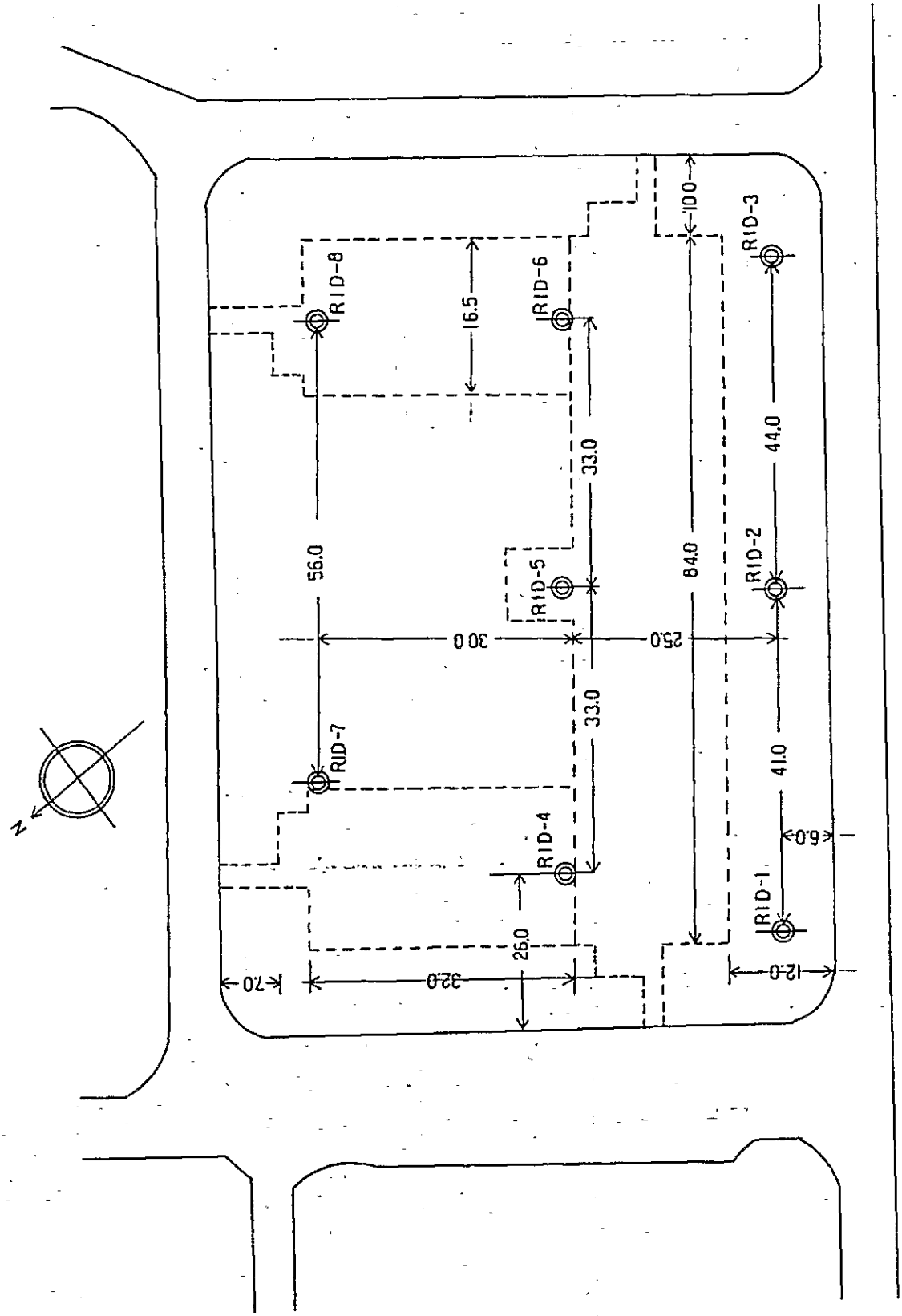




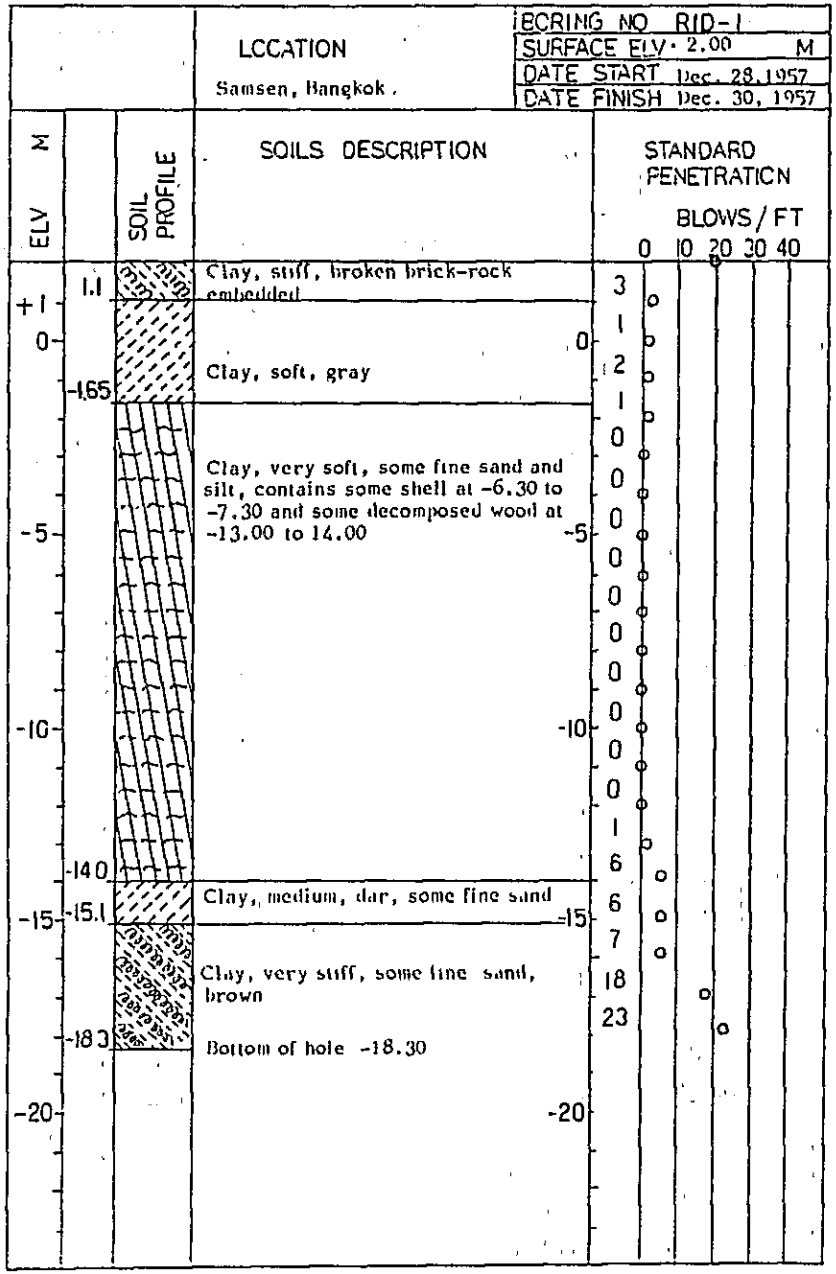
RENOVATION OF THE EXISTING BUILDING 2nd FLOOR PLAN

