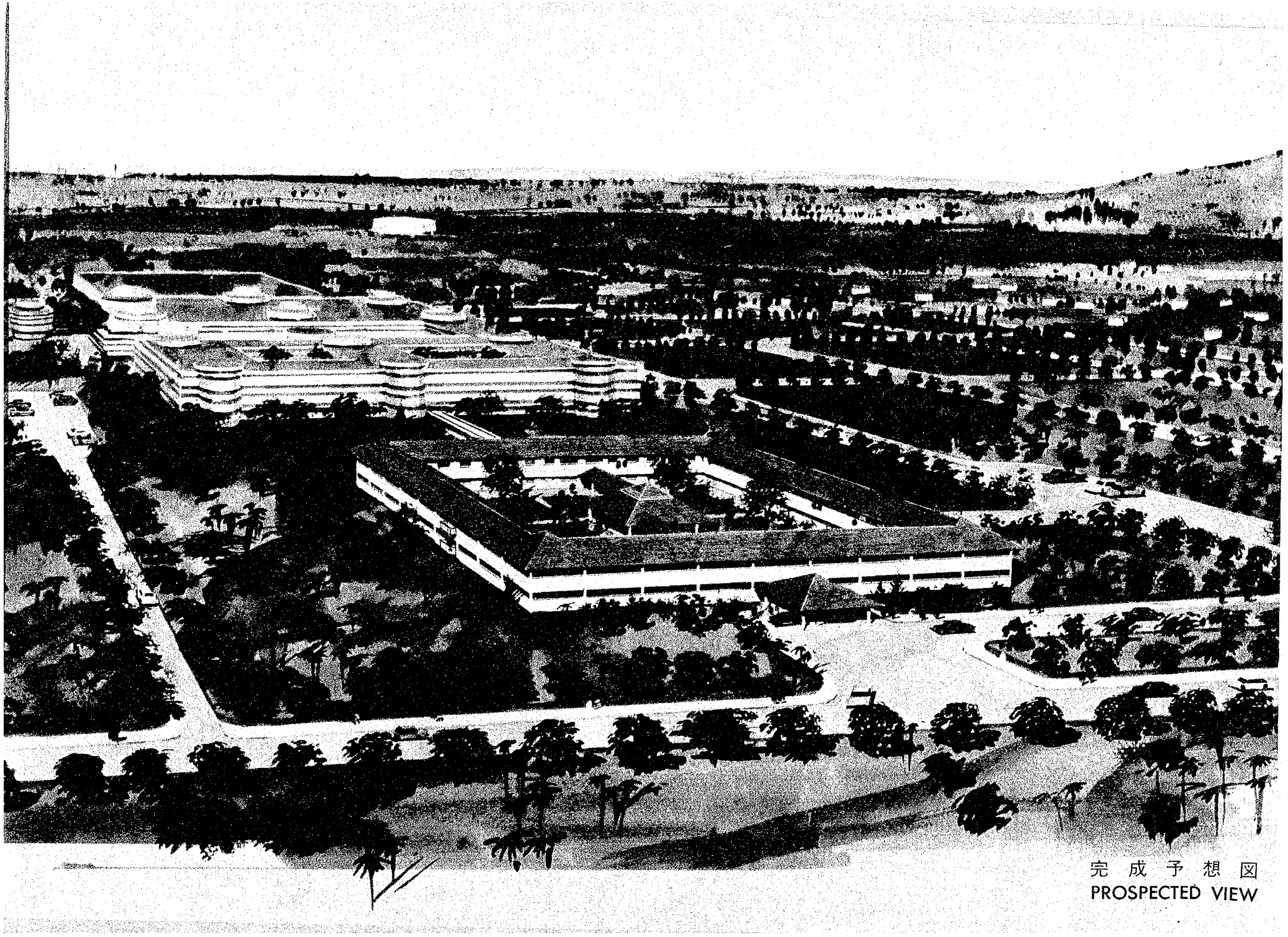
Postgraduate Medical Research Institute
University of GHANA
Medical School

