CHAPTER 4 BASIC DESIGN

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4-1 Basic Design Policy

The following are the basic policies for drawing up the design of the facilities and equipment of the Center.

(1) Consider the objectives, functions and activities (research and training programs) of the Center.

(2) Use locally manufactured construction materials and local construction method as much as possible considering durability, economy and simplicity of execution.

(3) Consider the climate of Quezon City (a tropical monsoon area), where the project site is located. Design the building to withstand the prolonged downpours of the rainy season, as well as to provide natural ventilation and lighting.

(4) Design the buildings for easy maintenance, considering the customs of the Filipino people and the functions of the Center as the research and training building.

(5) Design the air conditioning system only for those rooms that need air conditioning for the purpose of the room. Provide individual air conditioning to decrease building operation cost.

(6) Select the equipment to be granted to suit the actual situation of the Philippines. In particular, equipment easily maintained in the Philippines shall be provided.

4-2 Review of the Basic Design Conditions

4-2-1 Design Conditions of the Facilities

The required floor area of each room is estimated according to the required number of the staff based on the research and training programs of the Center.

As the U.S. design standards are adopted in general to calculate the required floor area in the Philippines, the floor areas of the project facilities is calculated in conformity with U.S. standards, also in consideration of the situation of the NIA headquarters such as in regard to the arrangement of furniture in the offices and laboratories.

(1) Main Building — Total floor area 5,533 m^2

Room Name	Area (m^2)	Purpose & Facilities
Administrative Section		478 m^2
Director's office	36	desk, chair, table, sofa, cabinet
Deputy director's office	36	desk, chair, table, sofa, cabinet
Secretary & waiting room	36	2 secretaries, (desks, chairs, couch, passageway)
Management & control room	138	1 manager, 7 line staff, 5 support staff
Conference room	72	for 30 persons
Common conference room	66	for 30 persons (also available as the lobby)
Clinic	15	first-aid for staff, trainees and others
Information desk	15	reception for guests
Storage	64	documents, accessories, spare parts, etc.

Research Section		1,580 m^2
Computer room	18	2 personal computers for research, desk & chair for secretary
Line staff's room	54	1 manager, line staff,
Research & study rooms	666	6 managers, 36 line staff, 18 support staff
Conference room	30	for 12 persons, staff meeting
Chemical test laboratory	143	for water and soil chemical analyses
Balance room	22	for precise weighing of water and soil
Instrument room	24	for water and soil analysis
Researchers' station 1	18	lab. observation and study room for water and soil tests
Researchers' station 2	18	lab. observation and study room for water and soil chemical tests
Soil Test Laboratory	167	for soil physics and soil engineering research
Compaction test room	6	for compaction testing of soil samples
Temperature controlled room	17	equipment like suction-plate-method PF meters which require constant temperatures
Distillation room	27	distiller and other equipment for heat treatment of samples
Drying room	30	infrared lamp and sample driers
Sample preparation room	58	preparing samples for experiments
Soil sample room	36	storage of soil samples before/after experiments
Water sample room	36	storage of water samples before/after experiments
Plant sample analysis room	36	laboratory for crop research
Chemical storage	18	storage of chemicals for chemistry tests
Library	54	closed type, 6,000 books, 2 librarians (desks, chairs)
Study room	48	17 desks and chairs
Reference room	36	2 card cabinets, 2 desks for 4 persons
Locker rooms	18	2 rooms for laboratory staff, passageway

Promotion & Training		943 m²
Instructors' room	15	3 instructors (desks, chairs, bookcase, lockers)
Classrooms	206	2 rooms for 50 persons (blackboards, bulletin boards, OHP screens, etc.)
Seminar rooms	108	2 rooms for 25 persons (blackboards, bulletin boards, OHP screens, etc.)
Convention hall	340	for 250 persons (chairs, movable stage, screen etc.)
Guest room	36	waiting space and emergency use
Audio-visual room	30	making and editing of video materials for publicity and training use
Exhibit room	54	plastic models of equipment, experimental farm, etc.
Printing room	66	preparation of publications for research and training aids
Projection room	24	movie projector
Storage room	64	chairs, tables, accessories, etc.
Garage		659 m²
Parking area	635	for 23 vehicles
Drivers' room	24	for 8 drivers (chairs, table)
Common Space		1,873 m²
Water tank room	36	54-ton capacity water tank
Pump room	24	2 lift pumps
Main utility room	55	control panels, generator
Transformer room	30	for MERALCO use
EV machine room	25	2 motors for elevator
Fan room	20	exhaust fan
Storage	20	equipment for outdoor experiments like scaffolds for test boring
Others	1,663	staircase, lavatory, hall, corridor, lobby, hot water service, DS, PS, elevator

(2) Dormitory total floor area 1,056 m²

Room Name	Area (m²)	Purpose & Facilities
Canteen		218.5 m²
Canteen	111	70 seats for 150 persons, turnover rate 2 to 2.5 times (staff, guests and trainees)
Kitchen	53	150 to 200 meal capacity
Dish washing space	12	150 to 200 meal capacity
Office	7	desk, chair, bookcase
Pantry	6	food stocks
Service rooms	14	2 rooms, 1 for men & 1 for women, available for locker room use
Others	15.5	lavatory, corridor, etc.
Dormitory		837.5 m²
Guest room	105	2 bed x 4 rooms = 8 pers. (with bathroom)
Men's sleeping rooms	183.75	2 bed x 7 rooms = 28 pers. (with lockers)
Women's sleeping rooms	131.25	2 bed x 5 rooms = 20 pers. (with lockers)
Caretaker's room	46.5	reception, dining kitchen, bathroom
Linen stocks	44.5	3 rooms, shelves for linen stock
Hot water service	17.5	sink, stove, shelf
Common space	309	staircase, hall, corridor, lavatory

(3) Others

Passage A	60 m²	between the Main Building and the NIA headquarters
Passage B	14 m²	between the Main Building and the Dormitory
Parking lot	210 m²	for 17 vehicles

4-2-2 Conditions for Selecting the Equipment

The type of the equipment will be selected and the necessary quantities will be estimated according to the conditions below.

(1) The type shall be decided considering the supply of spare parts and the maintenance service situations in the Philippines so that there will be no trouble in operating and maintaining the equipment provided even after the present technical cooperation is finished.

(2) The equipment will be so selected that it is not the same equipment as to be purchased as part of the technical cooperation.

(3) The video equipment to be used for the preparation of teaching materials and for technical information services shall be of a basic level. The studio will not be included in the project.

(4) The printing equipment shall be capable of preparing teaching materials for the seminars to be held in the Center.

(5) The laboratory equipment now used in the Soil and Water Laboratory in Muñoz is old and in addition most of it uses the foot-pound unit. It will not be moved into the Center.

(6) A big computer will not be provided but the capacity and capabilities of the existing mini computer will be expanded. Some personal computers are to be provided for this project.

(7) One mini bus for passenger use and one pick-up for sample and material use will be provided for transportation to the San Rafael Trial Farm, the National Training Center, etc.

4-3 Basic Planning of the Facilities

4-3-1 Arrangement of the Buildings

According to the basic design policies mentioned previously, the buildings will be arranged according to the following considerations:

(1) to define the separation of administration and the individuality of the Center and the NIA headquarters, taking care of the functional relations of each building,

(2) to locate the main entrance of the Center to face the main gate so that it is distinguishable from the main entrance to the NIA headquarters,

(3) to utilize the site effectively for maximum capacity and efficient arrangement,

(4) to harmonize with the existing buildings of the NIA, and

(5) to define the administrative separation of the Main Building and the Dormitory, taking care of the functional relations of each.

For the convenience of visitors to the Center, liaison with the NIA headquarters, and efficient utilization of the project site, the Main Building will be arranged in parallel to the NIA service road, beside the main entrance of the NIA headquarters.

The Dormitory will be placed at the rear of the Main Building away from the main gate for the sake of privacy. The canteen will be attached to the Dormitory for the sake of the work environment and to allow supervision from the Main Building.

A passageway with a roof will be provided between the Main Building and the NIA headquarters, passage out of the rain and sun. Another short passage with a roof will be provided between the Main Building and the Dormitory. A wide canopy will be designed for the canteen for the convenience of guests and the staff.

An open parking lot will be arranged along the NIA service road and provide maximum parking capacity.

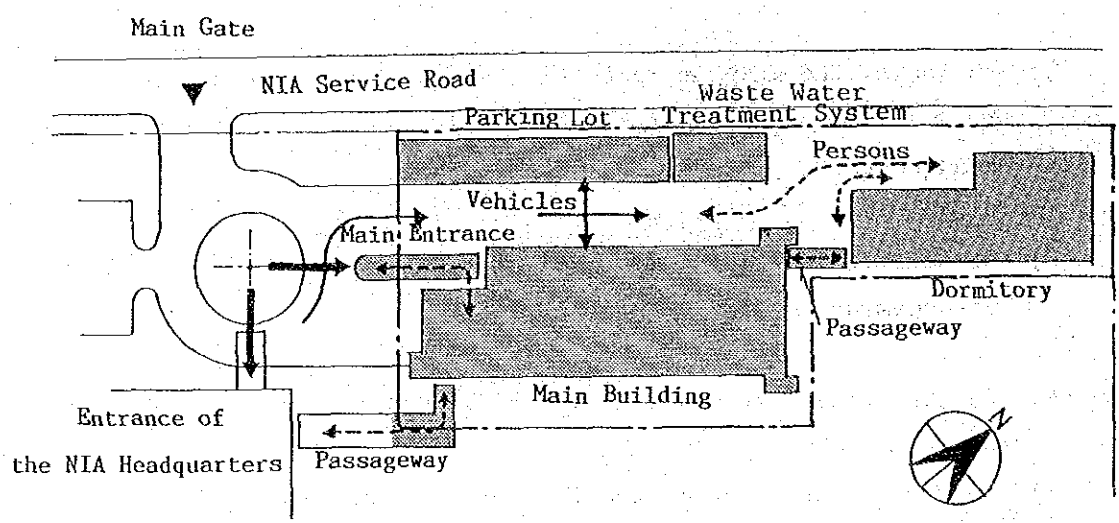


FIGURE 4-1 BUILDING LAYOUT

4-3-2 Architectural Plan

(1) Floor Plan

The Center will be designed considering the functional relations among the sections and the clarification of management divisions. On the whole, the arrangement will be designed for simplicity and convenience of utilization.

1) Administrative section

Offices for management and administration will be arranged on the 3rd and 4th floors.

2) Research and laboratory section

Noise and smells are expected from the laboratories where chemical and engineering analyses of water and soil materials will be done. These laboratories will be designed on the 2nd floor, separately from the other sections, above the garage on the ground floor so that the noise from the laboratories will not be heard. The compaction test laboratory, the source of considerable noise, will be encased in a small room surrounded by sound absorption layers. The rooms of the research section will be arranged giving the highest priority to convenience for experiments, with the personnel flow line of the greatest possible shortness.

A lift will be provided in the loading balcony outside the sample preparation room, so as not to contaminate the building in transporting water and soil materials. The line staff stations will be adjacent to the laboratories to protect the laboratory and research staff from noise and toxic gases. It will be also available for the staff to edit data and take short breaks. The library and the convention hall will be on the 5th floor so that people of every section can have access to them directly without passing through another section.

3) Promotion and training section

The classrooms and the seminar rooms will be located on the 3rd floor near the elevator. The convention hall will be on the top floor because it requires long spans between the beams without intervening columns, and so that noise at the time of assemblies does not reach the other areas. The exhibit room will be located on the ground floor by the entrance hall and available to everybody who visits the Center.

4) Canteen

The design will assume that more than half of the Center staff and all of the trainees will utilize the canteen and that the turnover rate of those eating there will be 2 to 2.5 times. It will have the capacity to serve snacks to the participants of the lectures and assemblies in the convention hall during the intermissions.

5) Dormitory

The Dormitory will be designed to ensure the privacy of the guests, while keeping in mind the relationship with the Main Building. The guest rooms for the executive staff and the instructors, sleeping rooms for men and those for women will be located separately on each floor for the sake of the privacy of each area. The service area will be able to put up trainees for training periods of about one week without inconvenience.

6) Garage

The garage will be located on the ground floor for greatest convenience. Another parking lot with a roof will be provided at the west in the project site for the full use of the site area.

7) Common sections

Corridors will be designed as the center corridor system. The entrance hall will be as large enough to serve as a waiting area, to avoid useless space. The main utility room and other utility rooms will have the minimum space necessary for their purposes. The balconies will be arranged to ensure two-way

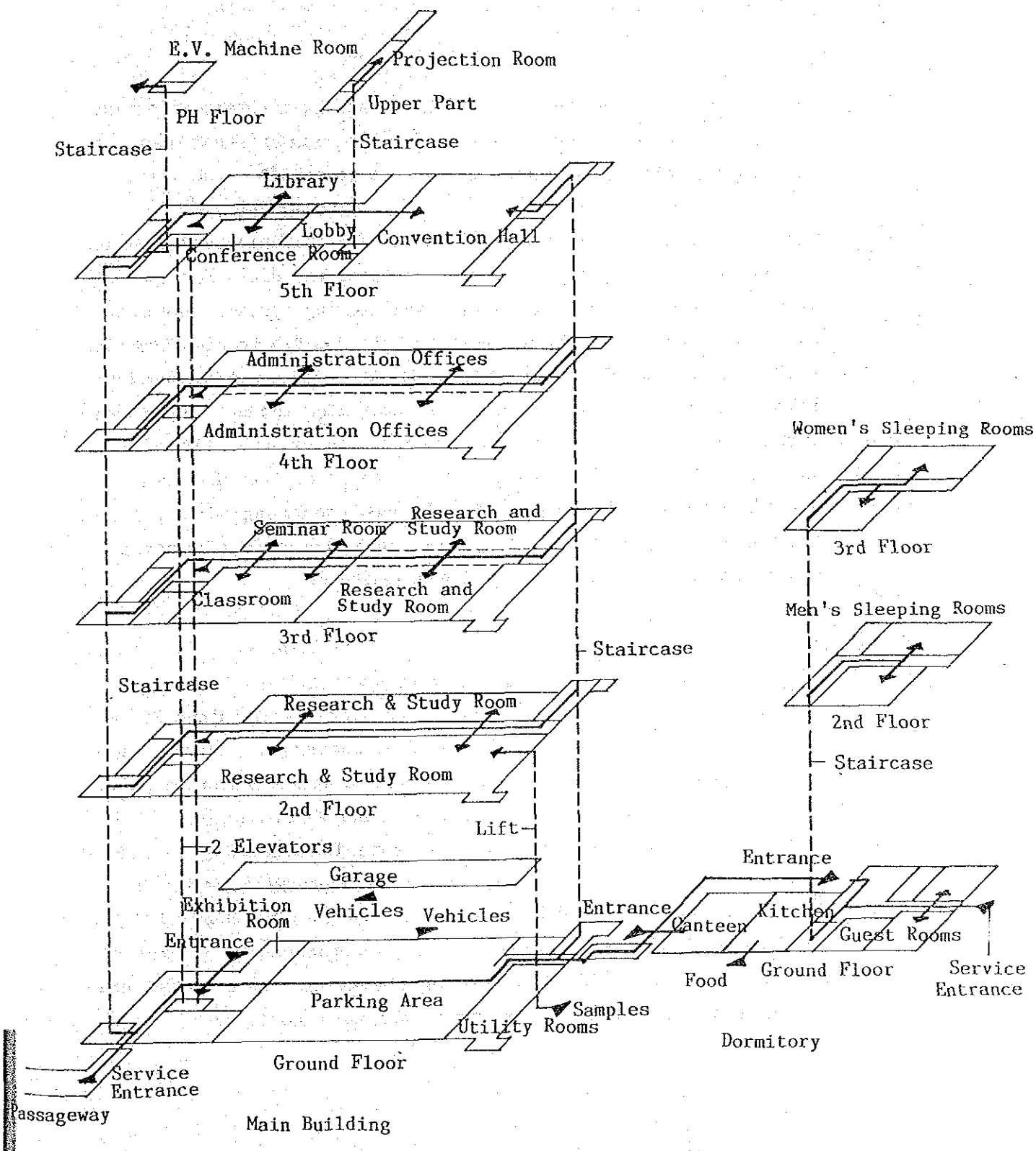


FIGURE 4-2 FLOW LINE DIAGRAM

emergency passage, to lower the cooling load of the air conditioning system, to allow installation of the outdoor units of the air conditioners, and to match the features of the NIA headquarters.

(2) Elevation

The government of the Philippines showed strong interest in having the Center and the NIA headquarters display similar features, as the former will be constructed within the compound of the latter.