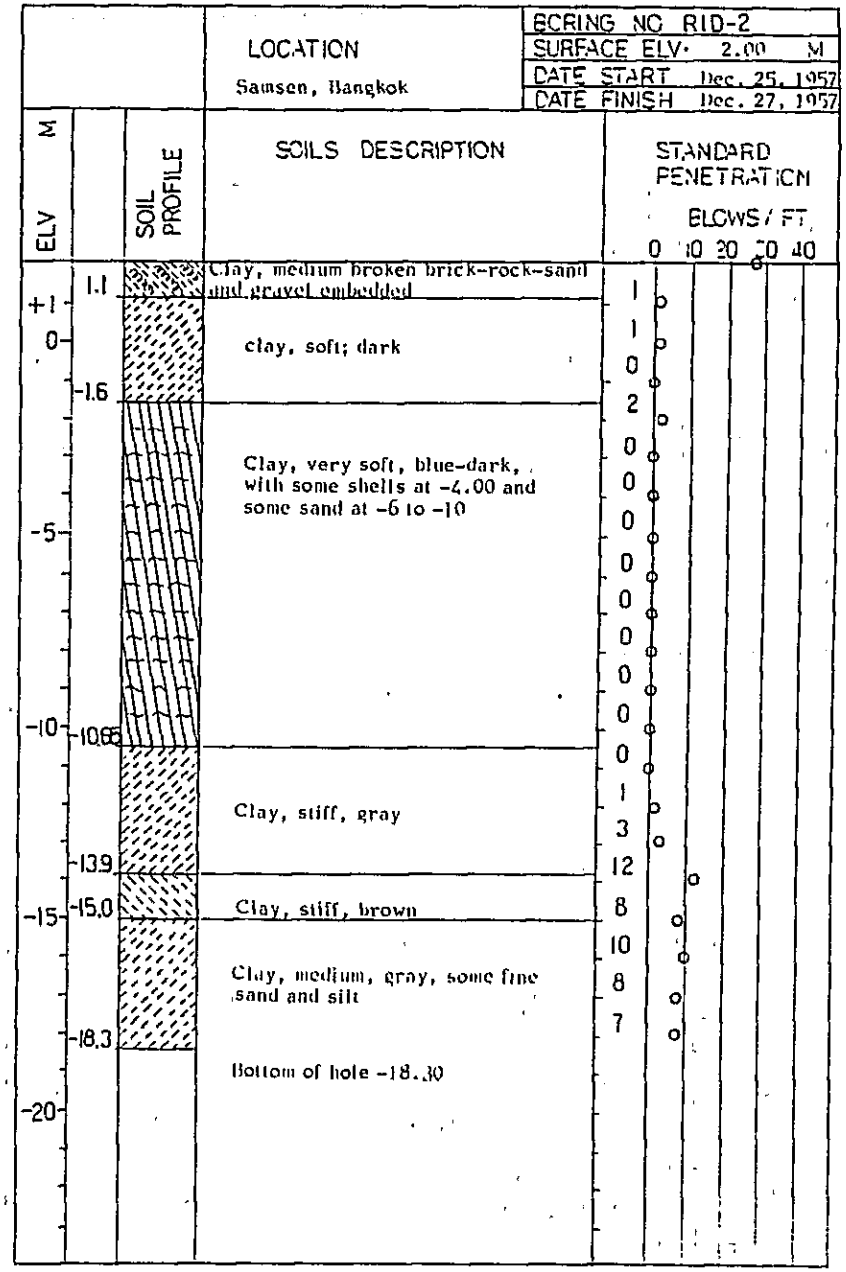
Appendix V Boring Data

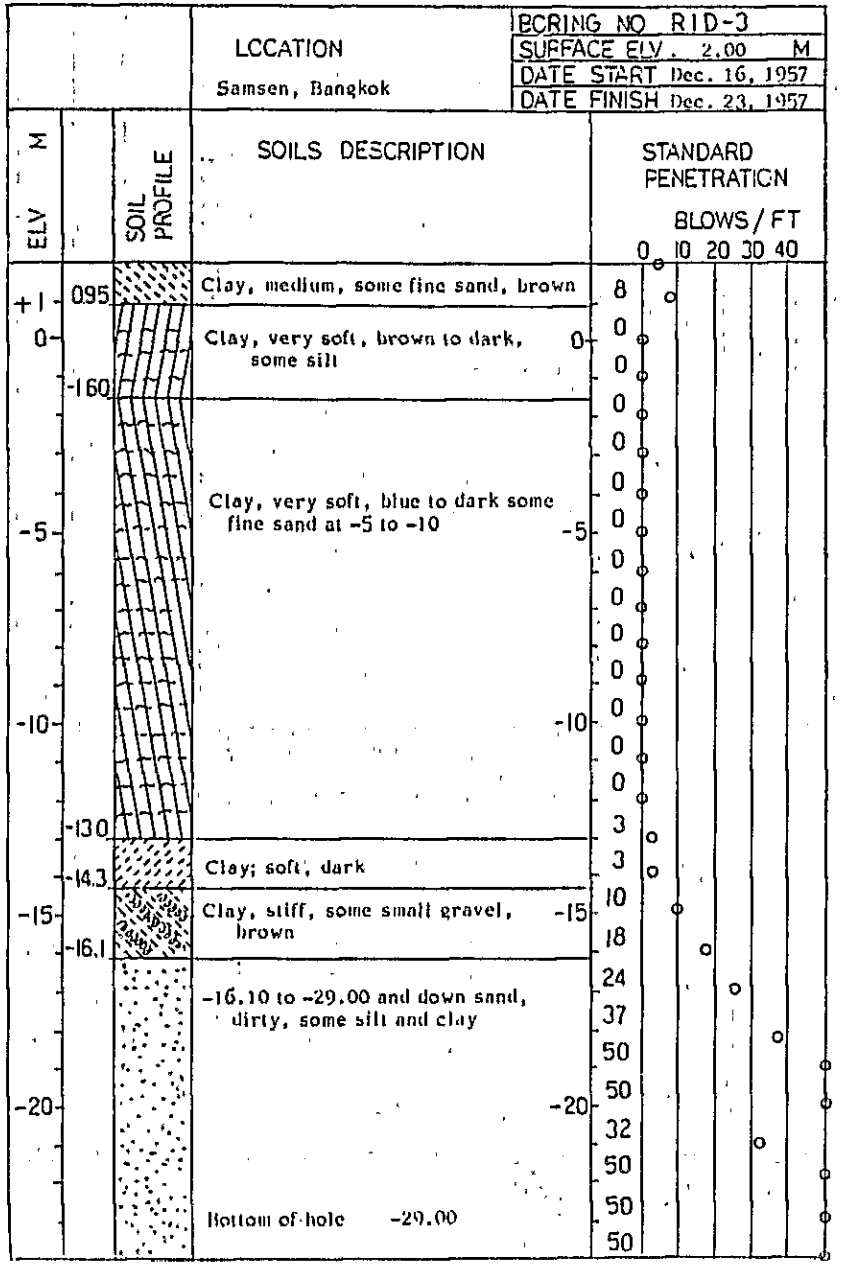
V-1 Boring Data in Samsen Compound

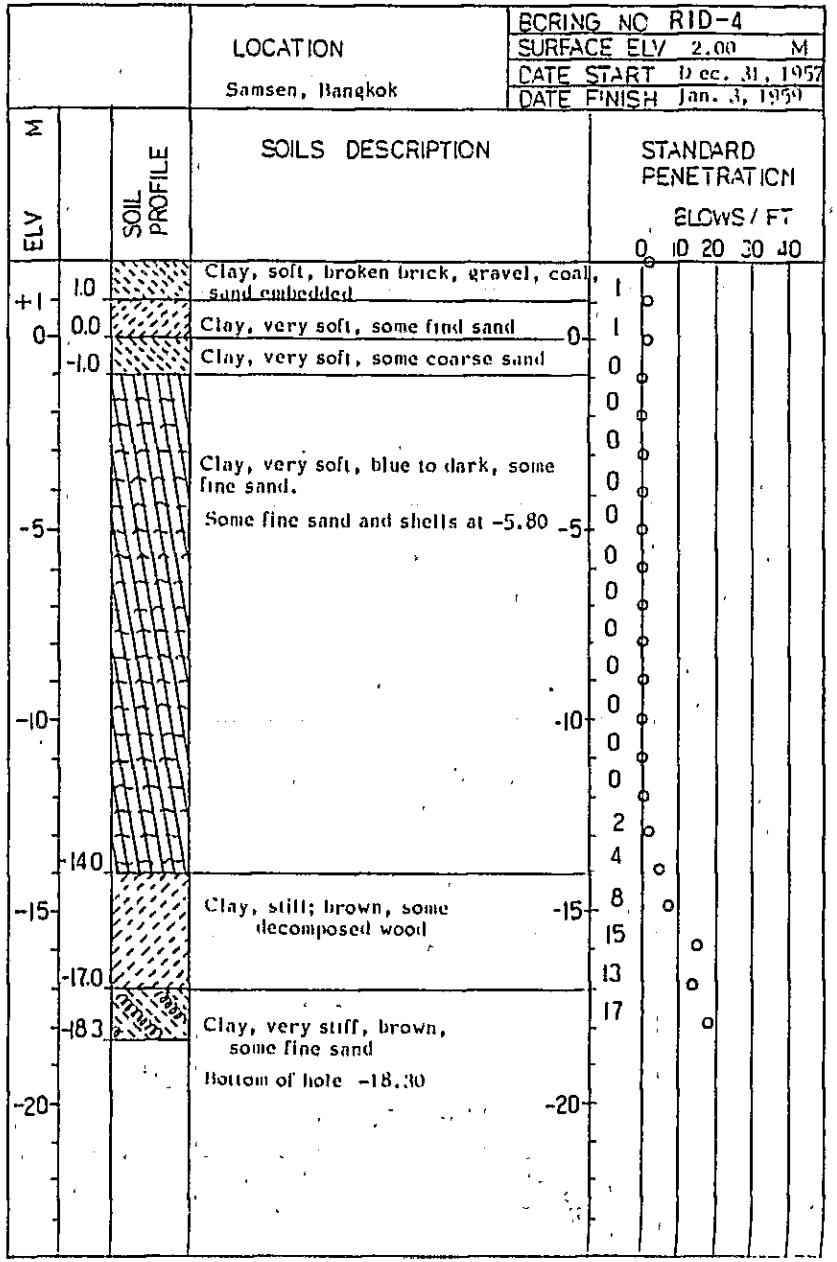


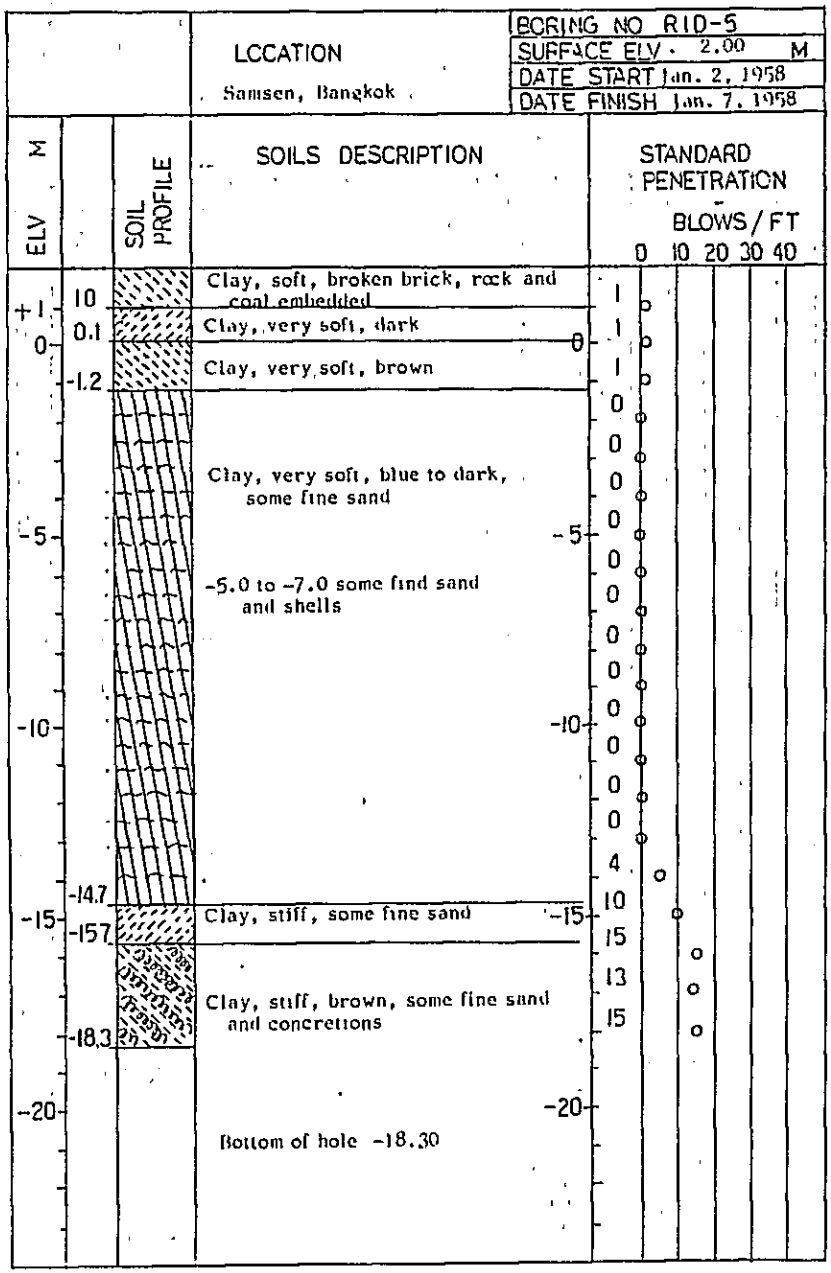
BORING LOCATION OF MAIN BUILDING
IN ROYAL IRRIGATION DEPARTMENT, SAMSEN, BANGKOK