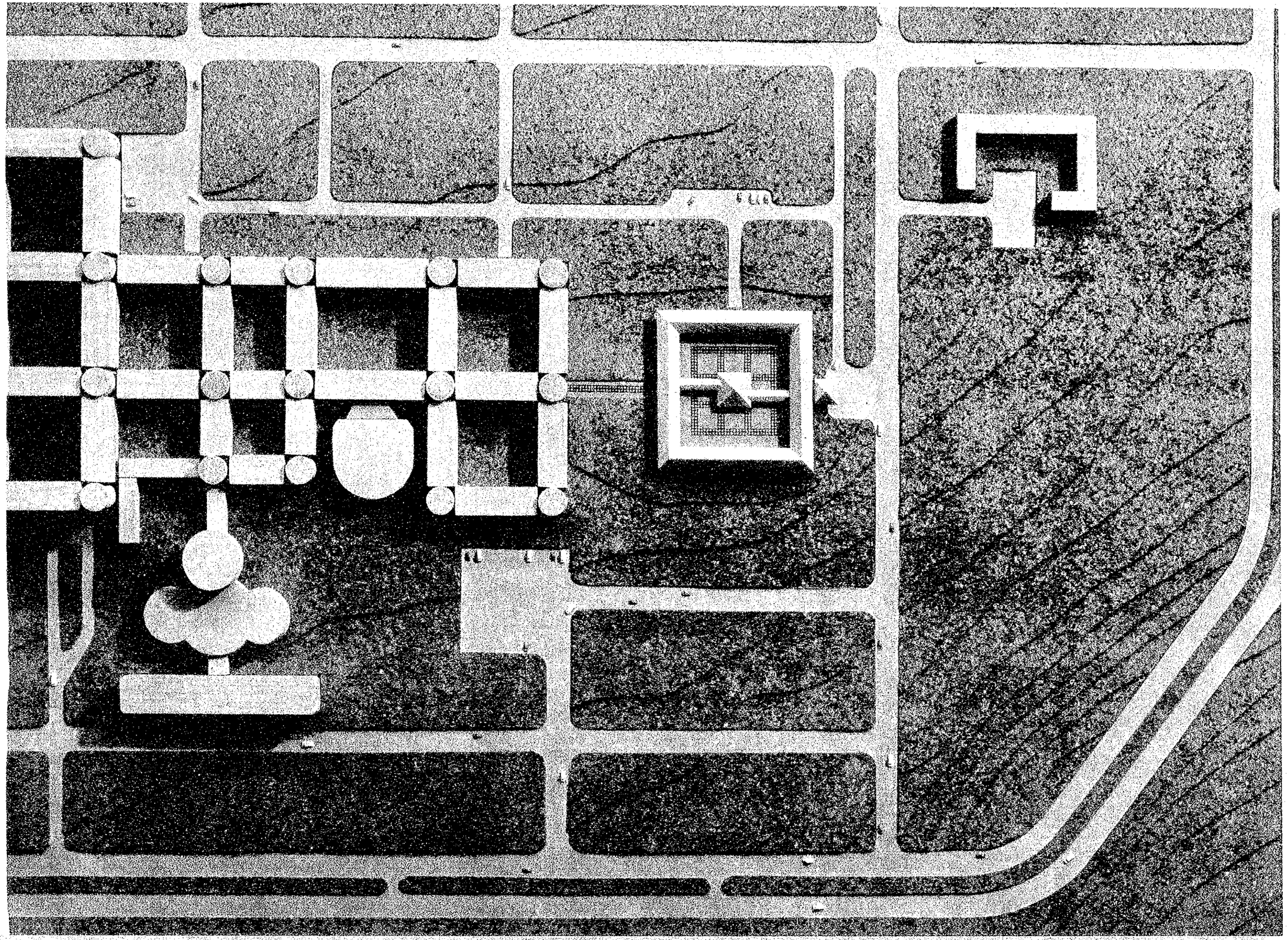
Nov. 1976

JAPAN INTERNATIONAL COOPERATION AGENCY

Postgraduate Medical Research Institute
University of GHANA
Medical School



完成予想図
PROSPECTED VIEW



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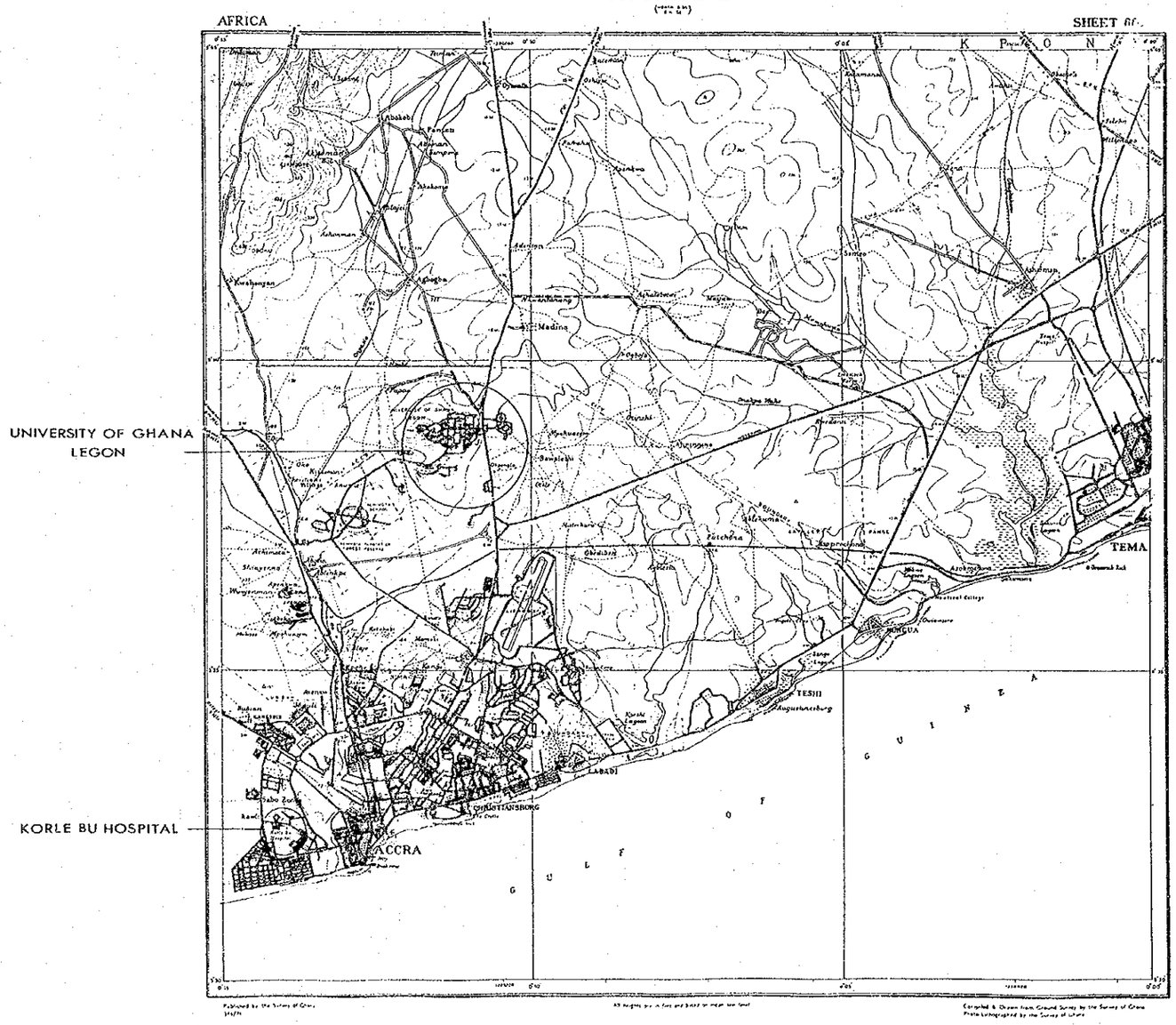
AFRICA
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G U L F O F G U I N E A

CONTENTS

PREFACE

In response to the request of the Government of the Republic of Ghana, the Government of Japan has decided to carry out a study necessary for the preparation of the preliminary design for the Construction Plan of a Post Graduate Medical Research Institute in the University of Ghana Medical School, and the Japan International Cooperation Agency conducted the study.

The Japan International Cooperation Agency has been rendering medical cooperation to the University since 1968 as a part of the technical cooperation programs of the Government of Japan and much has been achieved in this field.

However, in order to make the medical cooperation more effective and useful, the Construction of the Institute is considered to be important, thereby enabling to pursue basic medical research works as well as accommodate all the equipment and materials provided by the Government of Japan to make the best use of them.

In the recognition of the above mentioned background, the Japan International Cooperation Agency dispatched a survey team in August, 1976.

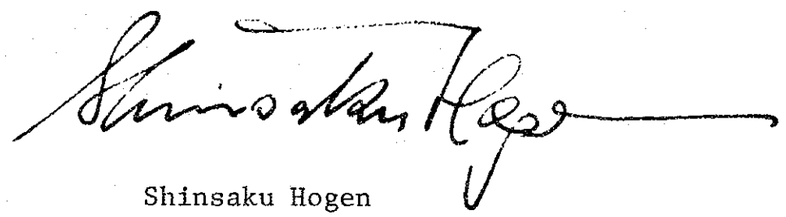
The field survey in Ghana was carried out very smoothly owing to the extensive cooperation of the Ghanian Authorities concerned.

Upon its return to Japan, the team engaged in related studies and analyses works, and its results are compiled in this report after the confirmation of the Government of the Republic of Ghana on the preliminary design in November, 1976.

I sincerely hope that this report would contribute to the progress of this project in the future and at the same time serves to strengthen the friendly relations now existing between the two countries.

I avail myself of this opportunity to express my heartful appreciation to competent Authorities concerned for the cooperation and hospitality extended to the team during the study period.

November, 1976



Shinsaku Hogen
President
JAPAN INTERNATIONAL COOPERATION AGENCY

CHAPTER 1 SURVEY FOR CONSTRUCTION

1. PURPOSE OF SURVEY

Since 1968, the Government of Japan has been carried out the technical cooperation through Japan International Cooperation Agency such as dispatch of specialist, provision of equipments and materials and acceptance of trainees.
Through these cooperation, expansion of space for the research laboratory has been recognized as the important subject corresponding to the success of cooperation.
For this point, Government of Ghana has been requested the construction of Post graduate Medical Research Institute to the Government of Japan, and in response to this request, Government of Japan decided to conduct the study necessary for preparation of preliminary design and drawings for the further close cooperation of both country.

2. SURVEY TEAM AND SCHEDULE

Japanese survey team which is led by Dr. K. Honda made the survey about three weeks from August 10, 1976 to Aug. 30, 1976.
Members of survey team are as follows.

Dr. Kenji HONDA (Leader)
Professor,
Director of Fukushima
Medical School Hospital

Dr. Yoshito TSUJI
Professor,
Fukushima Medical School

Mr. Seiichi MATSUDA
Qualified Architect,
Director of Overseas Division,
Kume Architects- Engineers

Mr. Akitada YANAGISAWA
Qualified Architect,
Architect of Overseas Division,
Kume Architects- Engineers

Mr. Tetsuo NAGASAKI
Vice Director of Handicapped
Persons Welfare Division,
Child and Family Bureau,
the Ministry of Public
Welfare

Mr. Shoji SHIMBO
Deputy Head of Second
Development Survey Division,
Social Development
Cooperation Department,
Japan International
Cooperation Agency (JICA)

Mr. Noriki ASAHI
Staff of Second Medical
Cooperation Division,
Medical Cooperation
Department,
Japan International
Cooperation Agency (JICA)

Mr. Shigeru NAKABAYASHI
Mechanical Engineer of Overseas Division,
Qualified Architect,
Kume Architects- Engineers

Mr. Hidefumi INOUE
Engineer of Overseas Division,
Kume Architects- Engineers

Mr. Koji KODAMA
Engineer of Overseas Division,
Kume Architects- Engineers

Followings are main activities in Ghana.

A. MEETING

- Ambassador
  Japanese Embassy
- Minister and officers
  Ministry of Economic Planning
- Chairman
  National Council for Higher Education
- Vice-channceller
  University of Ghana
- University of Ghana Medical School
- University of Ghana Development Office
- Architects-Engineers
  Consultants of Medical School

B. FELLED STUDY

- Construction Site
- Existing Facilities
- Kore-bu Hospital
- Legon Campus
- Tema Port
- Local construction site
- Construction Conditions
- Labour conditions

3. MUNUTES

Basic agreement between the Japanese survey team and party of Ghana was made through the many meetings and studies and signed by Mrs. M. Chinery - Hesse Principal Secretary Ministry of Economic Planning.
Professor H.H. Phillips. Acting Dean, University of Ghana Medical School and Professor K. Honda, Head of Japanese Survey Team.

ESTABLISHMENT OF A MEDICAL RESEARCH INSTITUTE

The Japanese Survey Team organized by the Japan International Co-operation Agency and headed by Professor K. Honda, director of Fukushima Medical School Hospital visited Accra, Ghana, for three weeks from August 12, 1976.

The purpose of their visit was to map out the preliminary design for the construction and establishment of a Postgraduate Medical Research Institute (hereinafter referred to as "The Institute"), which will constitute an important integral part of the proposed Ghana Medical Complex to be sited at Legon.

The team had a series of discussions and exchanged views with their Ghanaian counterparts in connection with the establishment of the Institute to be located at the University of Ghana Medical School at Legon.

As a result of the Survey and discussions, both parties have agreed to recommend to their respective Governments to start the construction work towards establishing the Institute. Minutes of the discussions are attached.

27th August 1976

Mrs M. Chinery-Hesse
Principal Secretary
Ministry of Economic Planning

Professor H.H. Phillips
Acting Dean
University of Ghana Medical
School, Accra, Ghana

Professor K. Honda
Head of the Japanese
Medical Survey Team

CHAPTER 2 DESCRIPTION OF PROJECT

1. OUTLINE OF PLAN

1.1 This general plan for the construction project of the Memorial Postgraduate Medical Research Institute to the late Dr. Hideyo Noguchi (hereinafter called the "Institute") was prepared on the basis of the report of preliminary study issued in August, 1973 for establishment of the Medical School at the University of Ghana. For preparation of this general plan, results of the study made in August, 1976 for the purpose of general planning as well as reports of Medical School and Medical Center Complex and other relevant documents made available by the University of Ghana were also referred to. Furthermore, discussions with persons in charge of the project were made several times at the Medical School of the University of Ghana.

