BASIC DESIGN

FOR

THE EXTENSION PLAN

OF

THE NATIONAL HYDRAULIC RESEARCH CENTER

IN

THE REPUBLIC OF THE PHILIPPINES

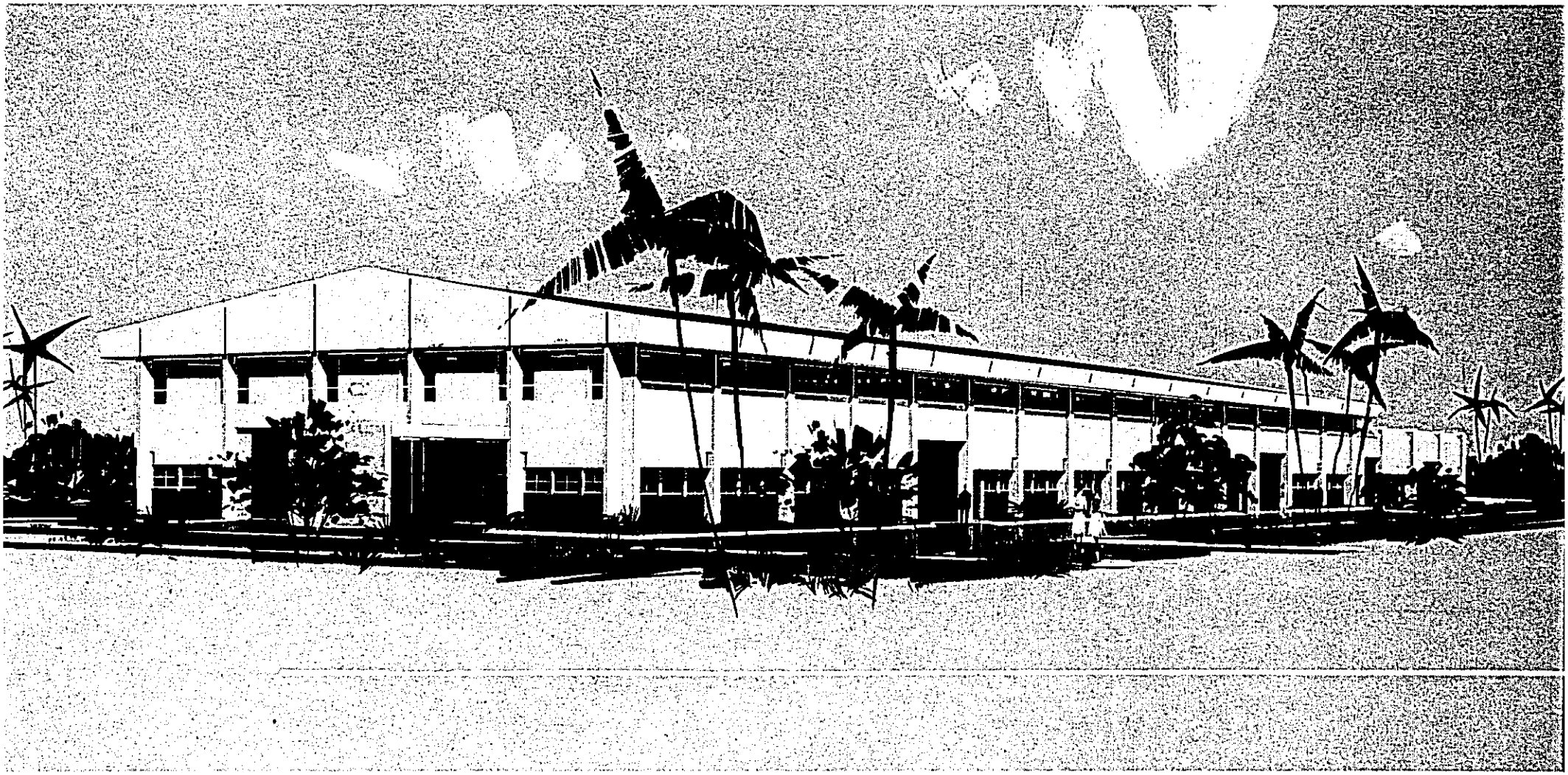
AUGUST 1977

JAPAN INTERNATIONAL COOPERATION AGENCY

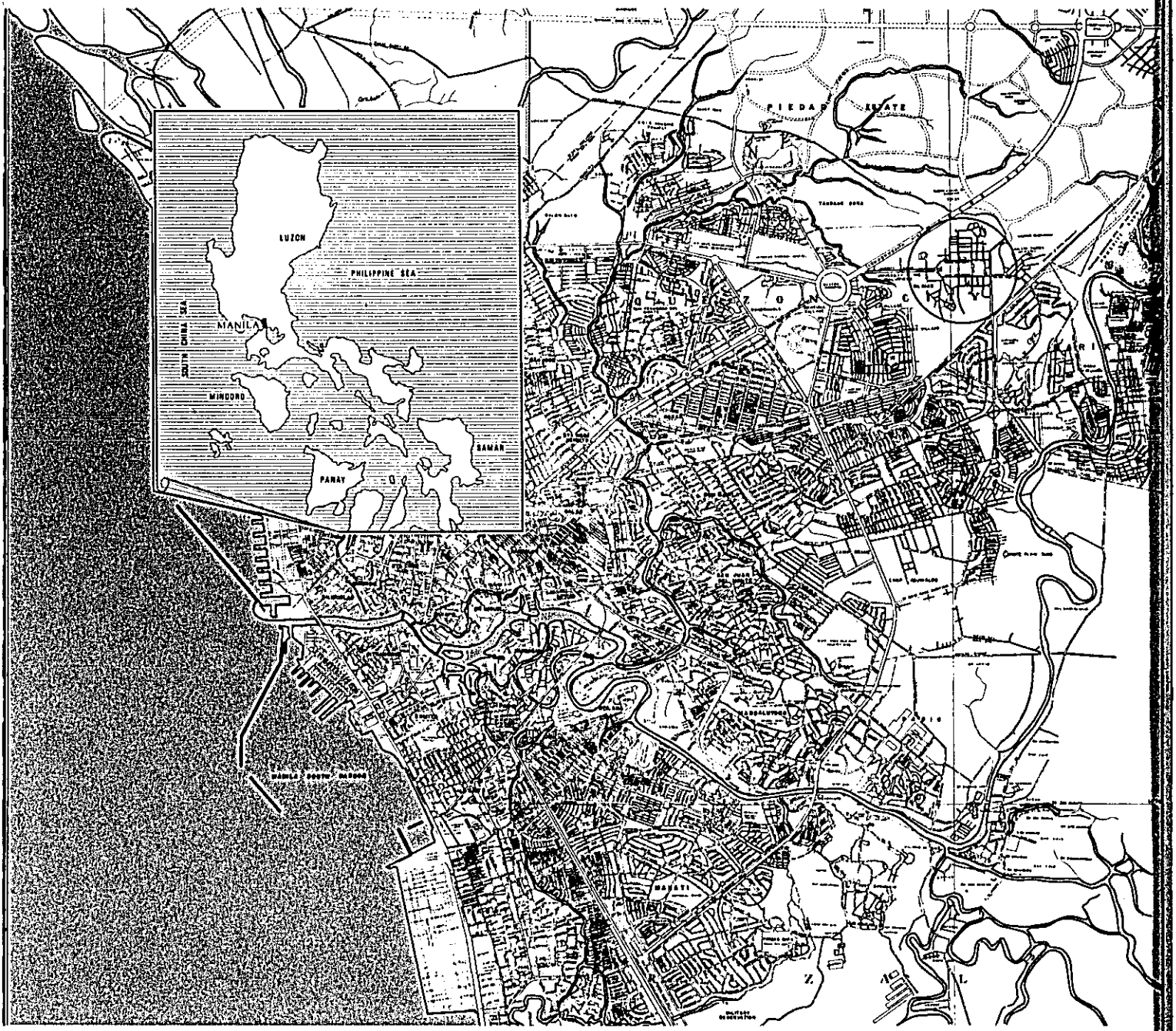
BASIC DESIGN
FOR
THE EXTENSION PLAN
OF
THE NATIONAL HYDRAULIC RESEARCH CENTER
IN
THE REPUBLIC OF THE PHILIPPINES

AUGUST 1977

JAPAN INTERNATIONAL COOPERATION AGENCY



PERSPECTIVE VIEW


LUZON
PHILIPPINE SEA
SOUTH CHINA SEA
MANILA
MINDORO
SAMAR
PANAY

MANILA

C O N T E N T S

Preface

At the request of the Government of the Republic of the Philippines, the Government of Japan decided to conduct a study for basic design for the extension of the National Hydraulic Research Center through the Japan International Cooperation Agency.

The Agency organized a survey team, headed by Dr. Akihiko TSUCHIYA, Director, River Division, Akabane Branch of Public Works Research Institute, Ministry of Construction, which conducted a preliminary survey and prepared a draft report on which it explained and discussed with the Philippine side.

The present Report we are now submitting herewith has been formulated taking fully into account the questions and answers at the meetings held in the Philippines.

I sincerely hope that this report will contribute to the extension of the National Hydraulic Research Center.

Finally I would like to express my deep appreciation to the authorities concerned in the Republic of the Philippines for their cooperation.

August, 1977

Shinsaku Hogen
President

JAPAN INTERNATIONAL COOPERATION AGENCY

I. SUMMARY AND RECOMMENDATION

I. SUMMARY AND RECOMMENDATION

The extension plan of the National Hydraulic Research Center is to be developed as a central hydraulic research center of the Republic of the Philippines. It shall therefore be given suitable perspective and scale in its master plan.

The cooperation this time shall make a first step toward the master plan providing the most urgent facilities required for the research on various projects incorporated in the national development plan.

The projects which are thus envisioned will require hydraulic research in the Center on the following items:

(1) Dam and auxiliary hydraulic structure

(2) River and canal

(3) Coast and harbour

This basic design has been made based on the study carried out by the Preliminary Study Team, dispatched by JICA (Japan International Cooperation Agency) in April 1977, and the subsequent Minutes between National Hydraulic Research Center (hereinafter referred to as the NHRC) and the Basic Design Survey Team concluded in July 1977, studying into details various aspects of the Center.

1-1. Scope of Work

The work to be undertaken shall be mainly to provide facilities for hydraulic model tests as follows:

1) Indoor hydraulic model test laboratory (Hydraulic Laboratory)

2) Outdoor hydraulic model test space

The administrative building shall be constructed in the future stage.

1-2. Site

The site has been proposed inside the campus of the University of the Philippines with a land area of 5 ha.

Drwg. No. 1 shows the site location and the area.

1-3. Hydraulic Laboratory Building

The Laboratory shall be used mainly for model test of dam and auxiliary hydraulic structures.

It shall consist of:

1) Indoor Model Test Room
2) Wood and Metal Shops
3) Pump Room
4) Staff Rooms, Store Room etc.
5) Water Reserve Tank

The Indoor Model Test Room shall facilitate at least 2 sets of dam models in large scale or 4 or 5 sets of smaller scale at a time, which number of sets has been recommended by this Mission.

Building Feature	:	One-story building (partially 2 storied)
Foundation, floor, column	:	Reinforced concrete structure
Roof	:	Steel structure with corrugated steel sheet roofing

Wall : Concrete and concrete block, plastered

Ceiling height : 9 m

Drwg. No. 2, 3, 4 show the conceptual design of the building.

1-4. Water Reserve Tank

Low water tank constructed of reinforced concrete shall be recommended. It shall be constructed under the floor of the Indoor Model Test Room.

Effective water reserve: 1,100 m^3

Effective water depth : 1.6 m

1-5. Outdoor Model Test Space

Outdoor model test space shall be mainly used for hydraulic model tests on river, canal, coast and harbour. The scope of work does not include any particular construction in the space partly because the above-mentioned tests are not deemed indispensable in the near future.

1-6. Water Supply System for Model Test

Water supply system for the Center shall be a central supply system by water pumps delivering to

1) Indoor Model Test Room
2) Outdoor Model Test Space and
3) Extended Indoor Model Test Room

The system shall be a direct-on-line pump feed system having the following characteristics:

Max. water delivery : 1.6 t/sec total

Pump	:	Double suction volute pump
Pump combination	:	400 l/sec x 3 units + 200 l/sec x 2 units
Water flow meter	:	Venturimeter
Water pressure gauge	:	Water immersed manometer
Pump operation	:	Manual
Water flow control	:	By valve, venturimeter pipe and bypass pipe

Water flow checking device: By checking water tank 24 m^3

1-7. Work Shop Equipment

Table - 1 in Minutes shows the recommended tool and machines for Wood and Metal Shops.

1-8. Instrumentation

Table - 2 in Minutes shows the recommended measuring instruments.

1-9. Wave Generator

Wave generator shall be for coastal and harbour model tests.

Type : Pendulum type, double combined, movable

Width : 10m x 2 = 20m

1-10. Pump Testing Equipment

Pump testing equipment is to test the characteristics of the pumps and shall be capable of testing up to 100 HP pump.

1-11. Others

Although an electronic computer system was proposed in the preliminary study, it shall be deleted from the scope of work because of the following considerations:

1) Electronic computer manufacturers of Japan has yet to accomplish business showing of the type of proposed computer (mini-computer) and has yet to organize maintenance staff in the Philippines.

2) The sole Japanese manufacturer who has been concentrating in sales of large computer system, quotes for the supply of spare parts and maintenance as follows:

Spare Parts	:	Approx. ¥15,000,000(for 2 years)
Maintenance	:	Approx. ¥2 - 3,000,000(per year)

The above costs seem considerably high for this project.

Considering the above conditions, it is concluded that the computer system shall be deleted and that the cost for the computer shall be used for the pump testing equipment and for additional testing space.

II. BASIC DESIGN FEATURE

2-1 HYDRAULIC LABORATORY BUILDING

2-2 WATER SUPPLY SYSTEM FOR MODEL TEST

2-3 WATER RESERVE TANK

2-4 WAVE GENERATOR

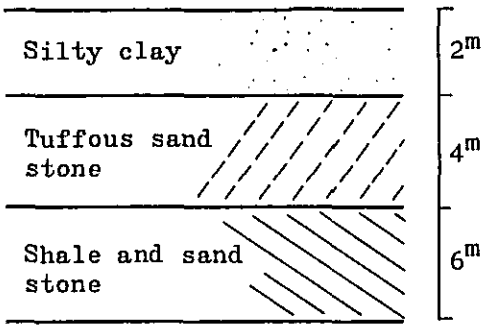
2-5 PUMP TESTING EQUIPMENT

II. BASIC DESIGN FEATURE

2-1. Hydraulic Laboratory Building

a. Geological Condition of the Site

According to a geological survey carried out by the University of the Philippines, the geological strata of the site are:



The survey report shows that the ground is suitable for building construction without foundation pile and the allowable bearing capacity is expected to be as much as 50 t/m^2 at the depth of 1 m below the existing ground surface.

b. Building Structure

Design conditions on structure are:

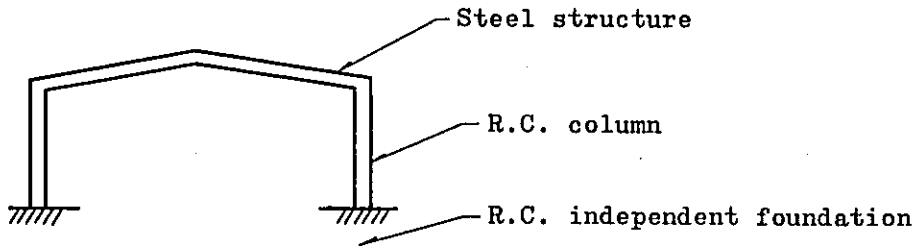
Seismic coefficient: K = 1/3 of Japan

Wind force : the same as Japan

Because of a large span of the roof frame, roof structure shall be of steel construction with light finishing on the roof. Column shall be of reinforced concrete construction since a rough structural calculation based on the above design conditions shows that reinforced concrete columns can be

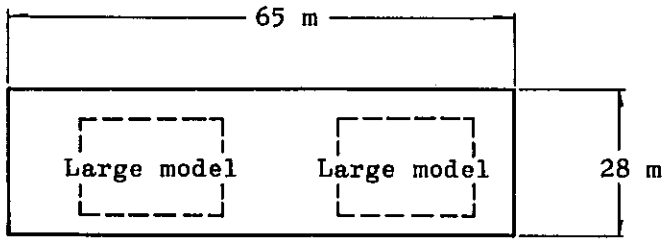
considerably slim and economical, though construction may take a little longer time than steel structure.