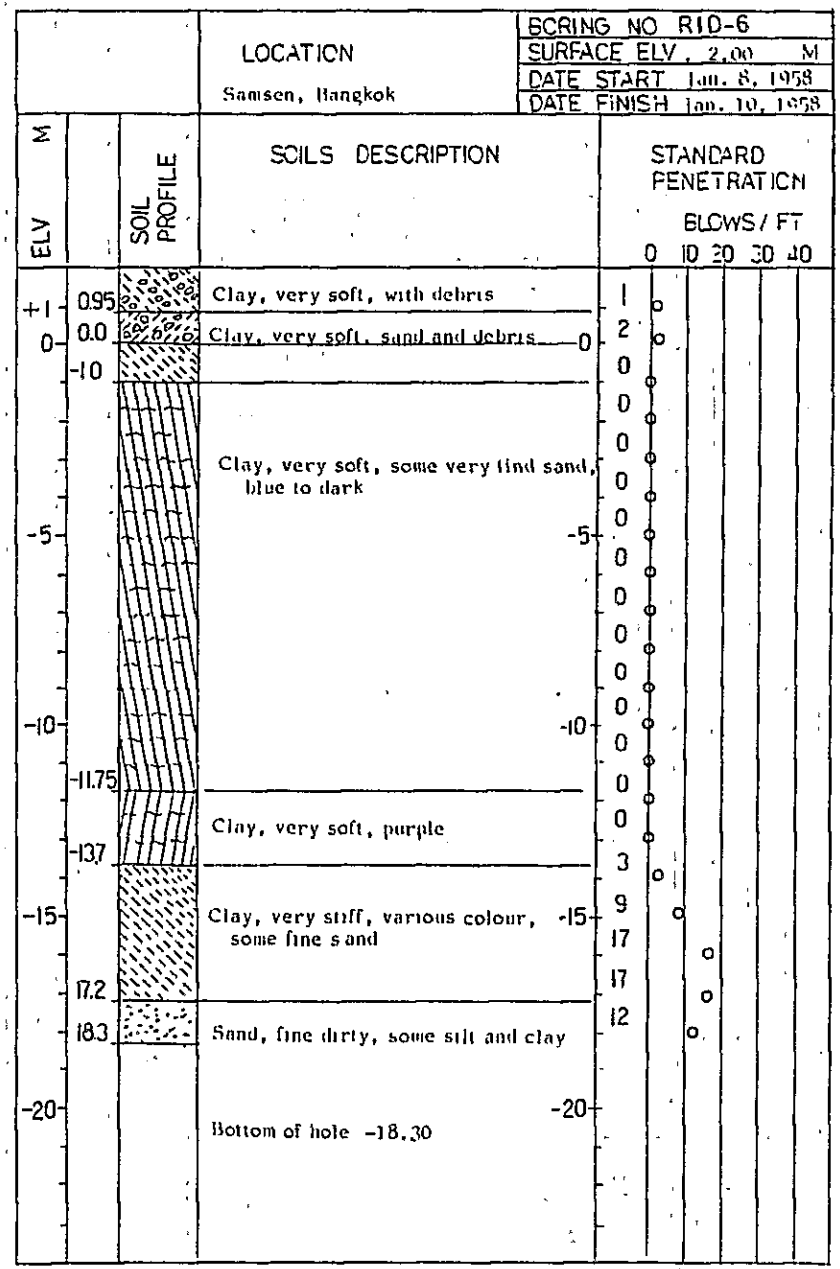

BORING NO RID-1
LOCATION
Samsen, Bangkok.
SURFACE ELV. 2.00 M
DATE START Dec. 28, 1957
DATE FINISH Dec. 30, 1957
ELV M
SOIL PROFILE
SOILS DESCRIPTION
STANDARD PENETRATION
BLOWS / FT
0 10 20 30 40
Clay, stiff, broken brick-rock embedded
Clay, soft, gray
Clay, very soft, some fine sand and silt, contains some shell at -6.30 to -7.30 and some decomposed wood at -13.00 to 14.00
Clay, medium, dar, some fine sand
Clay, very stiff, some fine sand, brown
Bottom of hole -18.30
1.1
0
-1.65
-14.0
-15.1
-18.3
+1
-5
-10
-15
-20
3 1 2 1 0 0 0 0 0 0 0 0 0 0 1 6 6 7 18 23

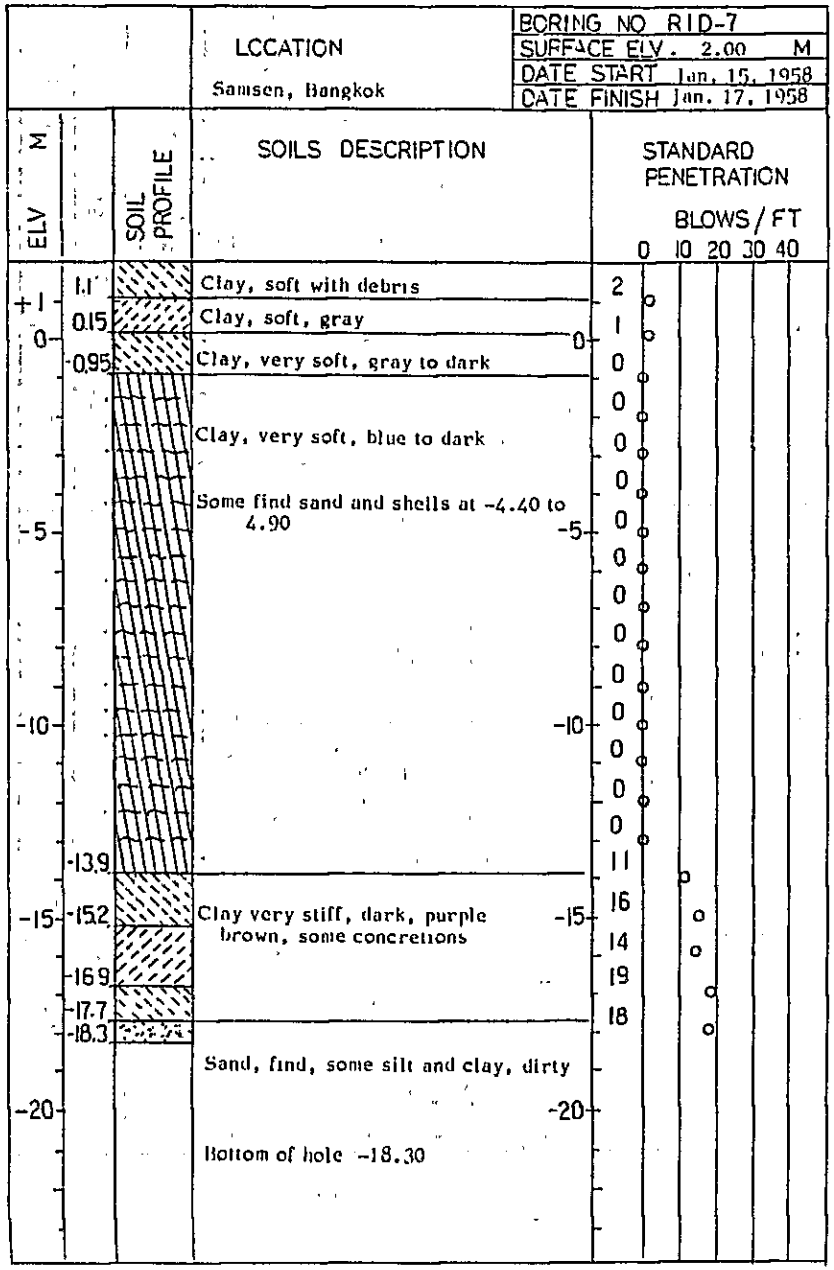

BORING NO RID-2
LOCATION
Samsen, Bangkok
SURFACE ELV. 2.00 M
DATE START Dec. 25, 1957
DATE FINISH Dec. 27, 1957
ELV M
SOIL PROFILE
SOILS DESCRIPTION
STANDARD PENETRATION
BLOWS / FT
0 10 20 30 40
Clay, medium broken brick-rock-sand and gravel embedded
clay, soft; dark
Clay, very soft, blue-dark, with some shells at -4.00 and some sand at -6 to -10
Clay, stiff, gray
Clay, stiff, brown
Clay, medium, gray, some fine sand and silt
Bottom of hole -18.30
1.1
-1.6
-10.6
-13.9
-15.0
-18.3
+1
-5
-10
-15
-20
1 1 0 2 0 0 0 0 0 0 0 0 0 0 1 3 12 8 10 8 7

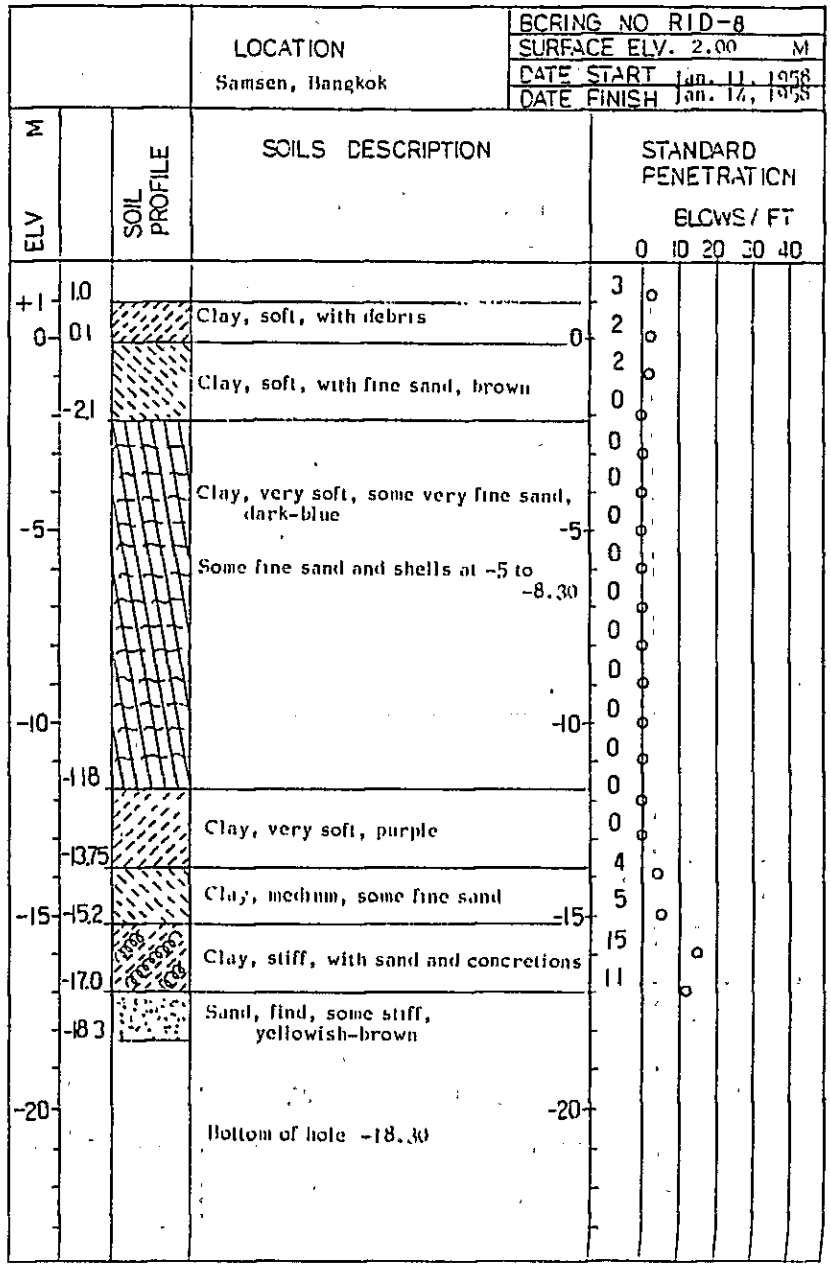

LOCATION
Samsen, Bangkok
BORING NO RID-3
SURFACE ELV. 2.00 M
DATE START Dec. 16, 1957
DATE FINISH Dec. 23, 1957
ELV M
SOIL PROFILE
SOILS DESCRIPTION
STANDARD PENETRATION
BLOWS / FT
0 10 20 30 40
+1
0
-5
-10
-15
-20
0.95
-1.60
-13.0
-14.3
-16.1
Clay, medium, some fine sand, brown
Clay, very soft, brown to dark, some silt
Clay, very soft, blue to dark some fine sand at -5 to -10
Clay; soft, dark
Clay, stiff, some small gravel, brown
-16.10 to -29.00 and down sand, dirty, some silt and clay
Bottom of hole -29.00
8 0 0 0 0 0 0 0 0 0 0 0 3 3 10 18 24 37 50 50 32 50 50 50