1.2 Responsible persons of various research sections in the Medical School of the University of Ghana proposed diverse requirements for different facilities. These requirements were incorporated in this general plan after coordinating them in view of technical problems for the construction work and in the light of advices given by Japanese medical experts resident in Ghana and professors at the Fukushima Prefectural Medical College.

1.3 Taking climatic and other natural conditions in Ghana into consideration, the building construction type, interior environment, exterior and interior installations, laboratory equipment layout, furniture and fixture layout, and other items were planned out after local construction conditions had been well examined.

1.4 Construction of this project is considered to be divided into two phases according to years when funds for construction will be raised, and the plan is arranged to avoid any hindrance to the construction. However, general planning and description of the project as a whole is only given here.

1.5 Construction of this project includes a number of key works which must be provided by the University of Ghana. In this general plan, works to be provided by the University of Ghana are also mentioned for such items as may be essential to the function of the Institute.

1.6 On the basis of data obtained as a result of the study of construction materials and labor cost in Ghana, an approximate estimate of construction costs for this project was made. For lack of materials locally available, imported materials must be largely used for construction of this project. As a result, the percentage of transportation cost in the total construction costs will be very high. For these points, a further detailed examination will be required at the stage of execution planning.

1.7 This general plan is submitted to the Medical School of the University of Ghana. After approval of this general plan has been obtained, execution planning work can be proceeded with in a smooth manner on the basis of the approved plan.

1.8 Drawings and specifications for construction of the Institute are subject only to the approval of the Construction Committee at the University of Ghana.

Unlike the case with general construction projects, the construction work of this project can be commenced without authorization of any other authorities.

2. GENERAL PLAN

2.1 BASIC LINES

Basic lines followed in planning the project of the Institute are mainly as follows:

a) Functions of laboratory facilities as requested by the Medical School of the University of Ghana are defined, and building planning, structural planning as well as equipment planning are carried out in line with the grade of buildings of the Institute as a whole.

b) Medical equipments already delivered as first and second technical assistances by the Japan International Cooperation Agency are planned to be installed preferentially in the building of the Institute completed in the first phase. Medical equipments which will be delivered as third technical assistance are planned to be installed in the building completed in the second phase.

c) Buildings are planned in such manner that they will meet any future plan for the Medical School of the University of Ghana and will not pose any problem of communication upon completion of the Medical School as a whole.

d) In view of vertical traffic line, bringing-in and bringing-out of laboratory equipments, construction cost, time for completion and other factors, buildings are planned to have only a two stories.

e) If the construction is divided into two phases, provisions are made to enable buildings completed in the respective phases to function independently of each other and also to prevent the building completed in the first phase from being affected by the construction of the building in the second phase.

f) For locally available construction materials, it is planned to adopt only those materials that can be used with reliability from a viewpoint of both quality and quantity. All other materials are planned to be imported from Japan.

g) In all aspects of planning, due consideration is given to climatic conditions, natural features, social conditions and other characteristics in Ghana.

2.2 SITE PLAN

Proposed location of the Institute in the Legon campus at the University of Ghana is planned out as a proposed site of the Medical School in the report on future plan of the University of Ghana prepared by Shepheard and Epstein Architects Town Planners in 1968. In the master plan of the Medical School prepared in May, 1975, the Medical School site planning is made on the basis of such fundamental conception as contained in that report. This is outlined also in the preliminary study report for establishment of the Medical School at the University of Ghana prepared by the Japan International Cooperation Agency in 1973. For details, see this preliminary study report.

During the present study, discussions were made several times with persons of the Medical School at the University of Ghana who were in charge of this project, as well as Architects and Engineers. From these discussions, the following conclusions were derived.

a) Separation between pedestrian ways and carriage ways, which forms a basic part of the master plan of the University of Ghana, should be observed.

b) Axis of the Institute should coincide with that of the master plan of the Medical School now in contemplation, so that the pedestrian deck for the Medical School may serve also as that for the Institute.

c) In view of its functional relationship with the Medical School, the Institute should be located adjacent to the basic science section of the Medical School.

d) At a initial stage of the construction, it is planned to use the main entrance of the Legon campus for access to the site. Upon completion of all buildings of the Medical School, an access road for the exclusive use of the Medical School is planned to be constructed. Accordingly, the Institute should be located so as to be served by both access roads in future.

e) Since the site has a slight slope, attention should be paid to the ground grade so as to avoid any interference with water supply or

drainage. It should also be planned to permit cross-ventilation, taking the natural wind direction into consideration.

2.3 FACILITIES INCLUDED

On an assumption that the construction would be divided into two phases as mentioned in Paragraph 2.1 - Basic lines, research sections covered by each phase were studied. On the basis of results of such study and also in view of the scale of common facilities, the facilities included in each phase were defined as follows:

Phase I

Research Sections	Common Facilities
Electron Microscope Lab.	Administration
Laboratory	Power Panel Room
Preparation Room	Air-Conditioning Machine Room
Dark Room	Conference Room
Scanning Electron Microscope Room	Engineer Room
Large Electron Microscope Room	
Staff Room	
Engineer Room	
Bacteriology	Storage
Washing & Sterilization Room	Toilet
Office/Lab. No. 1, 2, 3	LPG Storage Room
Cold Room	
Deep Freezer Room	

Research Sections	Common Facilities
Media Pouring Room	
Dark Room/Microscope Room	
Chemical Pathology	
Data Secretarial Room	
Immuno Chemistry	
Enzymology	
Balance Room	
Separation Room	
A.A.S. and Flame Photometry	
Deionizer Wash Room	
Cold Room	
Virology	
Washing & Sterilization Room	
Office/Lab. No. 1, 2, 3	
Instrument Room	
Tissue Culture	
Dark Room	
Constant Temperature Room	

Phase II

Research Sections	Common Facilities
Haematology Washing Room Immuno Haematology Coagulation Lab. Haemoglobinopathy Investigation Auto-Counter & Accessories Staff Room	Air-Conditioning Machine Room Storage Toilet Corridor & Stair Work Shop Lounge
Histo-Pathology Cold Room/Deep Freezer Room Data/Secretarial Room Cytology Histo-Chemistry Dark Room/Microscopy Microtomy & Stainning Reception & Preparation Room Washing Room	

Research Sections	Common Facilities
Special Experimental Lab. Laboratory No. 1, 2, 3 Animal House Germ Free Animal House Preparation Room Parasitology Office/Lab. No. 1, 2, 3 Dark Room Physiology Electro Physiology C.VS & RS Cardiorascular & Respiratory General Lab. Preparation Room	

2.4 BUILDING PLAN

Because of the first buildings to be constructed in the proposed Medical School construction site in the vast Legon campus, a mass matching to the scale of nature is planned. In addition, these buildings are planned to have only two stories so as to facilitate vertical traffic and carrying-about of equipments. Furthermore, since these buildings are to be constructed on the gentle slope of a hill located in the tropical savannah, consideration is given to the creation of a charming environment around the Institute.

The Institute as a whole is composed of two buildings, each two-storied and channel-shaped in layout with side corridor. These buildings are arranged synmetrically to one another to form a court. Axis of this synmetry is planned to coincide with the pedestrian deck which is the main axis of the Medical School. In the Institute, such pedestrian deck is planned as main entrance and hall as well as an open space in the shade.

Each side of the channel shape is allotted to each research section and planned so as to form an independent block not only from a structural viewpoint, but also in view of equipments and installations. Blocks thus formed are separated from each other so that court and hall may be airy.

Unit of each laboratory is planned to have a size of 4.5 m x 7.0 m. Repeated arrangement of such unit corresponding to the function of each particular laboratory is adopted for laboratory composition, so that changes in the Institute may be easily met and that simplification of the construction work and reduction in construction period may be achieved.

i) CONSIDERATIONS OF CLIMATIC CONDITIONS

For sunshine, examination of sun shadow curve and other data was made to cope with heat of radiation from the roof and insolation from windows. In this plan, a tile roof with wooden roof truss is placed on the reinforced concrete slab on the second floor to provide primary waterproofing and also to reduce the transmission of radiation heat with the aid of ventilation between tile roof and concrete slab. In addition, roof coating is applied on the concrete slab as secondary waterproofing

to take precautions against any instantaneous intensive rainfall. This system has been widely used in the tropical zone with success. Effect of insolation from openings was considered for a period of time from 8:00 a.m. to 3:00 p.m. and louver canopies were planned to be provided. According to the plan, an opening with a height of A requires a horizontal louver canopy with a width of 2A on both east and west facades of the building.

For external walls, use of materials or construction system presenting a high heat capacity is planned to prevent the radiation heat from being introduced directly into the interior of building and to create favorable air-conditioning load conditions by making use of outside temperature changes.

ii) LAYOUT OF RESEARCH SECTIONS

On the first floor of the building to be constructed in the first phase of the Institute project, administration office, air-conditioning machine room and power panel room which are general common facilities, as well as electron microscope rooms requiring anti-vibration provisions are located. Virology, chemical pathology and bacteriology sections are located on the second floor of the same building.

