THE BIOMEDICAL RESEARCH CENTRE
ANIMAL SUPPLY CENTRE
DRAFT 1977

JAPAN INTERNATIONAL CO-OPERATION
AGENCY

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1-1 Summarized purposes of construction survey

The construction work of the Biomedical Research Centre in the Socialist Republic of the Union of Burma has been continued since 1975 under the gratuitous economic assistance of the Japanese Government. In addition to the above construction, the preliminary survey for constructing the proposed animal houses has recently been conducted. This report is thus purposely made out for submitting the basic data and preliminary desig required for the construction of animal houses which have been discussed to date by various organizations concerned. The outline of the current report on preliminary design for animal house of the Biomedical Research Centre of the Socialist Republic of the Union of Burma is as follows.

o Preliminary survey for the construction of the animal house

o Disign principles of the animal house

1-2 Organization of survey team

Leader: Dr. Yoshihiro Hamashima, Professor of Pathology, Medical Department, Kyoto University

Member: Dr. Masaro Nakagawa, Veterinary and Head of 1st Laboratory for Animal Experiments, Department of Cattle Plague, National Institute of Health (in charge of animal house Functions)

Member: Mr. Naoteru Shimazaki, Head of Installations Department, Satow, Architects & Engineers Co., Ltd. (in charge of installations)

Member: Mr. Masaharu Hosoda, Group Chief in Designing Department, Satow, Architects & Engineers Co., Ltd. (in charge of designings in general and construction)

Member: Mr. Moriichi Kanai, Investigation Section, Social Development Co-operation Department, Japan International Co-operation Agency (in charge of administrative control)

1-3 Governmental members of the Socialist Republic of the Union of Burma

Dr. Aung Than Batu	Director General
Dr. Kywe Thein	Assistant Director
Dr. U Khin Maung Tin	Assistant Director
U Aung Khin	Head
U Toe Myint	Head
U Hla Pe	Head
U Soe Lu Gyaw	Research Officer

1-4 Itinerary of survey team

October 4th (Tuesday)	Leaving Haneda by JAL 463 Arriving at Rangoon in the evening
5th (Wednesday)	Joint meeting of Medical Survey Team. Inspection of the Site at D.M.R. and the existing machinery and tools. Discussions on Animal House Plannings
6th (Thursday)	Survey Team Discussions. Explanation on Conceptional Diagrams and Plannings in general. Inspection of Machinery Centre of C.R.C.
7th (Friday)	Explanation on Preliminary Plannings at D.M.R. Repeated Inspection of the Site after reaching an agreement on Preliminary Plannings. Discussions on Machinery Centre. Survey Team Discussions.
8th (Saturday)	Survey Team Discussions. Explanation on Animal House Plannings to All Members and confirmation thereof Discussions on final confirmation at D.M.R. Explanation on Animal House by Survey Team and discussions on Minutes of Meetings. Arrangement of information and data. Banquet given by Survey Team.
9th (Sunday)	Arrangement of information and data

October	10th (Monday)	Final discussions at D.M.R. Final confirmation of Minutes of Meetings. Presentation of Report on Survey Results to Japanese Embassy Banquet given by D.M.R.
	11th (Tuesday)	Leaving Burma by TG 302 and staying overnight at Bangkok.
	12th (Wednesday)	Back to Japan by JAL 472

1-5 Minutes of the Meetings exchanged between Japanese Survey Team and Department of Medical Research.

The above Minutes of the Meetings detailed hereunder were mutually confirmed by the members of both the Japanese Survey Team and Department of Medical Research and exchanged between the two Parties.

Subject: 1. Basic Design of Animal House and Instrumentation of Biomedical Research Centre.
2. Equipment for Biomedical Research Centre.

Japanese Survey Team	Department of Medical Research
1. Professor Yoshihiro Hamashi - Leader	1. Dr. Aung Than Batu, Director-General
2. Dr. Masaro Nakagawa, Member	2. Dr. Kywe Thein, Assistant Director
3. Mr. Seishi Kanai, Member	3. Dr. U Khin Maung Tin, Assistant Director
4. Mr. Masaharu Hosoda, Member	4. U Aung Khin, Head
5. Mr. Naoteru Shimazaki, Member	5. U Soe Myint, Head
	6. U Hla Pe, Head
	7. U Soe Lu Gyaw, Research Officer

Discussions were held 5, 6, 7, 8 October and 11th October 1977.

1. The Director-General first presented the basic requirement and function of the proposal Animal Services Centre and background information on present Animal Services at Department of Medical Research.

The Animal Centre would supply high quality strain of animals in sufficient quantity for future needs of the Department of Medical Research and research workers in other Institutions, and as stock to other Institution in Burma. The Centre would mainly stock small laboratory animals of good quality for research but should have provision for limited supply of Specific Pathogen free animal.

Facilities should also be present for experimental work on animals under suitable conditions.

2. The site and basic design of the Animal Supply Centre was then extensively discussed.

An understanding was then reached regarding the site of the building and basic design, dimensions of the Animal Centre building as shown in attached diagram (Page 3 - 8).

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Should there be a need to cut down costs the Experimental Animal Rooms could be reduced in number.

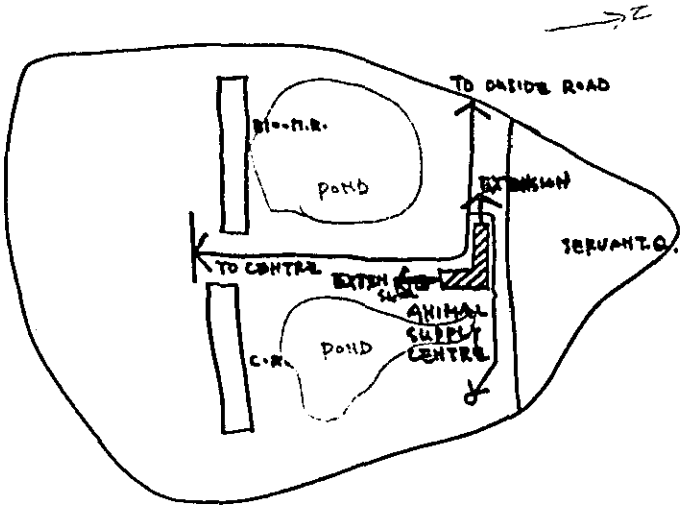
3. In view of the priority given to the need for an adequate Animal Centre as given in attached diagram it was understood that funds probably would not be available for a separate Instrumentation Centre building. However certain items of equipment would be made available for strengthening the present Instrumentation Division as per attached Tentative List give on page (9) from the Japanese Grant.

Should adequate funds become available from the Japanese Grant a separate Instrumentation Centre building would be reconsidered.

4. A List of Instruments and Equipment for the Biomedical Research Centre, Library, and Animal Services Centre and Instrumentation Services was presented for discussion by the Department of Medical Research. The attached list was then generally agreed upon, subject to alteration according to latest prices.

5. It was agreed by both side that the understanding reached above will be subject to subsequent agreement by the competent national authorities.

No. 4



TOTAL TRANSPORTATION SYSTEM.