LOCATION
Samsen, Bangkok
BORING NO RID-4
SURFACE ELV 2.00 M
DATE START Dec. 31, 1957
DATE FINISH Jan. 3, 1958
ELV M
SOIL PROFILE
SOILS DESCRIPTION
STANDARD PENETRATION
BLOWS / FT
0 10 20 30 40
+1
0
-5
-10
-15
-20
1.0
0.0
-1.0
-14.0
-17.0
-18.3
Clay, soft, broken brick, gravel, coal, sand embedded
Clay, very soft, some find sand
Clay, very soft, some coarse sand
Clay, very soft, blue to dark, some fine sand.
Some fine sand and shells at -5.80
Clay, still; brown, some decomposed wood
Clay, very stiff, brown, some fine sand
Bottom of hole -18.30
1 1 0 0 0 0 0 0 0 0 0 0 0 2 4 8 15 13 17

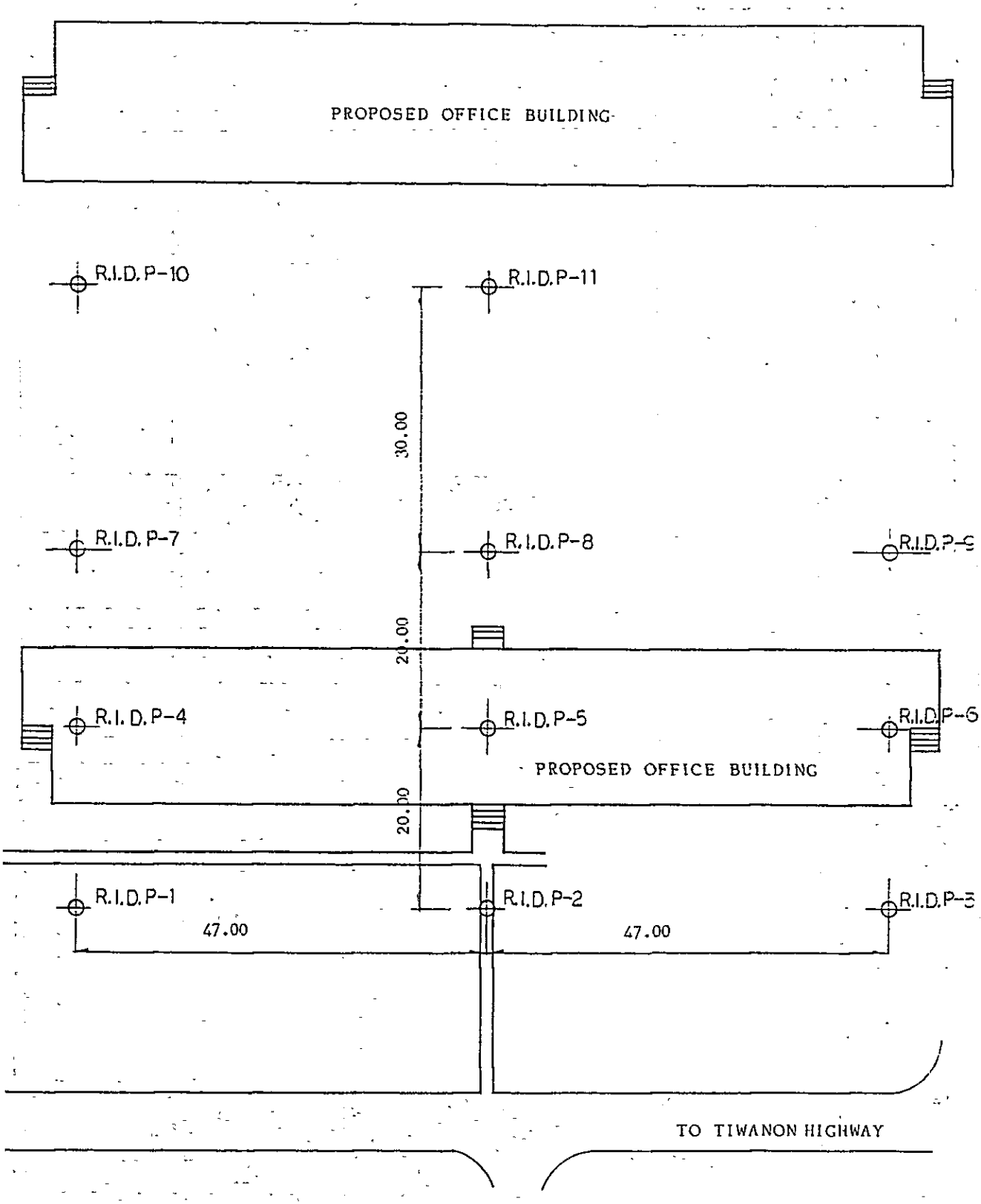

BORING NO R1D-5
SURFACE ELV. 2.00 M
DATE START Jan. 2, 1958
DATE FINISH Jan. 7, 1958
LOCATION
Samsen, Bangkok
ELV M
SOIL PROFILE
SOILS DESCRIPTION
STANDARD PENETRATION
BLOWS / FT
0 10 20 30 40
+1
0
-5
-10
-15
-20
10
0.1
-1.2
-14.7
-15.7
-18.3
Clay, soft, broken brick, rock and coal embedded
Clay, very soft, dark
Clay, very soft, brown
Clay, very soft, blue to dark, some fine sand
-5.0 to -7.0 some find sand and shells
Clay, stiff, some fine sand
Clay, stiff, brown, some fine sand and concretions
Bottom of hole -18.30
1 1 1 0 0 0 0 0 0 0 0 0 0 0 4 10 15 13 15


BORING NO R1D-6
SURFACE ELV. 2.00 M
DATE START Jan. 8, 1958
DATE FINISH Jan. 10, 1958
LOCATION
Samsen, Bangkok
ELV M
SOIL PROFILE
SOILS DESCRIPTION
STANDARD PENETRATION
BLOWS / FT
0 10 20 30 40
+1
0
-5
-10
-15
-20
0.95
0.0
-1.0
-11.75
-13.7
17.2
18.3
Clay, very soft, with debris
Clay, very soft, sand and debris
Clay, very soft, some very find sand, blue to dark
Clay, very soft, purple
Clay, very stiff, various colour, some fine sand
Sand, fine dirty, some silt and clay
Bottom of hole -18.30
1 2 0 0 0 0 0 0 0 0 0 0 0 0 3 9 17 17 12

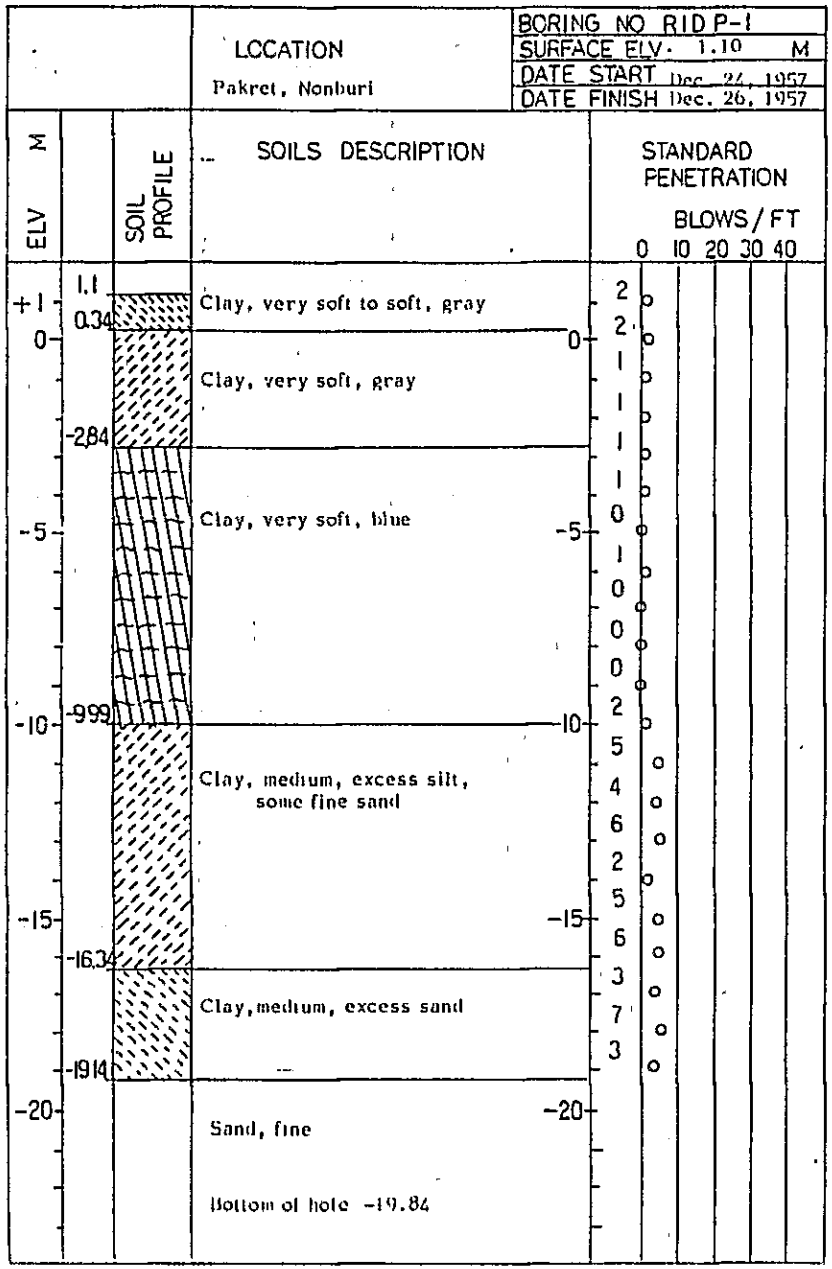

LOCATION
Samsen, Bangkok
BORING NO RID-7
SURFACE ELV. 2.00 M
DATE START Jan. 15, 1958
DATE FINISH Jan. 17, 1958
ELV M
SOIL PROFILE
SOILS DESCRIPTION
STANDARD PENETRATION
BLOWS / FT
0 10 20 30 40
+1
0
-5
-10
-15
-20
1.1
0.15
0
-0.95
-5
-10
-13.9
-15
-15.2
-16.9
-17.7
-18.3
-20
Clay, soft with debris
Clay, soft, gray
Clay, very soft, gray to dark
Clay, very soft, blue to dark
Some find sand and shells at -4.40 to 4.90
Clay very stiff, dark, purple brown, some concretions
Sand, find, some silt and clay, dirty
Bottom of hole -18.30
2
1
0
0
0
0
0
0
0
0
0
0
0
11
16
14
19
18