The NIA headquarters is distinguished by the balconies all around the building. They are designed to suspend the ducts for cooling air distributed by the central air conditioning system. However, the Center building will not need the all-round balconies because it is designed with the individual air conditioning systems to lessen operating costs. Therefore, the balconies will be placed only where functionally required. On the exterior walls of the hall where there is no balcony, a wide appentice will be placed to avoid the sun and the seepage of rain due to strong winds. The parapets will be designed to give an appearance of strength commensurate with that of the NIA headquarters.

(3) Section

1) Main building

The optimum ceiling height of an ordinary room is about 2.7 m. The storey height will be about 3.7 m including a duct space under the beam. The ceiling height of the convention hall, where a large number of people gather and where movies will be projected, will be at least 4.5 m to install the projection booth above the lobby, while the girder depth will be 1.0 m or more in order to support 20 m long spans. The storey height there will become 5.5 m or more. Thus, the storey height of the 5th floor will be 3.7 m for the library and conference rooms and 5.5 m for the convention hall area.

2) Canteen

The ceiling will be about 2.7 m high in the canteen and 2.4 m high in the kitchen. The storey height for the kitchen will also become 3.7 m to accommodate a space for the exhaust duct, etc.

3) Dormitory

The ceiling height of the dormitory rooms will be about 2.7 m to allow heat removal by the ceiling fan and natural ventilation through the windows. False ceilings will be provided to lessen the noise from the floor above, making the storey height 3.3 m.

4-3-3 Structural Plan

Seismic force and wind force must be taken into consideration because the Philippines is a part of the Circum-Pan-Pacific Earthquake Belt and is a breeding ground for the typhoons which strike Japan. However, Quezon City (Metropolitan Manila), where the project site is located, is in an area where seismic force is high to moderate and wind force is moderate. Their horizontal force is smaller than that in Japan.

(1) Foundation

The depth of the adobe layer (extremely hard tuff rock) as the bed rock varies from place to place, from -1.5 m to -4.5 m and the average depth -3.0 m from the surface of the ground. (See the ANNEX.) Based on these data, the standard foundation bottom level is set around B.M. -3.0 m, close to the average depth of the adobe layer, and where the adobe layer lies deeper, an artificial foundation bed is to be made with lean concrete to the adobe layer after checking the soil bearing capacity with the plate loading test and foundations set. The foundation system will be of the reinforced concrete isolated footing style for cost saving since the bearing capacity of the adobe layer is dependable. The foundation system is shown in the following chart.

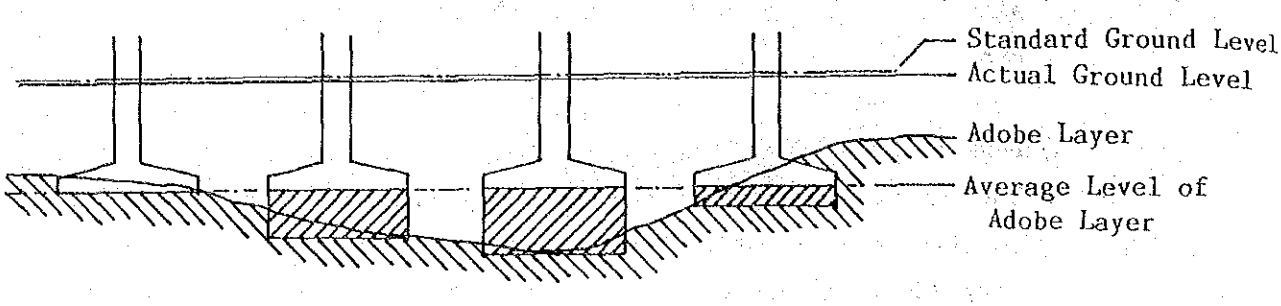


FIGURE 4-3 FOUNDATION SYSTEM

(2) Framing

The Main Building is to be a 5-storey reinforced concrete structure with rigid framing, and the Dormitory a 3-storey building with the same structure. A part of the reinforced concrete walls is to be designed as an earthquake-resistant wall in order to lower the construction cost of the framing. The exterior walls are designed to be reinforced concrete walls as much as possible, to prevent water leakage in a strong wind. Partition walls are to be of concrete blocks or wooden construction for cost economy and in order to allow removal with partition design change to accommodate usage change in the future.

The ground floor is planned to be a reinforced concrete floor slab that will not sink due to settlement of the filled soil under the slab. Among the north and south side spans, 6-meter spans and 8-meter spans can be constructed with the reinforced concrete beams. However, for such spans longer than 14 meters, the post-tensioning prestress method, which is commonly used in the Philippines, will be applied to prevent the beam depth and the number of the reinforcing bars from increasing for reasons of economy, after comparing the construction costs of both methods.

(3) Design Standards

The structural design of the project is to be based on the present construction regulations in the Philippines, and where the local standards are not available, the U.S. standards will be applied.

National Structural Code of the Philippines (NSCP)
Uniform Building Code (UBC)
ACI Code (Building Code Requirements for Reinforced Concrete)
Timber Design Specifications

(4) External Forces and Loads

1) Dead load

Dead load will include the weights of all the structural members, partitions, finishing materials, etc.

2) Live load

Live load of each room will be as follows, calculated in compliance with the NSCP and UBC.

Room	Live load (kg/m^2)
Office	300
Laboratory	300
(This figure may be increased if necessary to accommodate heavy equipment.)	
Library	615
Lecture Room	490
Lavatory	250
Corridor & Stairs	490

3) Seismic force

The base shear assumed to act on the structure and distribution of seismic force to each element will be determined according to the NSCP.

$V = Z \cdot I \cdot K \cdot C \cdot S \cdot W$

where

V: base shear

Z: numerical coefficient depending on the zone

See figure 4-4. Zone No.1, therefore Z = 3/4

I: occupancy importance factor

See table 4-1. I = 1.0.

K: horizontal force factor

See table 4-2. K = 1.0

C: coefficient determined by the natural frequency of the structure; must be less than 0.12.

$$C = \frac{1}{15\sqrt{T}} \qquad \text{therefore,} \quad T = \frac{0.05hn}{\sqrt{D}}$$

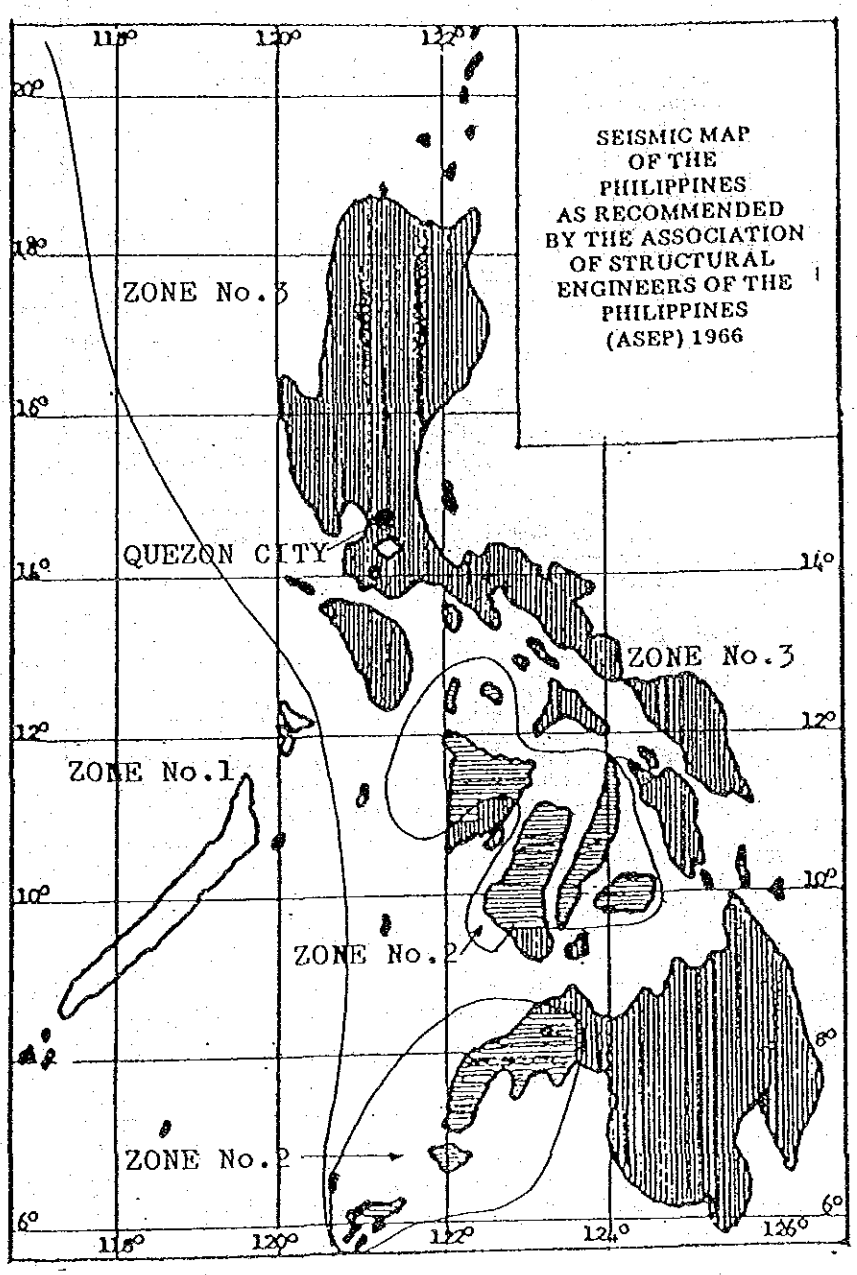
S: numerical coefficient for site-structure resonance

C S = 0.14 [as per UBC 2312 (d)]

W: total load for calculation of seismic force

4) Wind force

The wind force effecting the structure will be determined according to the NSCP. Quezon City belongs in AREA II, (figure 4-5), therefore the column of AREA II in table 4-3 will be applied. As for the pressure coefficient, the recommended value prescribed by the NSCP will be applied.



	ZONE No. 1	ZONE No. 2	ZONE No. 3
Z	3/16	3/8	3/4

FIGURE 4-4 SEISMIC MAP OF THE PHILIPPINES
(ASEP's Recommendation : 1966)

TABLE 4-1 VALUES FOR OCCUPANCY IMPORTANCE FACTOR

TYPE OF OCCUPANCY	I
Essential Facilities*	1.5
Any building where the primary occupancy is for assembly use for more than 300 persons (in one room)	1.25
All others	1.0

*See Section 2312 (k) for definition and additional requirements for essential facilities.

(National Structural Code of the Philippines)

TABLE 4-2 HORIZONTAL FORCE FACTOR "K" FOR BUILDINGS OR OTHER STRUCTURES[1]

TYPE OR ARRANGEMENT OF RESISTING ELEMENTS	VALUE[2] OF K
1. All building framing systems except as hereinafter classified	1.00
2. Buildings with a box system as specified in Section 2312 (b)	1.33
3. Buildings with a dual bracing system consisting of a ductile moment-resisting space frame and shear walls or braced frames using the following design criteria: a. The frames and shear walls shall resist the total lateral force in accordance with their relative rigidities considering the interaction of the shear walls and frames b. The shear walls acting independently of the ductile moment-resisting portions of the space frame shall resist the total required lateral forces c. The ductile moment-resisting space frame shall have the capacity to resist not less than 25% of the required lateral force	0.80
4. Buildings with a ductile moment-resisting space frame designed in accordance with the following criteria: The ductile moment-resisting space frame shall have the capacity to resist the total required lateral force	0.67
5. Elevated tanks plus full contents, on four or more cross-braced legs and not supported by a building	2.5[3]
6. Structures other than buildings	2.00

[1]Where wind load as specified in Section 2311 would produce higher stresses, this load shall be used in lieu of the loads resulting from earthquake forces.

[2]See definition of "Z" as specified in Section 2312(c).

[3]The minimum value of "KC" shall be 0.12 and the maximum value of "KC" need not exceed 0.25.

The tower shall be designed for an accidental torsion of 5 % as specified in Section 2312(e)5. Elevated tanks which are supported by buildings or do not conform to type or arrangement of supporting elements as described above shall be designed in accordance with Section 2312(g) using "Cp" = 0.3.

(National Structural Code of the Philippines)

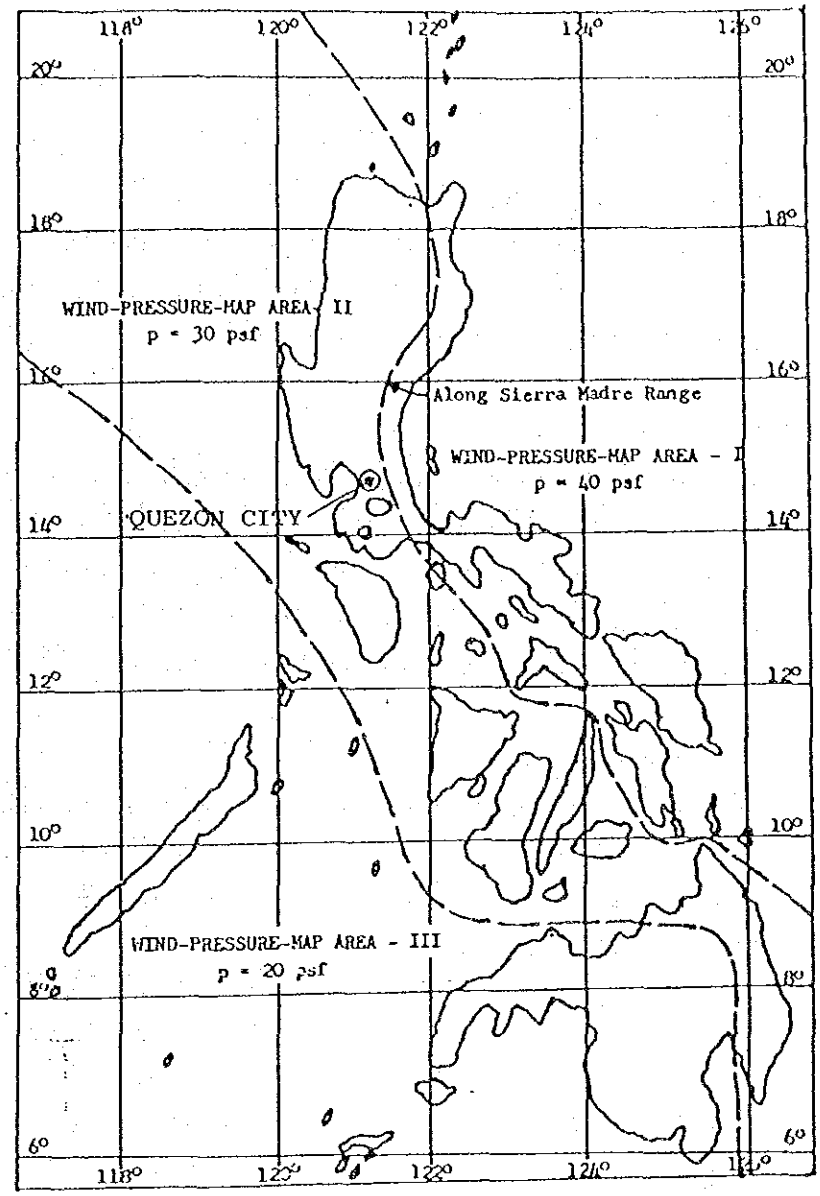


FIGURE 4-5 WIND-PRESSURE MAP AREAS FOR THE PHILIPPINES

TABLE 4-3 BASIC WIND PRESSURES FOR DIFFERENT HEIGHT ZONES ABOVE THE GROUND (UBC)

Height Zone in Feet	Wind-pressure-map Area		
	Area I	Area II	Area III
Less than 30	30 psf	20 psf	10 psf
30 to 50	40 psf	30 psf	20 psf
50 to 100	50 psf	35 psf	25 psf
100 to 500	60 psf	40 psf	30 psf
500 to 1200	70 psf	45 psf	35 psf
Over 1200	80 psf	50 psf	40 psf

4-3-4 Building Facilities Plan

(1) Electric System

1) Receiving and substation system

The main utility room will be provided and power supply of 3 ϕ 3 W 34.5 KV through the MERALCO substation to be installed on the ground floor of the Main Building.

2) Generator system

To deal with power failure, a generator system of 100 KVA will be provided. The power will be supplied to the safety and security facilities including sprinkler pumps, fire hydrant pumps, fire alarms, broadcasting amplifiers, lift pumps, the telephone exchanger, security lamps, etc.