Special experimental laboratory, animal house, haematology section and lounge are located on the first floor of the building included in the second phase. On the second floor of this building, histo-pathology section, parasitology section, physiology section and staff rooms are

located.

At the connection between first and second buildings, entrance and hall are provided as a gathering place for the staff of the Institute.

iii) CONSTRUCTION AND FINISH

Structure is planned as a reinforced concrete rigid frame construction and the wall as a block masonry. Typical span of 9.2 m x 9.2 m is planned.

For exterior wall and interior wall finishing, materials permitting easy maintenance in future are planned to be used. Details are as described in the schedule attached hereto. For the exterior wall, aggregate exposed terrazzo finish, aluminum sash windows and aluminum louvers are planned to be used. For the interior wall, polished terrazzo floor tile skirting, emulsion painted plaster wall and emulsion painted plaster ceiling are planned as general laboratory interior finish.

2.5 STRUCTURAL PLAN

2.5.1 BASIC LINES FOR STRUCTUAL PLAN

Ghana is situated outside all principal seismic zones in the world. Recorded earthquakes in this country are very small in scale. In addition, maximum instantaneous wind velocity ever recorded in this country is of the order of 28.3 m/sec. Accordingly, the lateral

force acting on a building is much smaller than that observed in Japan. This means that framework planning is considerably free. In designing a two-storied building, provision of some special frame against horizontal force is not required, but a simple frame composed only of columns and beams suffices to support both vertical and horizontal forces.

Soils of the proposed construction site consist of about 2 m thick surface layer of clay and about 2 m thick underlying layer of hard laterite supported on quartzite schist. Site ground is constituted mainly by these three formations.

Since this ground supporting the building has some spots superficially weathered, special care must be taken in setting the foundation on the bed.

In view of possible differential settlement of the building and concrete contraction, an expansion joint is provided to separate the building into two parts if its length exceeds 50 or 60 m.

Because of small horizontal force acting on the building, possibility of planning the individual footing foundation as a bearing foundation and also of room functions, it is recommendable to arrange columns at a unit span of the order of 4.5 m. For arrangement of columns according to the type of construction, span of about 4.5 m for the reinforced concrete construction and that of about 9 m for the steel

frame construction are considered economical.

2.5.2 BASIC LINES FOR STRUCTURAL DESIGN

Standards relating to the structural design are left to local structural engineers. Plan is made mainly on the basis of the British standards. In proceeding with the structural design of the Institute, the following points are to be taken into consideration:

i) External force and assumed load acting on the building are to be defined on the basis of local climatic conditions, site geography, site ground conditions and purpose of use of the building.

ii) Allowable unit stress of structural materials is to be defined on the basis of values specified in the applicable standards established by the Architectural Institute of Japan, for materials manufactured in Japan, and taking variations in quality into consideration, for locally manufactured materials.

iii) Framework stress calculation and section determination are to be made as specified in the applicable standards established by the Architectural Institute of Japan.

External force and load acting on the building are considered to include the following:

i) Dead Load

Dead load of structural materials, finishing materials and other materials incorporated into the building is calculated.

ii) Live Load

As live loads, values specified in the Building Code are adopted in principle, and for areas for special use, such as work shop and air-conditioning machine room, values meeting actual conditions are calculated.

Comparison of Japanese standards with British standards for principal areas is given in the following table.

Comparison of Live Loads (in kg/cm^2)

Area	Japanese Building Code		British Standard
	For Slab	For Column, Beam & Foundation	
Laboratory	300	180	306
Office	300	180	255
Corridor	360	330	408
Staircase	360	330	306

iii) Wind Pressure

In Accra, strong wind seldom blows. During the period of 1946 - 1972, average maximum wind velocity recorded is 13 m/sec, while

the instantaneous maximum wind velocity recorded is only 28.3 m/sec. If the building life-time is considered for these values, it is recommendable to take 40 m/sec as a design maximum wind velocity.

Velocity distribution of the wind pressure acting on a building is directly proportionate to the biquadratic root of the wind velocity in case of general low-rise buildings. If atmospheric pressure H = 720 mm and temperature t = 23°C are assumed for strong wind, velocity pressure q = 92.8 kg/m^2 is expected at the building top of GL = 10 m. As a result, it is decided to take 100 kg/m^2 as a design wind pressure.

iv) Sismic Force

As a result of the earthquake in June, 1939, the standard law concerning the earthquake was established in Accra. On the basis of the modified Mercalli scale, iso-seisme zones are defined and the Legon region belongs to Area VI. In terms of ground acceleration, a value of 0.033 g' is defined.

2.5.3 STRUCTURAL MATERIALS AND CONSTRUCTION METHOD

Structural materials are selected according to building scale, construction, purpose of use of building, quality and availability of materials, construction method and conditions of transport from Japan, as well as cost and other factors. For the structure, use of local materials is planned only for the following item:

i) Concrete

Fine aggregates locally used are sea sand and river sand. If sea sand is used, salt content conditioning is required. As coarse aggregates, crushed stone is used, but these aggregates are flat, angular and flaky. If the measurement by volume is adopted for these aggregates, predetermination of their porosity is therefore required. Cement is produced to BS 12 standard and its production well exceeds the local demand. To determine variations in quality, thorough inspection is required before use in the construction work.

For concrete mixing on site, mix proportions must be well planned and installations permitting precise weighing or measurement must be provided on site. Allowing for conditions of execution of work on site, the design basic strength is taken as $F = 180\ kg/cm^2$ and the plan is made taking the execution deviation as $\delta = 45\ kg/cm^2$ and the expected mix strength as $F = 225\ kg/cm^2$ or more.

2.6 MECHANICAL, PLUMBING, ELECTRICAL PLAN

In planning various equipments and installations, special attention was paid to problems possibly encountered during construction and problems of maintenance of equipments after completion of the building. Problems possibly encountered during construction includes lack of skilled labor necessary for execution of the equipment work on site and also necessity of importing necessary equipments. These problems not only cause damages to equipments and adversely affect the construction period, but also leads to those problems

of maintenance in future. In view of these facts, installations were planned to be simplified as far as practicable, and standarization of equipments, including realization of interchangeability of spare parts to the maximum possible extent, was considered so that repeated execution of a similar operation for the equipment work may be achieved. For maintenance of equipments after completion of the building, it was also decided to consider reduction in running cost, easier repair in the event of trouble, sufficient provision of spare parts and improvement of interchangeability.

2. 6. 1 AIR-CONDITIONING AND VENTILATION SYSTEM PLAN

Throughout the year, a mean temperature at the Institute construction is 25 to 30°C with mean humidity of 80% or more and maximum temperature exceeding 30°C. Air-conditioning is therefore indispensable throughout the year not only to ensure a comfortable working space for research workers, but also to protect laboratory equipments and instruments as well as documents. It was considered difficult to satisfy simultaneously interior temperature conditions of all rooms because different room functions would result in different periods of time of room occupation and different interior generated loads. In view of actual state of air-conditioning systems in service in various local buildings, conditions of execution of the work, running costs, repair conditions in the event of trouble and availability of spare parts, as well as lack of high-level technicians, it was also considered to keep air-conditioning satisfactory in the Institute. In designing the Institute, it was planned to install one small packaged air-conditioner in each zone, as described in

detail later, so as to supply primary air into each room and ensure the ventilation therein. These packaged air-conditoners are arranged to be in common service in the event of trouble of one of them. In addition, one unit air-conditioner is installed in each room to regulate the temperature in the room in combination with the corresponding packaged air-conditioner. Such unit air-conditioner can be operated even outside normal air-conditioning hours to protect laboratory equipments as required. Running cost is thus reduced.

i) Design conditions

Outdoor temperature: 33°C (Wb 30.5°C)

Outdoor humidity: 85%

Outer air enthalpy: 18.00 kcal/kg (in March)

Solar radiation: 65.55 cal/cm^2·h (in March)