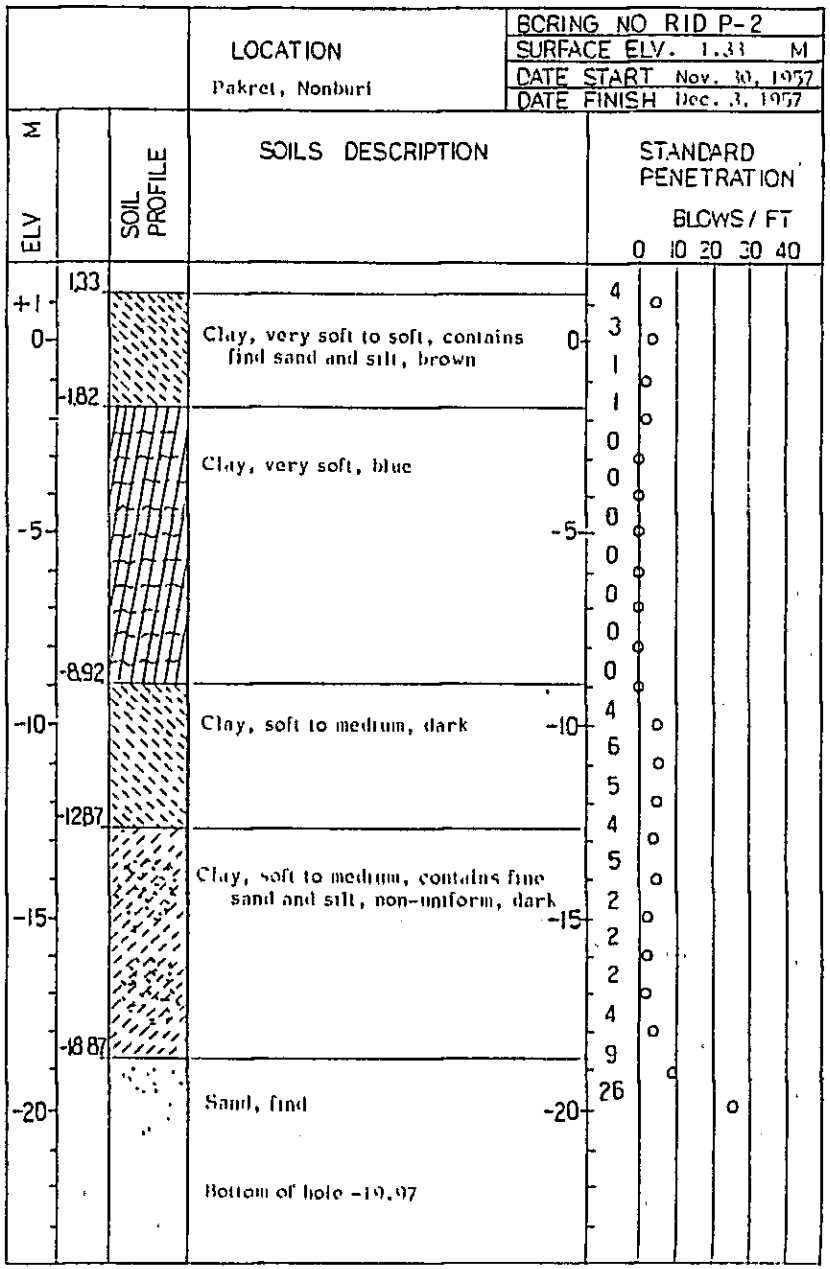

LOCATION
Samsen, Bangkok
BORING NO RID-8
SURFACE ELV. 2.00 M
DATE START Jan. 11, 1958
DATE FINISH Jan. 14, 1958
ELV M
SOIL PROFILE
SOILS DESCRIPTION
STANDARD PENETRATION
BLOWS / FT
0 10 20 30 40
+1
0
-5
-10
-15
-20
1.0
0.1
0
-2.1
-5
-10
-11.8
-13.75
-15
-15.2
-17.0
-18.3
-20
Clay, soft, with debris
Clay, soft, with fine sand, brown
Clay, very soft, some very fine sand, dark-blue
Some fine sand and shells at -5 to -8.30
Clay, very soft, purple
Clay, medium, some fine sand
Clay, stiff, with sand and concretions
Sand, find, some stiff, yellowish-brown
Bottom of hole -18.30
3
2
2
0
0
0
0
0
0
0
0
0
0
4
5
15
11