No. 3

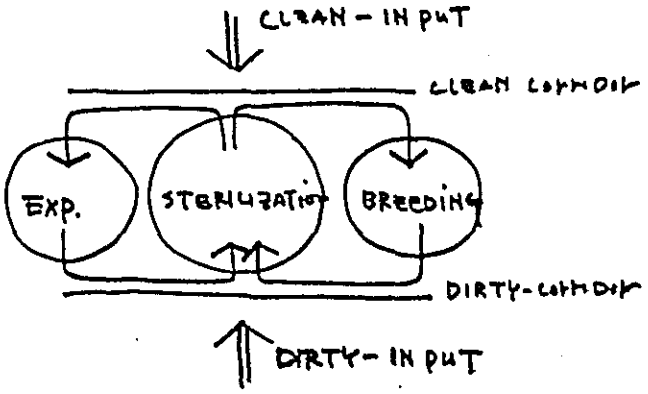


DIAGRAM OF CORRIDOR SYSTEM

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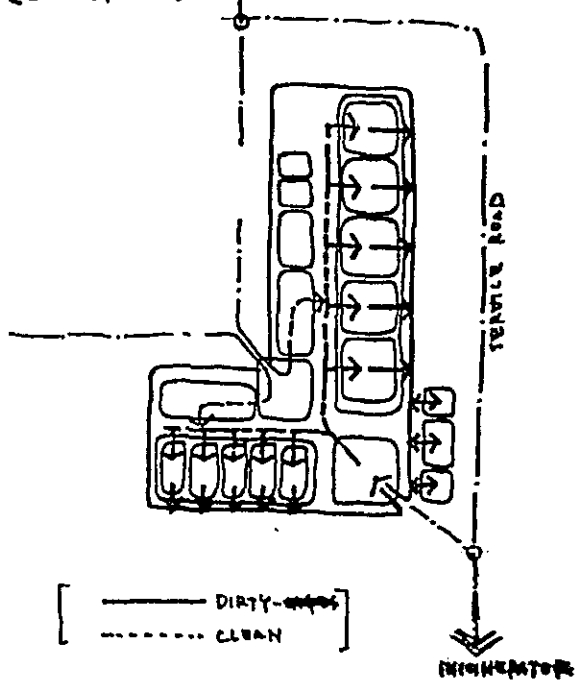
DIAGRAM OF ANIMAL SUPPLY CENTRE
(CONCEPTION)



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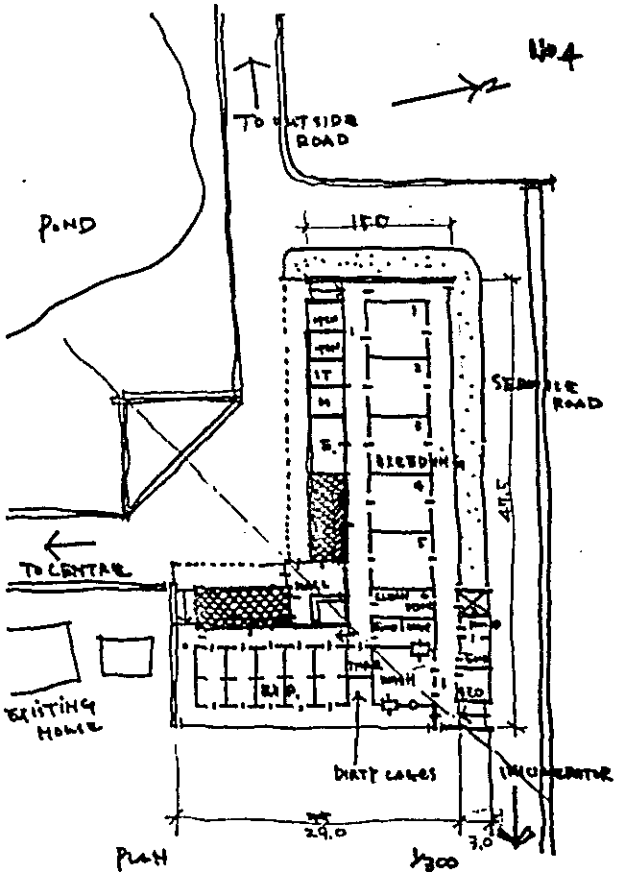

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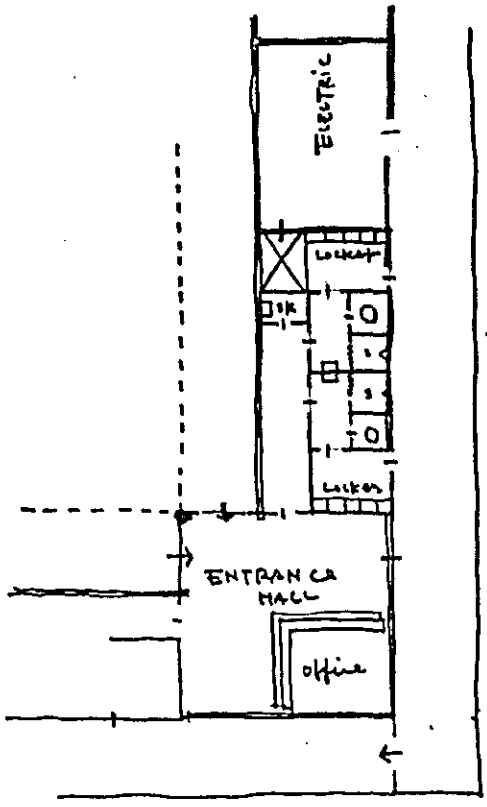

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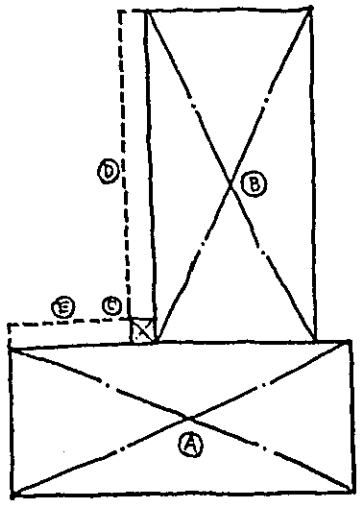
DETAILS OF WATER SECTION

No 6



A = 32.00 x 15.00 = 480.00
B = 32.5 x 15.00 = 487.50
C = 2.5 x 2.5 = 6.25
D = 30.00 x 2.5 = 75.00
E = 17.00 x 2.5 = 50.00

A+B+C = 973.75
D+E = 105.00

TOTAL 1078.75 m²

CHAPTER 2 Preliminary design

2-1 Design principles

2-2 Construction area and determination criteria

2-3 Land use planning

2-4 Architectural design

2-5 Structural design

2-6 Equipment

2-7 Cost estimates

2-8 Working schedule

2-9 Preliminary design

CHAPTER 2 Preliminary design .

2-1 Design priciples

This is a plan of animal houses to be constructed on the site of the Biomedical Research Centre in the Socialist Republic of the Union of Burma. The outline of the current project is conformable with the planning concept agreed upon through mutual discussions between the members of Japanese Survey Team and the governmental staffs of the Socialist Republic of the Union of Burma during a period from October 4 to October 12, 1977 (refer to Chapter 1 - 4).

2-1-1 Working objective

The above animal houses will be established on the northern end of the site of the Biomedical Research Centre.

The scheduled construction works are as follows.

Construction work		as per specified
Installation work	Machinery (air conditioning, ventilation) installation work	-do-
	Water supply and drainage equipment work	-do-
	Electric work	-do-
General outdoor work		-do-

2-1-2 Construction and dimension and determination criteria

The cost fluctuations of construction works in Burma are

largely attributable to not only the nation's dependence on the overseas markets in obtaining the required materials but also the frequent change of social conditions.

Therefore, the materials and manpower to be required for the current project will be supplied by both the Governments of the Socialist Republic of the Union of Burma and Japan. However, 10-20% fluctuations will have to be taken into consideration for the annual cost of materials and manpower.