Therefore, the below frame is recommended:



c. Room Space

1) Indoor Model Test Room: The room shall accommodate at least 2 sets of dam model in large scale or 4 - 5 sets of smaller ones for which the minimum room space required shall be:



2) Metal and Wood Shops: Study on tool and machine arrangement and working space shows the required space as shown in Drwg. No. 3 and 9.

3) Staff Rooms, Dark Room: Same as above

4) Store Room: Preferably to be as large as possible, but financial condition restricts the space as shown in Drwg. No. 3.

For large material storage (such as pipe), store house shall be constructed in the future.

5) Pump Room: Drwg. No. 3, 7 and 8 shows the required room space.

d. Building Finishes

1)	Roof	:	Corrugated steel sheet insulated with insulation boards internally
2)	Wall, Partition:		Concrete and concrete block, plastered
3)	Floor	:	Concrete troweled
4)	Ceiling	:	Acoustical ceiling tile
5)	Door	:	Main door; Steel rolling door Man door ; Steel (external) Wood (internal)
6)	Window	:	Steel made

e. Building Utility

1) Lighting (Indoor Model Test Room):
General lighting; 150 lux. Vicinity of test model shall be illuminated locally by reflector lamps.

2) Automatic voltage regulator:
To be provided for the measuring instruments.

3) Telephone facility:
Only terminal box (20 P/30 P) to be provided.

4) Air conditioner:
Packaged type to be provided for Instrument Room, Staff Rooms, Technicians Room and Dark Room.

5) Ventilation facility:

Roof and wall ventilators to be provided for Indoor Model Test Room, Pump Room, Electric Room, Wood and Metal Shops as shown in Drwg. No. 5.

6) Domestic water supply:

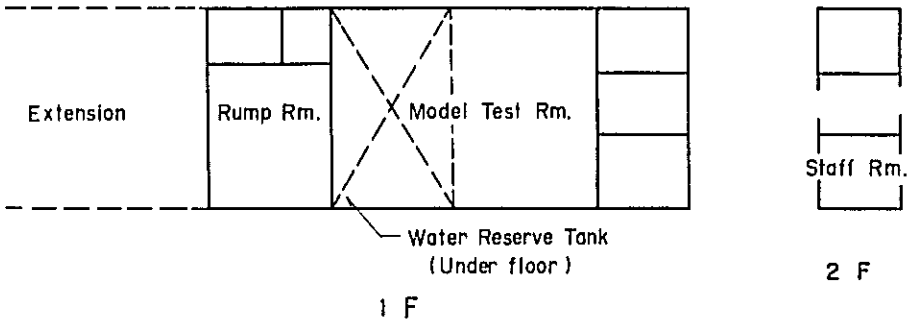
Faucets to be provided in Indoor Model Test Room for mixing cement mortar or concrete and for cleaning work.

7) Sewage disposal:

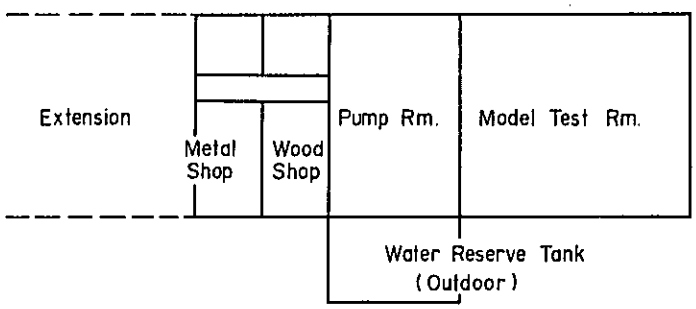
Sewage to be treated in a septic tank.

f. Room Arrangement

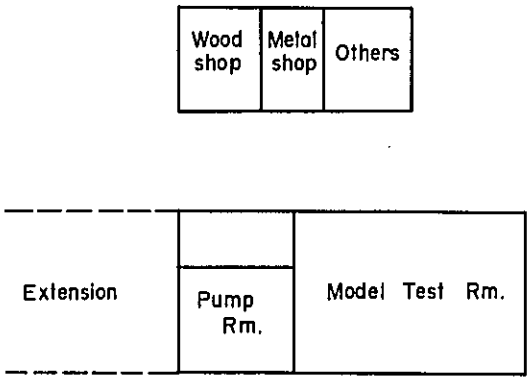
Plan - 1 (to be recommended)



Plan - 2



Plan - 3



The following points have been studied in selecting the proposed plan.

1) Considering the future extension, the Pump Room shall be located in the center of the building.

2) Since the Pump Room produces big noise, the Metal and Wood Shops shall be separated from it.

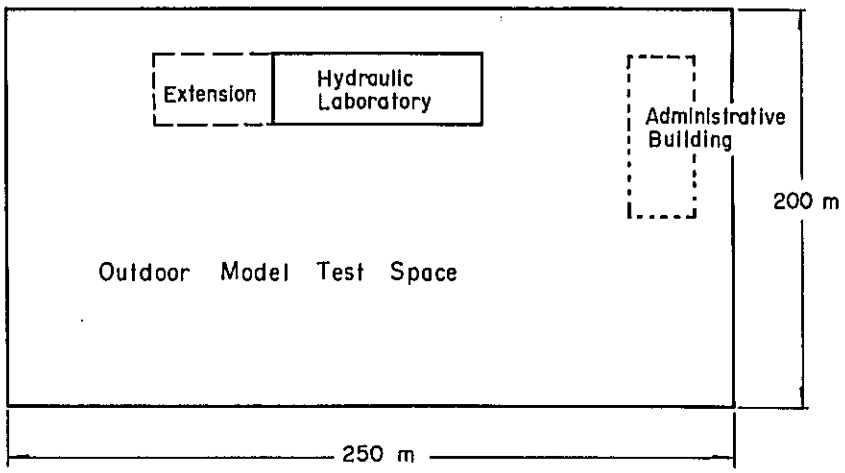
3) The water reserve tank, if located outside the building, will obstruct the outdoor model test space.

4) The Metal and Wood Shops do not have to be annexed to the Model Test Room because parts of the model and materials shall be brought into the space from outside so as not to interfere with other models being tested.

5) To separate the Wood and Metal Shops from the main building will be a little disadvantageous in view of land utilization and construction cost.

6) In plan - 2, the water supply piping for models in the extended part is a little inconvenient.

g. Site Plot



h. Others

The following works shall be carried out by the Philippine Government.

1) Land clearing and grading

2) Electric power distribution to the site including transformer and switchgear

3) Water distribution to the site

4) Drainage pipe line from septic tank

5) Access road to the site

2-2. Water Supply System for Model Test

Among the prevailing water supply system for model test, the direct on-line pump feed system shall be recommended from the economical point of view and due to its simplicity (other typical system is the head tank system).

a. Water Demand:

Required water volume for the model test:

Dam and auxiliary structure: $50^{l/sec}$ - $200^{l/sec}$ per model 2 sets of large model or 4 - 5 sets of smaller model being tested simultaneously.

River Model: $1.5^{t/sec}$, one model test at a time

Therefore, the range of water demand will be $50^{l/sec}$ - $1,500^{l/sec}$.

b. Pump:

Double suction volute pump with large water delivery and low water head. In order to meet the above range of water demand, the pump shall consist of the following units:

Capacity-200 $^{l/sec}$	x 2 units
Capacity-400 $^{l/sec}$	x 3 units
Total	5 units

c. Control of Water Flow:

By venturimeter pipe and sluice valve at model site together with overflow bypass pipe.

d. Valve Operation:

Overflow pipe valve; Motorized valve

Others ; Manual

e. Delivery Pipe: In order to limit the water velocity to about 3 m/sec and taking into account the frequent demand of small water flow, the delivery pipe size shall be;

for 200 l/sec pump : 300 ϕ

for 400 l/sec pump : 400 ϕ

f. Water Flow Meter

Water flow meter : Venturimeter

Water pressure gauge: Water immersed monometer with 3,000 mm range

In connection with "c. - Control of Water Flow" herebefore, the following venturimeter pipe shall be installed in each pump:

	No.1	No.2	No.3	No.4	No.5
Pump	200 l/sec	200 l/sec	400 l/sec	400 l/sec	400 l/sec
Venturimeter	300 ϕ	300 ϕ	400 ϕ	400 ϕ	400 ϕ
	200 ϕ	200 ϕ	300 ϕ	-	-
	100 ϕ	150 ϕ	200 ϕ	-	-

As a result of the above combination of venturimeter pipes, the following range of water flow will be obtained:

Venturimeter	Water flow
100 ϕ	5 - 25 l/sec
150 ϕ	10 - 50 l/sec
200 ϕ	20 - 100 l/sec
300 ϕ	30 - 200 l/sec
400 ϕ	60 - 400 l/sec

Whereupon, No. 1 and No. 2 pumps shall be for smaller model tests, No. 4 and No. 5 pumps for larger models and No. 3 pump for medium size models.

The upstream and downstream side of the venturimeter shall be provided with straight pipes in the length of more than 11 times the pipe diameter together with a flow rectifier and of more than 5 times the pipe diameter respectively.

g. Overflow By-pass Pipe

Overflow by-pass pipes shall be provided to No. 1, 2 and 3 pumps in relation with venturimeter which shall discharge at least half of the water delivery of the pump.

h. Flow Meter Check Device

For the purpose of checking and adjusting the venturimeter, a water tank type checking device shall be provided:

Tank	:	Steel construction
Capacity	:	24 m^3 (400 l/sec x 60 sec = 24 m^3)
Water outlet:		Rotary gooseneck pipe, activated by compressed air at 0.2 - 0.3 sec. intervals.
Level gauge	:	Manometer

2-3. Water Reserve Tank

Capacity of the water reserve tank is determined by the river model test which require flowing water of 1.5 t/sec as aforementioned and standing water of about 1,000 t in the model.

Therefore, the tank shall be designed to store effective water of 1,000 m^3 and gross space of 1,400 m^3 to include allowance for pumping operation.

Drwg. No. 3 shows the proposed reserve tank which has been designed after considering the following points:

1) Tank shall be made as shallow as possible to minimize water level fluctuation.

2) Outdoor tank is vulnerable to deterioration from water quality due to duckweed or the likes.

3) Under-floor tank is very convenient to take water for indoor model test in smaller scale.

4) Construction cost for under-floor tank is a little higher than the other.

5) Outdoor tank will likely to interfere with the outdoor model test.

Alarm system for the irregular water levels and overflow outlet shall be provided as required.

2-4. Wave Generator

1) Type : Pendulum type, double combined

2) Width : $10^{m} \times 2 = 20^{m}$

3) Wave profile: Regular wave

4) Wave height : $0 - 20^{cm}$

5) Cycle : $0.8 - 3.0^{sec}$

6) Motor : Speed reduction motor 15 KW, remote controlled

7) Amplitude : Manual adjustable

8) Travelling : By hand on folding wheels

9) Water depth : 50^{cm}

Drwg. Nos. 10 and 11 show proposed wave generator.

2-5. Pump Testing Equipment

The pump testing equipment is to test the characteristics of the pumps and shall be capable of testing up to 100 HP pump.

Typical methods of testing the pump are as follows:

1. By dynamometer
2. By calibrated motors

The former consists of direct current dynamometer, thyristor current transformer and control board.

The latter is to have several kinds of calibrated motors and connect one of them to the pump to be tested depending on its capacities.

Considering the cost of each method, the latter is recommendable.

III. BASIC DESIGN

3-1 BASIC DESIGN DRAWINGS

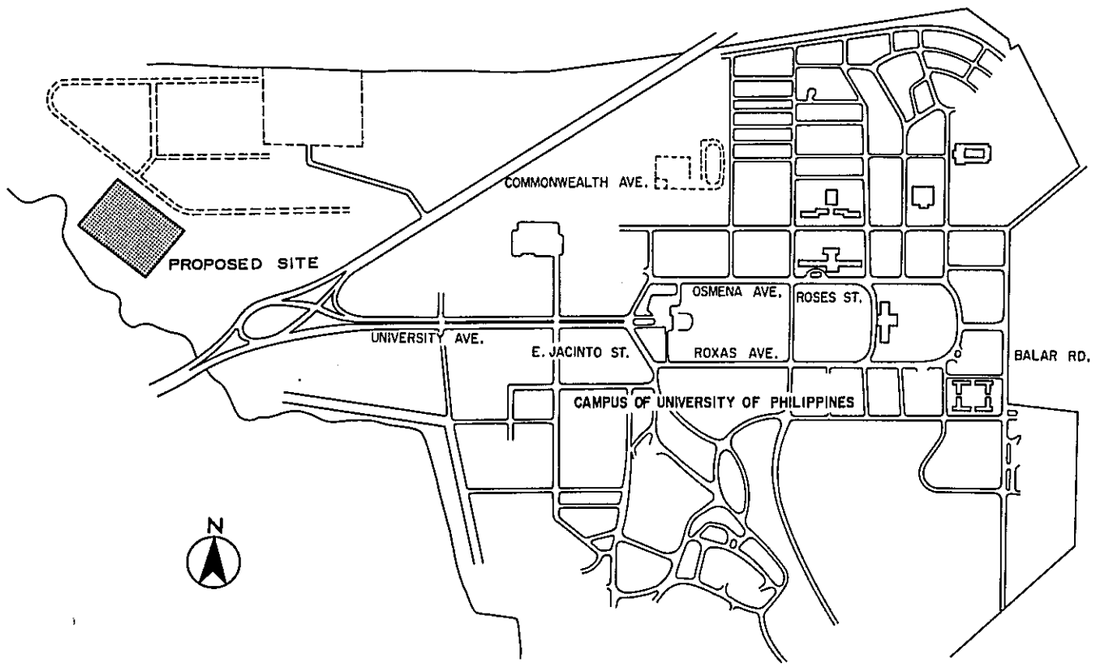
3-2 CONSTRUCTION SCHEDULE

3-3 CONSTRUCTION COST

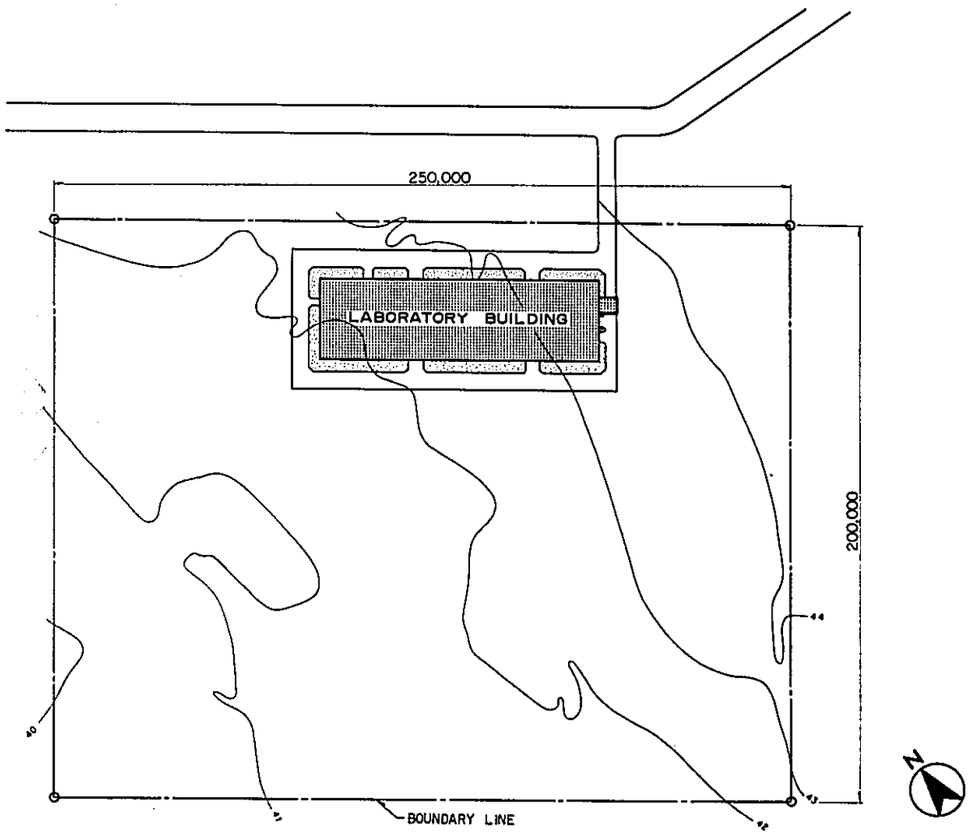
3-1. Basic Design Drawings

Basic design drawings prepared as a result of the studies as described in the preceding chapters consist of the following. The drawings include the piping in pump room and the principal laboratory facilities as well as the feature of the building.