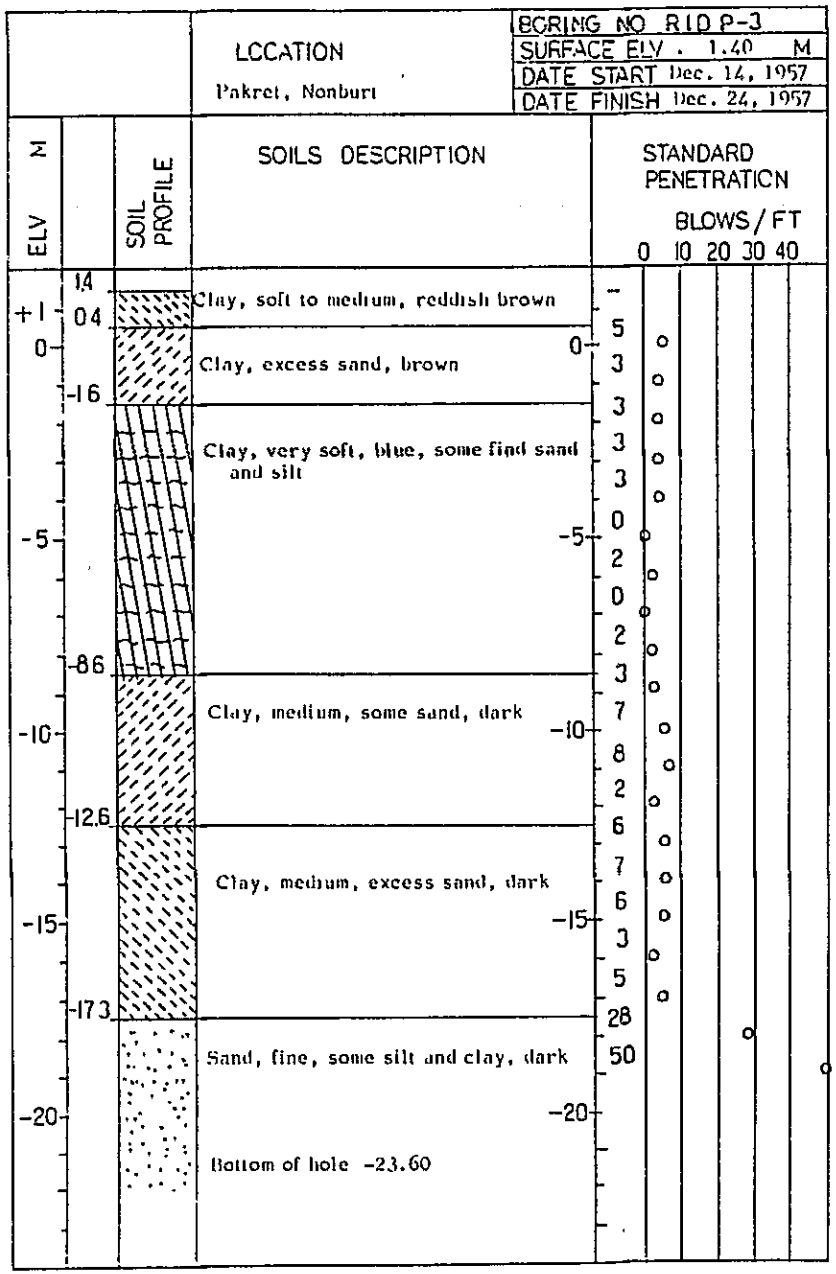
V-2 Boring Data in Pakret Compound

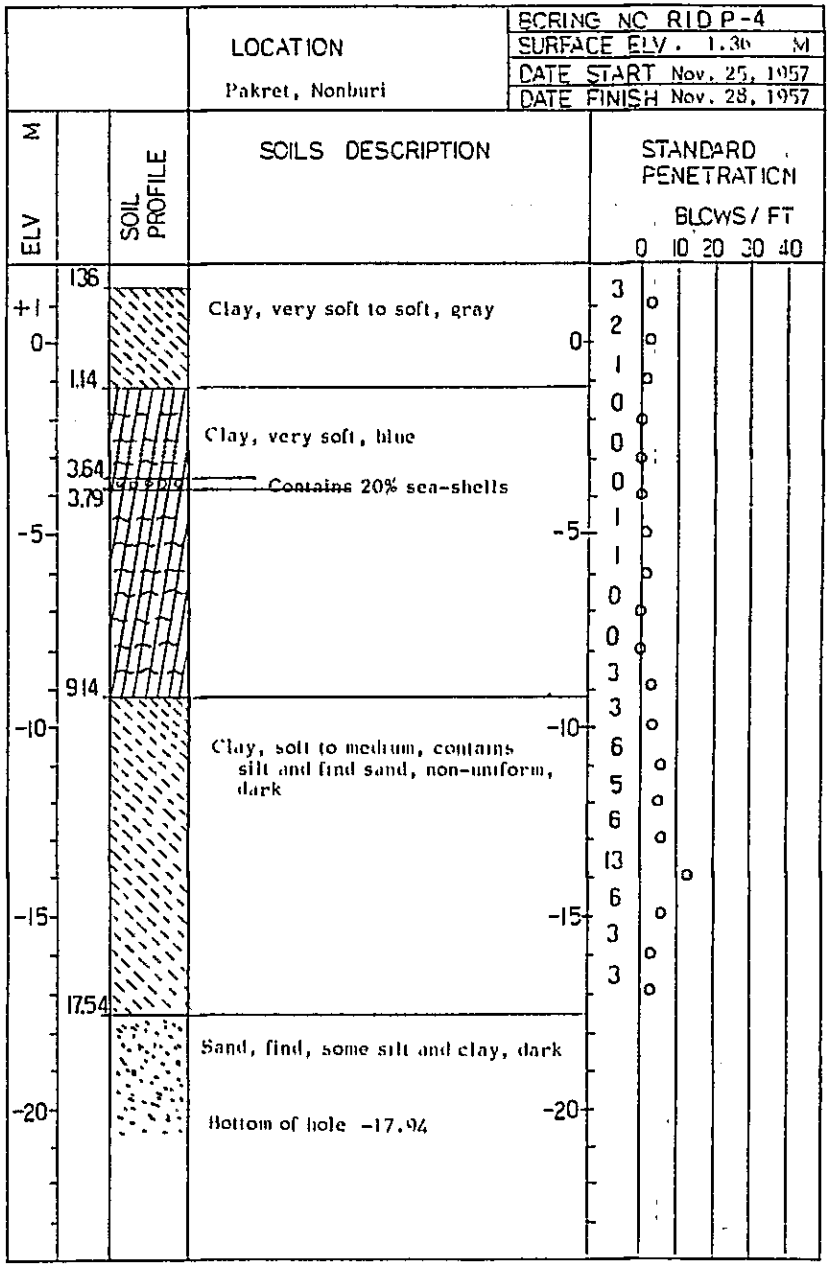


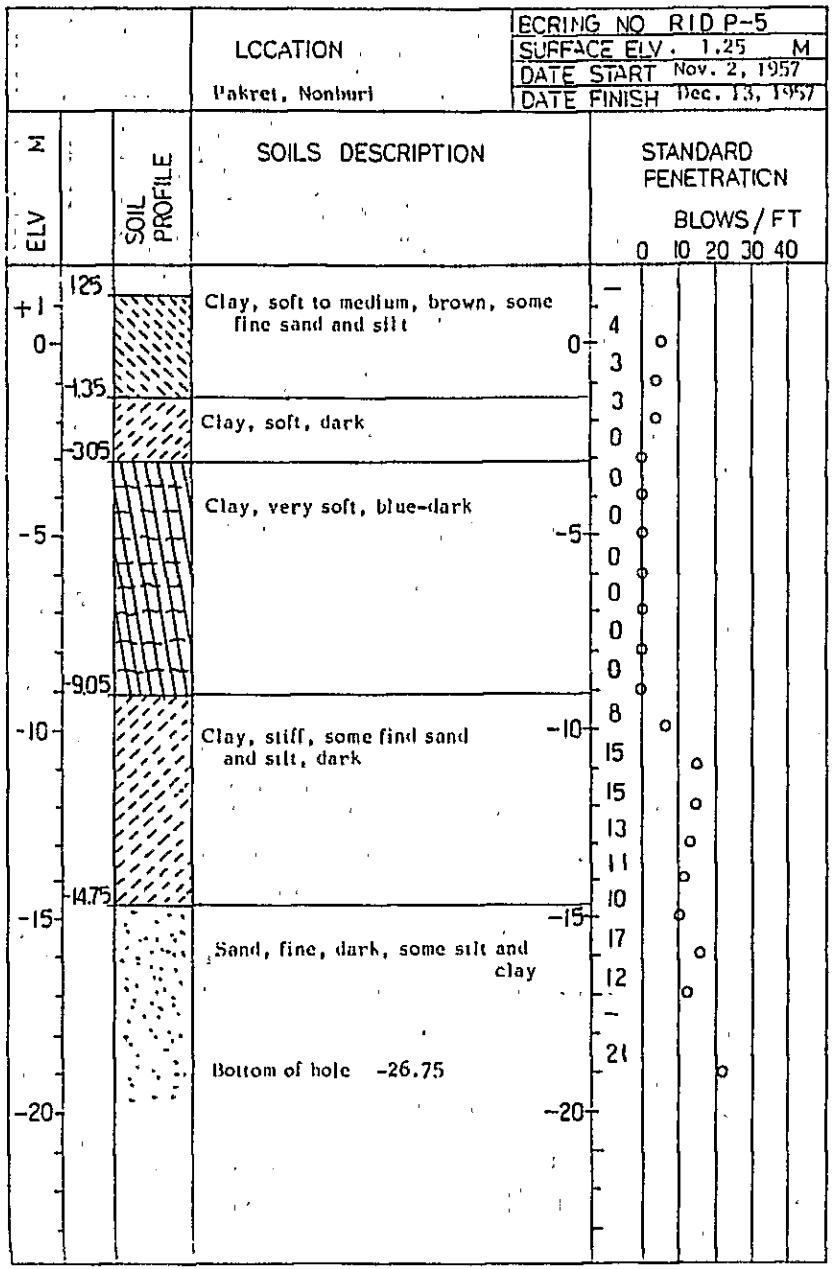
BORING LOCATION OF OFFICE BUILDING
IN ROYAL IRRIGATION DEPARTMENT, PAKRET

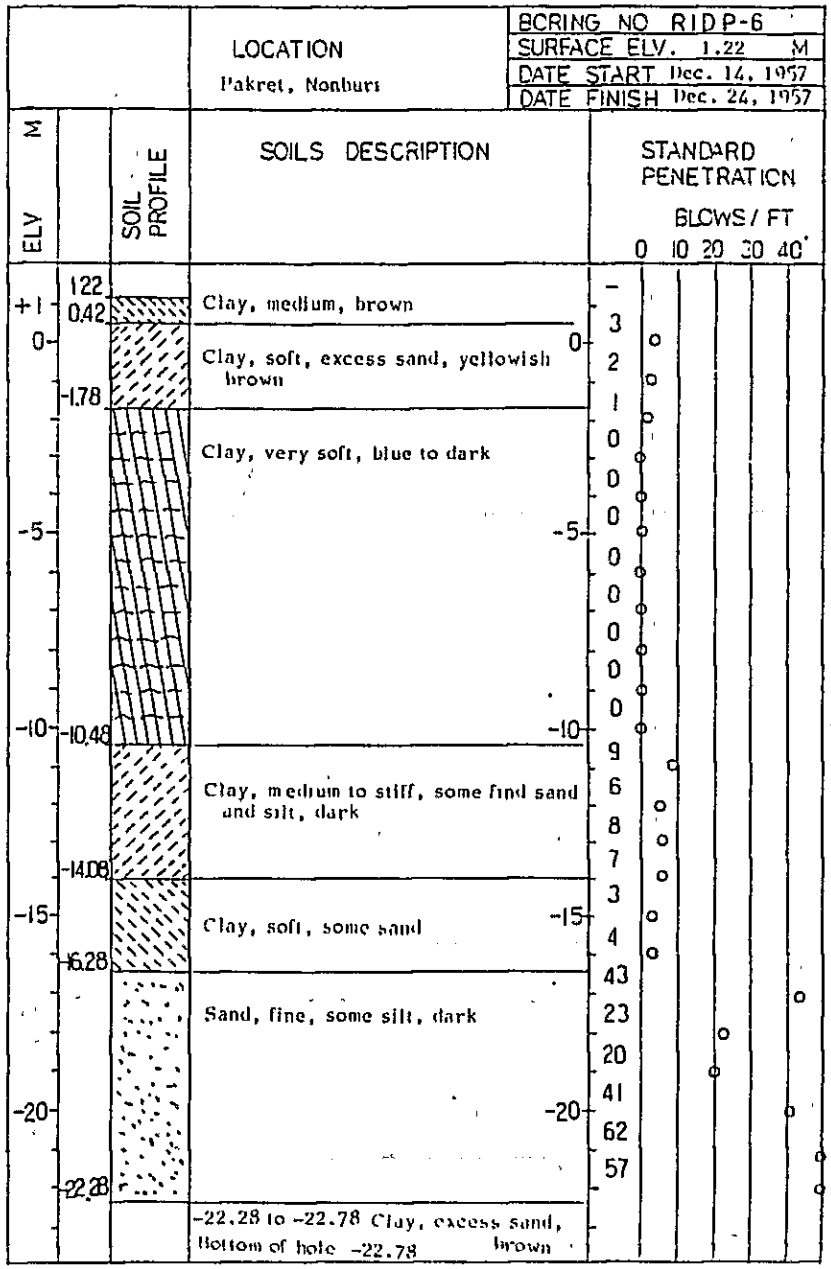

LOCATION
Pakret, Nonburi
BORING NO RID P-1
SURFACE ELV. 1.10 M
DATE START Dec. 24, 1957
DATE FINISH Dec. 26, 1957
ELV M
SOIL PROFILE
SOILS DESCRIPTION
STANDARD PENETRATION
BLOWS / FT
0 10 20 30 40
+1
0
-5
-10
-15
-20
1.1
0.34
-2.84
-9.99
-16.34
-19.14
Clay, very soft to soft, gray
Clay, very soft, gray
Clay, very soft, blue
Clay, medium, excess silt, some fine sand
Clay, medium, excess sand
Sand, fine
Bottom of hole -19.84
2 2 1 1 1 0 1 0 0 0 2 5 4 6 2 5 6 3 7 3

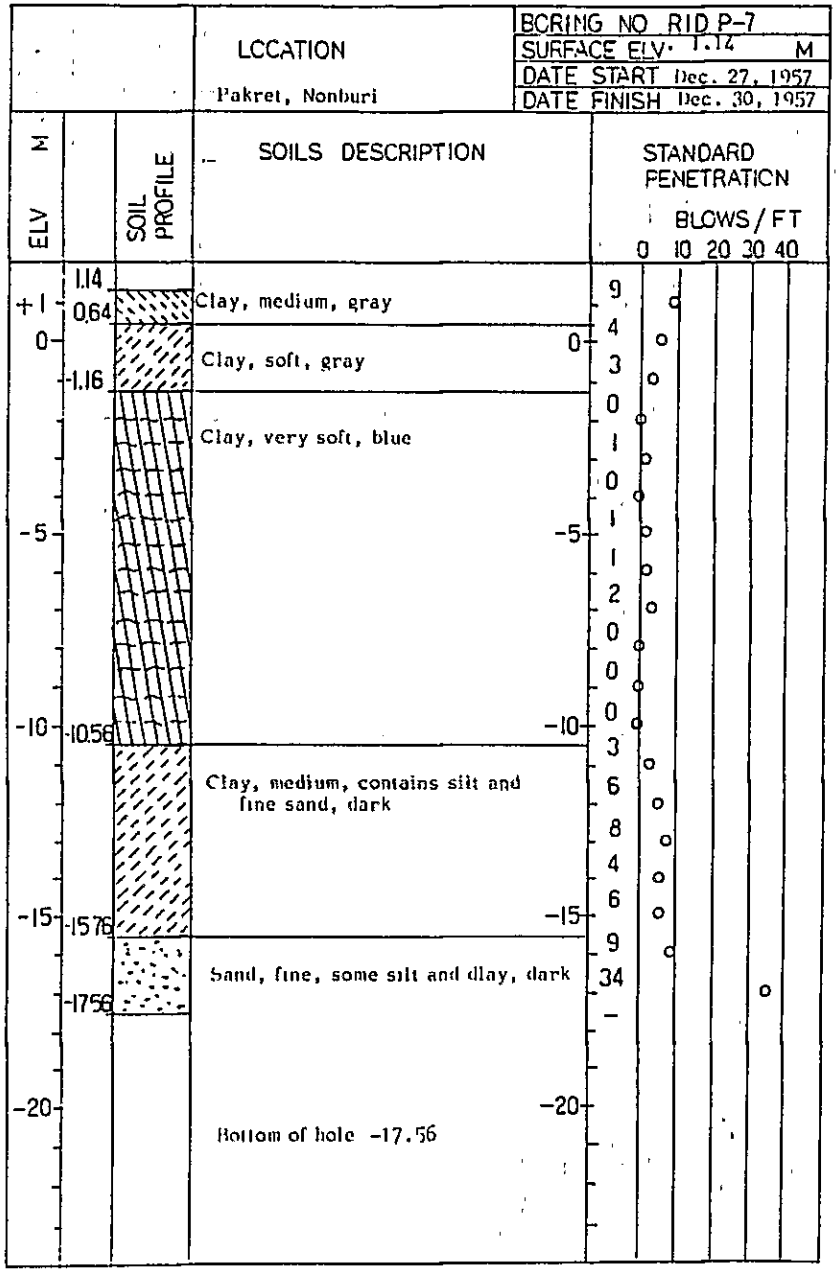

LOCATION
Pakret, Nonburi
BORING NO RID P-2
SURFACE ELV. 1.33 M
DATE START Nov. 30, 1957
DATE FINISH Dec. 3, 1957
ELV M
SOIL PROFILE
SOILS DESCRIPTION
STANDARD PENETRATION
BLOWS / FT
0 10 20 30 40
+1
0
-5
-10
-15
-20
1.33
-1.82
-8.92
-12.87
-18.87
Clay, very soft to soft, contains find sand and silt, brown
Clay, very soft, blue
Clay, soft to medium, dark
Clay, soft to medium, contains fine sand and silt, non-uniform, dark
Sand, find
Bottom of hole -19.97
4 3 1 1 0 0 0 0 0 0 0 4 6 5 4 5 2 2 2 4 9 26