3) Main feeder system

From the main switch board in the main utility room, power will be supplied to the lighting distribution panel and the power distribution panel on each floor. The wiring will be installed in the ceiling cable racks.

a) Lighting distribution panel	3 ϕ	3 W	230 V	60 Hz
	1 ϕ	2 W	230 V	60 Hz
b) Power distribution panel	3 ϕ	3 W	230 V	60 Hz

4) Lighting system

Fluorescent lamps will be used in principle. Lighting fixtures will be selected to ensure sufficient illumination. For the special purpose rooms, the equipment appropriate to the purpose will be selected. The JIS illumination criteria will be applied in the design.

5) Receptacle system

Receptacle outlets of sufficient capacity for the specified usage will be provided where necessary.

6) Power control system

The pumps will be provided with automatic on-off function. The power for the ventilation system will be regulated both at the switch panel and the remote switch.

In case either the power system or tank system malfunctions, alarms will sound in the management and control room.

7) Telephone system

10 circuits for the Center's exclusive use will lead into the building. A telephone exchanger will be installed in the management and control room, from which the telephone wiring will be distributed to each set. The exchange will be a type that allows both extension calls and public calls.

8) Master TV antenna system

The outlets will be installed in the director's office, assistant director's office, A-V room in the Main Building and the entrance lobby in the Dormitory

9) Broadcasting system

An amplifier for broadcasting in the Center will be installed in the management and control room for summoning staff members in the building. A local amplifier system will be installed in the seminar room, the convention hall and the canteen for individual broadcasting.

10) Electric clock system

A main clock will be installed in the management and control room. Branch clocks will be provided in each room connected to the main clock.

11) Fire alarm system

Alarm terminals will be provided where necessary, to activate fire alarms in case of fire. An automatic fire detector will be installed where fire is used.

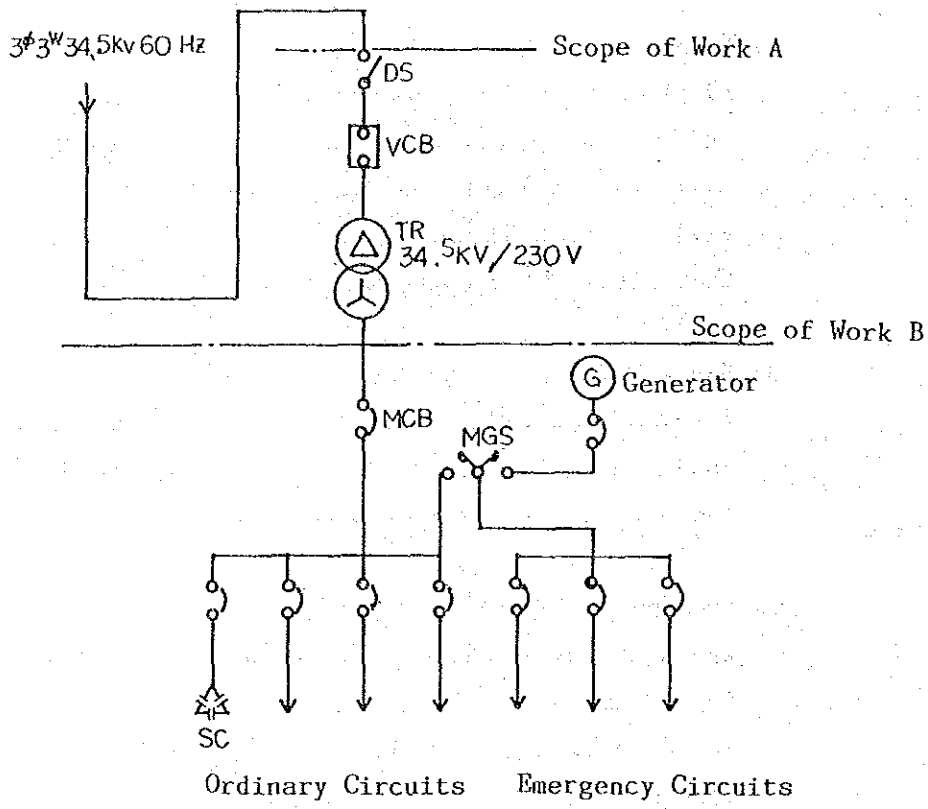


FIGURE 4-6 ELECTRIC SYSTEM DIAGRAM

(2) Plumbing System

A water main of 300 ϕ runs along EAST Ave. toward EDSA St. However, the water pressure in the area around the compound of the NIA is too low to ensure a reliable water supply. It will be designed to intake water from EAST Ave., there conditions being better than EDSA St. A deep well system will also be installed to provide against failure of the water supply.

A drainage pipe (combined type of rain water and sewage, 750 ϕ) for the existing buildings runs through the NIA compound and leads into a stream nearby. Drainage from the Center will be drained into this existing pipe, combined with rain water, after being treated in the sewage treatment system.

1) Deep well system

A deep well will be dug within the site to supply a sufficient amount of water for daily use of 75 m^3 - 150 m^3/day. Well water will be treated through the underground sedimentation pit and stored in the water tank to provide against failure of water supply.

Amount to be pumped	75 to 150 m^3/day
Diameter of the well	200 ϕ
Depth	250 m

2) Water supply system

Water will be lifted up to the elevated tank from the water tank (40 m^3) by the lift pump, and distributed to the Main Building and the Dormitory by a gravity type supply system.

3) Drainage system

Sewage and drainage water will be drained separately within the building, combined outside and treated in the sewage treatment system. The laboratory waste water will be led by an individual piping to the neutralization pit, and drained into the sewage treatment system after neutralization. Drainage after the treatment system will be combined with rain water and discharged into the existing drainage piping.

4) Hot water supply

The local hot water supply system will be used. A gas boiler will be installed where necessary to supply hot water.

5) Plumbing system

Plumbing fixtures will be installed where necessary according to the architectural design. Special provisions will be provided in the laboratories appropriate to the equipment.

(3) Air Conditioning and Ventilation System

1) Air conditioning system

Ordinary rooms : air-cooled package and duct system (partly direct blow system)

Special rooms : a window type cooler will be installed in each room

Fresh air will be taken into through the louvers. No heating system is assumed necessary.

2) Ventilation system

Kitchen : air intake and exhaust by the pressure fan

In other rooms, an individual fan will be provided where ventilation is required.

(4) Other Systems

1) Gas system

LPG will be used for kitchen and laboratory use. It will be supplied from the gas cylinders to points where gas is required via the central piping system.

2) Fire distribution system

The Main Building will be provided with a fire hydrant and sprinkler system, and the Dormitory with a fire hydrant system.

3) Sewage treatment system

Sewage and laboratory waste water will be treated to pass the sewage standards before discharging into the existing drainage piping.

TABLE 4-4 SEWAGE STANDARDS

	Protected Inland Waters (Class A & B)	Protected Coastal Waters (SB & NP)	Inland Waters (C & D)	Coastal Waters (SC)
Color in platinum cobalt units	100	100	100	200
pH	6-8.5	6-8.5	6-8.5	5.5-9
Temperature in °C	40	40	40	40
Phenols in mg/l	0.05	0.05	0.1	1
Suspended solids in mg/l	30	50	75	200
BOD in mg/l	30	50	80	250
Oil/grease in mg/l	5	5	10	15
Detergents in mg/l	1	1	5	10

(source : Manila Pollution Control Commission)

4-3-5 Materials Plan

Materials scheduled to be adopted in this project are as shown below. Local products and materials will be used as much as possible, unless they are disadvantageous as to quality, price and supply conditions, the aim being economy and easy construction and maintenance.

(1) Structural Materials (Main elements)

Member	Material	RP/Japan	Reason
1) Main Bldg.			
Columns, Beams	Reinforced concrete	o	
Floors, Stairs			
Exterior walls	Reinforced concrete	o	
Interior walls	Reinforced conc. block	o	
2) Dormitory			
Columns, Beams	Reinforced concrete	o	
Floors, Stairs			
Exterior walls	Reinforced concrete	o	
	Partly rein. conc. block	o	
Interior walls	Reinforced conc. block	o	
	Partly rein. concrete	o	

(2) Exterior Finish Materials

Member	Material	RP/Japan		Reason
1) Main Bldg.				
Roof	Asphalt waterproofing	o		
	Conc. waterproofing	o		
	Partial gravel cover, or	o		
	Membrane waterproofing		o	quality
Exterior wall	Spray tile		o	quality
Doors & Windows	Aluminum sash		o	quality, supply
Floors	Concrete, trowel finish	o		
	Partly marble stone, washing finish	o		
Eaves (plancier)	Cement board painting finish	o		
Balcony: skirting	Marble stone, washing finish	o		
floor	Mortar waterproofing	o	o	water-proofing agent from Japan
2) Dormitory				
Roof	Asphalt waterproofing with	o		
	gravel cover	o		
Exterior walls	Exposed concrete with	o		
	lithing spraying finish		o	quality
Doors & Windows	Aluminum sash		o	quality, supply
Floors	Marble stone, washing finish	o		
Eaves (plancier)	Exposed concrete with	o		
	lithing spraying finish		o	quality
Balcony: skirting	Exposed concrete with	o		
	lithing spraying finish		o	quality
floor	Mortar waterproofing	o	o	water-proofing agent from Japan

(3) Interior Finish Materials

Member	Material	RP/Japan		Reason
1) Main Building				
Floors:				
Research & study rooms	Plastic tile		o	quality
Laboratory	Vinyl sheet in rolls		o	quality
Director's Rm	Flooring block	o		
Hall	Marble stone, washing finish	o		
Electric. Rm	Mortar with trowel finish	o		
Walls:				
Seminar & ord. rooms	Mortar with trowel painting finish	o		
Director's Rm	Wooden board upright paneling with varnish	o		
Entrance Hall	Marble stone, marble with washing finish	o		
Electric. Rm	Exposed concrete	o		
Ceilings:				
Seminar & ord. rooms	Decorative gypsum board		o	quality, supply
Director's Rm & Convent.Hall	Rock wool acoustic board		o	quality, supply
Storage	Cement board, paint finish	o		
Stairs	Lithing spraying finish		o	quality
Doors & Windows:				
Ordinary rooms	Wooden door	o		
A-V Room	Aluminum sound-proof door		o	quality, supply

2) Dormitory

Floors:				
Canteen & sleeping rooms	Plastic tile		o	quality, supply
Kitchen	Mortar with trowel finish	o		
Walls:				
Canteen & sleeping rooms	Mortar with paint finish	o		
Toilet & kitchen	100 x 100 (mm) tile	o		
Ceilings:				
Canteen & sleep. rooms	Decorative gypsum board		o	quality, supply
Kitchen & storages	Cement board, painting finish	o		
Doors & Windows:				
Ordinary rooms	Wooden door	o		

4-3-6 External Work

Only those facilities indispensable to the Center will be designed. Two passages will be arranged for the connection between the NIA headquarters and the Main Building, and between the Main Building and the Dormitory. A parking lot for 17 cars will be designed along the NIA service road, available to visitors and the staff.

As the site ground is about 700 mm lower than that of the NIA headquarters, rain water may flow into the site in a heavy storm. The present plant area will be utilized to prevent rain water from entering the site ground. This area will also be used as a buffer zone between the Main Building and the court.

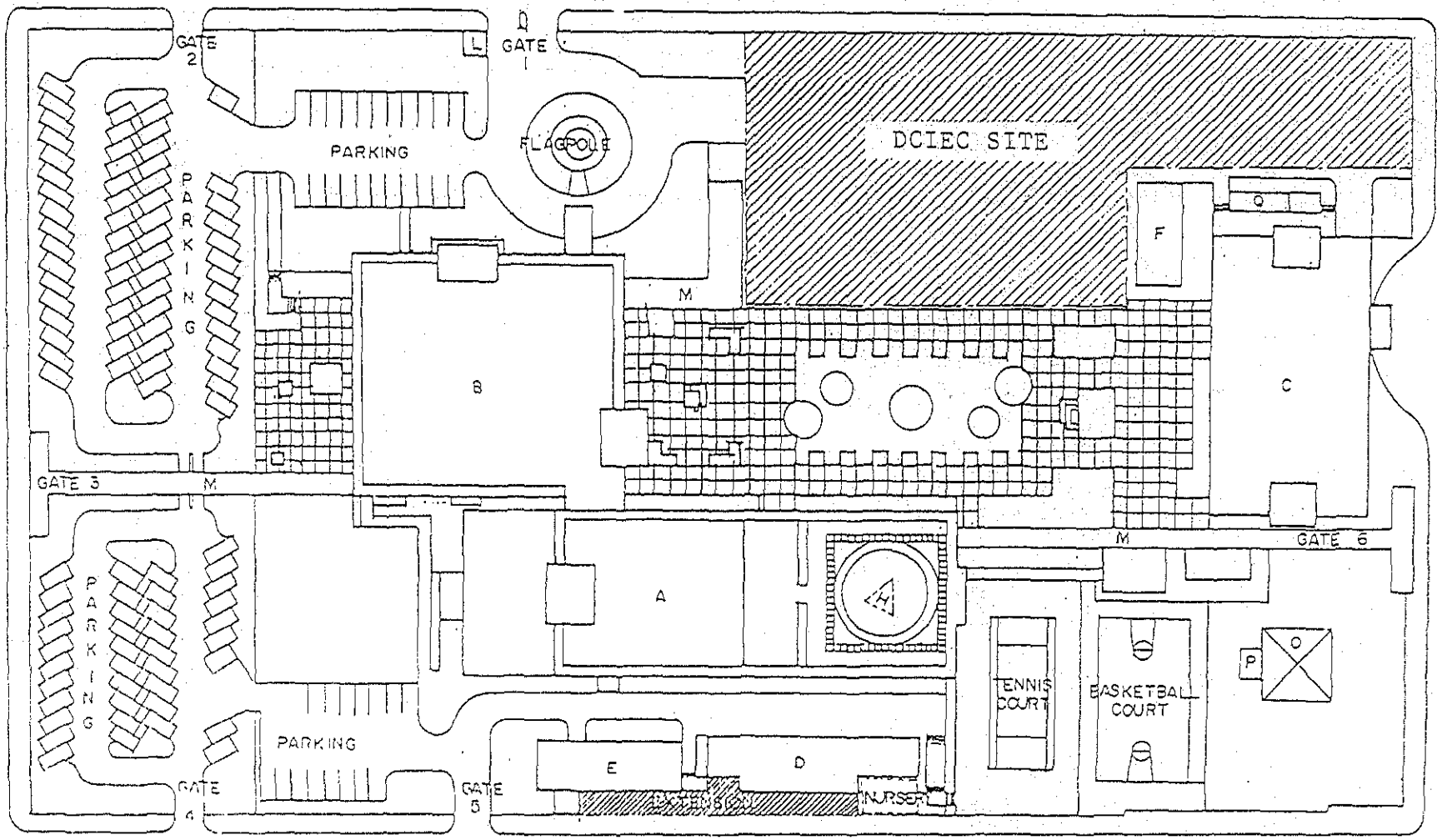
The present concrete paving in the site may be badly damaged when the existing buildings are demolished, even if work is done carefully. Therefore new concrete paving will be provided.