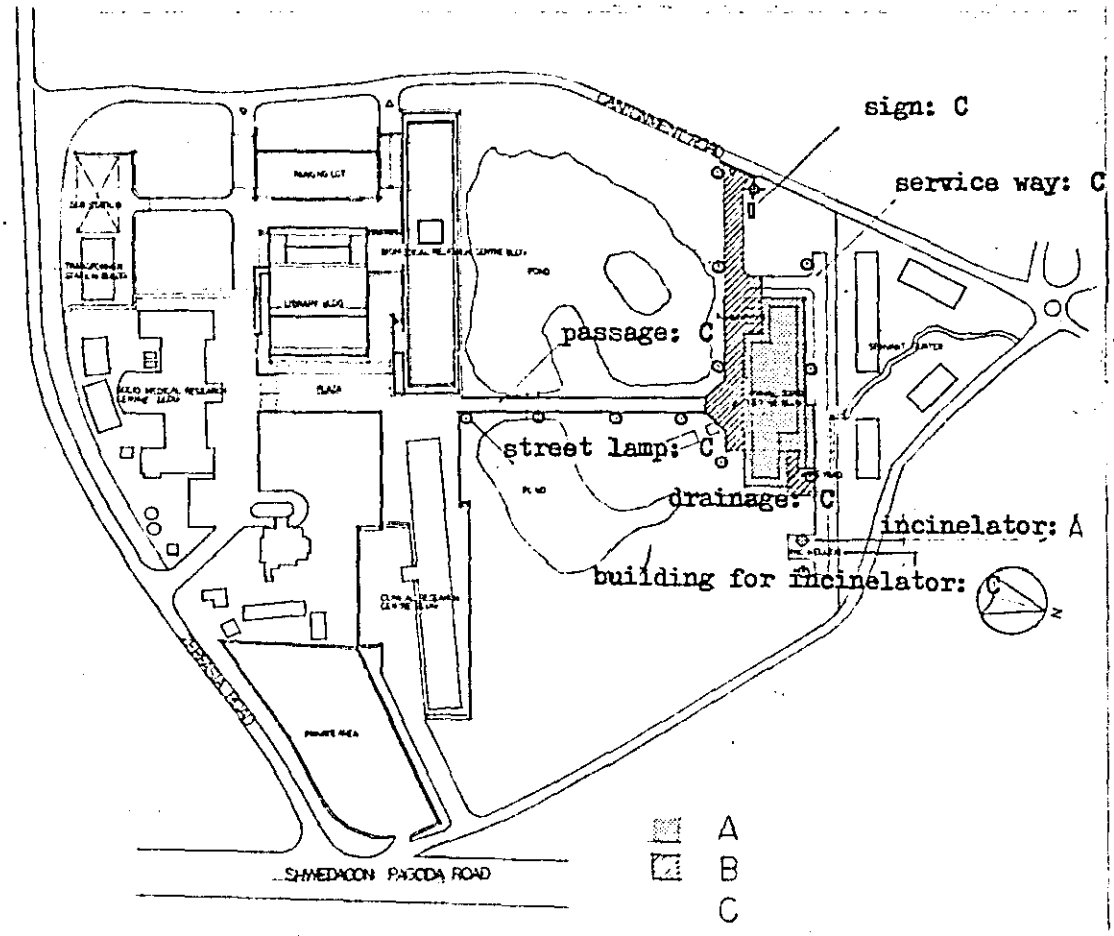
Thus, in view of the time of initiating the construction and flexible social conditions as well as the selection of materials, it is impossible to finally determine the entire cost of the construction work under the present stage (as of December 1977).

Such being the circumstances, there is no other alternative but to decide the total cost in the first place and allow the construction dimentions to be flexible in the preliminary designs and finally confirm them at such a time when working designs be completed. Although the final construction dimensions are shown hereunder, an extent of construction works that could be executed within the approvable maximum cost may be classified with the following criteria.

A. Minimum extent of works to be executed (Minimum requirement)
B. Extent of works that will be decided finally (Work not finalized as yet)
C. Extent of works to be executed with the expenditure of the Socialist Republic of the Union of Burma (Minimum requirement)

However, regardless of the time of initiating the construction works, the ground levelling and drainage works around should be done in an earlier stage.

FIG / Classified Construction Dimensions

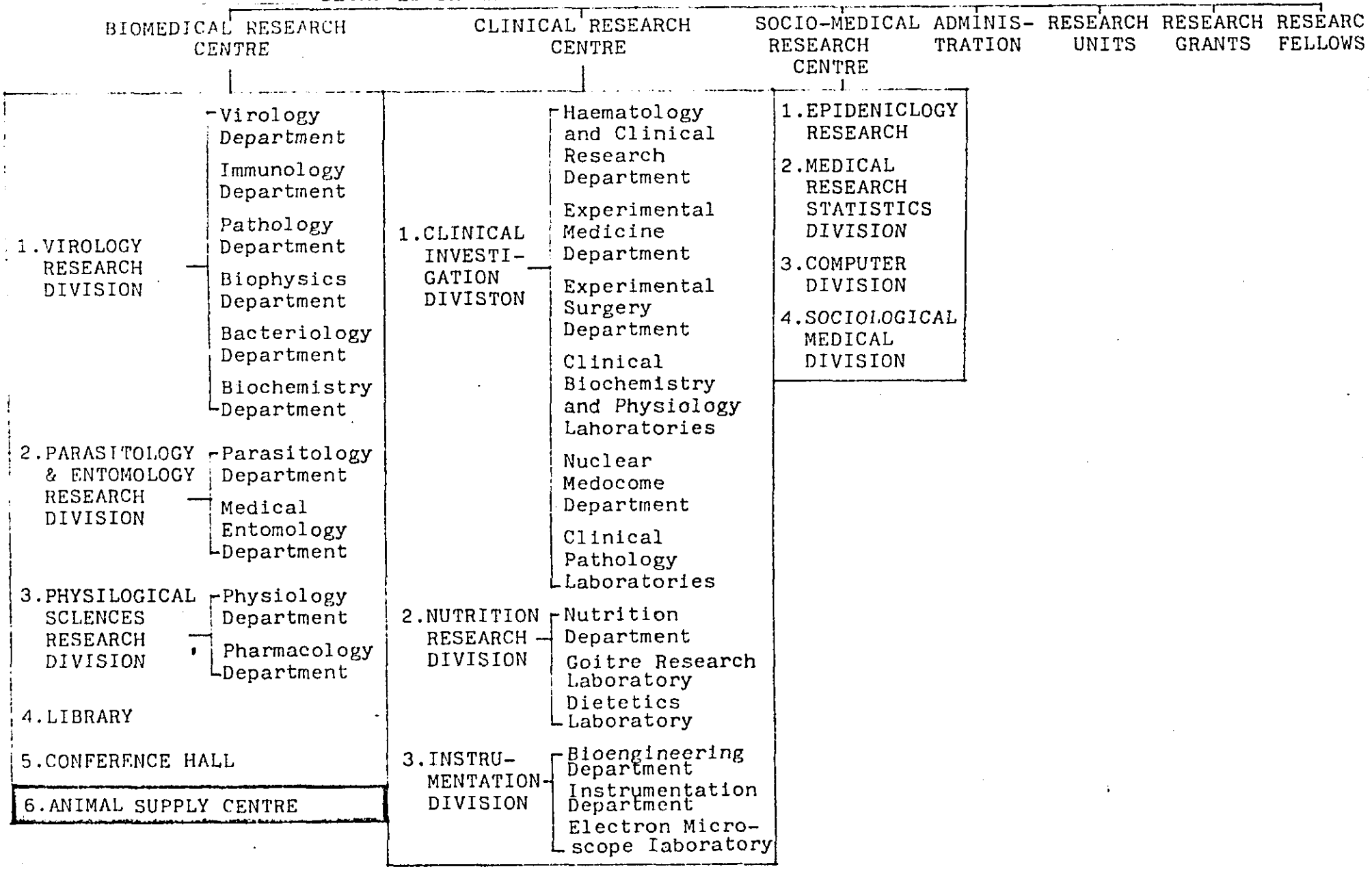


2-2 Functional layout of animal house and required research staffs

Research and Administrative Staff

Sr. No.	Name of Department	Total Staff at Precent (71-72)	Increase of Staff of Yearly 72-73	73-74	74-75	Total Projected Staff till 1975	
1.	Research Staff						
	1-1 Bacteriology Department	3	-	-	-	8	12
	1-2 Biochemistry Department	7	-	-	-	7	12
	1-3 Biophysics Department	3	-	-	-	3	12
	1-4 Immunology Department	8	-	-	-	8	12
	1-5 Medical Entomology Department	6	-	-	-	6	12
	1-6 Parasitology Department	8	1	-	-	9	12
	1-7 Pathology Department	1	2	1	-	4	12
	1-8 Pharmacology Department	11	-	-	-	11	12
	1-9 Physiology Department	12	-	-	-	12	12
	1-10 Virology Department	10	-	-	-	10	12
2.	Library Staff	7	-	-	-	7	12
3.	Animal Supply Centre Staff	5	2	-	-	7	12
4.	Instrumentation Centre Staff	10	1	1	-	12	12
5.	Stores Staff	4	-	1	-	5	12
6.	Adinistrative Staff	50	-	3	1	54	12

DETAILED ORGANIZATION CHART OF THE DEPARTMENT OF MEDICAL RESEARCH



2-3 Land use planning

2-3-1 Design point of view

The Biomedical Research Centre of the Socialist Republic of the Union of Burma covers the entire biomedical research activities to be carried out at Biomedical Research, Library and Substation buildings now being built (as of December 1977), and the existing Sociomedical and Clinical Research buildings including Animal Houses subject to the current 3rd term construction plan.