DRWG. NO.	DRWG. TITLE
1	PLOT PLAN
2	BUILDING ELEVATION
3	FLOOR PLAN
4	BUILDING SECTION
5	BUILDING UTILITY (1)
6	BUILDING UTILITY (2)
7	PIPING IN PUMP ROOM (1)
8	PIPING IN PUMP ROOM (2)
9	ARRANGEMENT OF WORKSHOP EQUIPMENT
10	WAVE GENERATOR (1)
11	WAVE GENERATOR (2)
12	CALIBRATION TANK
13	OUTLINE OF BUILDING FEATURES

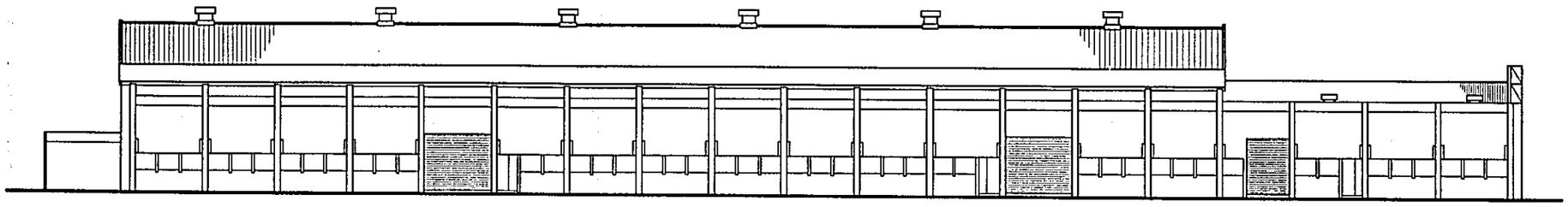


VICINITY MAP

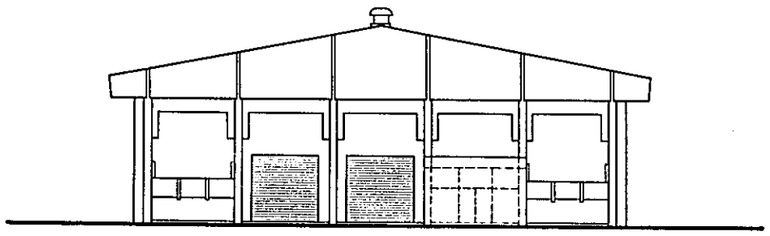


PLOT PLAN

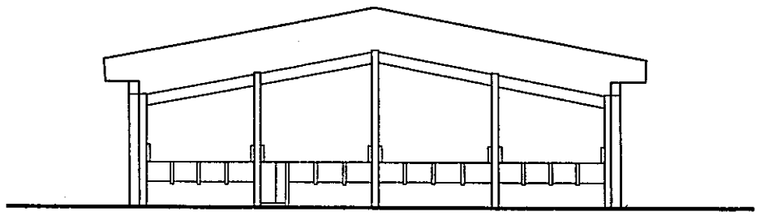
PLOT PLAN
1



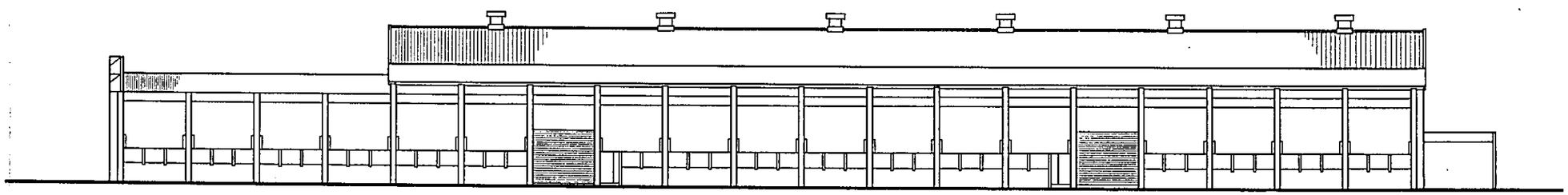
NORTH EAST ELEVATION



SOUTH EAST ELEVATION



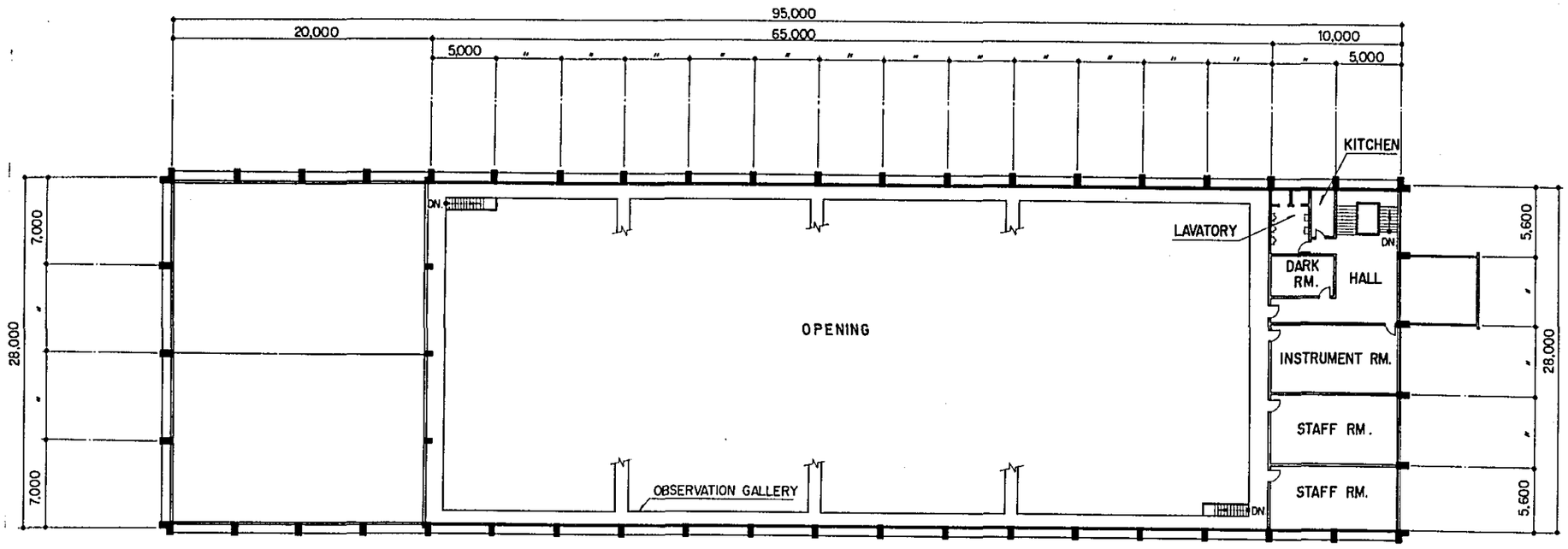
NORTH WEST ELEVATION



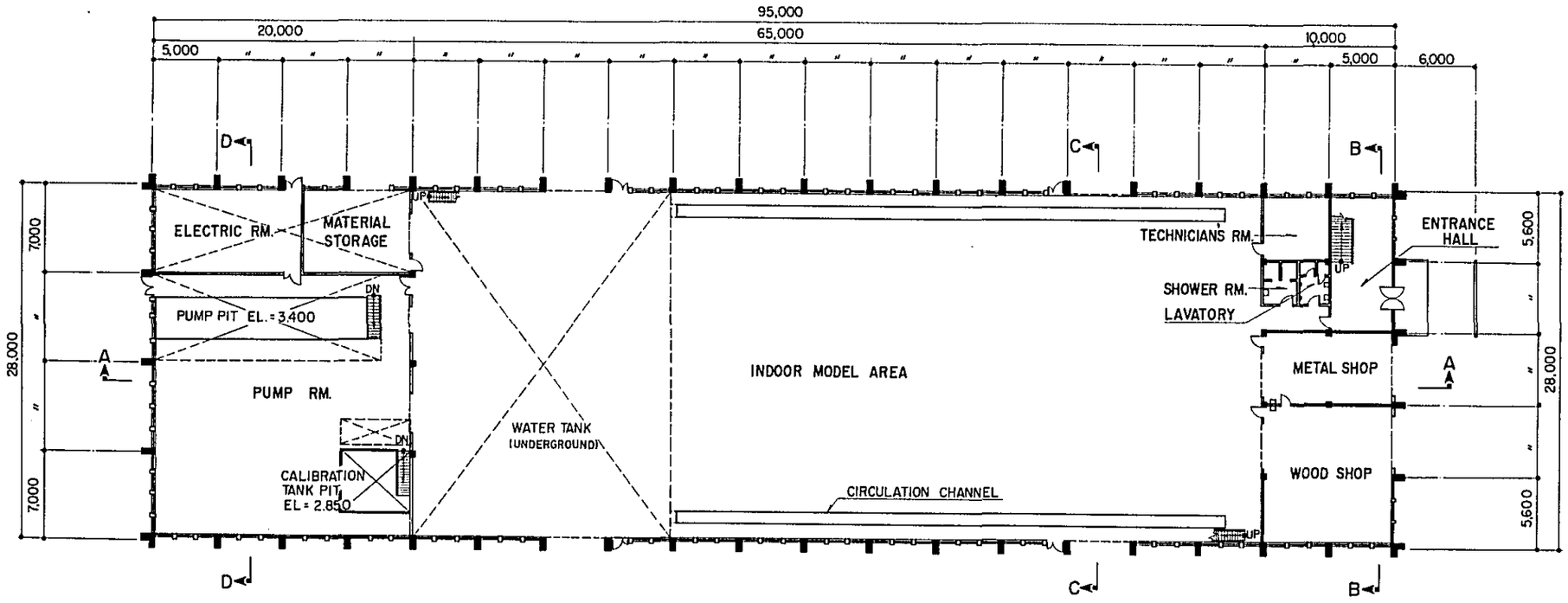
SOUTH WEST ELEVATION

SCALE
0 5 10 15 20m

BUILDING ELEVATION 2



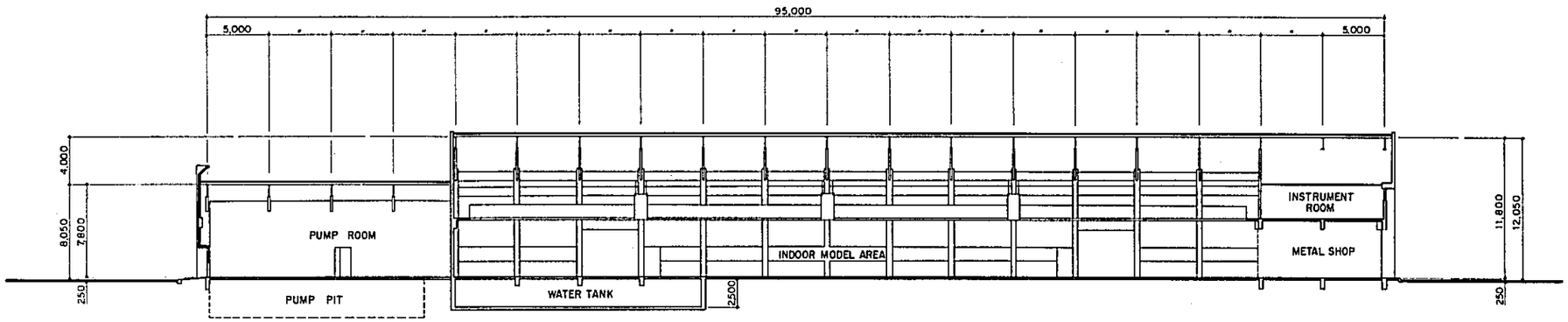
SECOND FLOOR PLAN



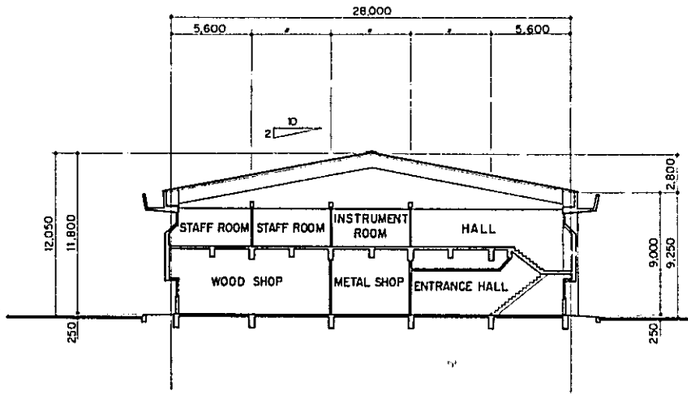
FIRST FLOOR PLAN

SCALE
0 5 10 15 20m

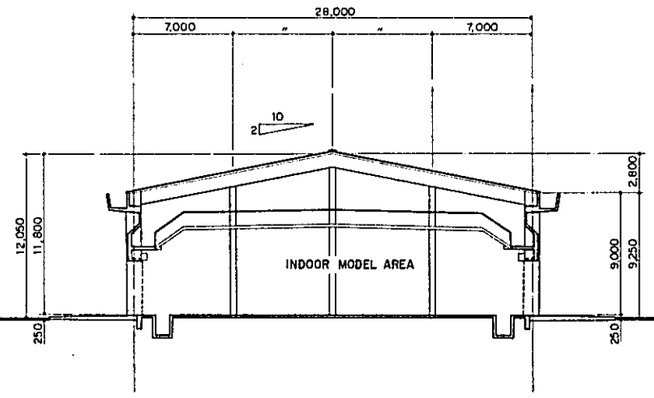
FLOOR PLAN
3



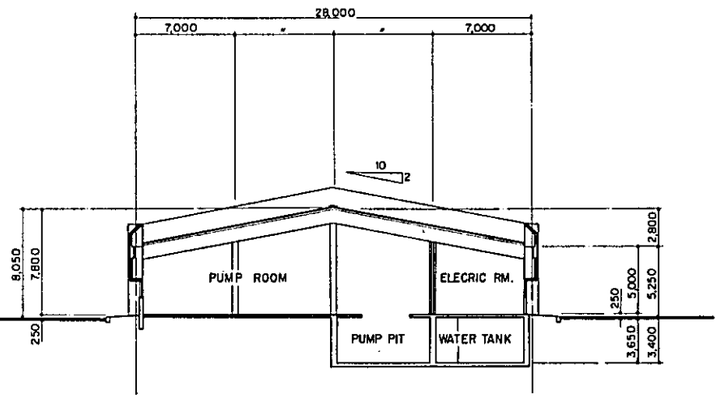
SECTION A — A



SECTION B — B



SECTION C — C



SECTION D — D

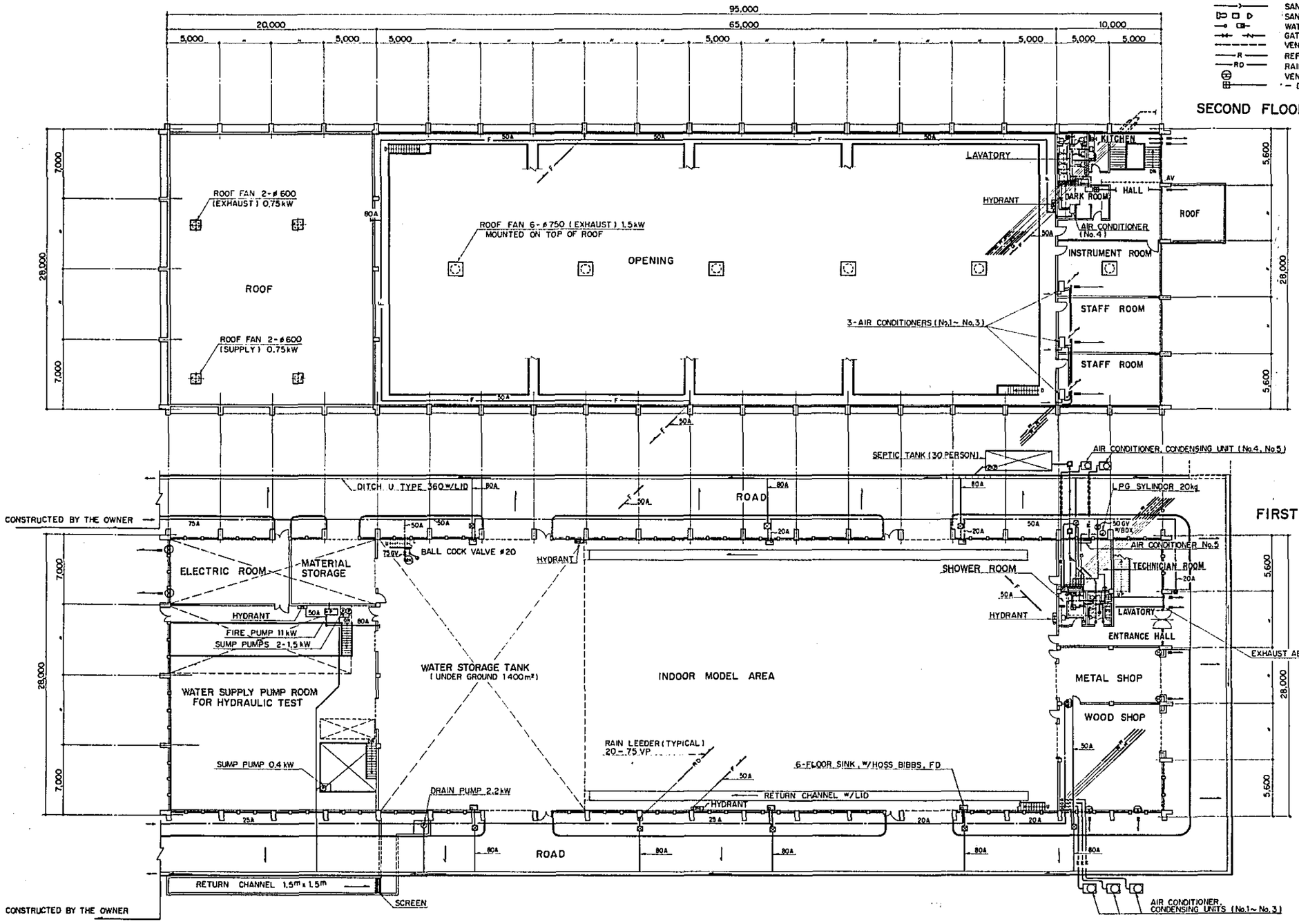
SCALE
0 5 10 15 20m

BUILDING SECTION
4

LEGEND

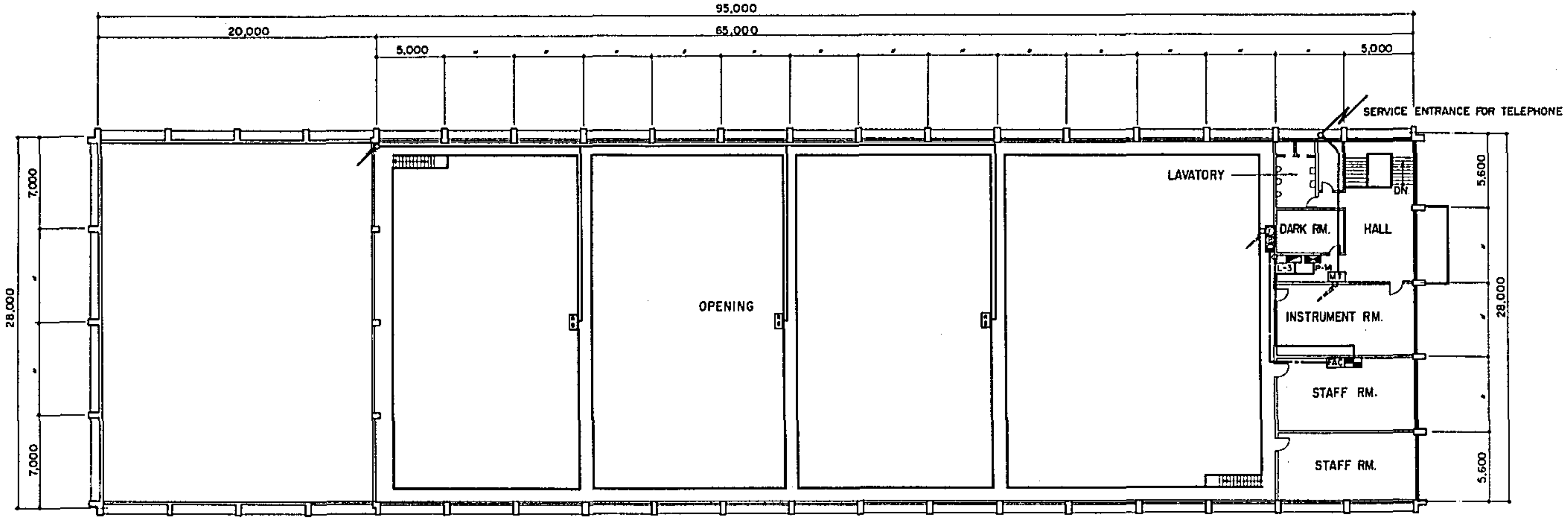
	WATER SUPPLY PIPE	GALVANIZED STEEL PIPE
F	FIRE HYDRANT WATER PIPE	— DO —
G	L.P.G. PIPE	— DO —
A	DRAIN PIPE	— DO —
VP	— DO —	P.V.C PIPE