4-3-7 Basic Design Drawings

00 SITE DEVELOPMENT PLAN
01 PLOT PLAN
02 MAIN BUILDING : GROUND FLOOR PLAN
03 MAIN BUILDING : SECOND FLOOR PLAN
04 MAIN BUILDING : THIRD FLOOR PLAN
05 MAIN BUILDING : FOURTH FLOOR PLAN
06 MAIN BUILDING : FIFTH FLOOR PLAN
07 MAIN BUILDING : PENTHOUSE FLOOR PLAN
08 MAIN BUILDING : NORTH ELEVATION
09 MAIN BUILDING : WEST ELEVATION, SECTION
10 DORMITORY : GROUND FLOOR PLAN
11 DORMITORY : SECOND FLOOR PLAN, THIRD FLOOR PLAN
12 DORMITORY : ELEVATION, SECTION

LEGEND :

A – BUILDING A
B – BUILDING B
C – ANNEX BUILDING
D – COVERED PARKING
E – POWER HOUSE
F – SEWAGE TREATMENT PLANT
G – GAS PUMP
H – HELIPORT
I – PRINTING ROOM
J – PELOTA COURT
K – SECURITY QUARTER
L – GUARD HOUSE
M – COVERED WALK
N – STORAGE ROOM
O – ANTENNA TOWER HT. = 50 M.
P – DIESEL GENERATOR HOUSE
Q – SUB-STATION
R – REPAIR SHED



SITE DEVELOPMENT PLAN

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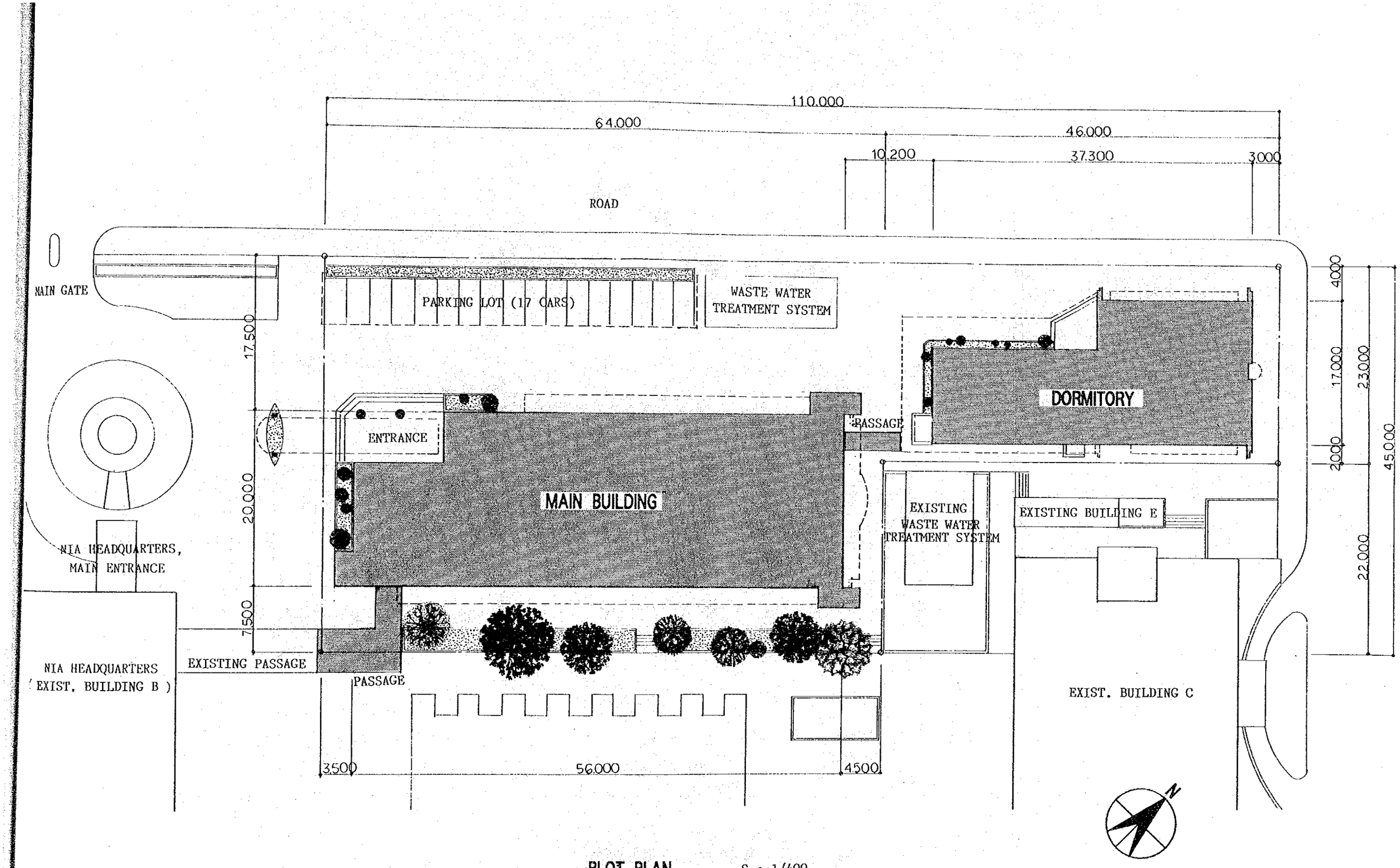
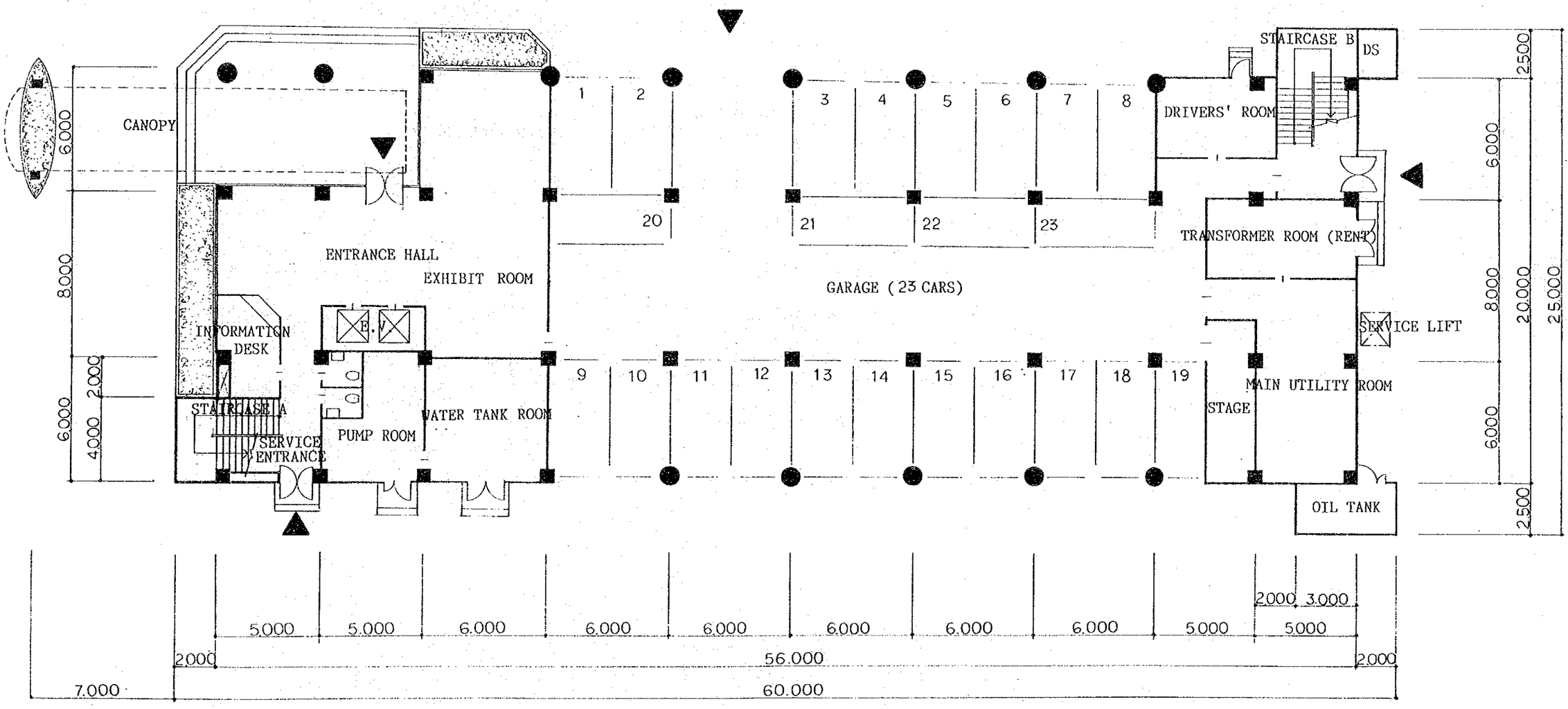