Therefore, the concept on basic designs covering the construction plans for the existing buildings and facilities including those now being constructed will be reflected on the current project for animal houses, whereby the utilization of the entire site be finalized.

The overall utilization of the site will be studied with the following factors, and the frame forming this very concept is implicating an entire picture of the planning concept to be carried over to the 2nd term construction plan.

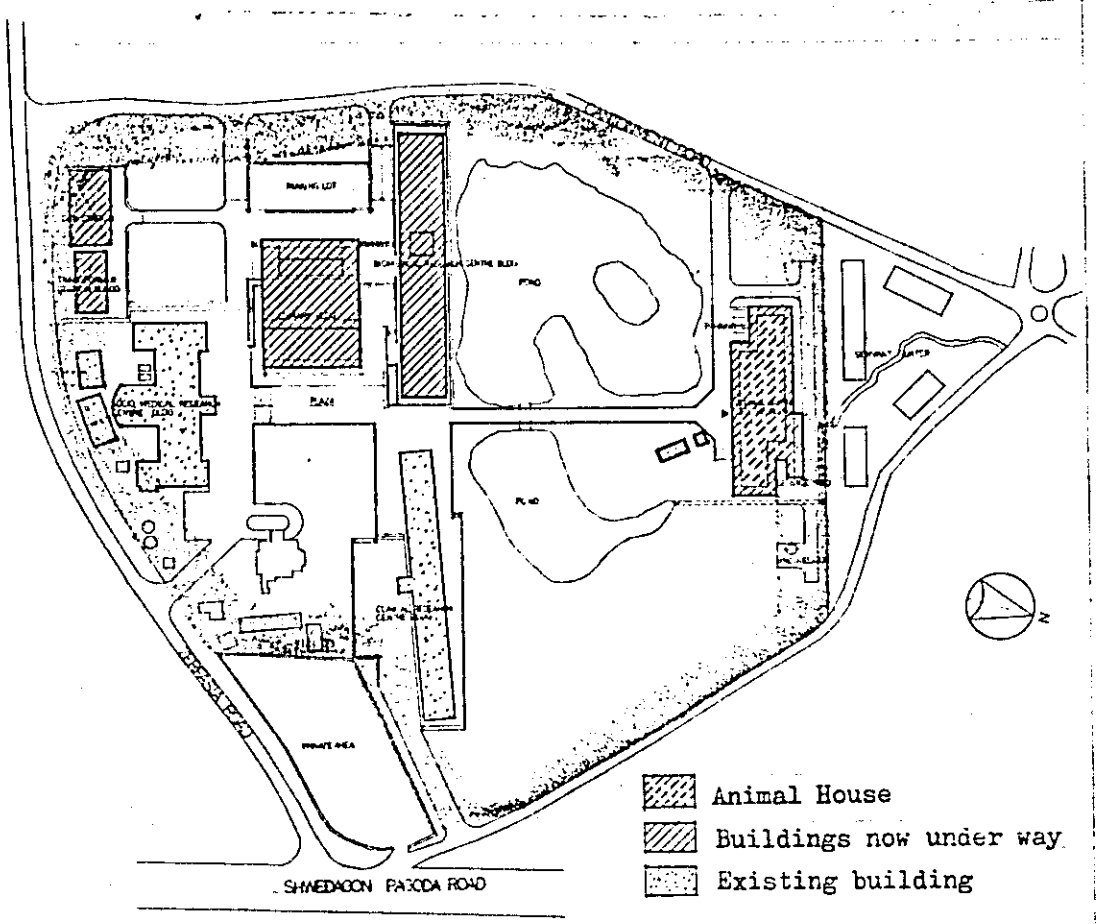
1. Zonning will properly distribute functions of respective facilities to the site, thereby deciding an extent of land utilization, density, purposes and allocation of building volume.

2. Traffice system will functionally operate respective facilities being allocated to the entire site most effectively.

3. Landscaping will set up the collective scenes matching with the natural environment embracing the allocated facilities and those already existing.

thereby visually unify the environment in and out of the site.

FIG 2 Facilities classified by the construction periods



2-3-2 Zoning

Zoning taken up in the current projet may be composed of the allocation of functions of the existing systems in the land use. The reason is that the allocation of purposes and activity of the given facilities on the utilizing land is reflecting the entire research activities. Zoning thus classified is shown hereunder.

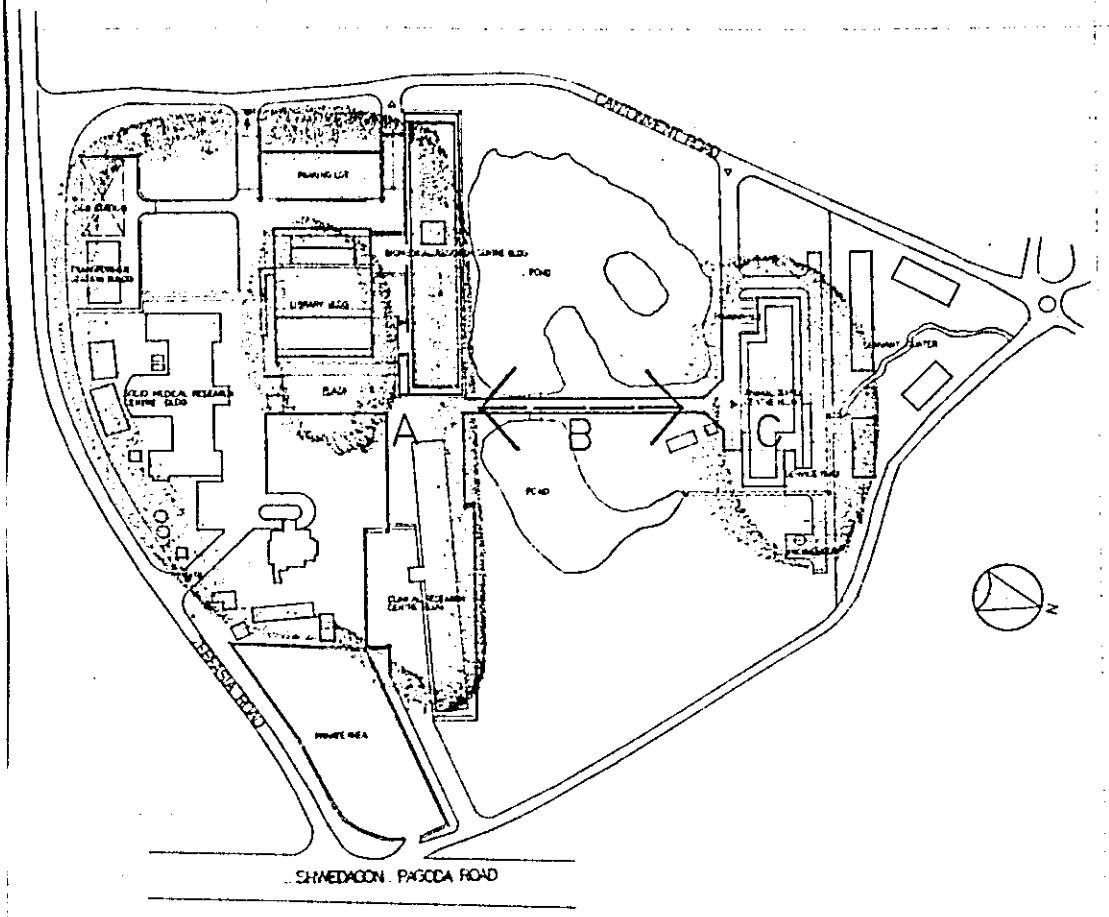
A zone: Zone for facilities (including public facilities and library) centering medical resarch activities.