	SANITARY DRAINAGE PIPE	CAST IRON PIPE
	SANITARY FIXTURES	
	WATER FAUCETS	
	GATE VALVE, CHECKVALVE	
	VENT PIPE	
R	REFRIGERANT PIPE	COPPER TUBE
RD	RAIN LEADER	P.V.C PIPE
	VENTILATING FAN	WALL MOUNTED
	— DO —	CEILING MOUNTED

SECOND FLOOR PLAN

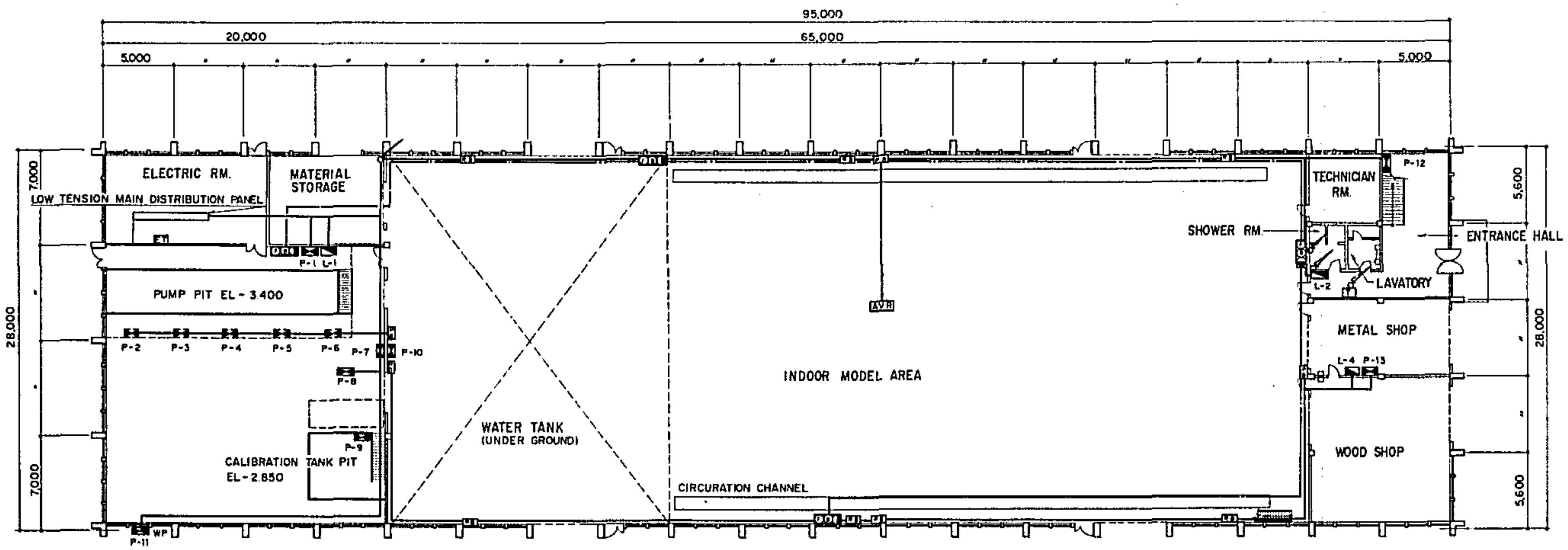


FIRST FLOOR PLAN

BUILDING UTILITY (1)



SECOND FLOOR PLAN

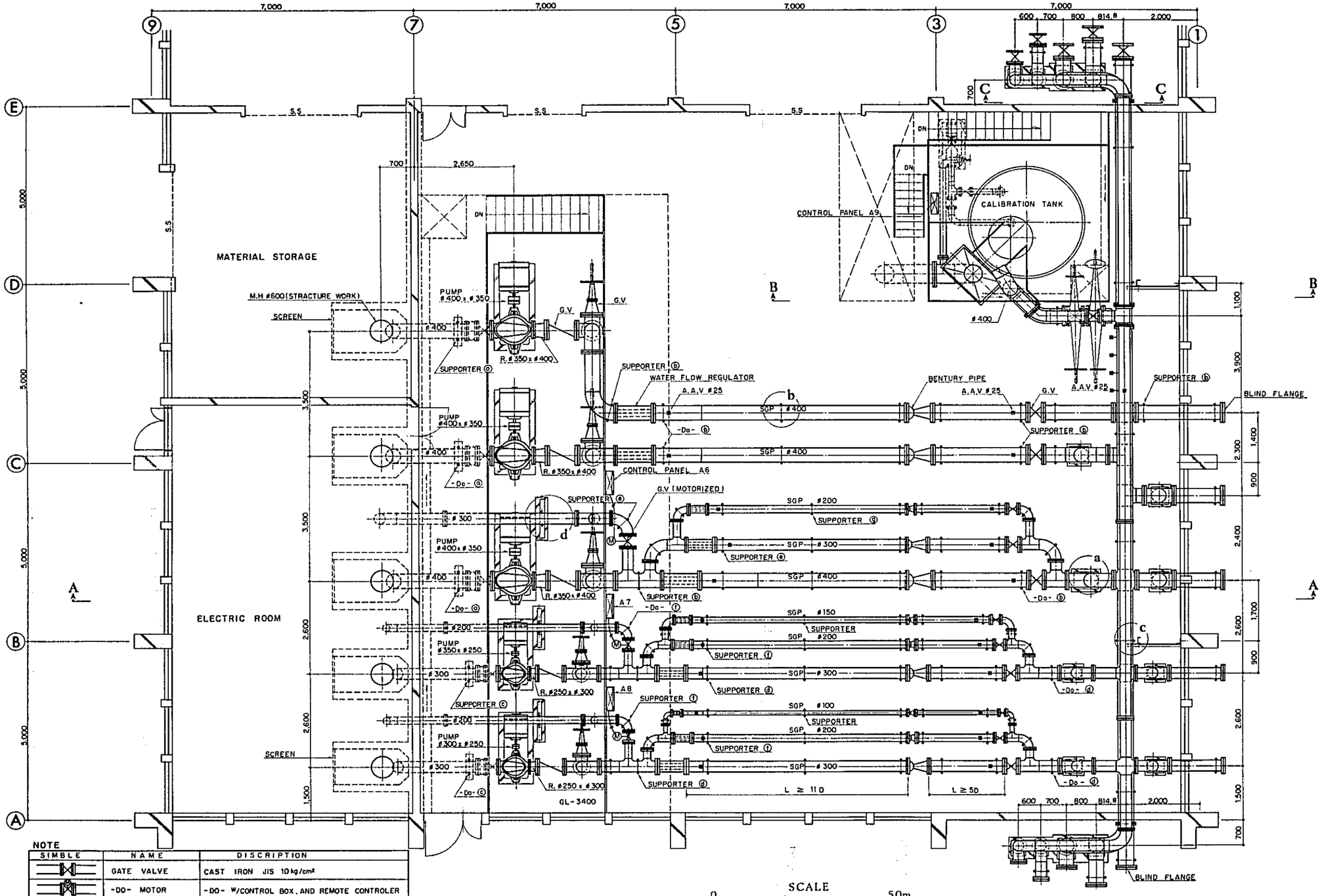


FIRST FLOOR PLAN

SYMBOL	NAME	LOAD DESCRIPTION	PHASE & VOLTAGE	Q'TY	UNIT (Kw)	LOAD (Kw)
(L-1)	LIGHTING PANEL	LIGHTING & RECEPTACLE	1ϕ 3W 220V/110V	1		12
〃 (L-2)	〃	〃	〃	1		8
〃 (L-3)	〃	〃	〃	1		38
〃 (L-4)	EQUIPMENT PANEL	MEASUREMENT EQUIPMENT & MOTOR	〃	1		35
(P-1)	POWER PANEL	FIRE PUMP, SUMP PUMP SHUTTER, ETC.	3ϕ 3W 220V	1 lot		15
〃 (P-2)	〃	MODEL TEST PUMP	〃	1		55
〃 (P-3)	〃	〃	〃	1		55
〃 (P-4)	〃	〃	〃	1		110
〃 (P-5)	〃	〃	〃	1		110
〃 (P-6)	〃	〃	〃	1		110
〃 (P-7)	〃	MOTOR VALVE SUMP PUMP, SHUTTER, ETC	〃	1 lot		18
〃 (P-8)	〃	DYNAMOMETER SETS	〃	1		22
〃 (P-9)	〃	CALIBRATION TANK	〃	1		55
〃 (P-10)	〃	WAVE MAKER MACHINE	〃	2	15	30
〃 (P-11)	〃	〃	〃	2	15	30
〃 (P-12)	〃	DRAIN PUMP AIRCOMPRESSOR & FAN	〃	1 lot		3
〃 (P-13)	〃	MACHINE & HEETER	〃	1 lot		80
〃 (P-14)	〃	AIRCOMPRESSOR & FAN	〃	1 lot		12
AVR		AUTOMATIC VOLTAGE REGULATOR	〃	1		2
R B		REFLECTOR BOARD FOR MODEL TEST	1ϕ 3W 220V/110V	10	10.5	105
P B		WELDER & COMPRESSOR MACHINE	3ϕ 3W 220V	4	12	48