PLOT PLAN S : 1/400

01

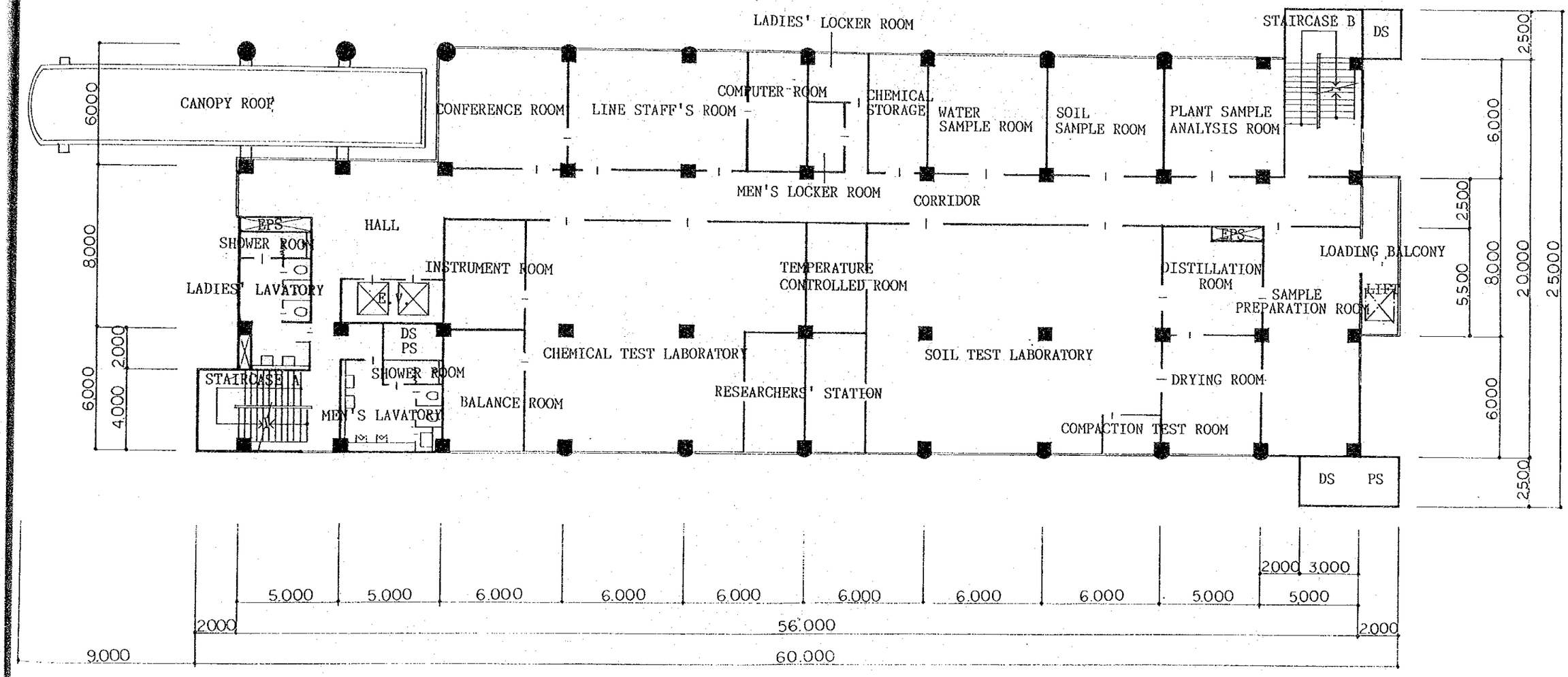
PLOT PLAN



GROUND FLOOR PLAN S : 1/200

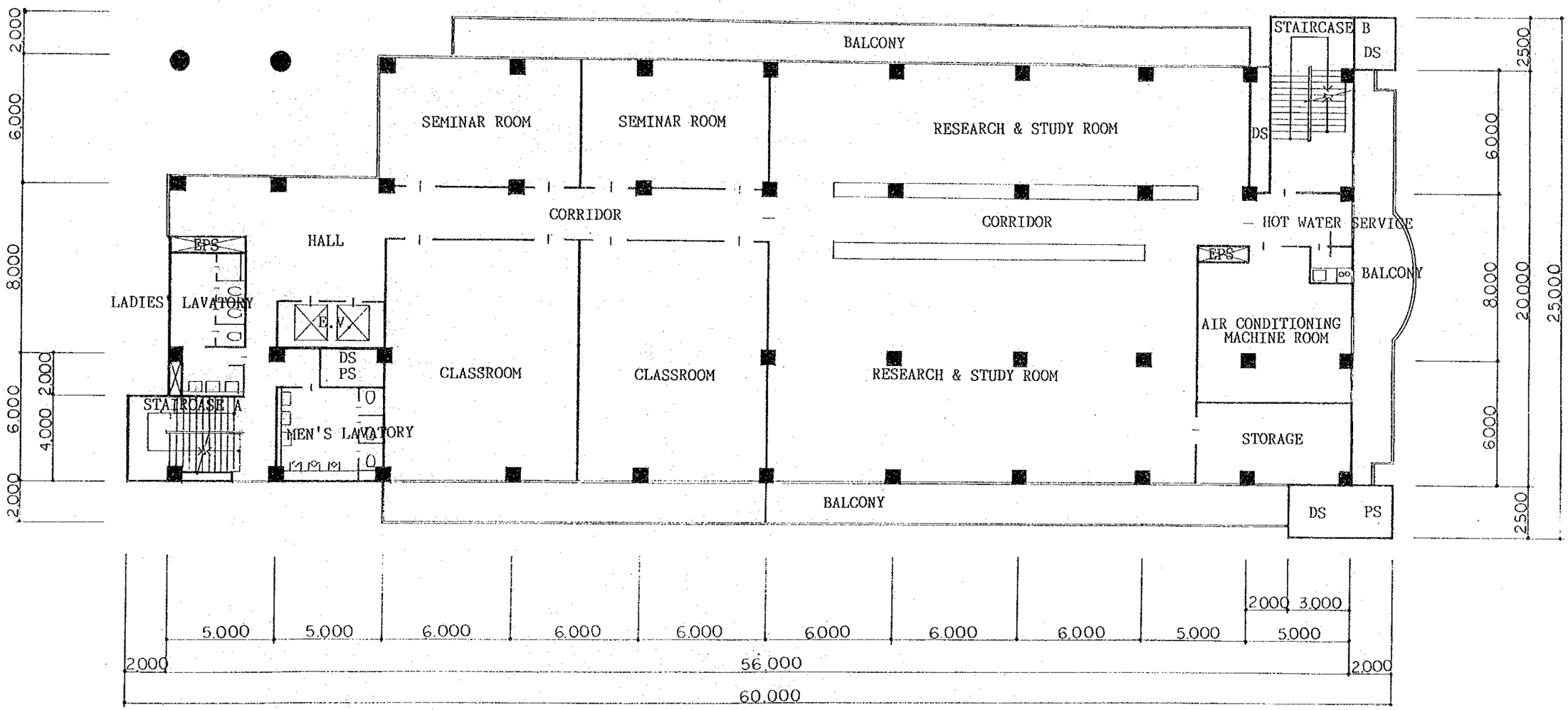
MAIN BUILDING : GROUND FLOOR PLAN

02



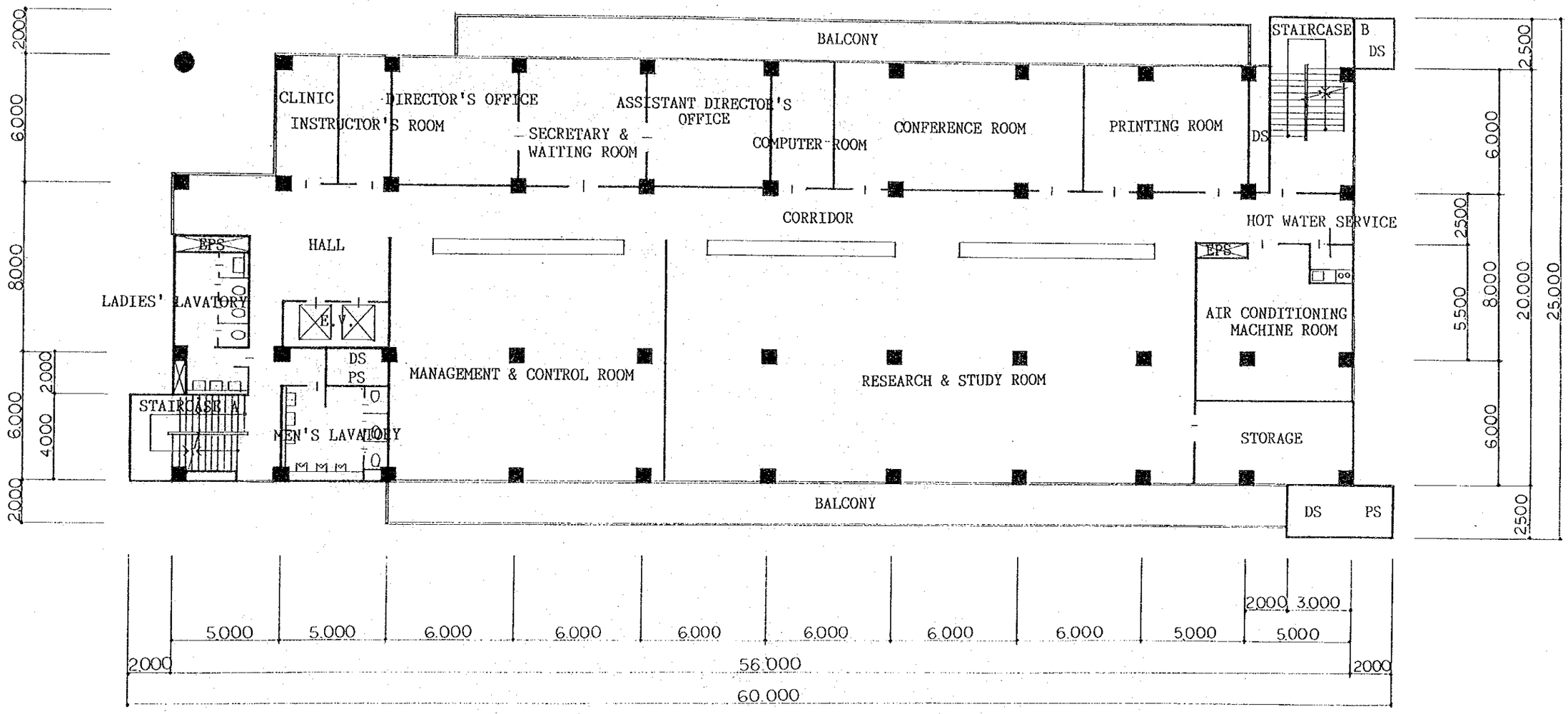
SECOND FLOOR PLAN S : 1/200

MAIN BUILDING : SECOND FLOOR PLAN



THIRD FLOOR PLAN S : 1/200

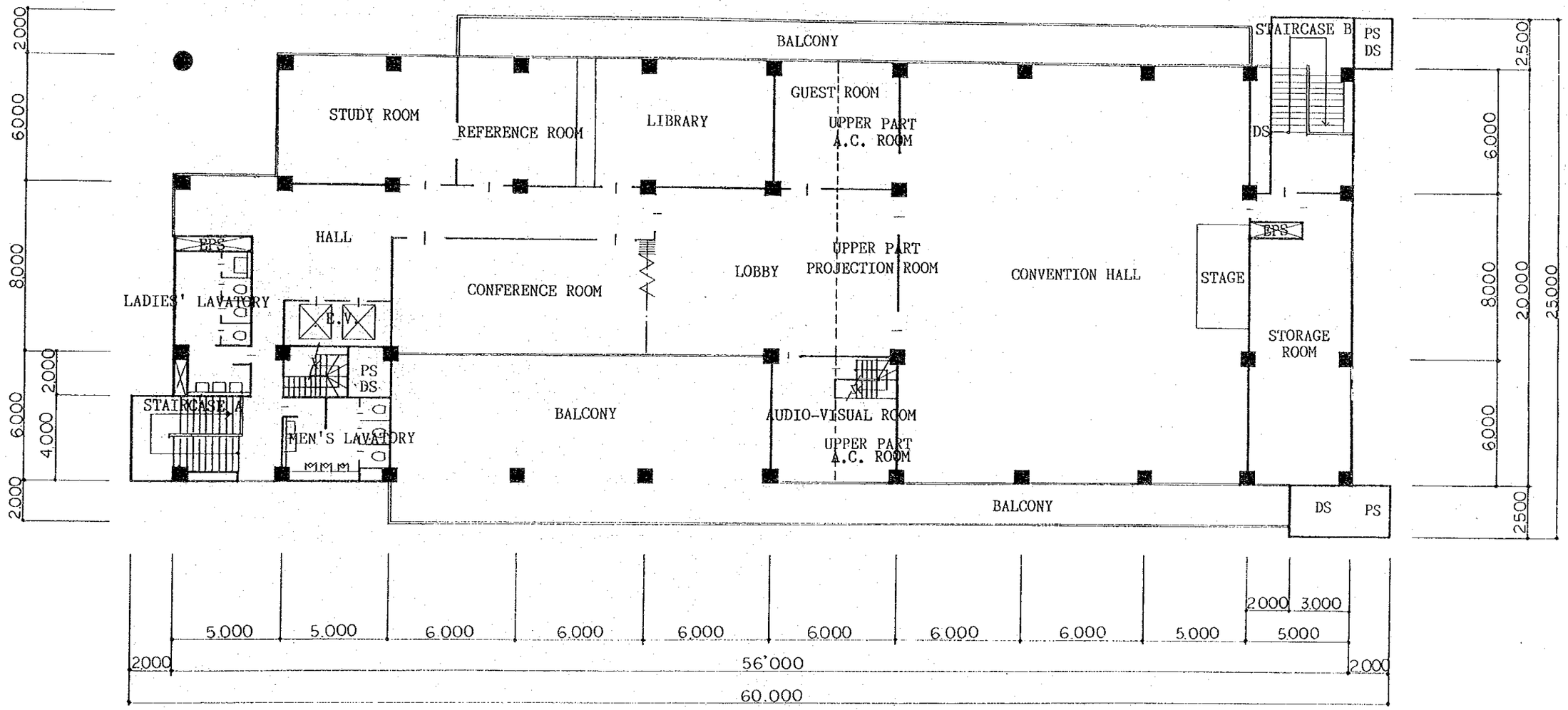
04 MAIN BUILDING : THIRD FLOOR PLAN



FOURTH FLOOR PLAN S : 1/200

05

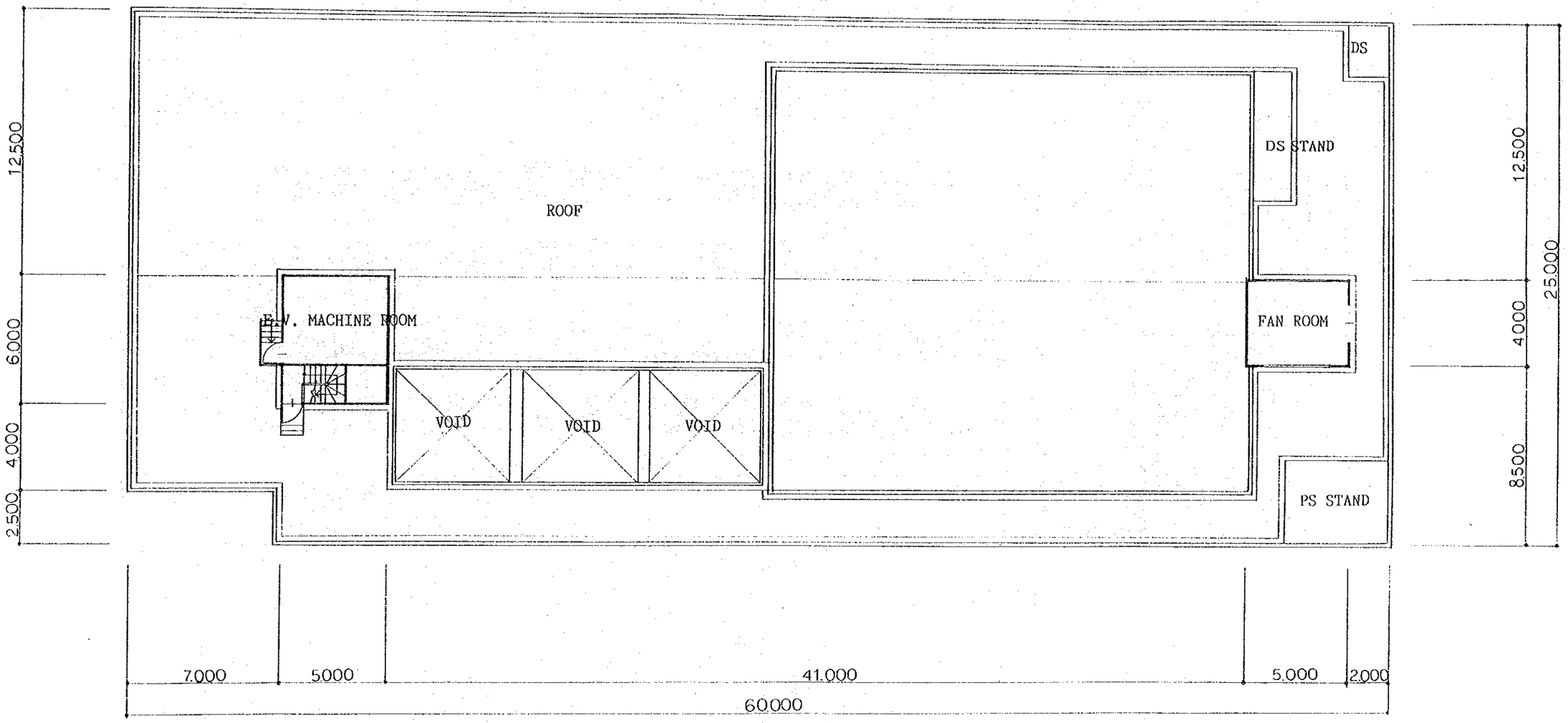
MAIN BUILDING : FOURTH FLOOR PLAN



FIFTH FLOOR PLAN S : 1/200

MAIN BUILDING : FIFTH FLOOR PLAN

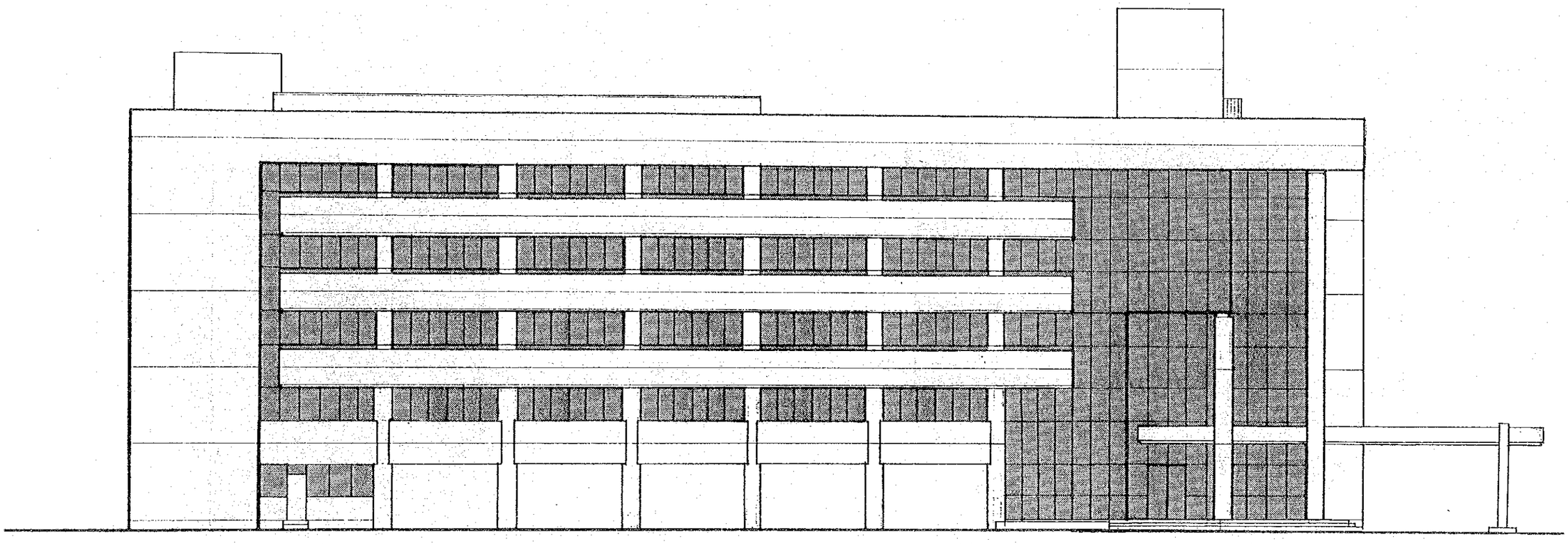
06



PENTHOUSE FLOOR PLAN S : 1/200

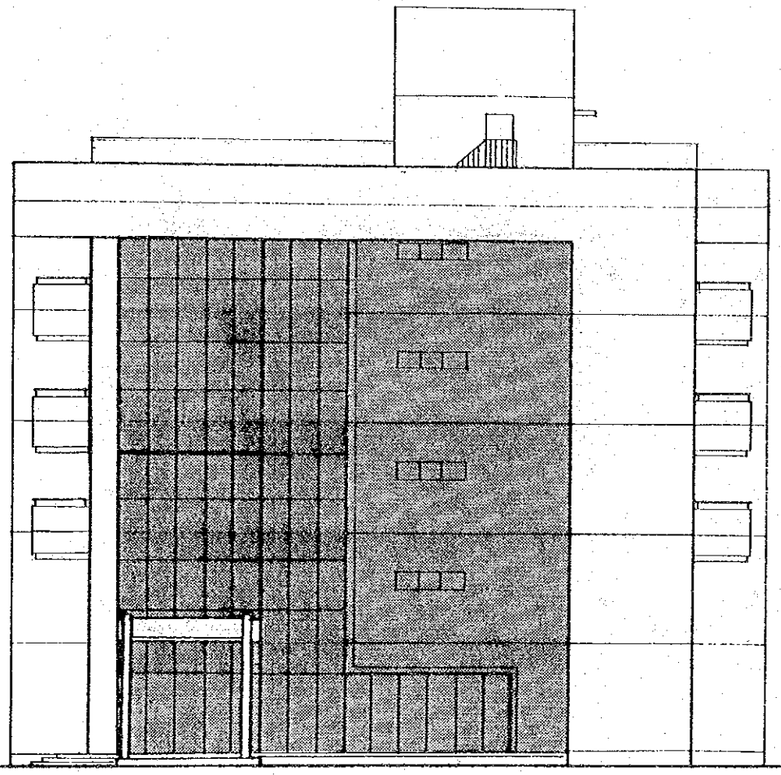
07

MAIN BUILDING : PENTHOUSE FLOOR PLAN

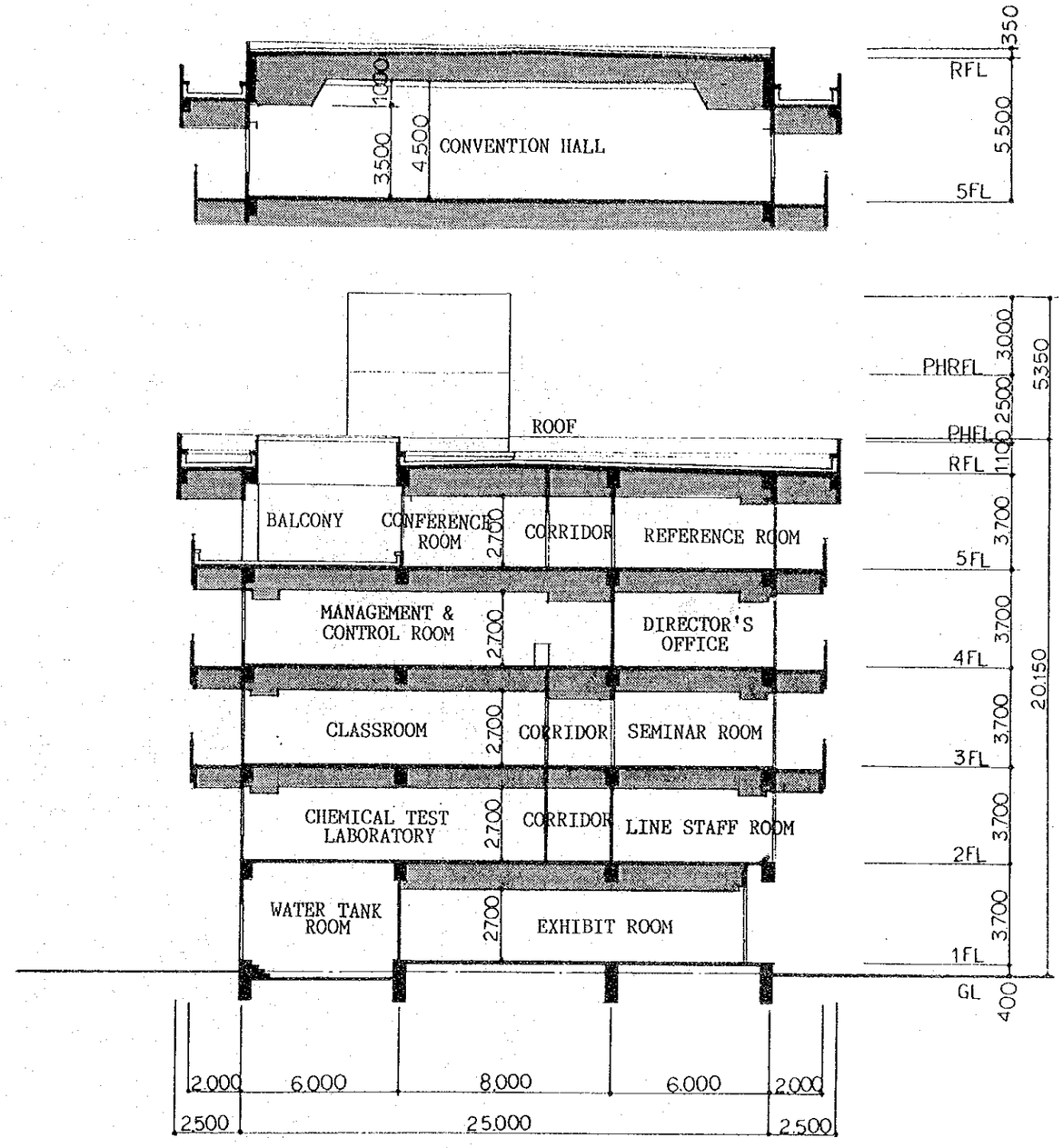


NORTH ELEVATION S : 1/200

08 MAIN BUILDING : NORTH ELEVATION