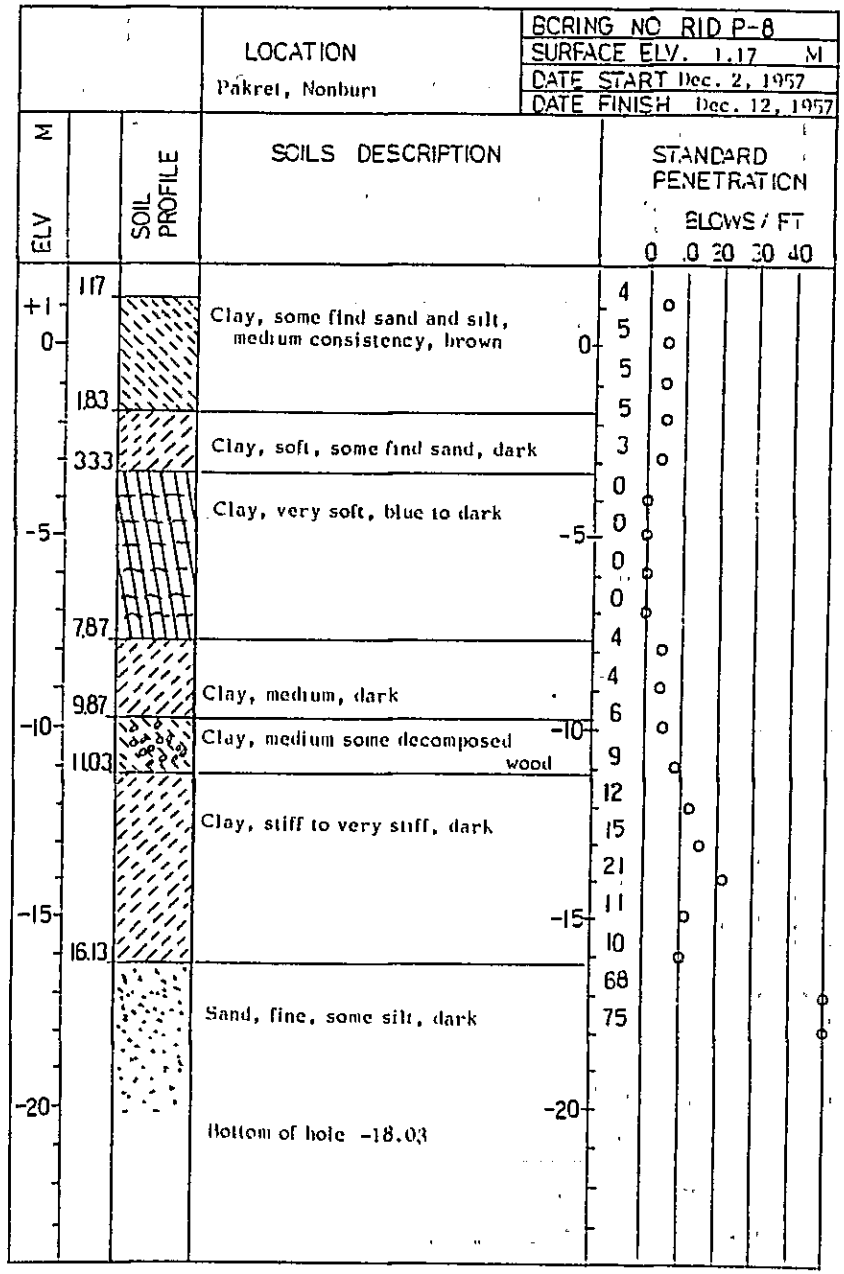

LOCATION
Pakret, Nonburi
BORING NO R1D P-3
SURFACE ELV . 1.40 M
DATE START Dec. 14, 1957
DATE FINISH Dec. 24, 1957
ELV M
SOIL PROFILE
SOILS DESCRIPTION
STANDARD PENETRATION
BLOWS / FT
0 10 20 30 40
+1
0
-5
-10
-15
-20
1.4
0.4
-1.6
-8.6
-12.6
-17.3
Clay, soft to medium, reddish brown
Clay, excess sand, brown
Clay, very soft, blue, some find sand and silt
Clay, medium, some sand, dark
Clay, medium, excess sand, dark
Sand, fine, some silt and clay, dark
Bottom of hole -23.60
5 3 3 3 3 0 2 0 2 3 7 8 2 6 7 6 3 5 28 50

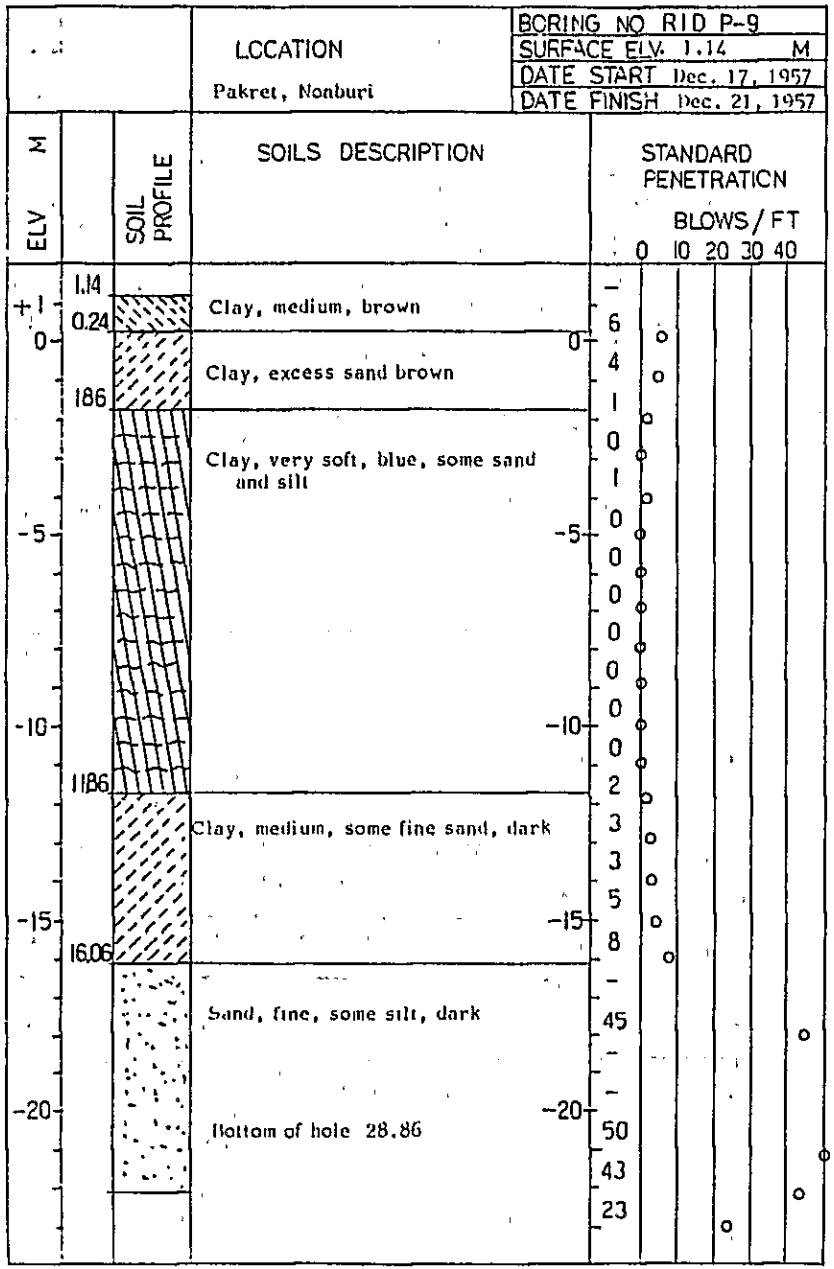

LOCATION
Pakret, Nonburi
BORING NO R1D P-4
SURFACE ELV . 1.36 M
DATE START Nov. 25, 1957
DATE FINISH Nov. 28, 1957
ELV M
SOIL PROFILE
SOILS DESCRIPTION
STANDARD PENETRATION
BLOWS / FT
0 10 20 30 40
+1
0
-5
-10
-15
-20
1.36
1.14
3.64
3.79
9.14
17.54
Clay, very soft to soft, gray
Clay, very soft, blue
Contains 20% sea-shells
Clay, soft to medium, contains silt and find sand, non-uniform, dark
Sand, find, some silt and clay, dark
Bottom of hole -17.94
3 2 1 0 0 0 1 1 0 0 3 3 6 5 6 13 6 3 3