B Zone: Rest zone as being a static space.

C zone: Zone where animal houses are allocated (the current project)

There exists a servant quarter of about 0.3 ha. on the northern end of the site, but this is independent of the current construction project. Hereunder are given detailed descriptions on respective zones.

FIG 3 Zoning



A zone: This particular zone where research activities will be carried out is grouped depending on the characteristics of function (similarity in research activities).

What is aimed at by such a grouping are the effective management and maintenance of research activities. Major facilities composing A zone, namely, Socio-medical, Clinical and Biomedical Research buildings, are the center of the Biomedical Research Centre

functions, and the pivotal of all the research activities. These facilities have to be independent in their activities while assisting mutual research activities.

On the other hand, a number of facilities (such as library and square, etc.) supporting the above research activities are being planned to be located on the centre of A zone so that such facilities could be used more effectively for research activities.

B zone: This quiet and green space is a so-called "rest zone" which forms a buffer area, visually linking A and C zone, and also a place where the natural environment embracing ponds and trees should be preserved exclusively. Particularly, this zone fulfills its function of removing bad smell and noise from animal house .

C Zone: Animal house subject to the current project will supply animals not only for the experiments by Biomedical and Clinical Research Laboratories but also the research institutions other than the Biomedical Research Centre.

The production and breeding are not the only role given to this animal house since experimental researches will also be carried out at this animal centre. Thus, C zone has to be separated from other zones because of the functional independence of animal house ,
Nevertheless, this zone is closely linked with A zone and there will be a heavy traffic of animals

and research staffs as well as various service items. Thus, the passage to C zone is not for vehicles but for either human or animal traffic.

Scene of B zone one could command from this passage will give him a visual pleasure while having a break after research works.

2-3-3 Traffic movements

This is a system of all the traffic linking facilities of each zone. The concept on this very system means a dynamic flow which makes it possible for the facilities under respective zonning to fulfill the given functions. It is a flow of vehicle, people, water, energy and information and so on which reflects the whole system in the end. In other words, it is a means to study the current project by converting all the research activities into a flow of elements which could largely be divided into the following 5 different categories.

1. Human being and vehicle
2. Physical items
3. Water
4. Energy
5. Information

The following is a brief study on each one of the above categories. As for the existing facilities, particularly Sociomedical and Clinical Research buildings covered under 4. and 5. categories are equally independent in their systems. Therefore, the facilities linked with the equipment system of Animal House are Biomedical Research, Library and Substation buildings now being established, and it is possible to take out a node of both input and output of these facilities from the location in a drawing showing a square on the eastern end of Biomedical Research building.

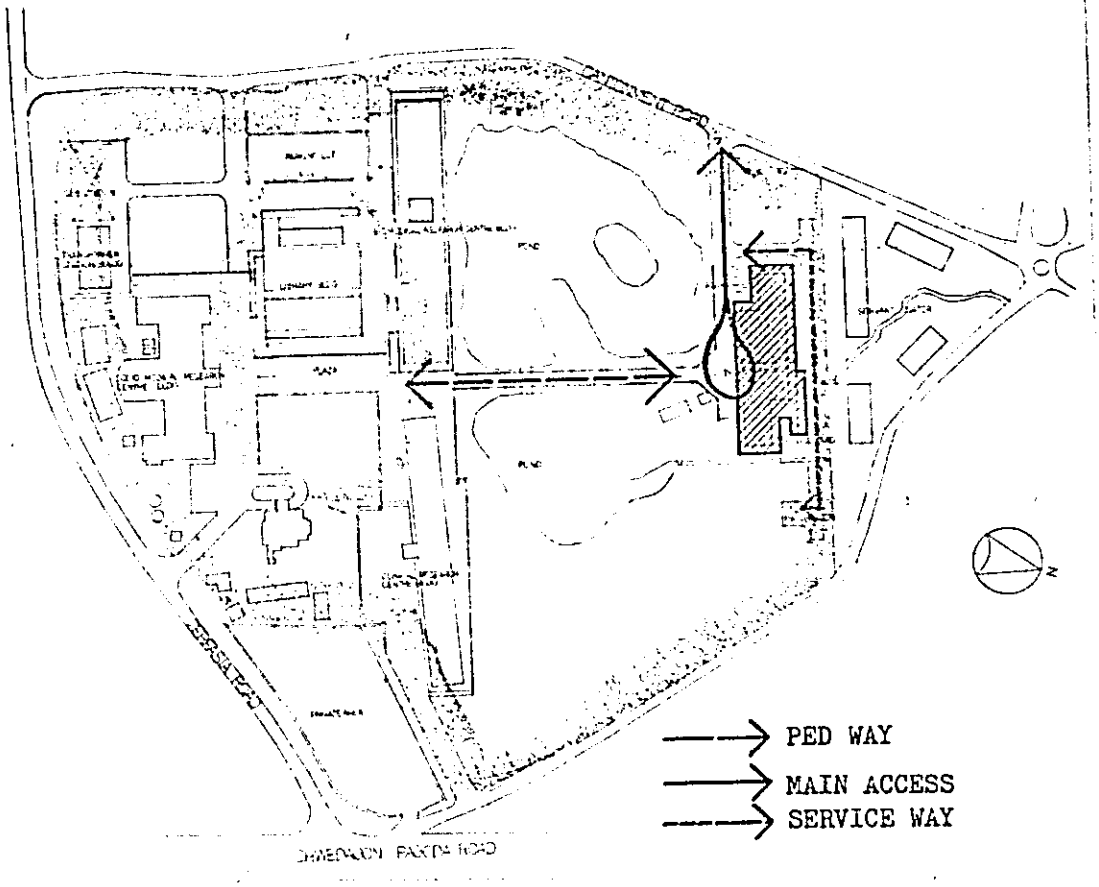
1. Human being and vehicle

A zone for human being and vehicle traffic was separated from the access to animal houses for the purpose of enabling more effective activities. The surrounding roads on the West side are basically the access for vehicles, while the passages linked with the central facilities are for human beings. Vehicles roads are mainly subject to various services.

2. physical items

This flow is included in the above human and vehicle flow. The traffice of physical items (including animals) depends on three lines of passages, namely MAIN ACCESS WAY, PED WAY and SERVICE WAY. Particularly, incinerated waste of experimental animals will be taken out of the site through the SERVICE WAY.

FIG 4 Transportation of human being vehicle and various items.



3. Water

Water obtained from deep wells outside the site for water supply will be examined at the Biomedical Research Centre and distributed thereafter to NODE through a water tower. Thus, water will be supplied to animal houses directly from NODE through water supply pipes.

Sanitary sewage, waste and experimental soil water have respective drainage systems, but because the total volume is relatively smaller, the drainage will be kept temporarily in a distributing reservoir. The drainage will then go through NODE and flow into SEPTIC TANK now under way which is linked with MAIN SEWER PIPES; while storm sewer be led to open channel grooves around animal houses and then to a pond on the South side. Particularly, since the land becomes swampy because of the poor drainage on the current project site, the distribution system has to be established before the construction of animal houses be started.