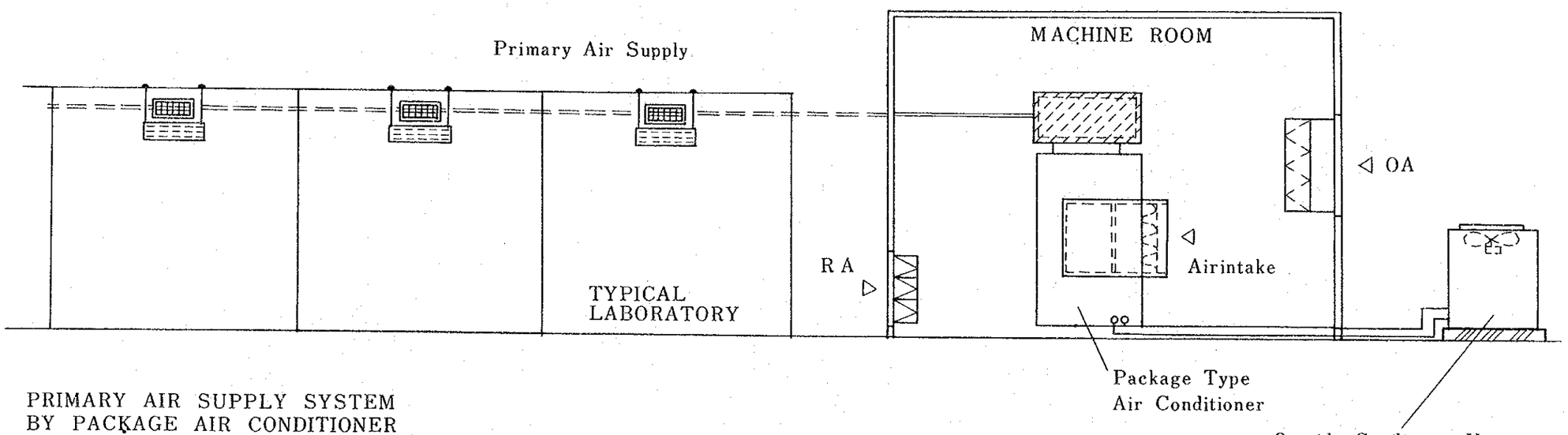
ii) Interior conditions

	Room temp.	Humidity
General laboratory & office	26°C	55% ± 5%
Constant-temperature & constant-humidity laboratory	22°C ± 1°C	50% ± 5%
Cold storage	0°C - 4°C	

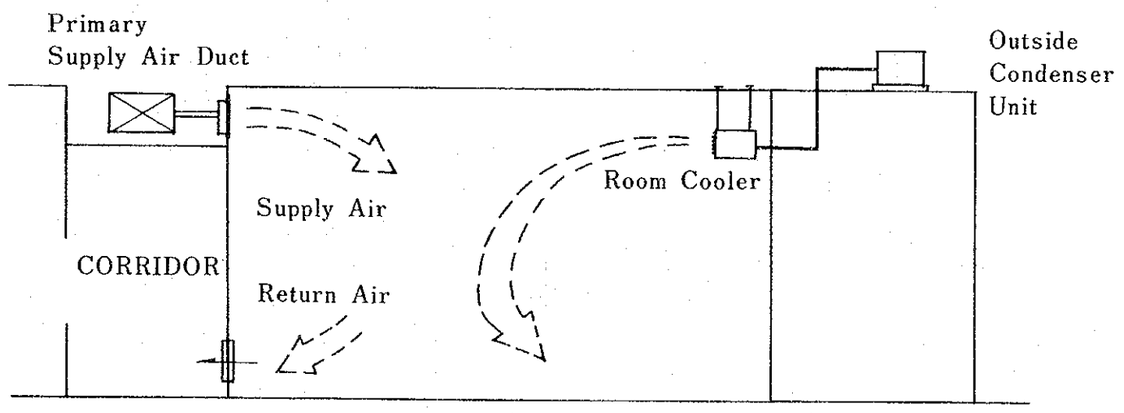
iii) Selection of method and extent of air-conditioning

In view of interior temperature and humidity conditions of each room and its relation with the research section, method and

TYPICAL AIR-CONDIPIONING STSTEM FOR GENERAL ROOM



PRIMARY AIR SUPPLY SYSTEM
BY PACKAGE AIR CONDITIONER



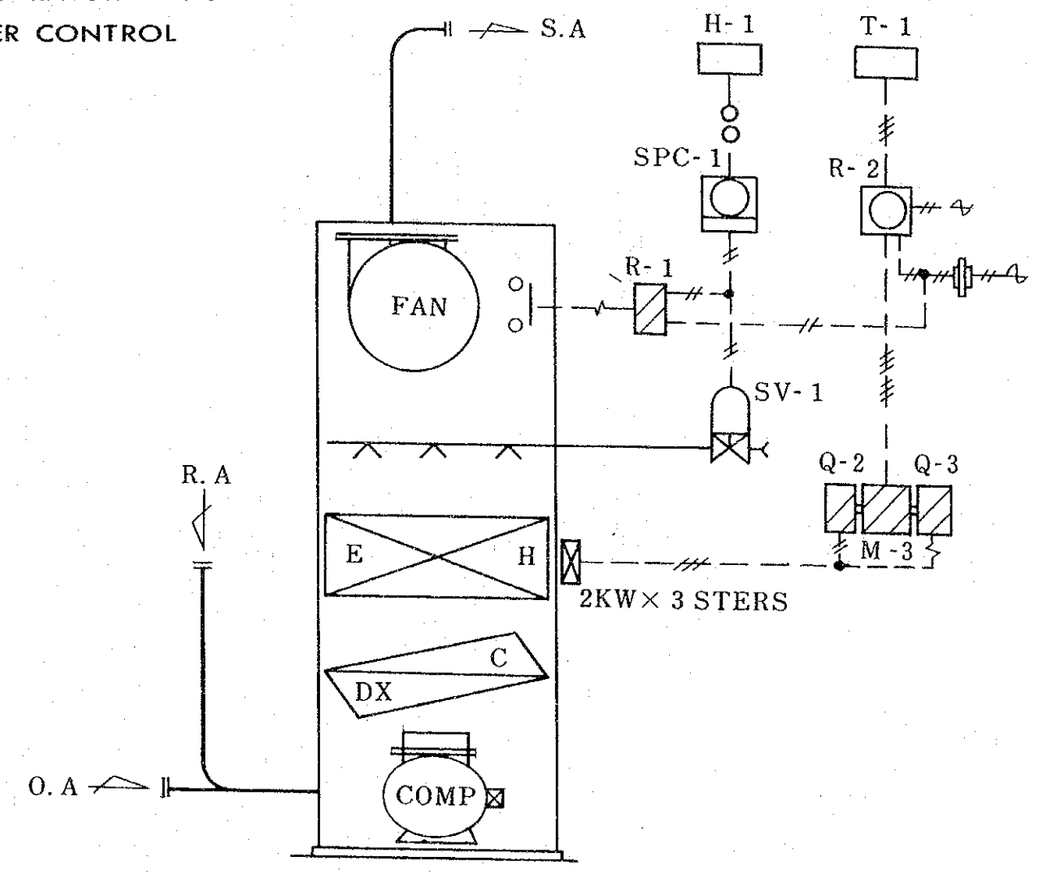
COOLING SYSTEM
AT TYPICAL LABORATORY

extent of air-conditioning were planned as follows:

a) As indicated in the air-conditioning system diagram, general laboratories, research working rooms and offices are grouped into six systems on each floor. Each system is provided with one independent packaged air-conditioner. During normal air-conditioning hours, fresh air is subjected to the primary treatment in this packaged air-conditioner and then forced directly into each room from the outlet on the room wall on the corridor side through a duct installed in the space above the corridor ceiling. On the exterior wall side of each room, one separate-type unit air-conditioner is installed to regulate the temperature in each room. Outside unit of this unit air-conditioner is fixed to the exterior canopy of the building. Such unit air-conditioner is identical for all rooms so that in the event of trouble of any one unit air-conditioner, spare one may take place of it. Interchangeability of unit air-conditioners is thus obtained.

Air-conditioning outside normal hours is required to continue experiments or to protect laboratory equipments or for other purposes. To meet such requirement, only the unit air-conditioner in the room concerned is operated. Reduction in running cost is thus obtained. In addition, room temperature control can be made to some extent only by unit air-conditioners in the event of out-of-service of packaged air-conditioners for inspection or repair.

CONSTANT TEMPERATURE ROOM PAC
AIR CONDITIONER CONTROL



LEGEND

T－1	:	SPACE TEMPERATURE-PULSE TRANSMITTER
H－1	:	HUMIDITY SENSOR
R－1	:	AUXILIARY RELAY
R－2	:	DIALA TROL
SW	:	EXCHANGE SWITCH
M－1	:	"MODUTROL" MOTOR
M－2	:	〃 〃
Q－1	:	AUXILIARY POTENTIOMETER
S－1	:	STEP CONTROLLER
SV－1	:	SERIES SOLENOID VALVES
SPC－1	:	"MODUTRAN" PROPORTIONAL TEMPERATURE CONTROLLER
ON－1	:	REMOTE MANUAL POTENTIOMETER
Q－2	:	AUXILIARY SWITCH (2 STEP)
Q－3	:	〃 〃 (1 STEP)
M－3	:	"MODUTROL" MOTOR

b) Special air-conditioning for the purpose of experiment is required in constant-temperature and constant humidity laboratory, cold storage room and animal house. These three areas are air-conditioned by the respective independent systems.