SYMBOL	NAME
FAC	FIRE ALARM CONTROL PANEL
	MANUAL FIRE ALARM PUSH-BUTTON / FIRE ALARM BELL / FIRE ALARM INDICATOR BOARD
	WATER LEVEL RELAY ALARM CONTROL PANEL
MT	MAIN TELEPHONE BOARD (FOR 30 PAIR WITH 10 CIRCUIT LINE SPACE)
T	BRANCH TELEPHONE BOARD (FOR 20 PAIR)
	MAIN CABLE & WIRE LINE
	FIRE ALARM LINE
	MAIN TELEPHONE CONDUIT LINE
	UP, DOWN

BUILDING UTILITY (2)



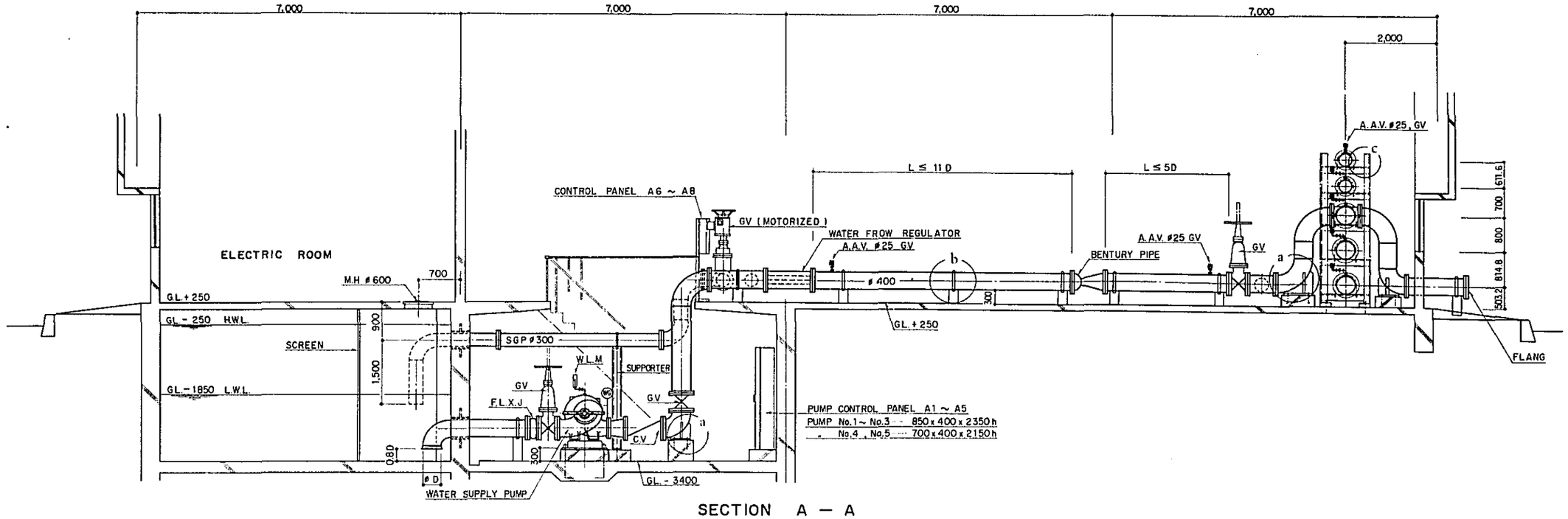
NOTE

SIMBLE	NAME	DISCRIPTION
	GATE VALVE	CAST IRON JIS 10 kg/cm²
	-DO- MOTOR	-DO- W/CONTROL BOX, AND REMOTE CONTROLER
	CHECK VALVE	CAST IRON JIS 10kg/cm² SWING TYPE
	FLEXIBLE JOINT	RAINFORCED RUBBER TYPE, JIS 10kg/cm²
	WATER FLOW REGULATOR	SUS 304 L≥2.5 DIAMETER
	BENTURY PIPE	CAST IRON

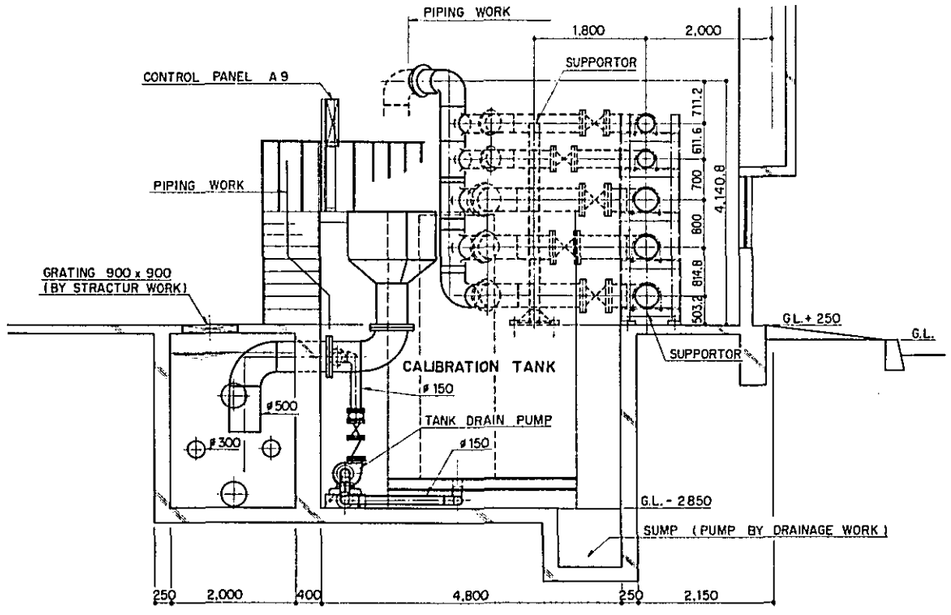
0 SCALE 5.0m

PIPING IN PUMP ROOM (1)

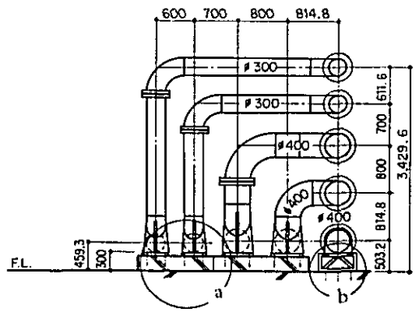
7



SECTION A — A



SECTION B — B

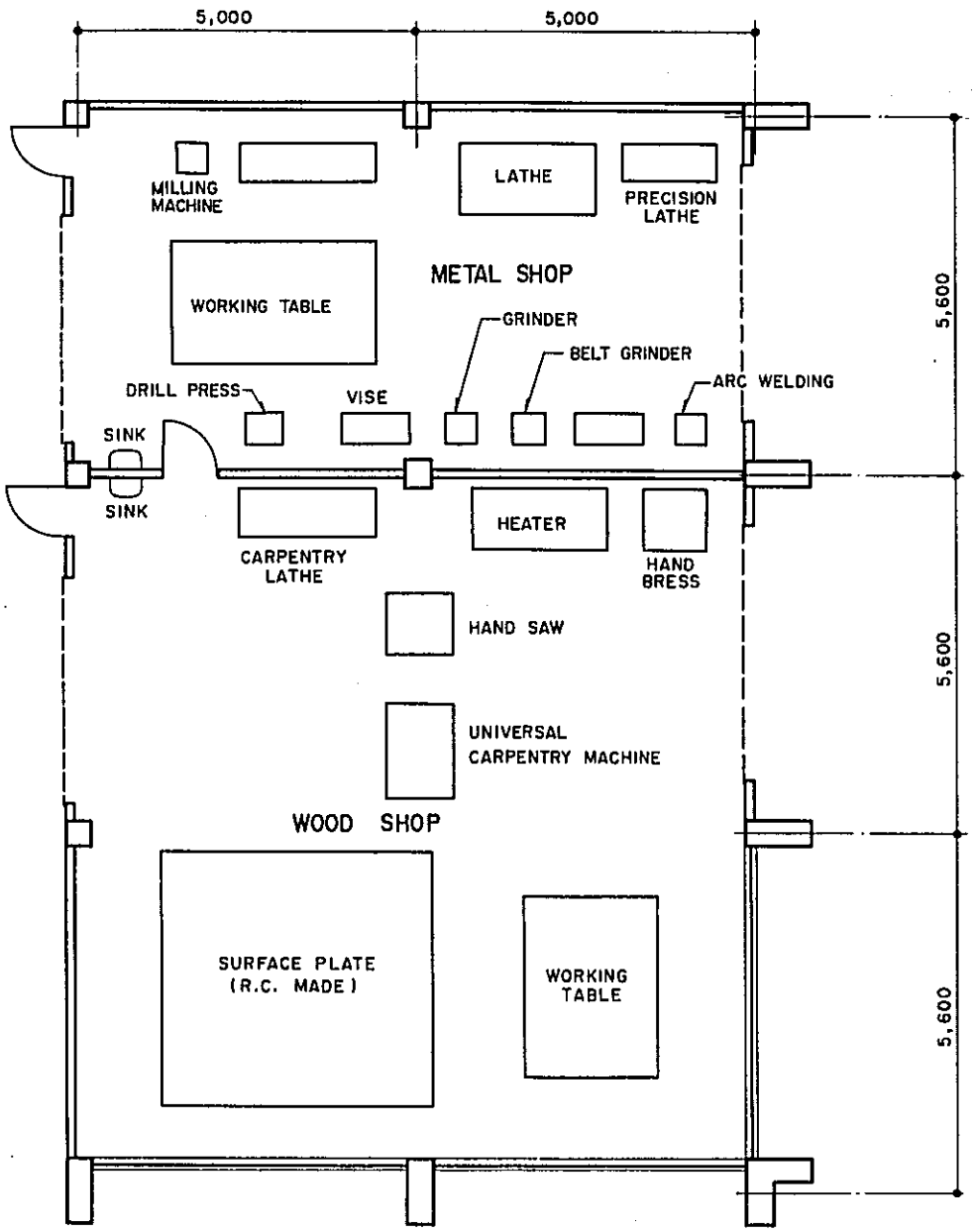


SECTION C — C

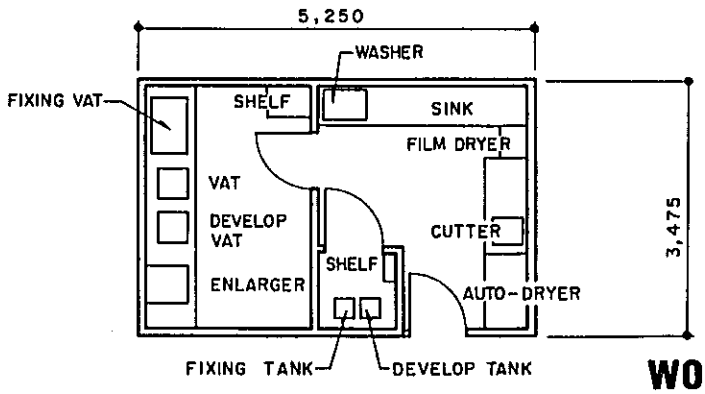
SCALE
0 5.0m

PIPING IN PUMP ROOM (2)