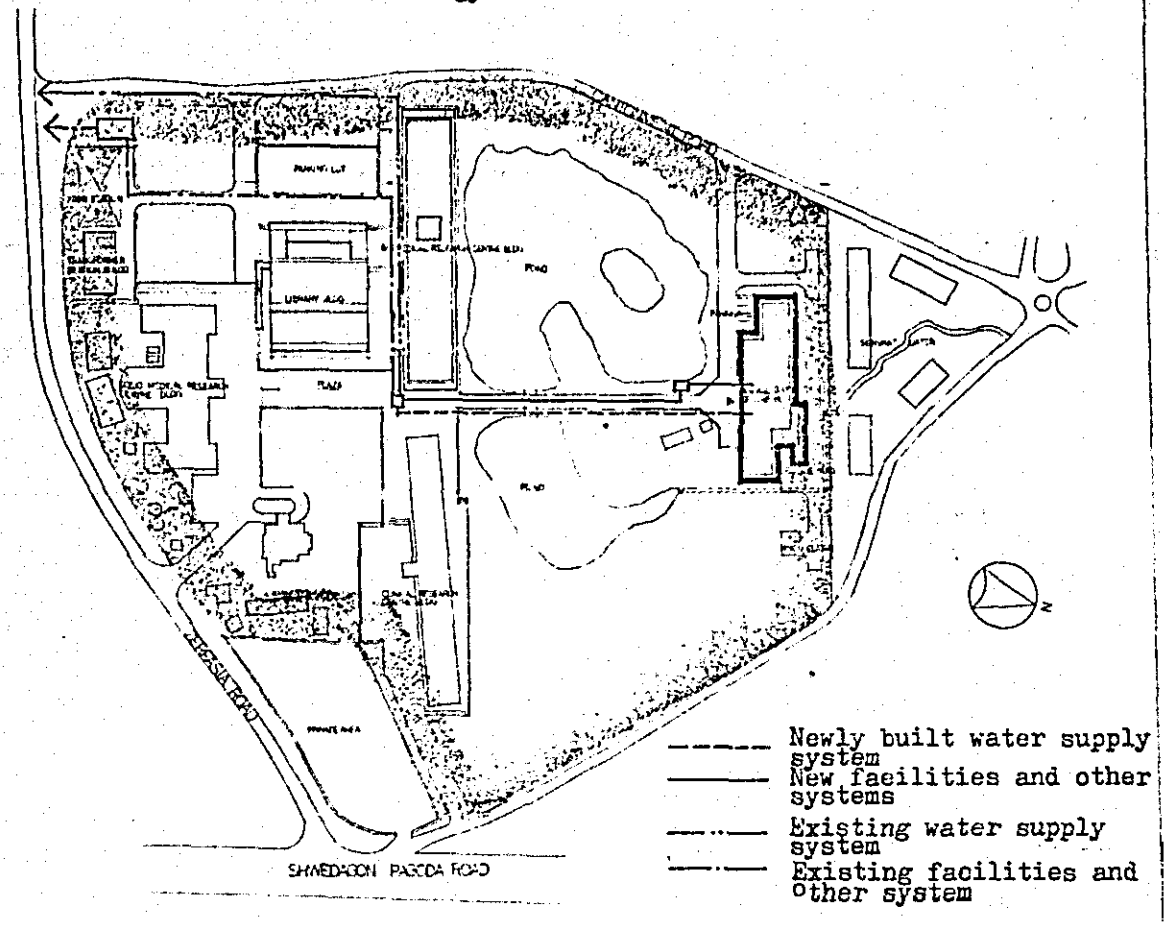
4. Energy

Energies to be supplied to animal house are electricity and gas (for experimental researches). The power supply will be stable when the construction of SUBSTATION be completed. When the maximum electric power consumption of animal house is estimated at 250 KVA, the electric power as high as 6,600 V receivable from SUBSTATION will be stepped down to 400 V and 230 V by a transformer equipped with the animal house.

5. Information

This is mainly a flow of information through telephone services. No direct central telephone exchange will be established, and calls will be connected with other facilities through a switchboard equipped with Sociomedical Research building. Communications between animal house will be made by interphones whenever necessary.

FIG 5 Transportation of water, energy and information.

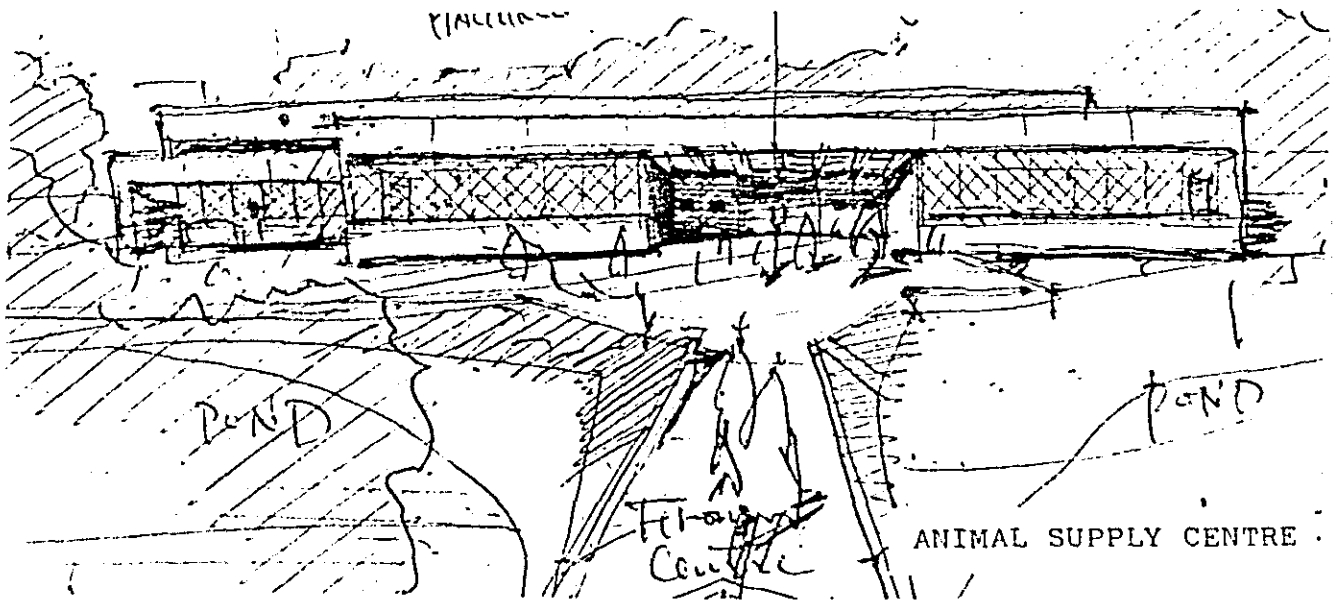


2-3-4 Landscaping

The foundamental viewpoint of appreciating a lanscape is to study AMENITY mainly associated with human being correlated with the surrounding facilities and environments. Thus, the major viewpoint upon treating a landscape in the current project is to examine the physical environments of the existing facilities attaching an importance to animal house .

Thus, what is required in the first place is to secure an appropriate outdoor space between the facilities and to signify a junction of such a space with ponds, verdure and facilities. It is therefore recommendable to locate facilities on the northern end of the site so as to occupy both edges of ponds to create some appropriate space variation over the entire site.

In the second place, it is required to unite the physical form of animal houses with the rest of facilities, for the physical beauty of the existing facilities that will eventually affect the entire site is taken into consideration, and the physical rythm of the existing facilities thus harmonized will decide the physical form of animal houses in creating an overall landscape on the project site.



2-4 Architectural design

2-4-1 Role given to animal house

Animal houses are the supply centre of experimental animals which will help each sector of the Biomedical Research Centre to obtain the experimental materials and the necessary data. These animal houses will fulfill their functions as an overall supply depot in the Socialist Republic of the Union of Burma.

2-4-2 Functions of animal house

1. Supply of information concerning ecological conditions of experimental animals.
2. Development of cages suitable for transporting experimental animals.
3. Development of animal feeds (breeding method) consisting of indigenous ingredients for various species.
4. Studies on the problems arised from various diseases or experimental failures.
5. Technical training of handling animals.
6. Expe rimental preservation of animal species.

2-4-3 Breeding facilities of experimental animals and their classification

The breeding environment of animals (contruction of facilities) will be decided by the requirements depending on the type of experimental breeding animals and environmental factors.