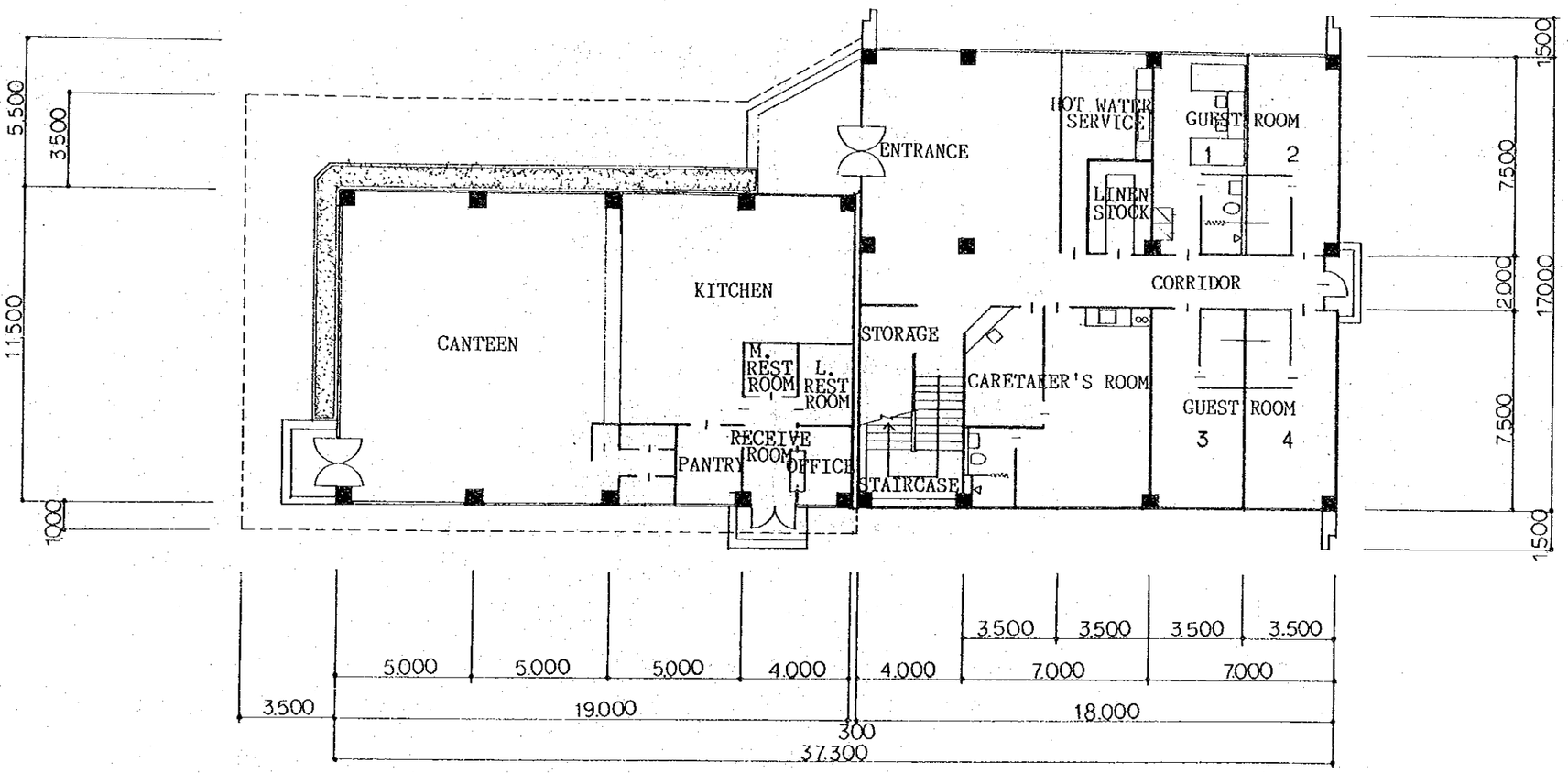
WEST ELEVATION S : 1/200



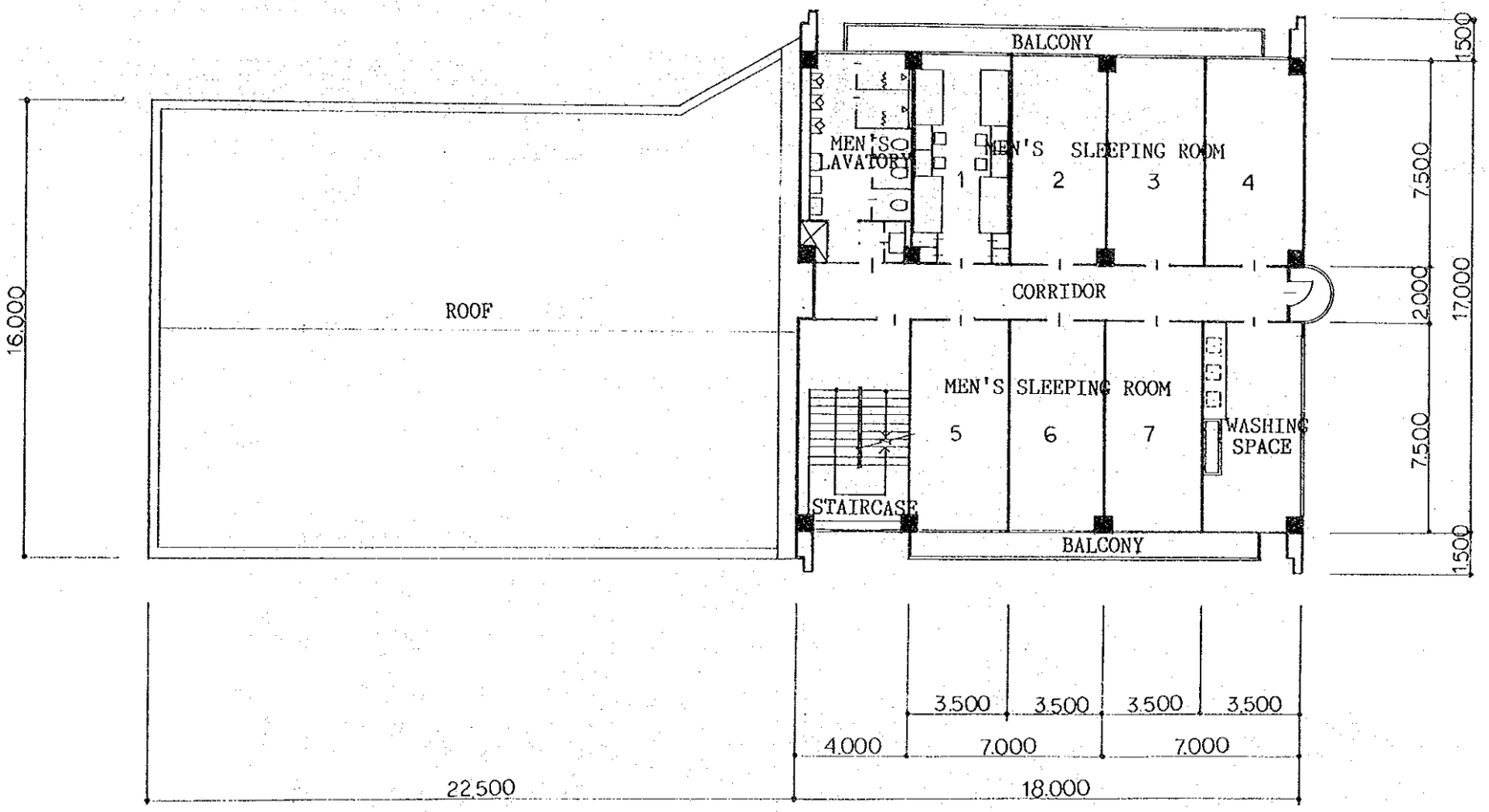
SECTION S : 1/200

MAIN BUILDING : WEST ELEVATION, SECTION

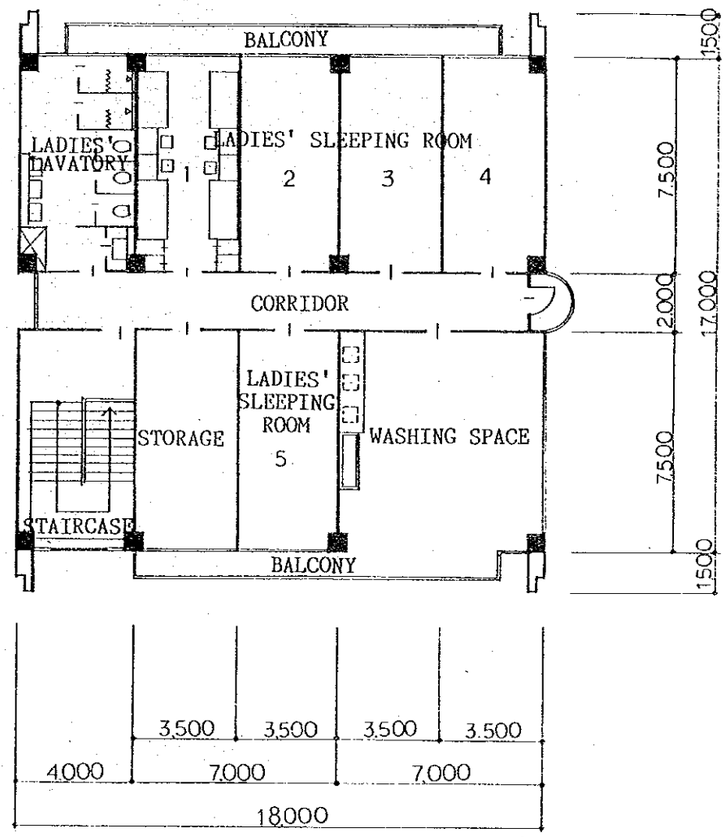
09



GROUND FLOOR PLAN S : 1/200



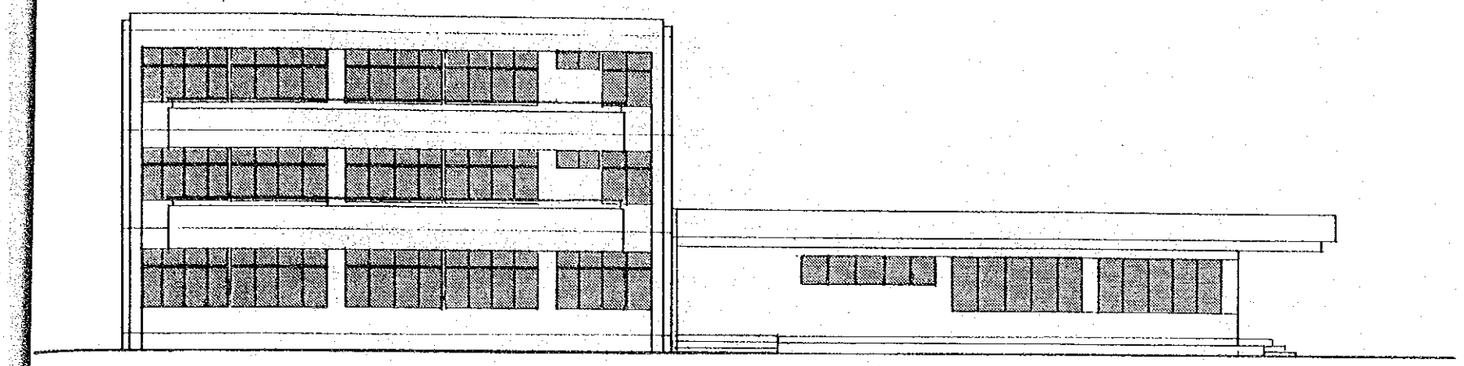
SECOND FLOOR PLAN S : 1/200



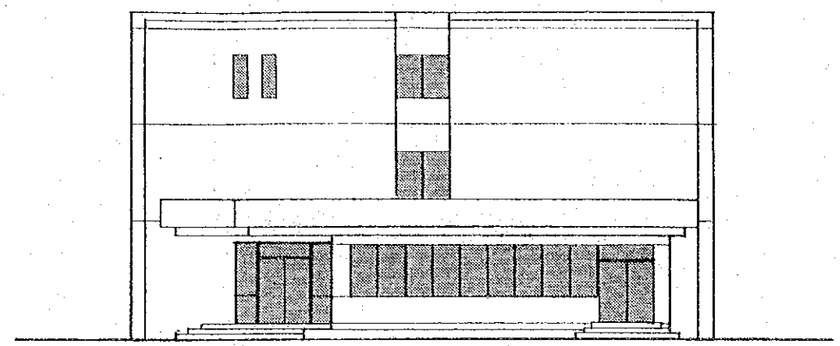
THIRD FLOOR PLAN S : 1/200

DORMITORY : SECOND FLOOR PLAN, THIRD FLOOR PLAN

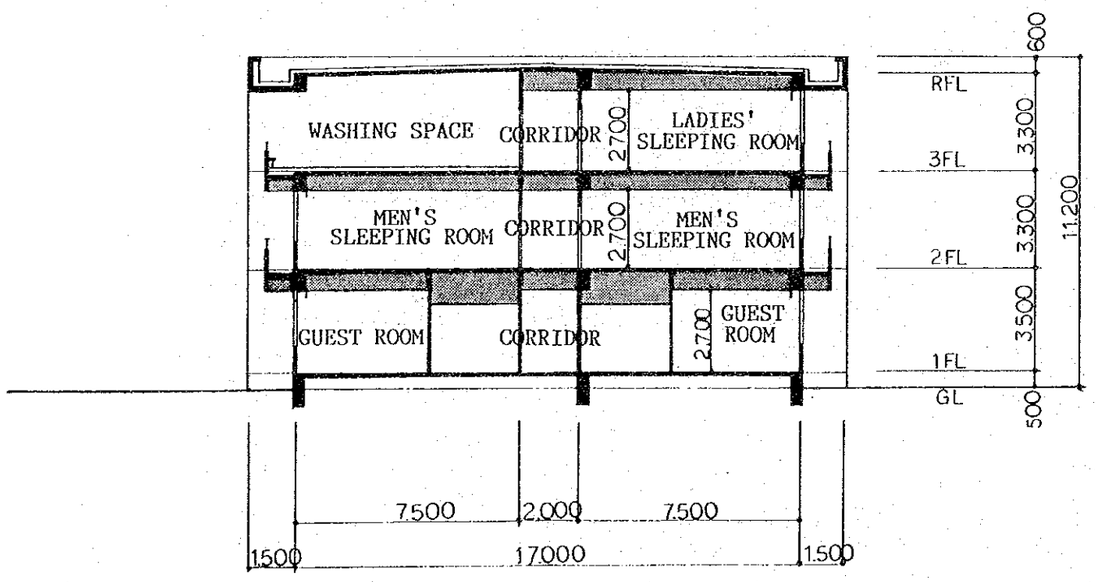
11



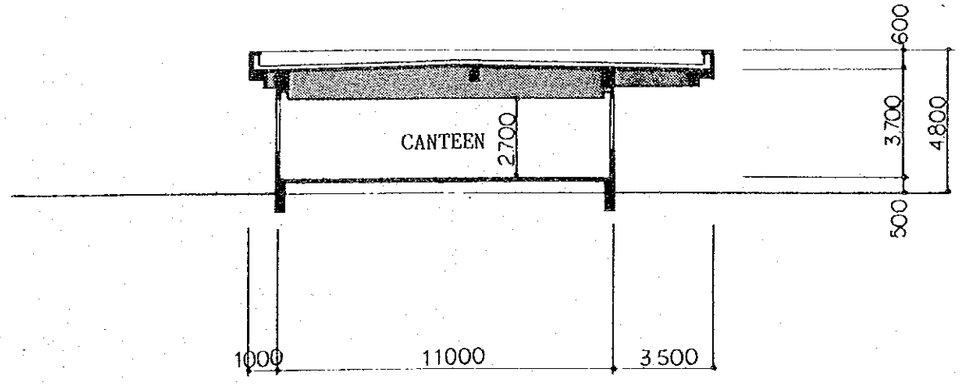
NORTH ELEVATION S : 1/200



WEST ELEVATION S : 1/200



SECTION S : 1/200



SECTION S : 1/200

12

DORMITORY : ELEVATION, SECTION

4-4 Basic Planning of the Equipment

4-4-1 Equipment Plan

(1) Equipment for Tests and Research

In principle, tests and research are separated into field research at the experimental farm and the laboratory tests.