8

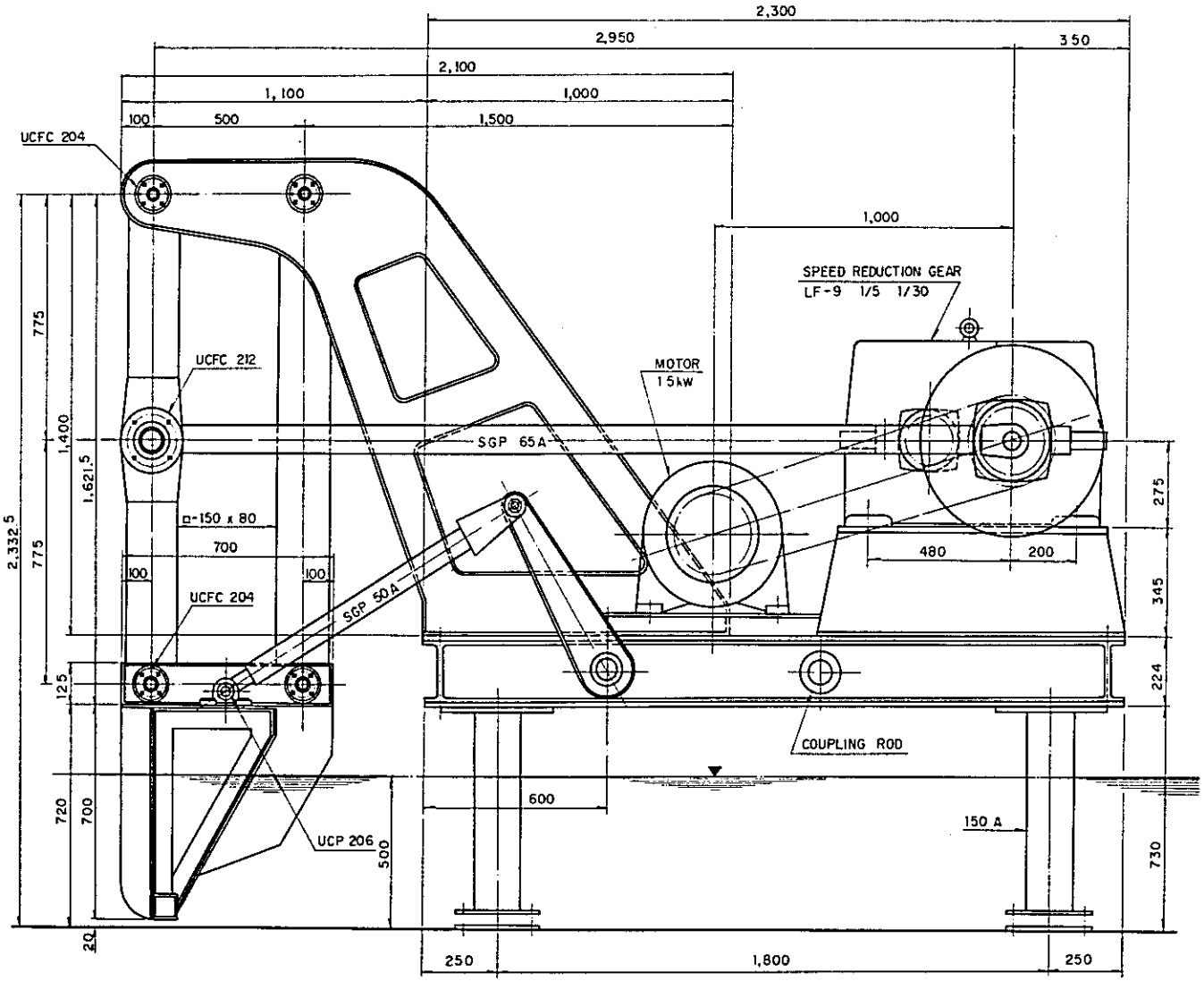


METAL & WOOD SHOP



DARK ROOM

ARRANGEMENT OF WORKSHOP EQUIPMENT

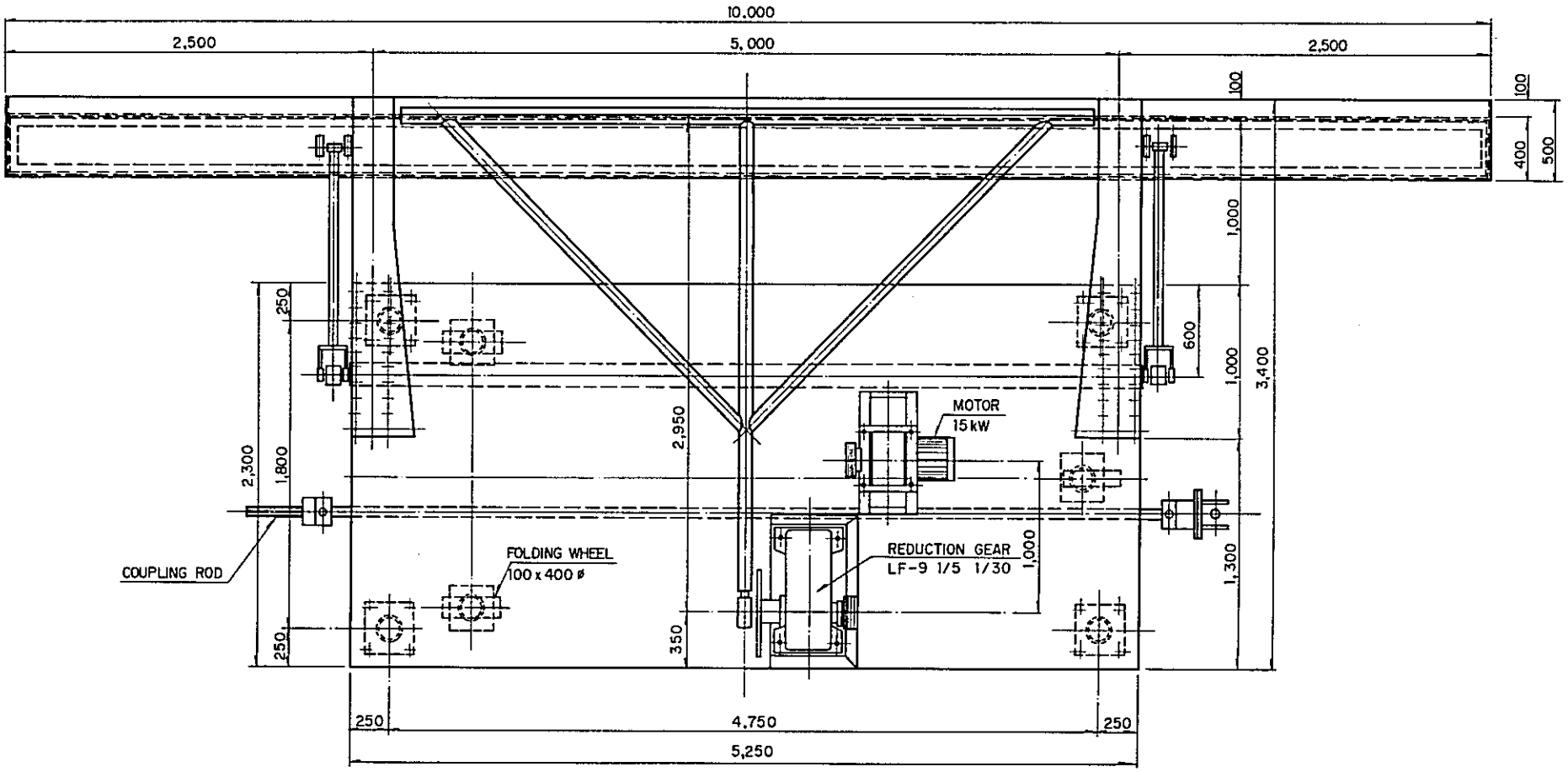


SPECIFICATIONS

TYPE	PENDULUM TYPE, MOVABLE, DOUBLE - COMBINED
BLADE WIDTH	10m x 2
WAVE PROFILE	REGULAR WAVE
WAVE HEIGHT	0 ~ 20cm
DRIVING	SPEED VARIABLE MOTOR 1.5kW
OPERATION	REMOTE CONTROLLED
TRVALLING	MANUAL ON FOLDING WHEES
AMPLITUDE	MANUALLY ADJUSTABLE

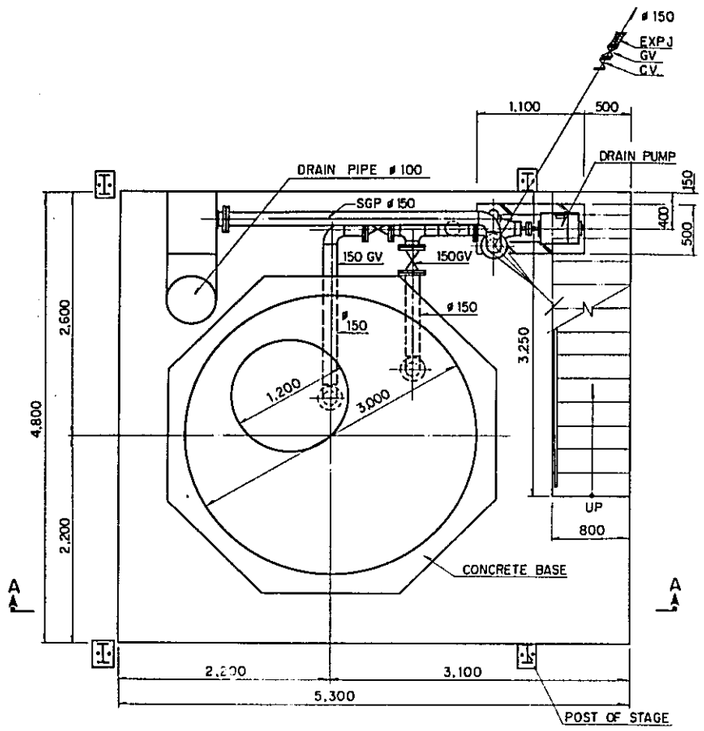
WAVE GNENERATOR (1)

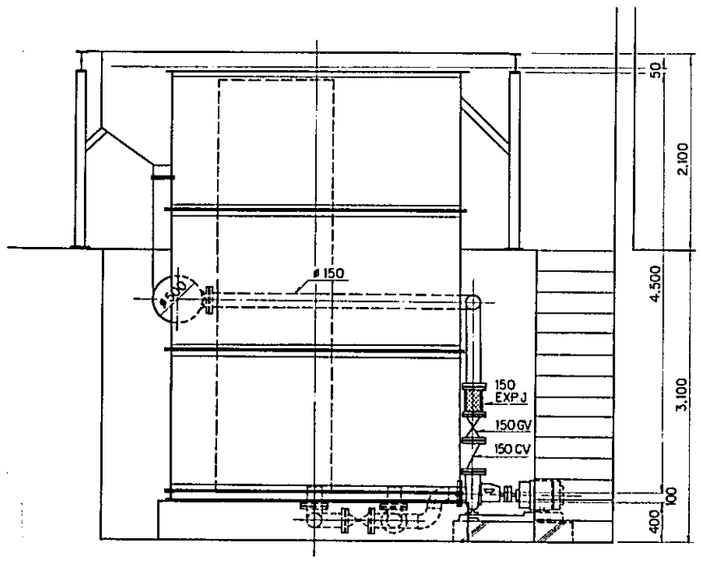
10



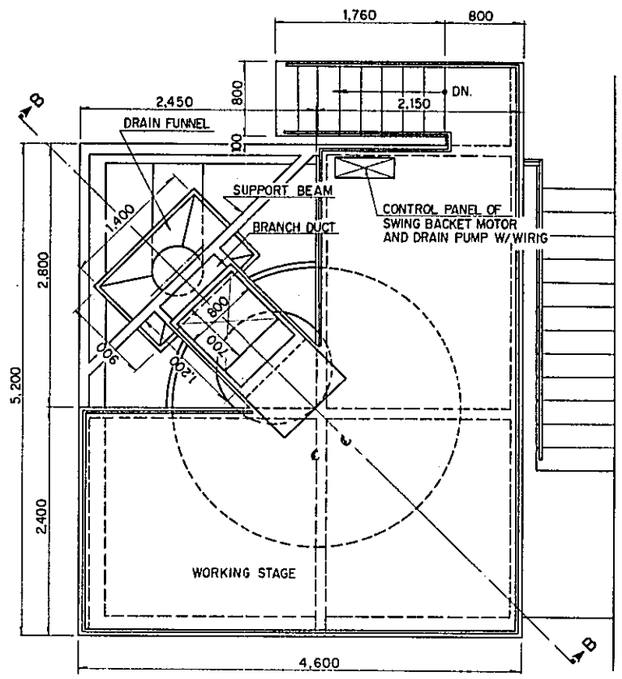
WAVE GENERATOR (2)

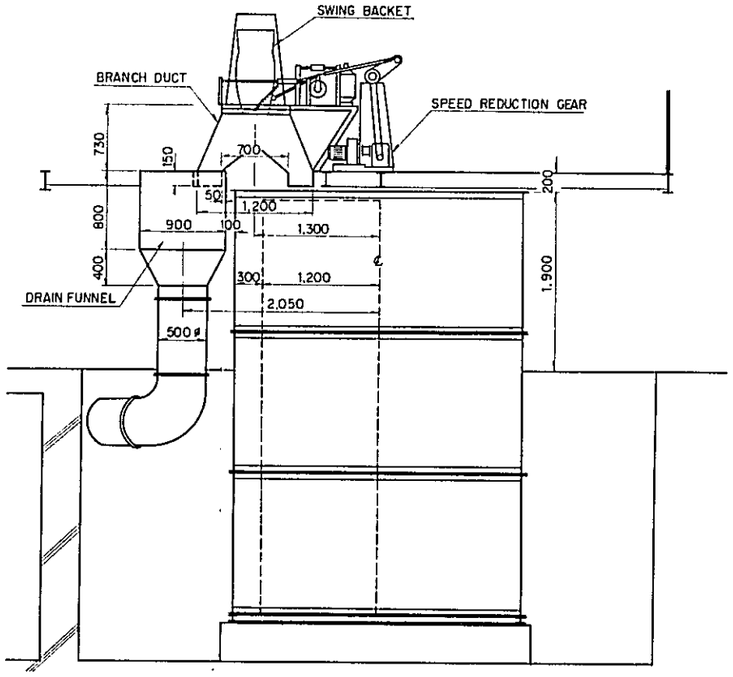
11





SECTION A - A





SECTION B - B

CALIBRATION TANK

12

DESCRIPTION OF FLOOR AREA

FIRST FLOOR	INDOOR MODEL AREA	1,820.0m^2
	PUMP ROOM	420.0
	METAL SHOP	56.0
	WOOD SHOP	112.0
	MATERIAL STORAGE	58.1
	ELECTRIC ROOM	81.9
	TECHNICIAN'S ROOM	28.0
	COMMON AREA	84.0
	TOTAL	2,660.0m^2
SECOND FLOOR	STAFF ROOM	112.0m^2
	INSTRUMENT ROOM	56.0
	DARK ROOM	17.5
	COMMON AREA	94.5
	TOTAL	280.0m^2
TOTAL FLOOR AREA		2,940.0m^2

OUTLINE OF STRUCTURES AND FINISHES

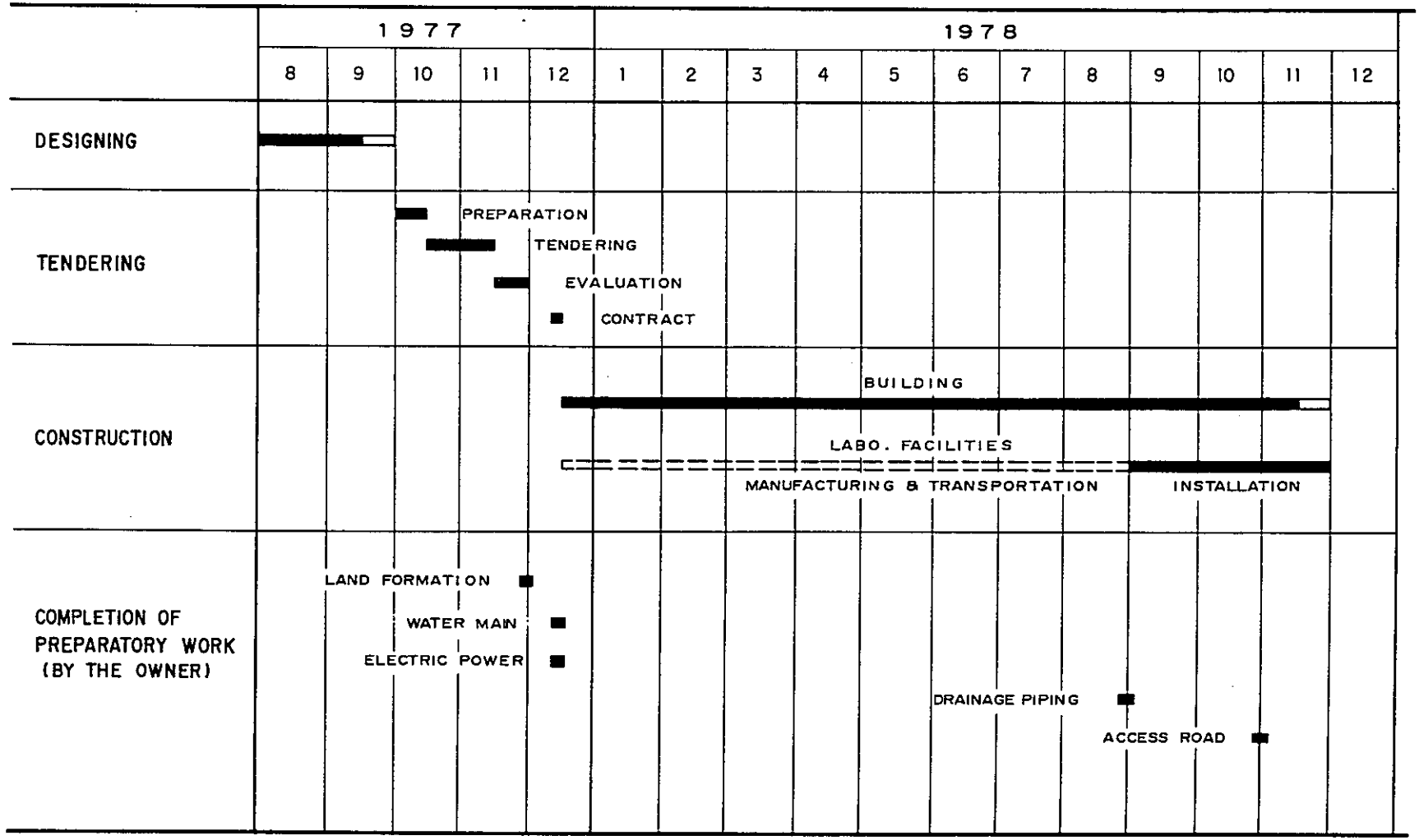
STRUCTURE	FOUNDATION AND BELOW GROUND FLOOR STRUCTURE :	REINFORCED CONCRETE FOUNDATION. REINFORCED CONCRETE GROUND BEAMS, GROUND FLOOR SLAB AND PITS SLAB
	UPPER STRUCTURE :	REINFORCED CONCRETE STRUCTURE.
	ROOF STRUCTURE :	STEEL STRUCTURE
	STAIRCASE :	REINFORCED CONCRETE FRAMING
	EXTERIOR WALL :	REINFORCED CONCRETE WALL
	INTERIOR WALL :	REINFORCED CONCRETE AND CONCRETE BLOCK WALL
FINISHES	FLOOR FINISH :	TERRAZZO TILE IN COMMON AREA AND STAFF ROOM. CEMENT MOLTAR IN INDOOR MODEL AREA, ETC.
	WALL FINISH :	VINYL PAINT ON CEMENT MORTAL TYPICALLY. CERAMIC TILE PARTIALLY IN LAVATORY.
	CEILING :	SUSPENDED ROCKWOOL ACOUSTIC TILE IN GENERAL.
	EXTERIOR WALL :	VINYL PAINT ON CEMENT MORTAL IN COLUMN AND EAVES. ARTIFICIAL STONE WASHOUT AND WALL TILE IN GENERAL.
	ROOF :	CORRUGATED GALVANIZED IRON SHEET WITH INSULATION.
	EXTERIOR DOOR AND WINDOW :	STEEL DOOR AND GLAZED WINDOW.