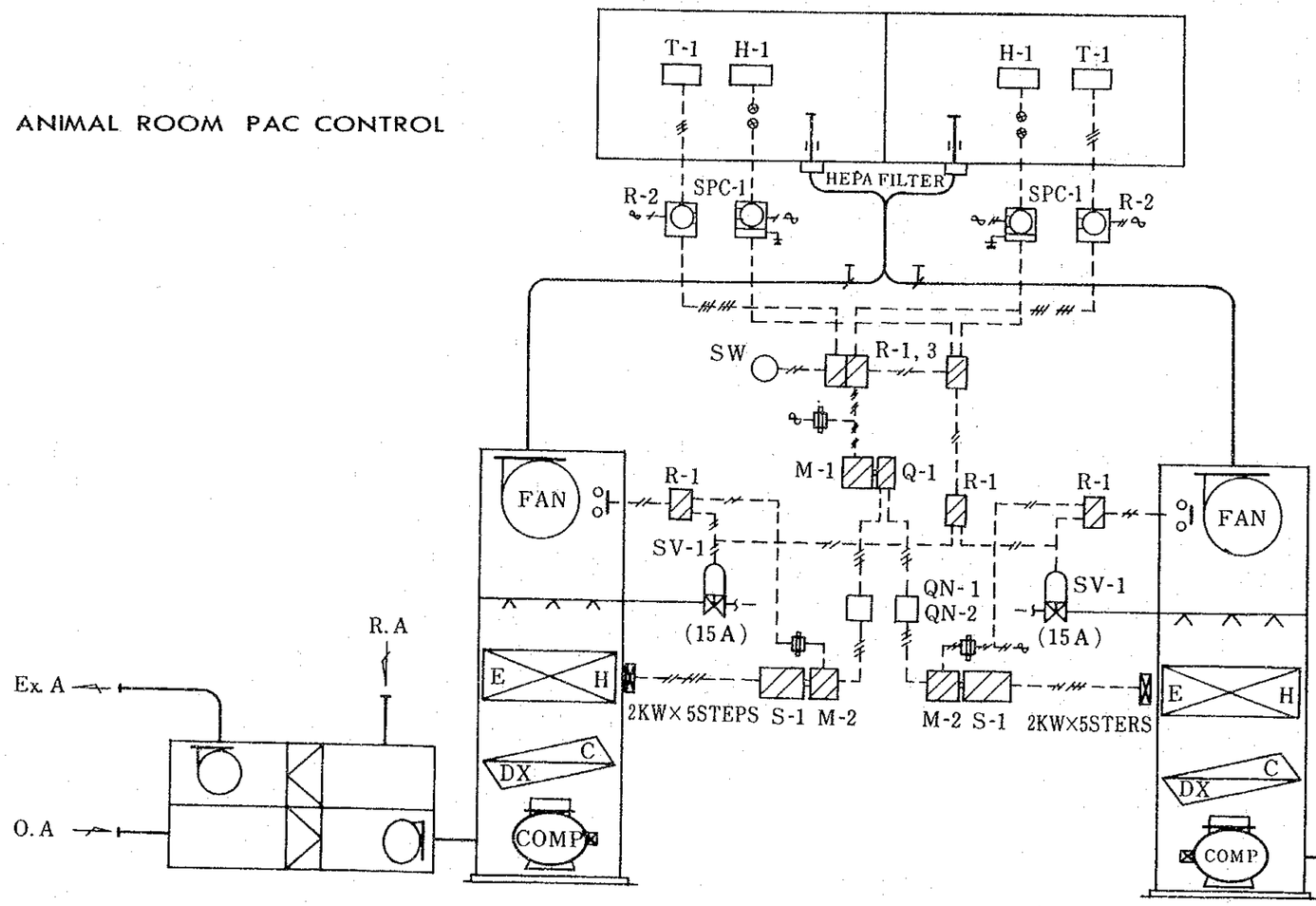
CONSTANT-TEMPERATURE AND CONSTANT-HUMIDITY LABORATORY

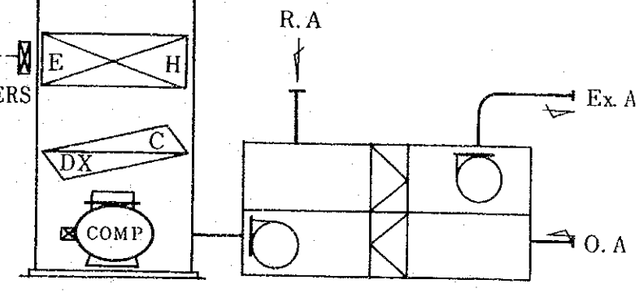
Interior conditions of the constant-temperature and constant-humidity laboratory included in the virology section are temperature of 22°C $\pm$ 1°C and humidity of 50% $\pm$ 5%. In this laboratory, an independent packaged air-conditioner with reheater is installed and provided with emergency power supply so that it may be put into continuous service on a 24 hours-per-day basis.

COLD STORAGE

One cold storage room is provided in bacteriology, chemical pathology and histo-pathology sections, respectively. Room temperature of 0°C to 4°C is required in these rooms. To meet this requirement, it is planned to install one air-cooled chiller in each room on the exterior wall side and keep it in continuous service on a 24 hours-per-day basis with provision made to connect it to the emergency power supply.

ANIMAL ROOM PAC CONTROL





DESIGNED ROOM TEMPERATURE & HUMIDITY
DB 24℃ ± 2℃
RH 55% ± 5%

LEGEND

T－1	:	SPACE THMPERATURE-PULSE TRANSMITTER
H－1	:	HUMIDITY SENSOR
R－1	:	AUXILIARY RELAY
R－2	:	DIALA TROL
SW	:	EXCHANGE SWITCH
M－1	:	"MODUTROL" MOTOR
M－2	:	〃 〃
Q－1	:	AUXILIAKY POTENTIOMETER
S－1	:	STEP CONTROLLER
SV－1	:	SERIES SOLENOID VALVES
SPC－1	:	"MODUTRAN" PROPORTIONAL TEMPERATURE CONTROLLER
QN－1	:	REMOTE MANUAL POTENTIOMETER
Q－2	:	AUXILIARY SWITCH (2 STEP)
Q－3	:	〃 〃 (1 STEP)
M－3	:	"MODUTROL" MOTOR

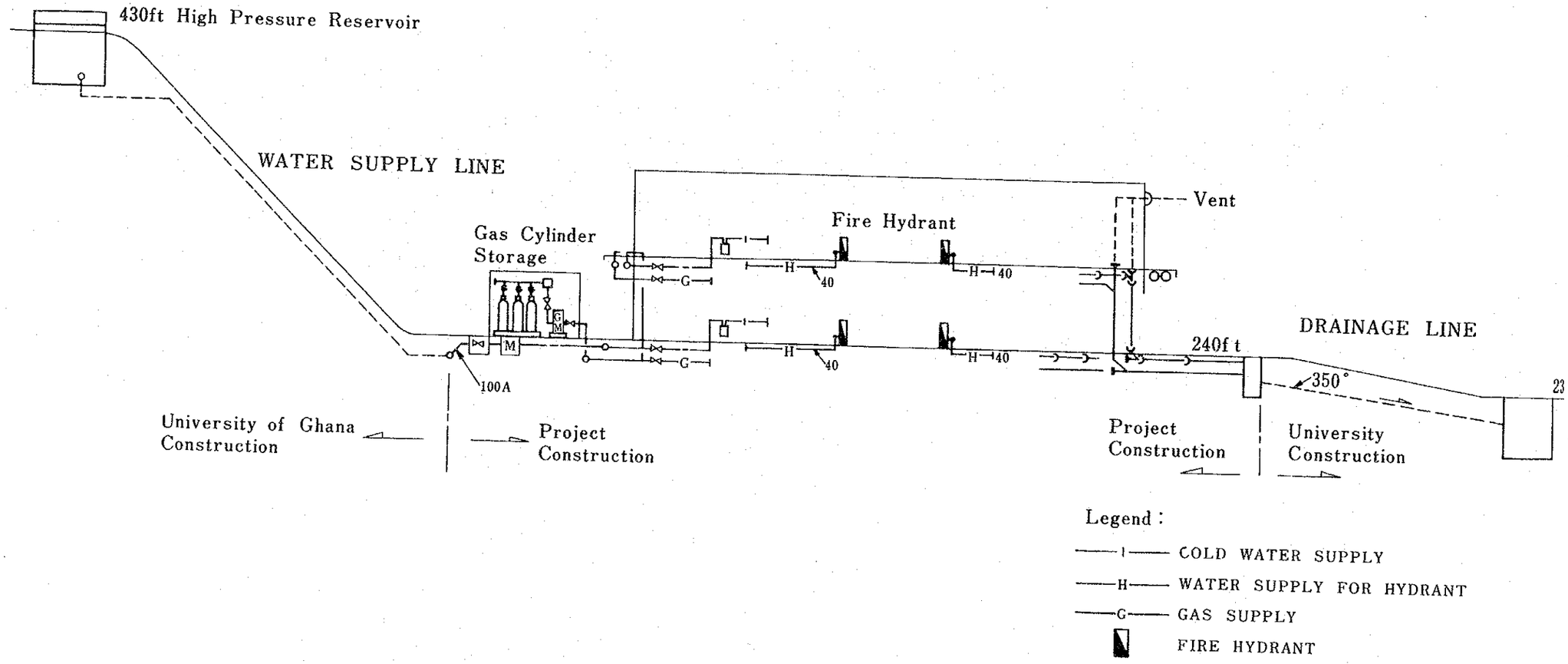
ANIMAL HOUSE

Two animal houses including anterooms are planned as a part of the special experimental laboratory. It is planned to install an independent packaged air-conditioner with high efficiency air filter in each animal house for air-conditioning by both overall heat-exchanging system and overall exhaust ventilation system. Provision is made to connect it to the emergency power supply for continuous service on a 24 hours-per-day basis. Air change is planned at 30 times/h. Provision is made to keep the balance in air pressure between anteroom and animal house so that the function as an aspeptic room may be fulfilled.

iv) Ventilation System

For rooms using a draft chamber during experiment, it is planned to permit total exhaust ventilation through this draft chamber. For dark room, deep freezer room, power panel room and washing room, total exhaust ventilation is also planned. In these general rooms and toilet rooms, local ventilation by pressure fan is planned.