1) Field research at the experimental farm

a) Research on the elements of irrigation in order to estimate the necessary amount of water

b) Research on irrigation efficiency and the water distribution factor etc. in various irrigation methods

c) Research on the optimum soil moisture for growing crops

d) Research on the appropriate cultivation methods and farm conditions

e) Observation of temperature, rainfall, sunshine duration and other meteorological factors

f) Practical farm experiments and market research

2) Laboratory tests

a) Water analysis

b) Analysis of organic and other soil elements

c) Measurement of soil moisture retention, distribution of grain size, density, etc.

d) Measurement of liquid, plastic and shrinkage limits

e) Tests of soil dynamics like permeability, shear resistance, vane resistance, etc.

As is mentioned above, the project-type technical cooperation is being carried out, and the equipment for the research in the experimental farm and a part of that for the physical tests in the laboratory is to be purchased. This equipment is not to be provided in the DCIEC project. The equipment for the physical tests will be moved into the Center when it is completed. Space and power sources for these facilities will be included in the design.

(2) Materials and Equipment for Training

The NIA has ample experience in the irrigation of rice fields but none in the irrigation of other crops. They have never carried out research and comparative tests on the amount of irrigation water for non-rice crops for design purposes. Nor they have done research on the irrigation technology for non-rice crops.

The NIA thus requested the development of a training module as part of technical cooperation. Prior to using this training module, however, it is suggested that basic skills be enhanced in diversified crop irrigation. It is also important to expand the skills of the NIA's staff in using the research equipment and introducing training technology.

Based on the present situation, 2 classrooms (for 50 persons each) for the training of more than 2,000 persons a year, and 2 seminar rooms (for 25 persons each) for small group discussions will be provided. A convention hall will also be designed to be used for assemblies of many people like symposiums. The equipment for research to be included in the project consists of A-V equipment, equipment to make teaching aids, and printing devices.

(3) Exhibit Room and Equipment

In the exhibit room on the ground floor by the entrance hall, the cut models of pumps and valves, plastic models of the water gate and other materials for training will be put on display.

(4) Computer

The NIA has one minicomputer (VAX II/750) and 22 personal computers. 93 persons among the NIA's staff including the programers operate them. These computers are mainly used for engineering calculation and data processing. The minicomputer is also used as the data base. This computer system now has a 100% operation load, and has no excess capacity. So that the staff of the Center can have access to the computer system, it is necessary to expand the capacity and the processing capability of the minicomputer and install more personal computers.

The computer system in the Center is assumed to be used mainly for the following data processing.

1) Processing basic data including meteorological data, hydraulic data, documents and materials for reference, and the geographic classification of the country by agriculture and civil engineering point of view
   The memory expansion needed to write in all the basic data will be as much as the capacity of another big computer, however, it is more appropriate to expand the capacity of the existing computer system of the NIA to maximum, considering the number of the technical staff, the running cost, etc.

2) Processing the data gained in the experimental farm and the laboratory. The personal computers are enough for this work. The 16 bit memory capacity is more than 300 K bites.
   Processing the soil moisture data, assumed to make up most of the collected data, the data of one tensiometer in one year, will need about 263 K bites. This can be well within the capacity of an ordinary microcomputer, including the capacity for software.

According to these conditions, the following equipment is scheduled to be provided.

1. Expansion of capacity and capability of VAX II/750

DEC 2 MB expansion memory	1 set
1,600/6,250 bpi magnetic tape drive and controller	1 set
800 LPM line printer and controller	1 set
DEC 456 MB fix disc drive	1 set

2. Personal computer

IBM PS/2 Model 50 system unit [1 MB memory, 20 MB fix disc, 1.44 MB (3.5") FDP]	8
12" color monitors	8

control keyboards	PC DOS	8
printers 15"	200 cps	8

The system to be provided will be ordinary grade, appropriate to the usage and maintenance conditions in the Philippines.

4-4-2 List of the Equipment

I Equipment for Research and Testing

1. Equipment for Soil and Water Analysis
   (pH Meter, Flame Photometer, Titration Assembly, Conductivity Meter, Nitrate Digesting Apparatus, Temperature Controlled Drier, Analytical Balance, etc.)

2. Equipment for Soil Physics
   (Vibrator, Muffle Furnace, Unconfined Compression Tester, Direct Shear Tester, Consolidation Tester, Constant Level Permeability Tester, etc.)

3. Laboratory Furniture
   (1) Balance Tables
   (2) Side Work Tables (single axis, double axis, corner type)
   (3) Center Work Tables (side sink, center sink)
   (4) Cabinets
   (5) Sink Units
   (6) Work Tables
   (7) Stools
   (8) Laboratory Carts
   (9) Chairs

4. Books and Documents

II Equipment for Training Use	Quantity
1. Classroom	
(1) Overhead Projectors	2
(2) Slide Film Projectors	3
(3) Speaker Systems	

2. Equipment for Audio-visual Room
   (1) Video Camera & Accessories
   (2) Video Tape Editing Equipment
   (3) Dubbing Equipment

3. Projection Room
   (1) 16 mm Film Projectors 2
   (2) Speaker Systems

4. Convention Hall
   (1) Video Projector 1
   (2) Overhead Projector 1
   (3) Slide Film Projectors 2
   (4) Speaker Systems

5. Exhibit Room
   (1) Cut Model of Pumps, Valves
   (2) Miniature Models of Water Gate
   (3) Miniature Models of Water Gauges
   (4) Irrigation Machinery

6. Printing Equipment
   (1) Scanning Machine & Accessories
   (2) Photocopy 1
   (3) Blueprint Copying Machine 1
   (4) Word Processors 1
   (5) Drafting Equipment
   (6) Bookbinding Apparatus

7. Vehicles
   (1) Mini Bus 1
   (2) Pick-up Truck 1

CHAPTER 5

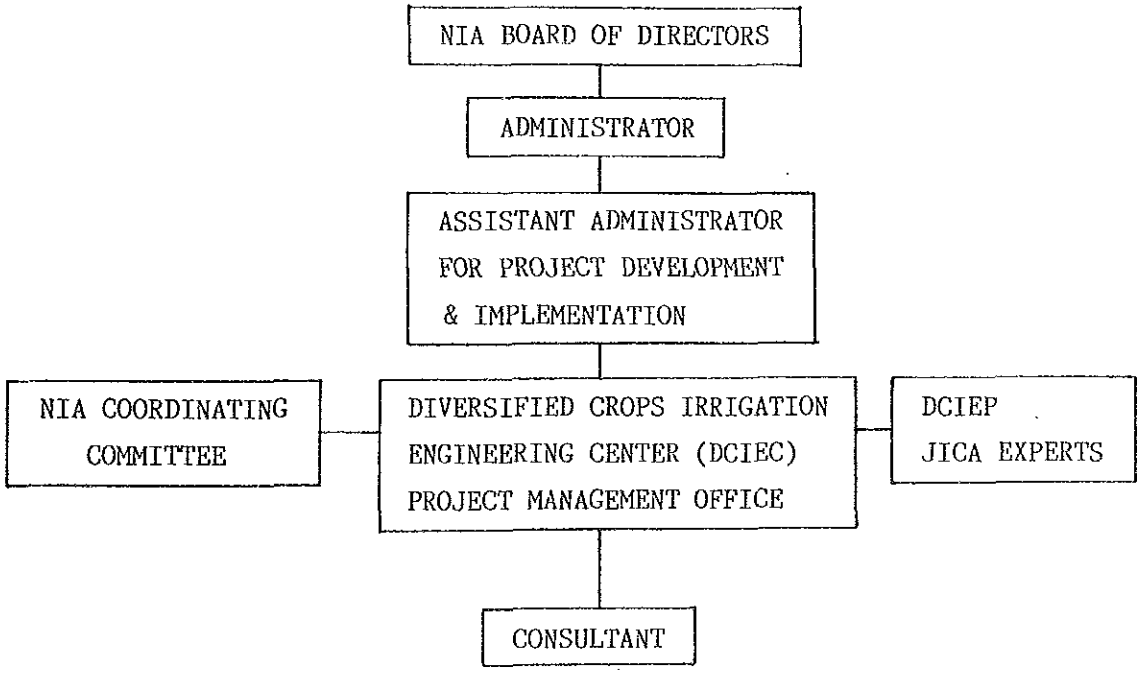
IMPLEMENTATION OF THE PROJECT

CHAPTER 5 IMPLEMENTATION OF THE PROJECT

When this project is realized through Japanese grant aid, it will be implemented in accordance with the following procedures.

5-1 Structure for Implementation

The Philippine organization for implementation is as shown below. The project will proceed under this arrangement until the completion of construction in close contact with the people concerned in the DCIEP for advice, as well as with JICA and the Japanese Embassy in Manila. The consultant and the contractor will be selected from among eligible Japanese firms, and will fulfill their responsibilities.



5-2 Scope of Responsibilities

Under the condition that this project be realized, the following arrangements are to be undertaken by each government.

(1) Japanese responsibilities

1) To construct buildings and facilities which are agreed upon to be granted by the government of Japan
2) To provide utilities for the above buildings and facilities
3) To provide and install the equipment which is agreed upon to be granted

(2) Philippine responsibilities

1) To secure the land for this project
2) To demolish existing buildings and prepare the land at the project site
3) To move the existing utility piping embedded in the project site
4) To secure the ground for the temporary work within the NIA compound
5) To cover the sewage treatment tank for the NIA headquarters
6) To apply for the permit, license and approval necessary for implementing the project
7) To provide the following systems:
   a) Electric power supply to the Center building
   b) Water supply pipe to the Center building
   c) Telephone piping to the terminal board in DCIEC
   d) Furniture, carpets, curtains and other accessories
8) To provide services relating to the banking arrangements, and to pay the following commissions to the authorized foreign exchange bank in Japan:
   a) Inspection fee for payment approval
   b) Payment commission
9) To handle unloading and the customs clearance, as well as to assure exemption of excise taxes and duties to be imposed at the unloading port

10) To exempt the Consultant and the Contractor from the value added tax (VAT) issued by the government of the Philippines. In case they are liable to taxation, the Philippine administrative agency concerned shall pay the VAT.

11) To carry out official formalities and to give approval necessary for the entrance to and residence in the Philippines to the Japanese whose services may be required in connection with the supply of the products and services according to the verified contract

12) To operate and maintain properly the facilities and equipment which will be provided by the grant

13) To secure budgetary measures necessary for transportation and installation of such equipment that is not included in the grant

14) To obtain the building permit

5-3 Construction Plan

5-3-1 Basic Construction Policy

The following are the basic policies for the construction of the Center:

As the Main Building has 5 storeys and there is only limited space around the buildings in the site, various types of work will need to be done at the same place simultaneously. Due care shall be given to safety precautions in planning the construction schedule as well as the supervision of the work so that the work can be completed without delay.

5-3-2 Observations for Construction

The following shall be well reviewed and investigated for the purpose of construction.

(1) There are expected to be a lot of pedestrians around the project site as it is located in the compound of the NIA. Due care needs to be given for the safety precautions such as erecting a temporary fence around the site.

(2) Wooden form posts and temporary scaffolds are used in the Philippines. The scaffolding shall be carefully designed as the Main Building has 5 storeys, with the eaves about 20 m in height.

(3) In case the earth work is done during the rainy season (May to November), due care shall be given to the safety precautions for the shoring method and the construction schedule, as the foundation bottom of the Main Building reaches from 3.0 m to 4.5 m in depth.

(4) There will be limited space around the two project buildings in one site. Therefore, locations of the field office, materials stockyard, field plant, the temporary workers' shed, etc. as well as spaces for the passageway for big automobiles and construction machines shall be arranged effectively.

(5) The purchase of local materials shall be scheduled in the early stage, due to insufficient supply. Those to be imported also need to be carefully scheduled taking into account the shipping and delivery periods to the site.

(6) Necessary precautions shall be prepared to protect against rain in the rainy season and avoid damage from high temperatures during the curing of structural concrete.

5-3-3 Supervisory Plan

The Consultant will call for the tenders for the work according to the contract. After the bidding, the Consultant will be responsible for fulfilling supervisory services from a neutral position and give appropriate judgement and indications.

During the work, an experienced capable field representative of the Consultant, who is well familiar with the project, will be stationed at the site for management and supervision of the work, and when necessary, architects and engineers will inspect and provide instructions at the site.

(1) Basic Design Policy

1) To maintain a close contact with and provide information to the organizations concerned belonging to the both governments, and to complete the facilities without delay, based on the construction schedule;

2) To impart adequate and timely advice and indications to the contractors, in order to complete the construction of the facilities according to the design documents;

3) To treat the project from a standpoint of a technology transfer, to realize the effects of a grant aid project with respect to methods and technology in construction;

4) To encourage the smooth operation of the Center and extend adequate assistance and directions to the people concerned in the Philippines as to the operation and maintenance of the facilities after the termination and transfer.

(2) Supervision of the Work

1) Collaboration in procedures of the construction contract

To represent the NIA, the owner of the project, in explaining the drawings and carry out the bidding in the presence of the representative of the owner. To investigate and evaluate the details of construction and assist in the signing of the construction contract;

2) Procedure of authorization to pay

To examine and approve requests for payment of the construction costs payable during and after the work;

3) Work reports

To hold periodical report meetings and present reports to the NIA. To prepare monthly reports and submit them to the NIA, Japanese Embassy, JICA Office in Manila, Ministry of Foreign Affairs of Japan and JICA Main Office in Tokyo;

4) Direction of the work

To hold meetings regularly at the site to confirm the workmanship and progress of the work, and to give necessary instructions to the Contractor;

5) Examination and approval of the shop drawings

To examine shop drawings, fabrication drawings of the equipment, and samples of construction materials, and give approval to the Contractor;

6) Inspection and assistance

To assist the inspection at each stage of the progress from the commencement and the completion of the work, and give approval for completion;

The Consultant, after confirming that the work is finished and the conditions of the contract fulfilled, will assist in the handling-over of the facilities. His services will finish with the approval of the Owner.

5-3-4 Procurement Plan for Materials

The products and materials are regulated under Philippine standards, which are based on standards of the American Society for Testing and Materials (ASTM).

The large factories are equipped with adequate machinery to manufacture products in high quality, conforming to the Philippine standards, while the small- and medium-scale factories do not have the capacity for quality control in observing the standards, and manufacture products of rather poor quality.

Materials	Country	Reference (Selection reasons & notes)
1) Construction Materials		
Cement	Philippines	The quality varies a little, but does not cause problems in compressive strength. The market sometimes has shortages of goods due to deliberate control by the suppliers.
Sand, gravel	Philippines	River sand and gravel are in sufficient quantity, in good quality in general.
Ready-mixed concrete	Philippines	There are many concrete manufacturers, Concrete productivity is 60 to 120 m^3/h, which is satisfactory for the work.
Reinforcing bars	Japan	Mostly deformed bars, manufactured in inch units. Some products are of poor quality, causing cracks while bar bending.
Structural steel	Philippines	Various types of sections are available in the Philippines.
Concrete blocks	Philippines	A lot of producers are available as to the specification desires.
Wooden frames	Philippines	Locally available, with no problems in quality.
Plywood	Philippines	Locally available, with no problems in quality.
Lumber	Philippines	Plenty of good cheap lumber is available. Woodcraft skills are high.
Stones	Philippines	Plenty of cheap marble and granite are available in good quality.
Tiles	Japan	Local products have a little in variety of color and size and are in rather poor quality in size precision, strength and glazing.
Doors and windows	Japan	Aluminum sashes are produced only for house use and are not very satisfactory in strength, finish, and water and air tightness.
Glass	Japan	Clear plate glass only is produced; others are imports.
Paint (interior)	Philippines	Local products are available in good quality and quantity.
(exterior)	Japan	Local products are of rather poor quality.