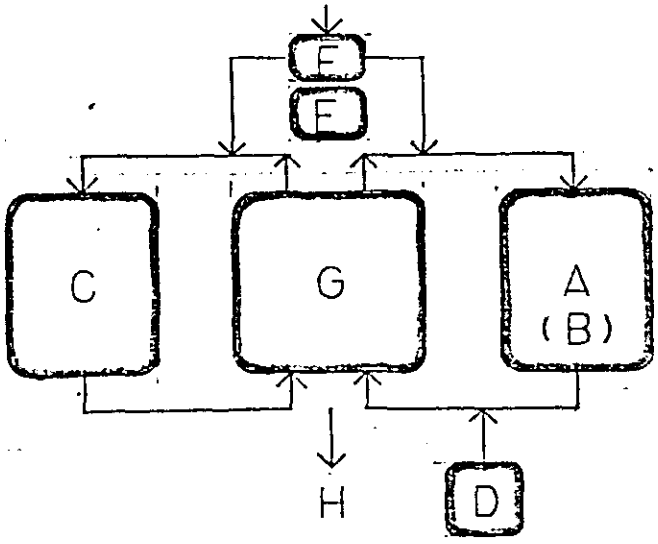
Kinds of Animal breeding

A. Production
B. Reproduction
C. Breeding
D. Experimental breeding

2-4-4 Functions of animal house

A. Breeding area (area for breeding, reproduction and observation)
B. Area for receiving animals (area for inspecting and quarantining animals brought in)
C. Experimental area
D. Area for accomodating various items and storage
E. Administrative area
F. Shower, locker and lavatory
G. Washing and sterilizing area
H. Incinerated animal carcass and waste disposal facilities

FIG 6 Functional chart



2-4-5 Breeding rooms of experimental animals

Animal rooms are recommended to be large enough for multi-purposes. When the dimensions of cage and its wheeled stand and their allocation are taken into consideration, the width of a breeding room given in Fig..... can be visualized. A part of these axial unit dimensions should conform with that of a laboratory, which will have to be 5-6 m in depth and not less than 3.5 m in height on the average.

The size of a door has to be decided in accordance with the size of equipment (wheeled stand for cage and its conveyor). Thus, it has to be at least 100 cm for a single door and 140 cm is standardized for a double door.

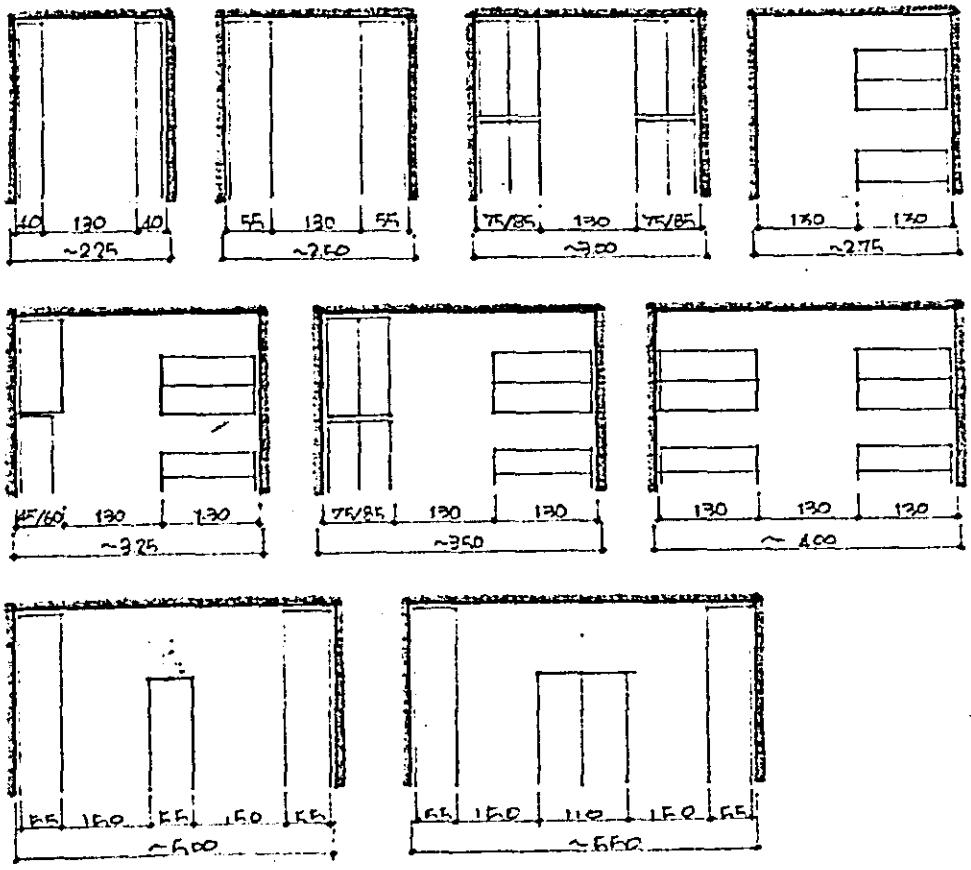
Viewing windows will be built in either external or internal wall between a corridor and an animal house so that one could see the inside of animal house from outside. However, these windows should not be too large in size for preventing heat or cold from coming in.

Either wall or ceiling has to be easily accessible for cleaning and sterilizing works and the drainage for sanitary sewer or waste should be built in the room. Electric heater may be installed whenever necessary, for the general heating purpose, but warm air heating system will be adopted instead when more heat be required.

Generally, the number of air change by an air supply and outlet equipment for animal houses will have to be 10-15 times/hr. on the average. The floor area required for the breeding of exp erimental animals is generally as follows.

5,000	Mouse	20 m^2
500-1,000	Rat	20 m^2
250 -.500	Guinea pig	20 m^2
100	Rabbit	20 m^2

FIG 7 Allocation of instruments and equipmnent breeding room of experimental animals and module.



2-4-6 Standard temperature and humidity required for the breading of experimental animals

The left side Table shows standard temperature and humidity values being adopted in the Western countries, but due to the different climate, natural features and various other conditions in the Socialist Republic of the Union of Burma, standard values given in the right side Table should conceivably be adopted for the breeding plans to be established.

Standard temperature and humidity required for the breading of experimental animals.

Animal speices	Temperature			Humidity			Reference	Temperature			Humidity		
	Min.	Opt.	Max	Min.	Opt.	Max.		Min.	Opt.	Max	Min	Opt.	Max.
Mouse	20.0	22.2	26.7	30	50	80	A. W. I						
	22.2	—	24.4				W. Thorp	20	26	28.29	30	70	80
	21.0	—	26.7	50	—	55	Inst. L.A.R						
Rat	20.0	22.2	26.7	30	50	80	A. W. I						
	22.2	23.3	24.4				W. Thorp	20	26	28.29	30	70	80
	21.0	—	26.7	50		55	Inst. L.A.R						
Humster	20.0	22.2	29.4	30	50	80	A. W. I						
	21.0	—	24.0				Inst. L.A.R						
Infant & child	20.6	—	21.7				〃						
Breeding room	22.2	—	23.3				〃						
Mornot	15.6	21.2	26.7	30	50	80	A. W. I						
	22.2	—	24.4				W. Thorp	20	26	28.29	30	70	80
Rabbit & Cat	15.6	20.0	26.7	30	50	80	A. W. I						
	18.3	22.2	24.4	30	50	80	A. W. I	20	26	28.29	30	70	80
Monkey	23.9	24.8	25.6				W. Thorp						
	16.7	28.2	37.8	30	50	80	A. W. I						
Dog adult	12.8	22.2	37.8	30	50	80	A. W. I						
Infant, Child	21.1	23.9	35.0	30	50	80	〃						
General	18.3	23.9	29.5	40									
	22.2	—	25.6										

Note : A.W.I. : Animal Welfare Institute; Comfortable Quaters for Laboratory Animals, Oct. 1956.

W. Thorp: The Design of Animal Quaters; J. of Med, Education Vol. 35, No. 1, Jan. 1960.

Inst. L.A.R : Institute of Animal Resources, National Academy of Sciences, May, 1962.

2-4-7 Number of air change per hr and amount of ventilation

The figures given hereunder are recommendable for the number of air changes (figures indicating the number of times of filling the room volume with the amount of air supply per hr) and the air volume, but they vary depending on the external conditions and requirements for the proposed facilities.

Required number of air changes and amount of ventilation
(Fresh open air)

No. of air chenge	Animal speices	Reference
5～10	Geveral	ASHRAE Guide 1961.
10～15		Guide for. Lab. Anim. Core.
6.～10～12	Mours	(12) Inst. Lab. Anim Res.

Note: Whether we term "air chang per hr" means Fresh open air or air supply to an animal house is often obscure, but here it means "Fresh open air".