PLUMBING DIAGRAM



2. 6. 2 PLUMBING AND SANITARY EQUIPMENT PLAN

i) Water Supply System

Water supply services in the Legon campus are outlined in the preliminary study report for establishment of the Medical School at the University of Ghana, issued in August, 1973. From the present study, it was made clear that water would be supplied to the Institute from the high pressure reservoir through the existing water pipe line layed in the Legon campus. At present, the Development Office of the University of Ghana is planning water supply and drainage systems at the University as a whole, including the Medical School. Before preparation of the execution design, therefore, some discussions have to be made with the University of Ghana for re-coordination.

Water supply system within the Institute is planned as a gravity system making use of the pressure in the above-mentioned high pressure reservoir and also as a loop piping system with a view to stabilizing the supply volume. In view of the maintenance in the future, it is planned to lay the piping in the space within the exterior double wall under the exterior canopy and branch it into each room from that space. Piping in each room is to be layed on the floor, making use of spaces in testing benches. All piping materials is to be supplied from Japan. Use of P.V.C. lined steel pipes or galvanized steel water pipes is contemplated.

Water consumption in the Institute is estimated to be about 200 tons per day and 4" pipes are planned as water mains.

ii) Hot-water Supply System

With due regard paid to hot-water consumption, equipment cost, running cost and maintenance, the central hot-water supply method was considered unsuitable. Installation of small electric water heaters of the accumulation type only in laboratories and such other rooms in the Institute as may require them is contemplated with copper pipings.

iii) Drainage and Vent Systems

Soil water, waste water and experimental effluent water are to be drained toward the outside of the building through separate pipings. Experimental effluent water is to be treated and then led into the sewage treatment plant together with soil water and waste water. After discussion with the University of Ghana, it was decided to connect the drainage system within the Institute to the drainage pipe leading to the east sewage pump station. In the present plan, the drainage system to be installed to the final collector outside the building is contemplated and the system thereafter is to be installed by the University. Since the elevation of the site is about 250 ft above the sea level, sewage conveyance into the sewage pump station is by gravity. Taking the corrosion into consideration, rigid P.V.C. pipes are to be used for interior drainage of experimantal

effluent water and concrete Hume pipes for exterior drainage of the same. Total quantity of water drained from the Institute is estimated to be 35 tons/h.

iv) Sanitary Fixtures

On the basis of the building plan, earthen ware sanitary fixtures are installed for sinks in laboratories and toilets.

v) Fire Extinguishing System

High pressure reservoir is situated at an elevation of 430 ft above the sea level, while the elevation of the site is around 250 ft above the sea level. Head of about 180 ft (6 kg/cm^2) can therefore be expected. Local laws do not require any hydrant, but in the present plan, installation of one hydrant at each building corner and four on each floor is contemplated against five. These hydrants are to be connected directly to water mains so as to make use of the above-mentioned head.

vi) Gas Piping

For L.P.G. used for experiments in each research section, it was planned to provide a gas cylinder house outside the building and supply gas to each laboratory through the piping from that house, taking gas cylinder carrying-about, storage space and danger into consideration. This system can well balance gas consumptions in various laboratories and also make the service of a gas supply company easier.

vii) Emergency Showers

In view of possible accident suffered by research workers during experiment operation, installation of emergency showers is contemplated. It was planned to install one shower in each research section at the corner of corridor and at such place as may permit easy identification of the shower. Opening and closing of each shower by lever operation are contemplated.

2. 6. 4 ELECTRIC INSTALLATION PLAN

At present, electricity is supplied to all facilities in the Legon campus from the Legon Service Area Substation located near to the campus main entrance and operated by Ghana National Electric Power Corporation. In this substation, power transmitted at 33 KV from the Akosombo Power Station is transformed into 11 KV, which is then fed into the high-tension power board house installed in the campus of the University of Ghana. From this high-tension board, the distributing main within the campus is installed as a loop system with one substation house placed for each block having its own load capacity predetermined. In these substation houses, supply voltage is dropped from 11 KV to 240/415 V, three-phased, four-wired, which is then distributed to each building. For power supply to the Institute, construction of a new substation house is planned, taking also the power supply to the Medical School as a whole. This new substation house will be located close to the Institute. Existing power supply and distribution system is installed by means of underground cables. Such underground cables will be layed also for the new power distribution system for the Institute.

In planning the electric installation for the Institute as described below, the following points were taken into consideration:

a) Works related to the general facilities of the Medical School at the Uniersity of Ghana should be planned and executed by the

University. This makes it possible to secure unity in both system and equipments for the entire campus so as to facilitate maintenance and security.

b) It was planned that all materials and equipments to be used in the electrical works should be supplied from Japan. To avoid any possible occurrence of problems of maintenance in the future, first priority is to be given to the safety in their design.

c) Certain local standards based on the British electrical standards are in force in Ghana. In view of standards and specifications applicable to materials and equipments manufactured in Japan, however, it was planned that any design should conform to the applicable Japanese electrical standards with due regard naturally paid to the local standards.

i) SUBSTATION FACILITY

In the new substation house planned by the University to be constructed for the Medical School, transformers allowing for 820 KVA as a load capacity of the Institute must be installed. Break-down of this capacity is as follows:

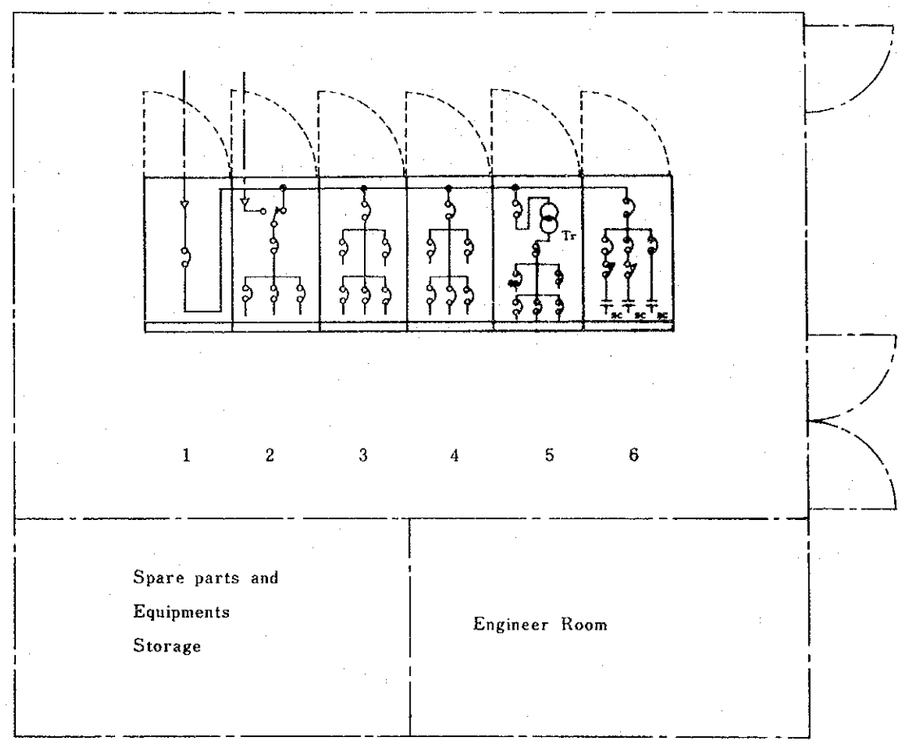
	Phase I	Phase II	Total
· Load outlets for experimented researches, general lighting, general outlets, unit air-conditioner of each room, water heater of each room	200 KVA	200 KVA	400 KVA
· Power for air-conditioning equipments	120 KVA	120 KVA	240 KVA
· Special for air-conditioning equipments (with emergency power supply)	65 KVA	65 KVA	130 KVA
· Transformers for 100 V power supply for experiemnts	25 KVA	25 KVA	50 KVA
TOTAL			820 KVA

Voltage will be dropped to 240 V/415 V, three-phased, four-wired, 50 Hz by transformers and then fed into the power panel room provided in the Institute. In this room, installation of cubicle type low-tension power boards is planned.

POWER ROOM IN THE INSTITUTE BUILDING

Layout of low-tension distribution panel :

1. Receiving Panel
2. Emergency Power Panel
3. Power Panel
4. Laboratory Room & Lighting Panel
5. Laboratory Room Use 100V panel with 3 phase 4 wire 415V/100V/173V 50 KVA.
6. Condenser Panel with 415V, 100 KVA condenser x 3 sets



ii) STAND-BY EMERGENCY GENERATOR SET

Service interruption seldom occurs in the Legon service area, but an AC generator set is to be installed as an emergency power supply source only for those circuits required for experiments and the like. This generator set is to be connected to the following rooms:

Phase I - Paraffin preparation room in the electron microscope section.