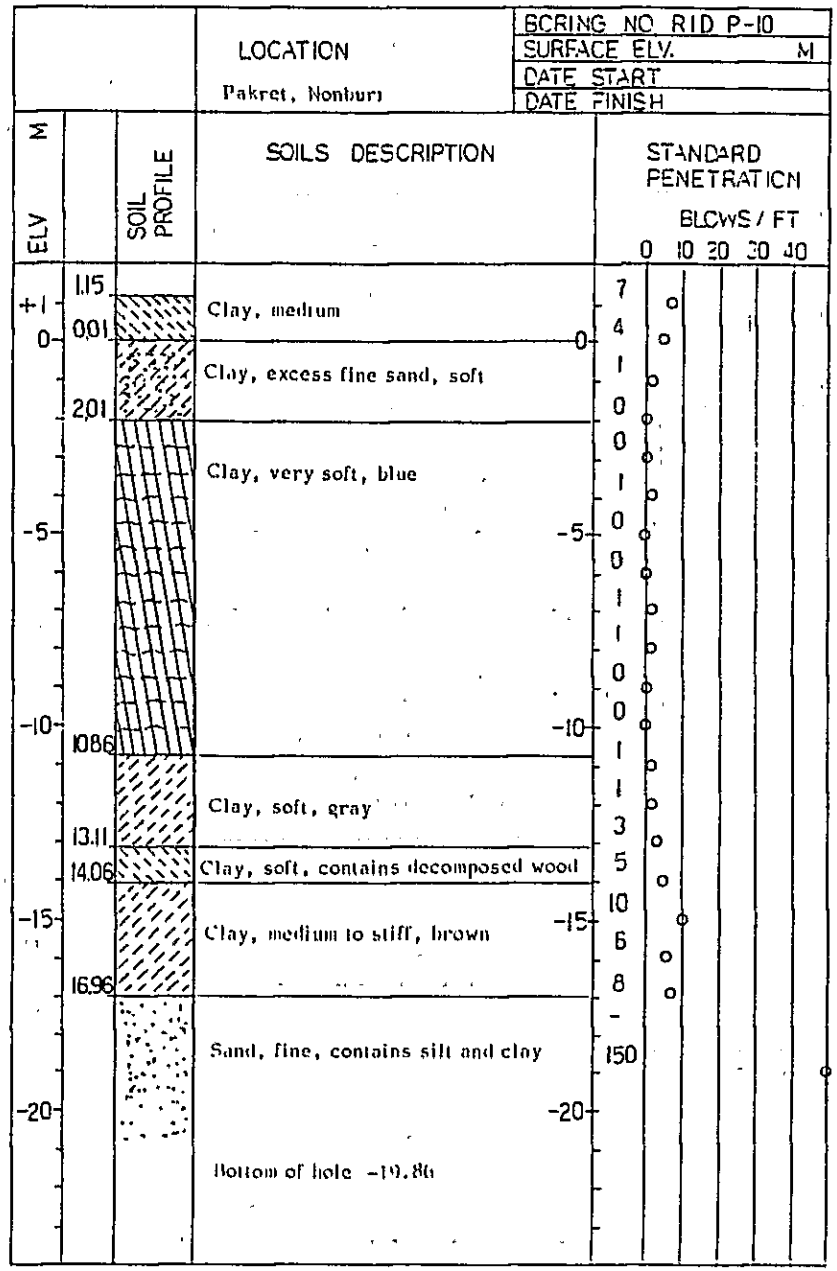

BCRING NO RID P-5
SURFACE ELV. 1.25 M
DATE START Nov. 2, 1957
DATE FINISH Dec. 13, 1957
LCCATION
Pakret, Nonburi
ELV M
SOIL PROFILE
SOILS DESCRIPTION
STANDARD PENETRATION
BLOWS / FT
0 10 20 30 40
+1
0
-5
-10
-15
-20
1.25
-1.35
-3.05
-9.05
-14.75
Clay, soft to medium, brown, some fine sand and silt
Clay, soft, dark
Clay, very soft, blue-dark
Clay, stiff, some find sand and silt, dark
Sand, fine, dark, some silt and clay
Bottom of hole -26.75
4 3 3 0 0 0 0 0 0 0 8 15 15 13 11 10 17 12 21

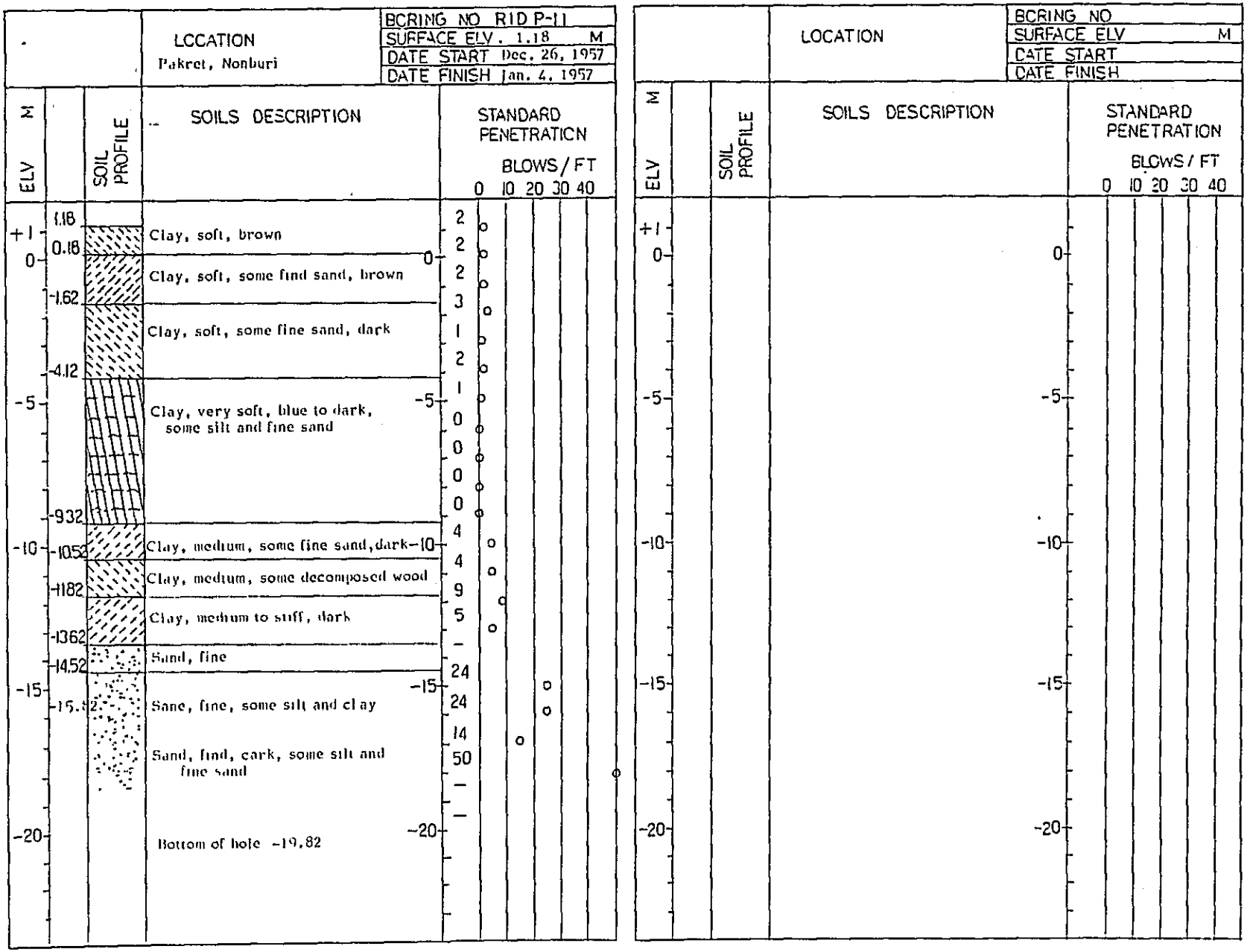

BCRING NO RID P-6
SURFACE ELV. 1.22 M
DATE START Dec. 14, 1957
DATE FINISH Dec. 24, 1957
LOCATION
Pakret, Nonburi
ELV M
SOIL PROFILE
SOILS DESCRIPTION
STANDARD PENETRATION
BLOWS / FT
0 10 20 30 40
+1
0
-5
-10
-15
-20
1.22
0.42
-1.78
-10.48
-14.08
-16.28
-22.28
Clay, medium, brown
Clay, soft, excess sand, yellowish brown
Clay, very soft, blue to dark
Clay, medium to stiff, some find sand and silt, dark
Clay, soft, some sand
Sand, fine, some silt, dark
-22.28 to -22.78 Clay, excess sand, brown
Bottom of hole -22.78
3 2 1 0 0 0 0 0 0 0 9 6 8 7 3 4 43 23 20 41 62 57


LOCATION
Pakret, Nonburi
BORING NO RID P-7
SURFACE ELV. 1.14 M
DATE START Dec. 27, 1957
DATE FINISH Dec. 30, 1957
ELV M
SOIL PROFILE
SOILS DESCRIPTION
STANDARD PENETRATION
BLOWS / FT
0 10 20 30 40
1.14
0.64
-1.16
-10.56
-15.76
-17.56
Clay, medium, gray
Clay, soft, gray
Clay, very soft, blue
Clay, medium, contains silt and fine sand, dark
Sand, fine, some silt and clay, dark
Bottom of hole -17.56
+1
0
-5
-10
-15
-20
9 4 3 0 1 0 1 1 2 0 0 0 3 6 8 4 6 9 34


LOCATION
Pakret, Nonburi
BORING NO RID P-8
SURFACE ELV. 1.17 M
DATE START Dec. 2, 1957
DATE FINISH Dec. 12, 1957
ELV M
SOIL PROFILE
SOILS DESCRIPTION
STANDARD PENETRATION
BLOWS / FT
0 10 20 30 40
1.17
1.83
3.33
7.87
9.87
11.03
16.13
Clay, some find sand and silt, medium consistency, brown
Clay, soft, some find sand, dark
Clay, very soft, blue to dark
Clay, medium, dark
Clay, medium some decomposed wood
Clay, stiff to very stiff, dark
Sand, fine, some silt, dark
Bottom of hole -18.03
+1
0
-5
-10
-15
-20
4 5 5 5 3 0 0 0 0 4 4 6 9 12 15 21 11 10 68 75


LOCATION
Pakret, Nonburi
BORING NO RID P-9
SURFACE ELV. 1.14 M
DATE START Dec. 17, 1957
DATE FINISH Dec. 21, 1957
ELV M
SOIL PROFILE
SOILS DESCRIPTION
STANDARD PENETRATION
BLOWS / FT
0 10 20 30 40
1.14
0.24
1.86
11.86
16.06
Clay, medium, brown
Clay, excess sand brown
Clay, very soft, blue, some sand and silt
Clay, medium, some fine sand, dark
Sand, fine, some silt, dark
Bottom of hole 28.86
+1
0
-5
-10
-15
-20
6 4 1 0 1 0 0 0 0 0 0 0 2 3 3 5 8 45 50 43 23


LOCATION
Pakret, Nonburi
BORING NO RID P-10
SURFACE ELV. M
DATE START
DATE FINISH
ELV M
SOIL PROFILE
SOILS DESCRIPTION
STANDARD PENETRATION
BLOWS / FT
0 10 20 30 40
1.15
0.01
2.01
10.86
13.11
14.06
16.96
Clay, medium
Clay, excess fine sand, soft
Clay, very soft, blue
Clay, soft, gray
Clay, soft, contains decomposed wood
Clay, medium to stiff, brown
Sand, fine, contains silt and clay
Bottom of hole -19.86
+1
0
-5
-10
-15
-20
7 4 1 0 0 1 0 0 1 1 0 0 1 1 3 5 10 6 8 150


LOCATION
Pakret, Nonburi
BORING NO RID P-11
SURFACE ELV. 1.18 M
DATE START Dec. 26, 1957
DATE FINISH Jan. 4, 1957
ELV M
SOIL PROFILE
SOILS DESCRIPTION
STANDARD PENETRATION
BLOWS / FT
0 10 20 30 40
1.18
0.18
-1.62
-4.12
-9.32
-10.52
-11.82
-13.62
-14.52
-15.82
Clay, soft, brown
Clay, soft, some find sand, brown
Clay, soft, some fine sand, dark
Clay, very soft, blue to dark, some silt and fine sand
Clay, medium, some fine sand, dark
Clay, medium, some decomposed wood
Clay, medium to stiff, dark
Sand, fine
Sand, fine, some silt and clay
Sand, find, cark, some silt and fine sand
Bottom of hole -19.82
+1
0
-5
-10
-15
-20
2 2 2 3 2 1 0 0 0 4 4 9 5 24 24 14 50
LOCATION
BORING NO
SURFACE ELV M
DATE START
DATE FINISH
ELV M
SOIL PROFILE
SOILS DESCRIPTION
STANDARD PENETRATION
BLOWS / FT
0 10 20 30 40
+1
0
-5
-10
-15
-20