3-2. Construction Schedule

Schedule from the commencement of the execution design to the completion of construction is as shown in the Construction Schedule attached herewith.

The preparatory works which are to be executed by NHRC are also included in the Schedule to show the expected completion time of the works.

CONSTRUCTION SCHEDULE



3.3. Construction Cost

a. Conditions for the estimation of the construction cost.

1) Rates for both labor and material used for the estimation shall be based on the prices as of June, 1977.

2) Exchange rate shall be determined at thirty eight (38) Yen per Peso.

3) It is considered that the building construction will mainly be executed by local labors and local materials, while the laboratory facilities such as pumps, pipings, measuring instruments and equipments will be supplied from Japan.

4) Materials and equipments imported from Japan shall be free of import duties in the Philippines.

5) Cost for inland transportation for the imported materials and equipments shall be excluded.

b. Estimated Quantities of Major Construction Items.

1) Building works

Excavation	3,700 m^3
Concrete	1,850 m^3
Form	8,500 m^2
Reinforcement	170 t
Structural steel	120 t
Corrugated G. I. sheet	2,900 m^2
Artificial stone washout	1,200 m^2
Cement mortar plastering	7,000 m^2
Steel doors and windows	600 m^2

2) Water Supply System for Model Test

Water supply pump	400 ℓ/sec.	3 units
- do -	200 ℓ/sec.	2 units
Gate valve		58 ea.
Check valve		5 ea.
Motorized gate valve		3 ea.
Air vent valve		27 ea.
Calibration tank	24 m^3	1 set
Steel pipe	500φ	5.5 m
- do -	400φ	132 m
- do -	300φ	132 m
- do -	200φ	33 m
- do -	150φ	11.5 m
- do -	100φ	11.5 m
- do -	25φ	11.5 m
Spiral steel pipe	6 m, 400φ	34 ea.
- do -	6 m, 300φ	34 ea.
- do -	6 m, 200φ	34 ea.

c. Estimated Cost

1)	Hydraulic Laboratory Building	¥302,500,000
2)	Water Supply System for Model Test	138,000,000
3)	Instrumentation	21,300,000
4)	Work Shop Equipment	22,600,000
5)	Wave Generator	27,400,000
6)	Pump Testing Equipment	18,200,000
	Subtotal	530,000,000
7)	Design and Supervision Fee	70,000,000
	Total	¥600,000,000

C O N T E N T S

APPENDIX - 1. PRELIMINARY STUDY

1-1. PURPOSE OF PRELIMINARY STUDY

THE NHRC was established in 1973 for the promotion of the water resources development projects in the Republic of the Philippines. Since then, NHRC has been performing experimental tests, designings on various hydraulic structures and collecting data with the cooperation of the U.P. College of Engineering and the National Water Resources Council established in the Department of Public Works, Transportation and Communication. However, since the present facilities are not considered sufficient for the prosecution of the above mentioned research activities, the government of the Republic of the Philippines has prepared an extension plan and requested the Japanese government's cooperation for the implementation of the project on a Grant Aid base.

The purpose of this study team was in clarifying the intension of the Philippine government and exchanging of views, and for determining the actual requirements for the extension plan of NHRC.

1-2. SURVEY TEAM AND SCHEDULE

The Preliminary Survey Team which was led by Dr. A. Tsuchiya made the survey for fifteen days from April 10, 1977 to April 24, 1977. Members of the survey team were as follows;

Name	Post	Title
AKIHITO TSUCHIYA	Leader	Director, River Division, Akabane Branch of Pubric Works Research Institute (P.W.R.I.), Ministry of Construction.
HIROSHI HASHIMOTO	Coast and Harbour	Head, Coastal Engineering Section, River Division, Akabane Branch of Pubric Works Research Institute (P.W.R.I.), Ministry of Construction.
SEI FUJIMOTO	River and Canal	Chief, Shinosaki Hydraulic Laboratory, P.W.R.I., Ministry of Construction.
HIROSHI SUZUKI	Building Planning	Deputy Director, Building Division, Government Building Department, Ministry of Construction.
MASANORI SHINAGAWA	Electric and Mechanical	Senior Engineer, River Planning Division, River Bureau, Ministry of Construction.
MITSUO UMEZAWA	Hydraulic Equipment	Staff, Planning Division, P.W.R.I., Ministry of Construction.

SUMIO SHINOHARA	Building Designing	Department Manager, Architectural Department, Nippon Koei Co., Ltd.
MASAO WATANABE	Administration	Staff, Development Survey Division, Social Development Cooperation Department, Japan International Cooperation Agency (J.I.C.A.).

1-3. MINUTES

The basic agreement between the Preliminary Study Team and the NHRC of Philippines is a result of several meetings and studies by the two parties and signed by Dr. A. A. Alejandrino, Director of the NHRC and Dr. T. Tsuchiya, leader of Japanese Preliminary Study Team.

PRELIMINARY STUDY FOR THE EXTENSION PLAN OF THE NATIONAL HYDRAULIC RESEARCH CENTER IN THE REPUBLIC OF THE PHILIPPINES

1. Introduction

In response to the request made by the Government of the Republic of the Philippines, the Japan International Cooperation Agency (JICA), an official agency responsible for the implementation of technical cooperation programme of the Government of Japan, is conducting the study for the extension of the National Hydraulic Research Center in close cooperation with the Philippine Authorities concerned.

The preliminary study team stayed in the Republic of the Philippines from April 10 to April 24, 1977.

2. Objectives of the Study

In preparation of the implementation of the Grant Aid, the requirement for extension of the Research Center's facilities should be investigated from the viewpoints of research works and model experiments expected in future.

The team collected the informations related to the above items and drafted possible scope of cooperation.

3. Summary

3.1 The following items have been discussed by the Japanese study team and the Philippine Authorities concerned.

a) Newly Proposed Project Site - Figure 1
b) Building Annex - approximately 2,700 m^2
c) Water Circulation Facilities
d) Computer Facilities
e) Workshop Facilities
f) Instrumentations
g) Coastal Model Facilities (Wave Generators)

Details of above items are explained in attached appendix. Figures of numbers and sizes in appendix are apt to change on the future study.

3.2 The basic design study team organized by Japanese Government shall be assigned as soon as possible, for preparing next stage of implementation of the Grant Aid.

3.3 The preliminary survey works and tests required at the project site will be the following:

a) A 1:500 survey map covering around ten (10) hectares, including about 50 m perimeter zone of the proposed site. Furthermore, the map shall show contour lines every 50 cm, the reference point installed, the existing foot pass, local heaps and other important matter. Map should be prepared within one (1) month.

b) Soil bearing capacity values, to be obtained by boring tests (measurement of the N value) at two points in the site, with a depth of about ten (10) m. The loading test should strictly comply with the appropriate standards. Results are expected after one (1) month.

3.4 The following tasks are expected to be done by the Philippine Authorities concerned.

a) site clearing and making formations before the work commences which is expected on the early part of September 1977.

b) construction of an access road to the site.

c) installation of an electric power supply line with an estimated load of 900 KVA from the main source up to the building.

d) construction of a waste water drainage system.

e) installation of water supply facilities from the main source to the reservoir with an expected supply capacity of 300 liters/min.

21 April 1977

DR. AKIHIKO TSUCHIYA
Leader
Japanese Preliminary Study Team

A. Tsuchiya
(Signature)

DR. ANGEL A. ALEJANDRINO
Director
National Hydraulic Research Center

(Signature)

APPENDIX - 2. SURVEY FOR BASIC DESIGN

2-1. PURPOSE OF SURVEY

Explanation to NHRC and obtaining an agreement on the fundamental matters set forth in the DRAFT OF THE BASIC DESIGN prepared in advance by the Basic Design Survey Team.

2-2. SURVEY TEAM AND SCHEDULE

The Basic Design Survey Team which was led by Dr. A. Tsuchiya made the survey for two weeks from June 23, 1977 to July 6, 1977.

Members of the survey team were as follows;

Name	Post	Title
AKIHITO TSUCHIYA	Leader	Director, River Division, Akabane Branch of Public Works Research Institute, Ministry of Construction.
SUMIO SHINOHARA	Building, General	Department Manager, Architectural Department, Nippon Koei Co., Ltd.
SHINYA OHSUMI	Building	Senior Engineer, Architectural Department, Nippon Koei Co., Ltd.
KENICHI KAWAGUCHI	Mechanical Equipment	Senior Engineer, Architectural Department, Nippon Koei Co., Ltd.
TAKURO TERASHIMA	Laboratory Facilities	Senior Engineer, Engineering Laboratory, Nippon Koei Co., Ltd.
SHIGEKI NISHIMURA	Water Circulation System	Staff, Engineering Laboratory, Nippon Koei Co., Ltd.

2-3. MINUTES

The basic agreement between the Basic Design Survey Team and the NHRC of the Philippines is a result of several meetings and studies by the two parties and signed by Dr. A. A. Alejandrino, Director of the NHRC and Dr. A. Tsuchiya, leader of Japanese survey team.

Remark:

The Basic Design Drawings (Fig. 1 - Fig. 10) attached to the Minutes have been revised to the Drawings as listed in the preceding Clause 3-1 due to the enlargement of areas of the model test room, which has resulted from deleting the electric computer as stated in Clause 8 in the Minutes.

BASIC DESIGN FOR THE EXTENSION OF THE NATIONAL HYDRAULIC RESEARCH CENTER IN THE REPUBLIC OF THE PHILIPPINES

1. General

Following the preliminary study and the agreement worked out by the National Hydraulic Research Center (hereafter referred to as the NHRC) and the Preliminary Study Team from the Japanese government in April, 1977, the Basic Design Team (hereafter referred to as the Mission) presented the NHRC with conceptual drawings and reference data and discussed various aspects of the Project during their stay from June 23 to July 6, 1977.

The NHRC and the Mission have come to a general agreement on the basic design of the Research Center involving minor modifications as described hereafter.

2. Summary

The major items discussed and agreed upon are the following:

1) Hydraulic Research Facilities

   a) Laboratory Building
   b) Water Supply System for Hydraulic Test
   c) Workshop Facilities
   d) Instrumentations
   e) Coastal Model Facilities
   f) Computer System

2) Construction Cost
3) Construction Schedule
4) Works to be Carried out by NHRC
5) Detailed Designing
6) Other particulars

3. Laboratory Building

Fig. 2 and Fig. 3 attached hereto show the basic features of the building.

The following points shall be modified and further studied in the detailed design.

a) Water return channel on the floor shall be rearranged and, if cost allocation allows, be made into a closed circulation.

b) Roof structure of Pump Room shall be modified to facilitate a future extension above it depending on considerations on aesthetic view, technical matters and cost.

c) Suitable ventilation and insulation to roof shall be considered for Model Test Room in view of the tropical climate.

d) Additional administrative office space shall be provided integral with the Laboratory Building and Computer Room shall be cancelled depending on the provisions as stated in 8-Computer System hereafter.

4. **Water Supply System for Hydraulic Test**

The water supply system for hydraulic test shall be a central direct-on-line pump feed system which has water delivery outlets to 1) Indoor Model Test Room, 2) Outdoor Model test space and 3) Extended indoor model test room.

The system shall consist of the following pumps, piping, calibration and testing facilities;

Max. water delivery	:	1.5 t/sec total
Pumps	:	Mixed Flow pump, head = 10^{m} each 400 l/sec x 3 units 200 l/sec x 2 units
Water flow meter	:	Venturipipe with manometer
Water Flow control	:	Valve, venturipipe and by-pass pipe
Valve operation	:	Motor-driven valve on by-pass pipe, others manual
Venturimeter calibration	:	Steel made calibration tank with manometer, 24 m^3
Static pressure test pump	:	Manual type, test range up to 17 kg/cm^2
Pump testing equipment	:	Test range up to 20 HP

Arrangement of the pumps, pipes, valves, venturipipe, calibration tank, by-pass pipes etc. are shown in Fig. 4, Fig. 8 and Fig. 9 attached hereto.

In addition to the above, the following pipes shall be supplied for construction of pipe lines between the water outlets and the test models;

400 mm ϕ x 5 ^{m}	:	40 pcs
300 mm ϕ x 5 ^{m}	:	40 pcs
200 mm ϕ x 5^{m}	:	40 pcs

Valves and pipe fittings required for the pipe line shall later be figured out in the detailed design.

5. **Workshop Facilities**

Tools and equipment to be supplied and installed in Wood Shop and Metal Shop are listed in the attached Table - 7 with quantities and major specifications therefor.

6. ***Instrumentations***

Measuring and recording instruments including some spares, shall be supplied as listed in Table - 2 with quantities and major specifications therefor.

7. **Coastal Model Facilities**

2 units of wave generator shall be supplied for this purpose as specified below and as profiled in Fig. 6 and Fig. 7:

Type	:	*Pendulum type, combinable*
Width	:	10^{m}
Wave Profile	:	Regular wave
Wave Height	:	$0 \sim 20$ cm
Cycle	:	$0.8 \sim 3$ sec
Motor	:	Speed reduction motor, remote controlled
Amplitude	:	Field adjustable
Travelling	:	By manpower on folding wheels
Water depth	:	50 cm

8. **Computer System**

Although an electronic computer system was proposed in the Preliminary Study, it shall be deleted from the scope of work because of the following considerations:

a) Electronic computer manufacturers of Japan has yet to accomplish business showing of the type of proposed computer (mini-computer) and has yet to organize maintenance staff in this country.

b) The sole Japanese manufacturer (FACOM Computers Philippines, Inc.), who has been concentrating in sales of large computer system, quotes for the supply of spare parts and maintenance as follows:

Spare Parts	:	Approx. 15.000.000 (for 2 years)
Maintenance	:	Approx. $2 \sim$ 3,000,000 (per year)

c) The above costs seem considerably high compared with those of computer equipment which is estimated to be about 35,000,000 ¥ .

Considering the above conditions, the computer system could not justify the required costs and the NHRC and the Mission have come up with a conclusion to use the cost for the computer for the following purposes, in order of priority:

1) Pump testing equipment
2) Construction of administrative office space
3) Additional testing space

The Mission shall investigate the cost for the pump testing equipment immediately and study the use of remaining fund either for the administrative office space or the additional testing space.