Constant-temperature and constant-humidity room in the virology section.

Low-temperature experiment laboratories and refrigerator rooms in bacteriology and chemical pathology sections.

Phase II - Animal house

Low-temperature experiment laboratory and refrigerator room in the histo-pathology section.

According to the total load for these rooms, the generator capacity should be of 150 KVA, and the system of automatic starting and stopping in the event of service interruption is planned.

It is planned that such generator set should be installed in the above-mentioned new substatin house.

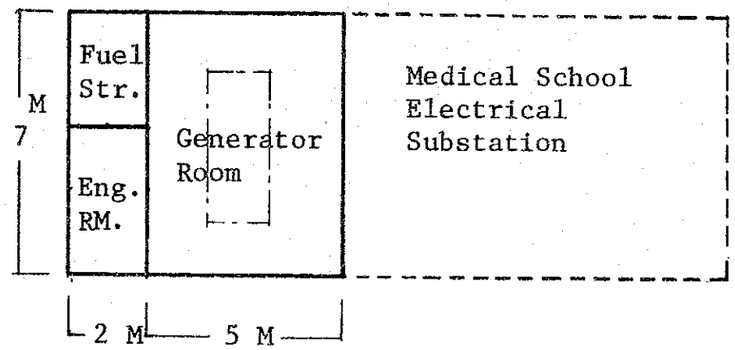
EMERGENCY DIESEL ENGINE-GENERATOR

CAPACITY OF AC GENERATOR:

3 phase 4 wire 240/415 volts 50 Hz
Output : 150 KVA
Rated speed : 1,500 rpm

DIESEL ENGINE

Continuous Output : 180 ps/1,500 rpm.



Building will be provided by the University of Ghana for the Generator Room and Fuel Storage next to Medical School Electrical Substation.

iii) POWER SYSTEM AND DISTRIBUTING MAINS

Conduit and wiring work is planned to be executed from the above-mentioned cubicle type low-tension power boards just to power control panels, lighting distribution panels, laboratory distribution panels, various office equipments, telephone exchange power source and the like. Power distribution is planned to be made by the distributing mains running in the space above the corridor celing.

iv) LIGHTING SYSTEM AND OUTLETS

Installation of lighting distribution panels as well as all lighting fixtures, outlets and tumbler switches downstream of these panels is planned. For laboratories, it is planned to install a control panel in each laboratory so that power distribution may be made to laboratory equipments, unit air-conditioner, electric water heater, 100 V laboratory equipments and lighting system in each laboratory from such control panel.

v) LIGHITNG FIXTURES

Fluorescent lamps are planned for light sources. In addition to such lamps, use of incadescent lamps, germicide lamps, fluorescent mercury-vapor lamps or other lamps are planned according to the function of each area. Voltage planned is 240 V, single-phased, which corresponds to the rating of lighting fixtures to be used. Intensity of illumination planned for principal areas is as follows:

PABX SYSTEM

The PABX (Private Automatic Branch Exchange) System of the Institute is as follows.

XB-EX : Crossbar Switch Exchange Cabinet-type

Line capacity 100／100

W	D	H	
1,380	600	2,000	700 kg.

MDF : Main Distribution Frame

W	D	H	
720	470	2,000	200 kg.

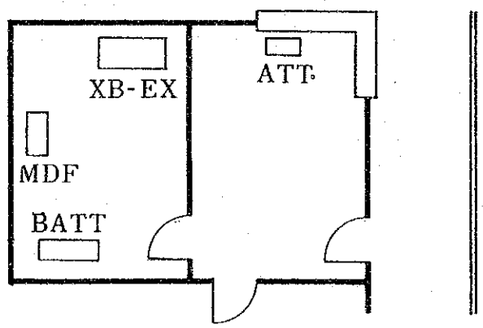
BATT : Charger and Battery

W	D	H	
1,000	600	1,300	300 kg.

ATT : Attendant Console

D Cesk top type Cordless console

W	D	H	
420	351	224	10 kg.



· Laboratory	:	300 lux.
· Office	:	300 lux.
· Corridor & hall	:	100 to 150 lux.
· Storage and equipment store	:	50 to 150 lux.
· Animal house	:	150 lux.

vi) TELEPHONE CONDUIT LINE AND EXCHANGE

At present, existing telephone exchanges in the Legon campus receive 60 local telephone circuits in total and have 150 interior telephone circuits as extensions, about 60% of which is in actual use. On the basis of the present study, the following three plans of telephone system were considered.

1) Reserve extension circuits provided in existing telephone exchanges in the campus should be utilized.

2) Local telephone circuits should be separately laid on in the Institute and connected to an independent exchange installed therein.

3) Plans 1) and 2) above should be combined.

As for plan 1), existing exchanges are old-fashioned and do not operate well. In near future, therefore, these exchanges must be replaced by new up-to-date ones. Accordingly, new telephone sets connected to reserve extension circuits from these exhcanges are likely not to function effectively.

As for plan 2), considerably frequent intercommunication between the Institute and other facilities at the University is expected since the Institute form an integral part of the University. Form a view-point of expenses, it is not advisable to always use local telephone circuits for such frequent intercommunication. In addition, the actual state of telephone services in Ghana makes it difficult to lay on as many local telephone circuits as desired in the Institute.

For these reasons, it was decided to contemplate the combination of these plans, namely, plan 3). It was planned to provide the Institute with its own crossbar system exchange having 10 local telephone circuits and 100 extension circuits, and to install a recieving and transmitting equipment for 10 circuits between this new exchange and existing exchanges in the Legon campus.

About 10 dial telephone sets are planned to be connected to extension circuits of the new exchange.

vii) RADIO AND T.V. COMMUNITY RECEIVING SYSTEM

It is planned to install a radio and T.V. community receiving antenna on the roof and lead conduit tube and wiring from this antenna to the terminal provided in the administration office.

viii) DISPLAY LAMP PANNELS

To serve the convenience of staff and telephone operators, display lamp panels for the staff of senior class and over are to be placed on

Institute entrance reception counter and switchboard as well as in the caretaker's room.

ix) LIGHTNING PROTECTION SYSTEM

Flat type copper bar lightning conductors are to be installed on ridges of buildings constructed in Phase I and Phase II. It is planned to provide protrusion rods and grounding of lightning conductors as required.

x) ALARM SYSTEM

Alarm push buttons are to be provided at six places on each floor, namely, in hydrant boxes so that alarm bells also provided in hydrant boxes may be activated. AT the same time, an alarm signal generated by any push button is to be displayed in the Administration Office.

xi) INTERPHONE SYSTEM

As provision against emergencies, the substation house is to be connected with low-tension power board room and engineer room in the Institute by means of interphone systems.

2.7 EXTENSION PLAN

At present, natural surroundings are left almost intact around the proposed site of the Institute with only a limited part of the land being utilized as an agricultural land. No building exists. The Institute is the first step of the Medical School construction project planned by the University of Ghana. Construction of this Institute

ıl undoubtedly become a great propulsion for construction of the ıedical School. From this viewpoint, the site development, not only around the Institute, but of the Medical School as a whole, is of urgent necessity. The present plan is however limited only to the site development around the Institute. The plan should be executed by the University of Ghana. Items of the work required at the minimum in this plan are as follows:

i) ACCESS ROAD AND PARKING AREA

Road from the Legon campus main entrance to the Institute is planned as a main access road, but the construction of such road has not been completed except the existing section only to Manciples Store which is the existing south and facility in the campus. This point is about 4,000 ft (approximately 1.2 km) distant from the Institute. Construction of the road section from this point to the Institute is a key work determining the possibility of commencement of the construction of the Institute. In addition, car parking area for the staff and general employees' transport bus stop facility are required since principal means of transport will be automobiles. The University of Ghana should plan and execute such parking area so as to accommodate at least so cars.

ii) SITE STORM-WATER DRAINAGE PLAN AND LAND GRADING PLAN

Drainage around the buildings are to be included in this plan. On the other hand, the drainage of peripheral site should be

properly planned together with the construction of other necessary facilities and executed prior to construction of the Institute on the part of the University of Ghana. Land grading of the site should be planned in conjunction of the road construction.

iii) PORCH AND COURTYARD LEADING TO THE BUILDING ENTRANCE

Construction of the portion between entrance of the Institute and campus road is included in the Institute project. For such portion, including the courtyard, landscaping with trees and ponds is palnned with a view to securing comfortableness of the staff.

iv) EXTERIOR LIGHTING

To facilitate the night guard, exterior electric lighting is palnned to be provided only around buildings. Lighting fixtures are to be provided with timers for automatic switching in and off. For the courtyard, it is planned to install garden lights will provision made to permit switching in and off as required.

2. 8 LABORATORY EQUIPMENT, FURNITURE AND FURNISHINGS

According to the function of each laboratory, fixed testing equipments, test benches, chairs, desks, blackboards, notice-boards and the like are planned to be provided in laboratories.