Materials	Country	Reference (Selection reasons & notes)
2) Materials for Mechanical Systems		
Pipes	Japan	Some are manufactured locally, but there are problems in quality, precision, and accessories. They are expensive because of using imported materials.
Sanitary	Japan ware	Local products are inappropriate as to quality in precision, strength, glazing and accessories.
Air conditioners	Japan	Not produced in the Philippines.
Wires, cables	Japan	Some are manufactured locally but are not very good in quality.
Conduits	Japan	Some are manufactured locally but are not satisfactory in quality and availability of accessories.
Lighting fixtures	Japan	Lighting fixtures are not produced locally except for fluorescent lamps.
Elevators	Japan	Not produced in the Philippines.
Lifts	Philippines	Lifts are available locally with the exception of hoists.
Kitchen equipment	Japan	Most local equipment is of poor quality in size, precision, and accessories.
3) Laboratory Equipment	Japan	Local products are not as good as those the Center requires in quality, quantity and unit rate.
4) Construc. Machinery	Philippines	Most machines are available in the Philippines.

5-3-5 Work Plan under the Responsibility of the Government of the Philippines

The NIA will undertake the following preparation work prior to the commencement of work.

(1) Grading

There are a flat storage, two covered parkings, a pelota court, gas pumps and a motor pool, etc. in the project site. The NIA will demolish or move these facilities and grade the ground.

(2) Covering the Existing Sewage Treatment System

The open-top, aeration type sewage treatment system used for the NIA headquarters is adjacent to the project site. The Dormitory is designed near this tank. As no air cooling system is considered for the dormitory rooms, it is assumed that people will open the windows in the evening. To avoid the odor from this tank, a tight lid will be fixed on top of it and a forced air supply/exhaust device will be provided by the NIA.

(3) Relocation of the Embedded Drainage Piping

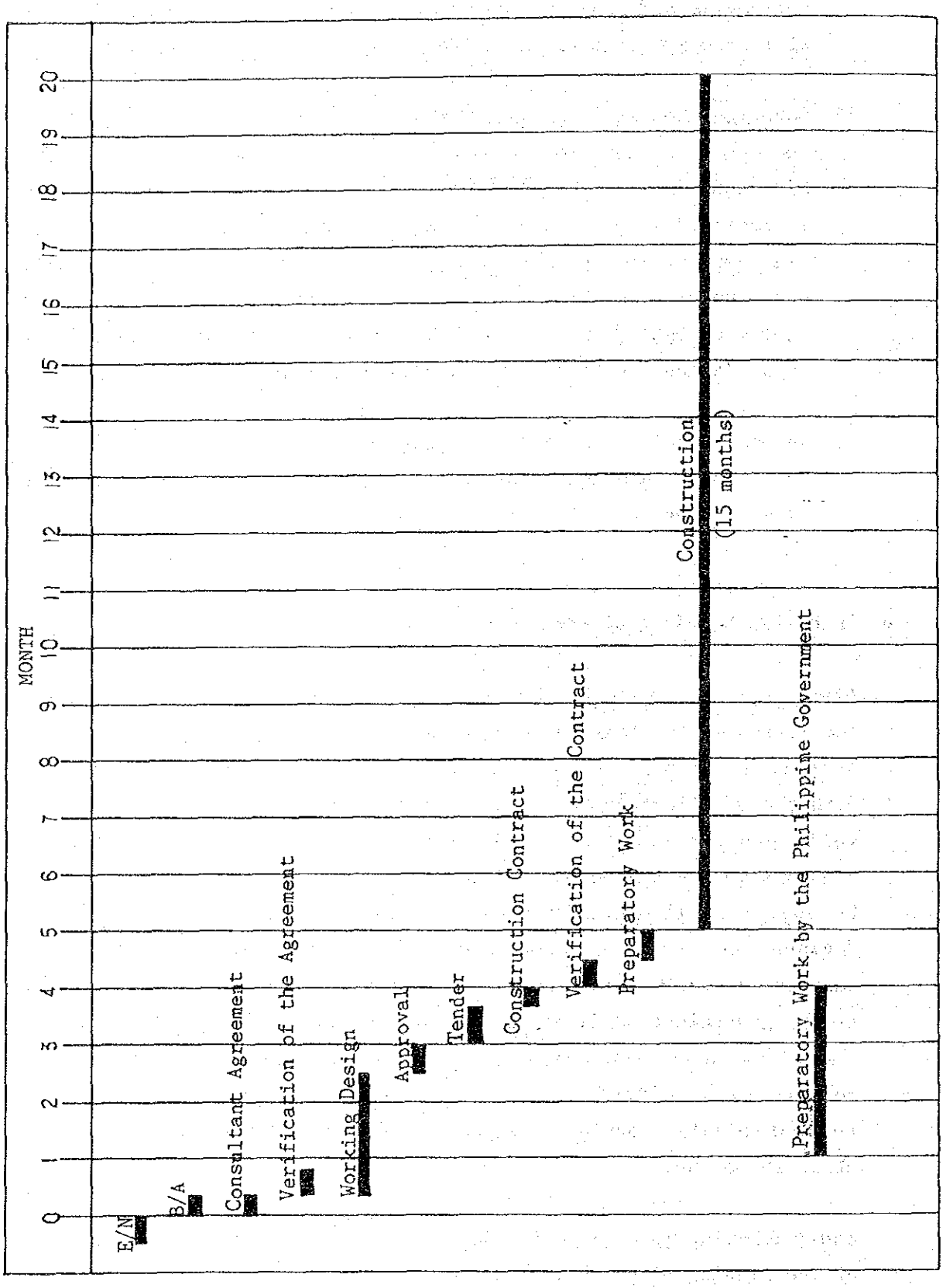
The existing drainage piping which is assumed to cross the project site will be moved to other places.

5-4 Tentative Schedule of the Project

After signing the E/N, the NIA, Owner of the project, will deposit a commission in the bank for the banking arrangement, and enter into the agreement for the consulting services. The Consultant will proceed with the verification of the agreement with the government of Japan while proceeding with the working design. Preparing the working drawings in about 2 months and having them approved by the NIA, the Consultant will explain the contract documents and the bidding to the Japanese construction companies. The successful contractor will conclude a construction contract with the NIA, which shall be verified by the government of Japan, and start construction work. It will take about 5 months from the signing of the E/N to the commencement of construction. The NIA will complete the work in the area of its responsibilities during this period. The construction period will be about 15 months.

The following is a tentative schedule of the project starting the day of the signing of the E/N.

TABLE 5-1 TENTATIVE SCHEDULE OF THE PROJECT



5-5 Approximate Local Project Cost

Among the project cost to be born by the government of the Philippines, the installation of water supply intake pipe (about 350 m long, from EAST Avenue to the NIA compound, pipe diameter 50 mm) is assumed to cost approximately one million yen.

Removal of existing structures in the site and grading will be done by the NIA with its construction machinery.

CHAPTER 6
OPERATION AND MAINTENANCE PLAN

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6-1 Operation and Maintenance System

The NIA headquarters has a well organized operation and maintenance system for the building and utility systems. The Center will be a separate building with the independent utility system from the NIA headquarters and will be appropriated with its own budget for operation and maintenance.

The Center, in view of its size, shall have regular well-experienced operation and maintenance staff in order to establish such a system to take care of the Center according to circumstances. It is suggested that the staff be appointed well before the completion of construction so that they can receive practical training from the Consultant in how to install and maintain the building facilities and equipment during construction.

Consideration will be given to the selection of equipment for research and training use which is easily available and maintained in the Philippines.

6-2 Maintenance Schedule

In general, the physical life span of a reinforced concrete constructed building means the period until the concrete changes from alkaline to neutral (to over pH 12) and loses the support of reinforcing bars as the bars become rusty and lose their structural strength. Though the period of neutrality depends on the environment of the building as well as concrete proportion ratio, especially the weight ratio of cement and water (water-cement ratio) and workmanship, this life is usually 40 to 80 years. The life span of building facilities is said to be shorter, 20 to 25 years for the electric installations, 15 to 20 for water supply and drainage installations, and 10 to 15 years for air-conditioning equipment. This project plans to expose the building

facilities and piping system as much as possible for the purpose of easy inspection, maintenance and repairs.

The life span of a building is indicated in the following curve. This curve starts at the time of completion of building construction though almost flat at that time. Inspection, maintenance and repairs are to retard attrition to expand the life of the building from point T to T'.

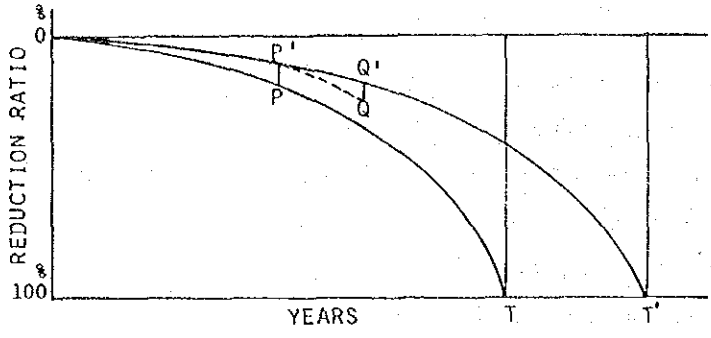

FIGURE 6-1 REDUCTION CURVE OF BUILDING

Annual maintenance costs vary from country to country but usually amount to 0.6% to 1.4% of the construction cost. The Japan Housing Corporation charges the residents 1.1%. Maintenance costs of 0.3% of the building cost are regarded as reasonable for this project considering the type of the building and the fact that no interest is to be charged on the construction costs.

The depreciation period for the analytical equipment and laboratory furniture is considered to be about 10 years, both of which also require regular inspection, maintenance and repairs. This period can be extended with proper maintenance, like the building. However, the supply of spare parts may stop along with the development of new equipment. A necessary amount of spare parts shall always be kept on hand. The annual maintenance cost of the analytical equipment and laboratory furniture is estimated at around 2% of the purchase price.

The frequency of maintenance is recommended to be scheduled as shown in the following diagram.

Materials & Equipment	Air Conditioning								Plumbing & Fire Extinguishing					Electricity		
	Piping					Duct & Equipment										
	Hot & cold water	Cooling water	Steam	Oil	Refrigerant	Air conditioning	Ventilation	Smoke exhaust	Water supply	Hot water supply	Sewage	Fire extinguisher	Gas	Communication	Power feeder	Energency
Pipes																
Steel, exposed	A	A	A	B					A	B	A	A	A			
Steel, in concrete			B	B					B	B	C	C	B			
Steel, embedded				B					B		C	C	B			
Stainless steel	C								C	C						
Cast iron, exposed									B		A					
Cast iron, embedded									C		B					
Copper	C				A				C	A	C					
Lead									B		B					
Lining steel		C							A				B			
Coating steel											C					
Plastic		B							B	C	B					
Valves	B	B	B	B					B	B	C	B	B			
Conduits & cables														A	A	A
Ducts																
Steel, stainless steel						A	A	A								
Glasswool						C	C									
Resin							C									
Flexible						B	B									
Dampers, outlets						B	B	B								
Equipment																
Freezer, boiler						B										
Cooling tower						B										
Heat excg., tank, header						B										
Pumps						B			B	B	C	B				
Air-han.unit, pckge, fan						B	B									
Radiator						B										
Automatic controller						B	B	B								
Water treatment unit						B			B	B						
Tank (plumbing)									B	B	B					
Hot water tank										B						
Sani.ware, hardware, pit									B	B	B					
Fire extinguisher												B				
Transformer															A	
Generator															A	
Panel															A	
Lamp, receptacle outlet															A	
Lighting fixture															A	
Communication system														A		
Security system																A
Lightning, ground															A	
Transportation															A	
Outdoor lighting															A	
Others (kitchen, septic tank, incinerator, etc.)																

Frequency : A --- high, B --- moderate, C --- low

6-3 Operation and Maintenance Costs

The annual operation and maintenance costs are estimated as follows taking into account the size of the buildings, the number of the staff, the building occupation and the operating conditions:

(conversion rate: 1 peso = 6.5 yen)

(1) Personnel expenses (based on the NIA's information)

Annual wages ₱ 3,163,380 (¥20,561,970)

(2) Electricity cost

Conditions: 8 h/day, simultaneous consumption rate 50%
22 days/month, 1 kw/h = ₱2.25

Annual cost:

900 kw x 8 h x 0.5 x 22 dys x 2.25 x 12 mts = ₱ 2,138,400
(¥13,899,600)

(3) Water supply cost (not necessary if well water is provided)

Conditions: ₱ 5.34/m^3, 22 days/month

Annual cost: 75.2 m^3 x 22 dys x 5.34 x 12 mts = ₱ 106,014
(¥ 689,091)

(4) Gas charge (one 11.5 kg-LPG cylinder = ₱ 85)

Conditions: 8 h/day, simultaneous consumption rate 50%
22 days/month

Annual cost:

13.16 kg x 0.5 x 22 dys x 85/11.5 x 12 mts = ₱ 12,840
(¥ 83,460)

(5) Fuel cost for the generator (₱ 7.18 /liter)

Conditions: 1 h/day, 30 liters/h

Annual cost: 30 l x 22 dys x 7.18 x 12 mts = ₱ 56,866
(¥ 369,629)

(6) Equipment maintenance cost

According to Japanese statistics, the average annual cost for the first 10 years is 305 yen/m^2 (₱ 47/m^2), equal to 25 yen/m^2 a month. The maintenance cost is assumed at 70% of this average cost considering the situations in the Philippines and the grade of equipment.

Annual cost: 6,873 m^2 x 47.0 x 0.7 = ₱ 22,613
(¥ 146,985)

(7) Miscellaneous costs

[10% of the total costs from (1) to (6) above]

	Pesos	Yen
Personnel	3,163,380	20,561,970
Electricity	2,138,400	13,899,600
Water supply	106,014	689,091
Gas	12,840	83,460
Fuel for the generator	56,866	369,629
Equipment maintenance	22,613	146,985
Sub-total	5,500,113	35,750,735
In case water supply cost is excluded:	5,394,099	35,061,644

Annual cost: 5,500,113 x 0.1 = ₱ 550,011 ¥ 3,575,074

(8) Total operation and maintenance cost

Annual cost: approximately ₱ 6,050,000 (¥ 39,350,000)

In case city water is not used:
approximately ₱ 5,933,000 (¥ 38,570,000)

CHAPTER 7 EVALUATION OF THE PROJECT

CHAPTER 7 EVALUATION OF THE PROJECT

7-1 Effects of the Project

This project is included in one of the objectives stated in "A Short-term Recovery Plan for the Rural Sector" and "A Long-term Policy Agenda for the Agricultural Sector", presented by the DA and aims to construct the facilities and provide the necessary equipment for the improvement of crop irrigation technology and engineering training.

As is stated in the foregoing chapters, the development of diversified crops irrigation engineering is indispensable in the Philippines. The realization of this project is significant in accomplishing this development. This project is expected to have the following effects when the Center is completed and being managed smoothly by the Philippine authorities.

(1) Economic Effects

When the NIA owns the first diversified crops irrigation engineering center in the Philippines, it will make possible virtually unprecedented training of irrigation engineers and studies on secondary crop cultivation. The training is scheduled in 7 subjects for a total of 18 weeks in the first year, 17 subjects and 55 weeks in the second, and 19 subjects and 57 weeks in the third and after. The total number of participants in the training is expected to be 2,000 persons. Twenty five study subjects will be aimed at.

Through these training programs and studies, efficient crop cultivation to substitute for rice in the dry season will be promoted, leading to diversification out of single-crop rice cultivation. The program is expected to achieve overall self-sufficiency in food and to increase farmers' incomes. Of lesser importance is that irrigation water will be more effectively utilized by the efficient crop substitutions for rice, which will increase the collection rate of water control fees and improve the NIA's finances.

(2) Social Effects

1) Technology introduced from overseas during the design and construction of the diversified crops irrigation facilities will be studied and adjusted to the circumstances in the Philippines for application throughout the country.

2) The substitution of other crops for rice as secondary cultivation will raise yield for crops like corn and reduce the importation of food, which now amounts to about 300,000 met. tons annually at present.

3) Meanwhile, more vegetables will be produced and be distributed in market. This will lead to a better-balanced diet, now rather heavy on rice, and raise the standard of life of the Philippine nation.

7-2 Feasibility of the Project

Based on the examination of the request and the background of the project as well as field surveys in the Philippines and follow-up studies in Japan, the establishment of the Diversified Crops Irrigation Engineering Center with the facilities and services as stated in this report is regarded as of high priority in the Philippines.

The location of the construction site in the compound of the NIA in Quezon City is convenient for trainees from other institutions and the management of the Center. The environment is suitable to the building of a research and training center.

Considering the functions, components, structures, building facilities and construction scheme, a 5-storey reinforced concrete construction as the Main Building (floor area 5,533 m^2), 3-storey one as the Dormitory (1,056 m^2) and other facilities of 284 m^2, equaling 6,873 m^2 in total are appropriate as the scale of the facilities.