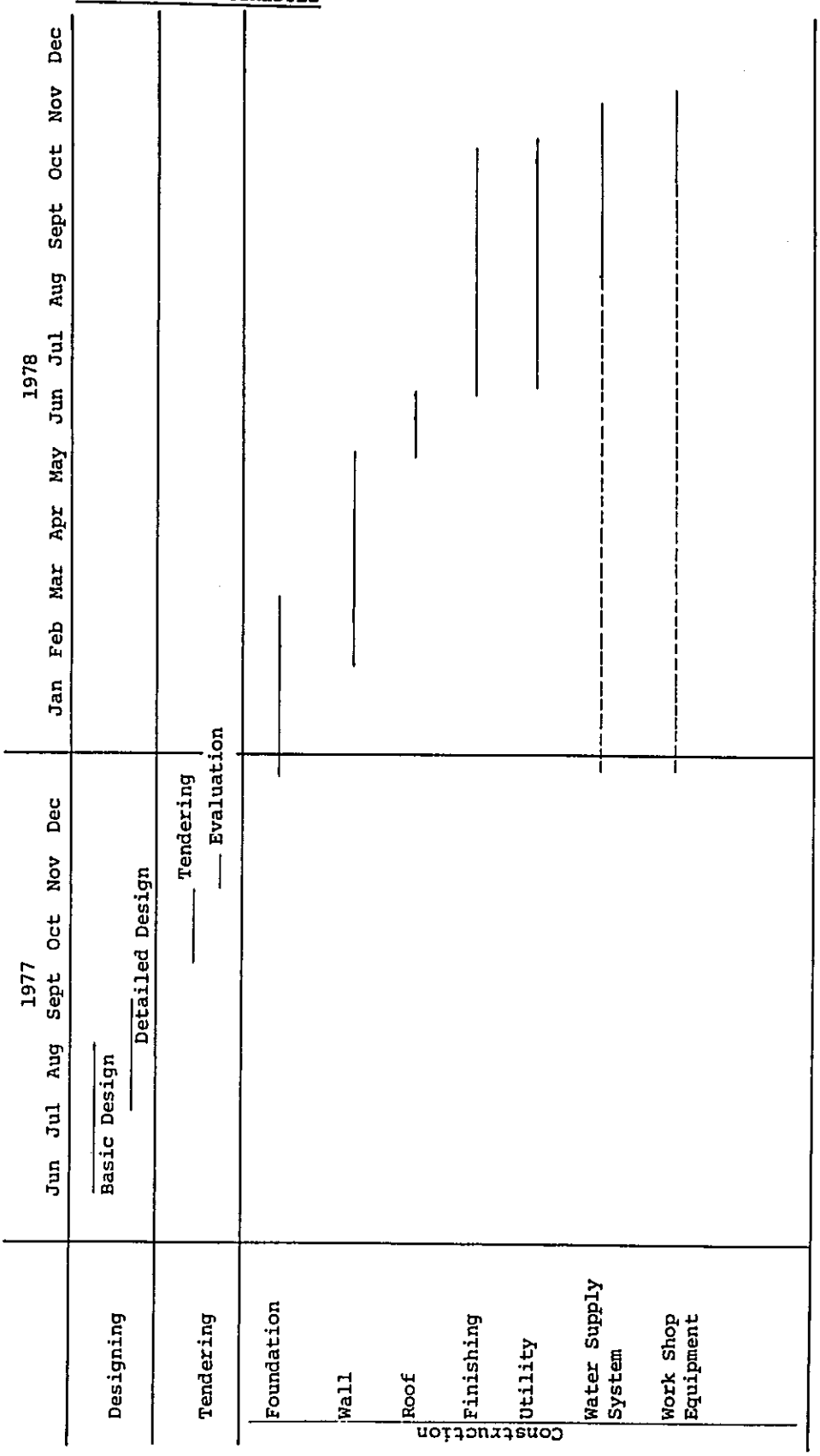
It is noted that present Computer Room shall be used as a staff room or the like.

9. **Construction Cost (estimate)**

a) Laboratory Building	272.500	(x 1.000)
b) Water Supply System for Test	138.000	
c) Instrumentation	21.300	
d) Workshop Facilities	22,600	
e) Coastal Model Facilities	27.400	
f) Provisional Sum	48.200	
	530.000	
g) Design and Supervision Fee	70,000	
Total	600,000	(x 1,000)

Where, f) Provisional Sum is the fund recovered by the cancellation of the electronic computer system and shall duly be utilized for the purposes as described in 8 - Computer System hereto.

10 CONSTRUCTION SCHEDULE



Minutes-5

11. **Works to be Carried Out by NHRC**

The following works are required to be carried out by the NHRC complying with the construction schedule;

			To be completed
a)	Land formation work	:	By end of November, 1977
b)	Deep well construction	:	By middle of December, 1977
c)	Electric Power Supply	:	By middle of December, 1977
d)	Access road to the site	:	By end of October, 1978
e)	Drainage pipe line	:	By end of August, 1978

The completion time of b) Deep well construction and c) Electric power supply have been set as above for the sake of smooth construction of the works and of saving the cost. Both shall be incorporated in the Research Center as permanent facilities including a re-installation of transformers and switch gear into the Laboratory Building after completion thereof.

July 6, 1977

DR. AKIHIKO TSUCHIYA
Leader
Japanese Basic Design Team

(Signature)

DR. ANGEL A. ALEJANDRINO
Director
National Hydraulic Research Center

(Signature)

APPENDIX

Table 1 - **Work Shop Equipment**

	Q'ty	Remarks
Universal carpentry machine	1	Planer, circular saw
Band Saw	1	Max sawing height 38 cm
Jig saw	1	Wood 60mm, Mild steel 6mm
Portable circular saw	1	Blade dia. 185 ϕ
	1	Blade dia. 335 ϕ
Wood lathe	1	Max. center distance 650mm
Portable planer	1	Cutting width 136 mm
Drill press	1	Drill dia. 23 ϕ
Portable drill	1	Heavy duty
	1	Light duty
Belt grinder	1	W = 100 mm
Disc. grinder	1	Disc dia. 180 ϕ
Disc. sander	1	Disc. dia 100 ϕ
Bench grinder	1	Disc. dia. 255 ϕ
Metal lathe	1	Max. center distance 650 mm
Table precision metal lathe	1	Max. center distance 220 mm
Table milling machine	1	max. longitudinal travel 260 mm
Shaper	1	Max. stroke 610 mm
Oxyacetylene welder	1	
Arc welder	1	250 A
Chain block	1	2ton
	1	1 ton
Cement mixer	1	0.1 m3
Pipe cutter	1	Bar 75 ϕ, pipe 105 ϕ, shape steel 135 x 135
4 wheel carrier	6	300 kg
Spray gun	1	For paint, nozzle 1.6 mm ϕ w/cup
Air compressor	1	400 l/min. 7 kg/cm^2

Vacuum cleaner	1	Heavy duty, 6.5 m^3/min 2,000 mm Aq
Hand tool set	1	
Bench vise	1	Large
	1	Small
Anvil	1	Large
	1	Small
Fork lift	1	2 ton w/bucket attachement
Drying oven	1	Ultra-red, 1,000 x 1,000 x 1,000mm

Table 2 - **Measuring Instruments**

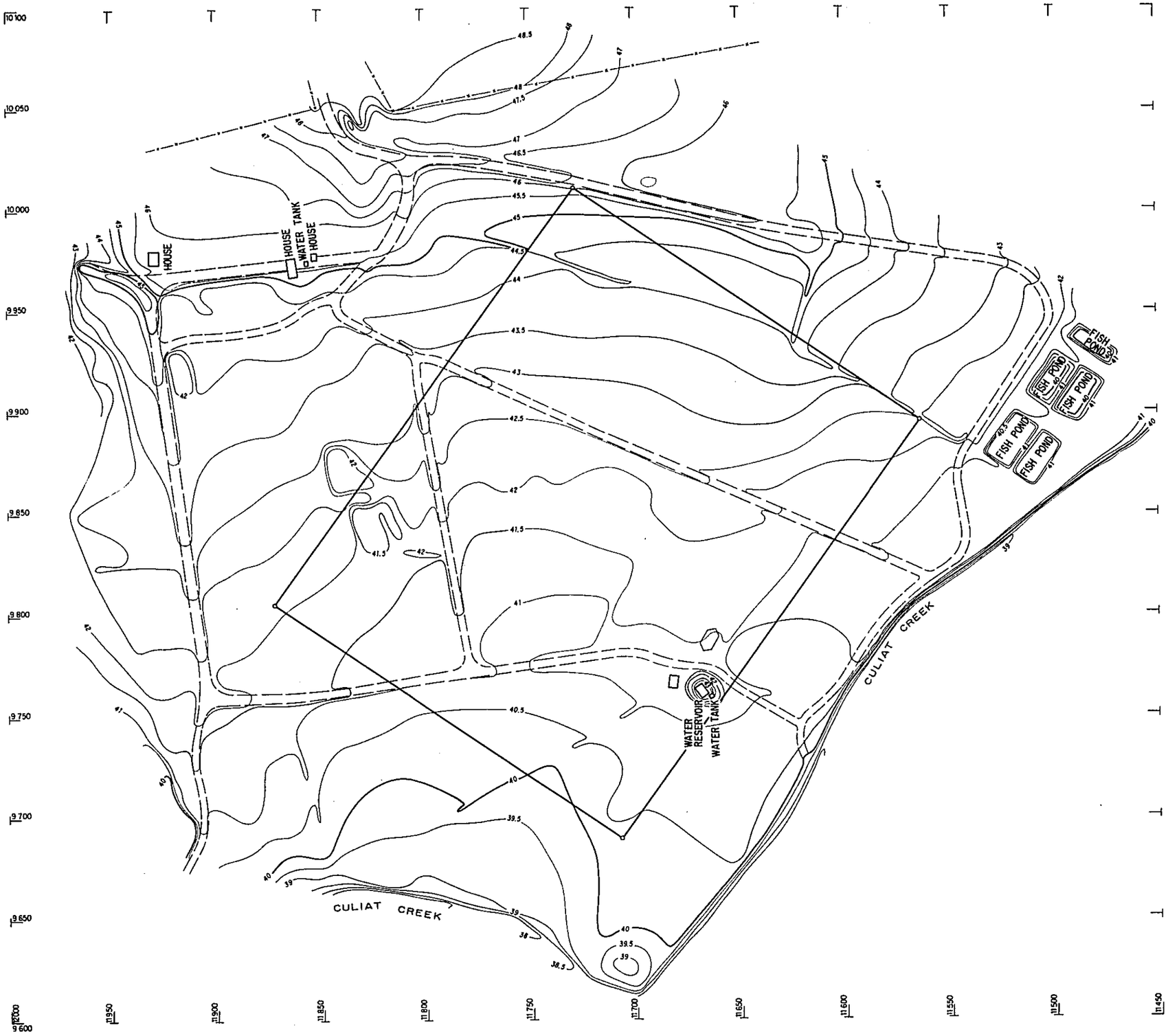
	Q'ty	Remarks
Manometer	1	Multi-pipe type, w/20 tubes, 1,000 mm scale
	5	For Venturimeter 300-0-300mm
5 ϕ Current meter	1	Analogue indicator
	2	Propeller with 5mm diameter
20 ϕ Current meter	3	Digital indicator (portable type)
	6	Propeller with 20 mm diameter
Profiler	3	Maximum measurement depth 400mm with digital printer
Point gauge	5	500mm
Hook gauge	5	600 mm
Pressure transducer	6	Max 1 kg/cm^2, general purpose pressure
	6	Max 1kg/cm^2, differential pressure
Dynamic strain amplifier	1	6 channel, w/power unit
Pen recorder	1	6 channel
Oscillograph	1	9 channel
Oscilloscope	1	Dual-beam, w/built in amplifier
Multi-tester	2	5 measurements
Digital multi-meter	1	- do -
Automatic voltage regulator	1	2 kw
Wave gauge	1	6 channel amplifier
	6	Wave gauge (range 0 400 mm)
Tranceiver	4	500 mw
Camera	1	Motorized, 35mm, reflex camera, with 50mm, 28mm lens.

APPENDIX - 3. SITE DATA

The following site data were worked out by NHRC and delivered to the Japanese Preliminary Study Team for this project. The Basic Design is made based on the undermentioned data.

1) Site Survey Map DRWG. NO. 14

2) Site Geological Survey Table-3, Table-4



SITE SURVEY MAP
14

Table 3

GEOTECHNICS PHILIPPINES, INCORPORATED

11st BEN-LOR BLDG. QUEZON BLED. EXT., Q.C.

B O R I G L O G

PROJECT -- PROPOSED NHRC BLDG. JOB NO. 442 BORE HOLE NO. 1

LOCATION Diliman, Quezon City DATE STARTED 5-30-77 DATE COMPLETED 5-30-77

GROUND WATER ELEV. 4'-10" GROUND SURFACE ELEV.

DRILLING METHOD Coring & SPT SAMPLERS USED No core barrel

WT. OF HAMMER 140 lbs. HAMMER FALL 30"

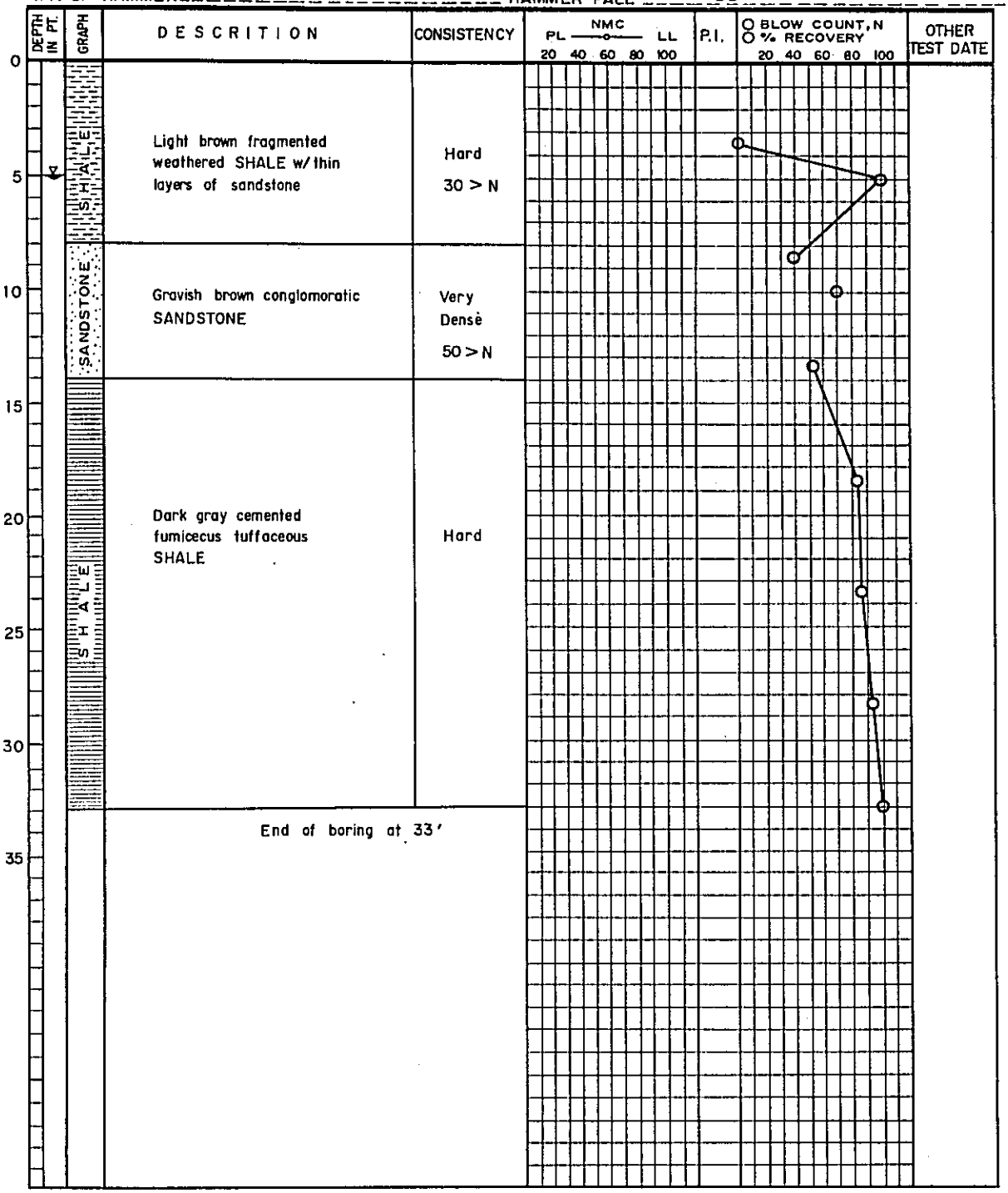


Table 4

GEOTECHNICS PHILIPPINES, INCORPORATED

11st BEN-LOR BLDG. QUEZON BLED. EXT., Q.C.

B O R I G L O G

PROJECT -- PROPOSED NHRC BLDG. JCB NO. 442 BORE HOLE NO. 2

LOCATION Diliman, Quezon City DATE STARTED 5-27-77 DATE COMPLETED 5-28-77

GROUND WATER ELEV. 5' GROUND SURFACE ELEV.

DRILLING METHOD Coring & SPT SAMPLERS USED No core barrel

WT. OF HAMMER 140 lbs. HAMMER FALL 30"