Metabolic amount of classified by species and required amount of ventilation

Animal species	Weight (g)	Metaboli amount no. of animals equivalent to that of man	Required for keeping the air fresh		Desciption
			Air volume (m /NO.)	Amount of ventilation (m /h/NO.)	
Mouse	21	672	0.085	0.85	Move aitiued move arund at midnight
Rat	200	110	0.113	1.27	
〃	400	73			
Hamster			0.113	2.54	
Guinea pig	410	70	0.170	1.7	
Rabbit	2,600	21	0.283	3.2	
Cat	3,000	16	1.0	17.0	Metabolic rate is considered almost some as that of man
Monkey	3,000	16	—	—	
Dog	14,000	5	4.25	4.72	

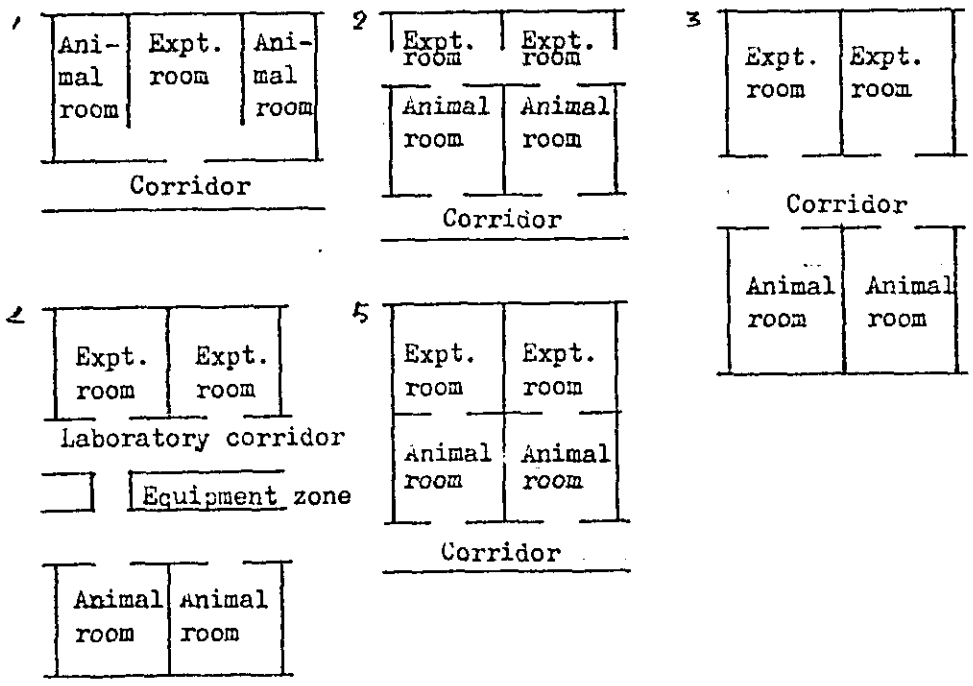
2-4-8 Allocation of animal rooms and laboratories

It is desirable to have free access between experimental animal rooms and laboratories. It may be an idea to have a laboratory between two aniaml rooms when the rooms are arranged on the same line. When a building has a corridor in the middle, animal rooms are often arranged on one side and laboratories on the other.

In the current project plan, animal rooms will be arranged along the window and a treatment rooms on the side of corridor.

Arrangement samples shown hereunder are so proposed for raising up movability and workability within the minimum space of laboratories.

Fig 8 Allocation of animal rooms and laboratories



2-4-9 Energy production of experimental animals

The following Table shows energy output, body weight and body surface area.

Energy Production

Animal	Body weight (kg)	Body surface area (Square meters)	Energy output *	
			(cal./kg./day)	(cal./square meter/day)
Man	56 −65	1.65−1.83	23.2−25.5	790−910
Baboon	6.2	0.40	48	760
Chimpanzee	38	1.1	29.2	980
Macaque	4.2	0.31	49.3	675
Rhesus monkey	3.2	0.26	48.4	610
Dog	11.7−15.5	0.58−0.65	33.5−38.5	770−800
Rabbit	3.5	0.2	47	810
Guinea pig	0.8	0.07	62	690
Rat	0.2	0.03	130	830
Mouse	0.02	0.005	170	525

* The energy output values represent basal metabolism.

Reference

Comparative Biochemistry. (Edited by M. Florkin, H. S. Mason) Vol. I Sources of free Energy. p. 495(1960) Academic Press. New York and London.

W. S. Spector, ed., "Handbook of Biological Data." National Academy of Sciences - National Research Council, Washington, D. C., 1956.

2-4-10 Project animal production

The dimensions of animal breeding facilities and the number of animal in the annual production were decided in late 1977 in accordance with the supply and demand of animals. However, the current project has to be initially planned in both the construction and equipment to meet an eventual increase of supply and demand in future through the possible reproduction of animals.

The following are the number of animal species in the annual production requested by the Government of the Socialist Republic of the Union of Burma and the same currently proposed for the current project.

	Number of animals requested by the Government of the Socialist Republic of the Union of Burma (per year)	Number of animals proposed for the current project (per year)
Mouse	10,000	16,000
Rat	5,000	3,800
Guinea pig	3,000	1,200
Rabbit	3,000	1,200

The above figures proposed for the project are based on the production ratio of about one half of the Japanese domestic production. As for larger size of animals, they are expected to be raised and used for experiments. In such a case, the existing facilities may be used, but it will be necessary to plan the construction of additional facilities.

2-4-11 Room dimensions

The floor area required for each animal room is as follows. Each floor area given in an attached Table is merely estimated for the project plan, and thus there amy be some deviation the final plan.

Area table

Control Section (General)	Entrance Holl	3 6	
	Rocker Ravatory Breeding section Shower	3 6	
	Rocker Ravatory Laboratry section Shower	3 6	
	Storage room	1 8	
	Machine room	3 6	
	Electric room	1 8	
	Boiler room	1 8	Total 1 9 8 m^2
Breeding Section	5 Breeding rooms	3 6 × 5 = 1 8 0	
	Clean, Bench room	1 8	Total 1 9 8 m^2
Laboratory Section	4 Laboratories	1 8 × 4 = 7 2	
	I Laboratory for nifections diseases	2 5. 5	Total 9 7. 5 m^2
	Washing room	3 6	
	Working space	3 6	
	Storage room (equipped with a washing room)	1 8	
	Storage room and finishing room (Food)	3 9	
	Storage (Bed)	6	Total 1 3 5 m^2
Pubbic use	Corrider	5 3 4	Total 5 3 4 m^2
	Total		Total 1, 1 6 2. 5 m^2

2-4-12 Flow diagram

The flow of the following 5 items is taken up here. Each one of these items has to be studied as an independent flow for the smooth mangement of animal rooms without affecting the flow of other items.

1. Research staffs (could also be administrative staffs)
2. Animal (in principle, animals are not expected to be sent in this research laboratory through any outer sources)
3. Equipment (cages, etc.)
4. Feed
5. Waste (animal carcass and feces)

Fig 9 Research staff flow

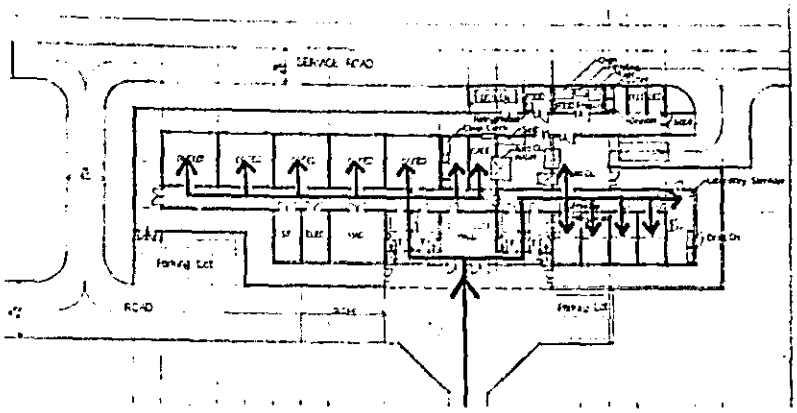


Fig 10 Administrative staff flow

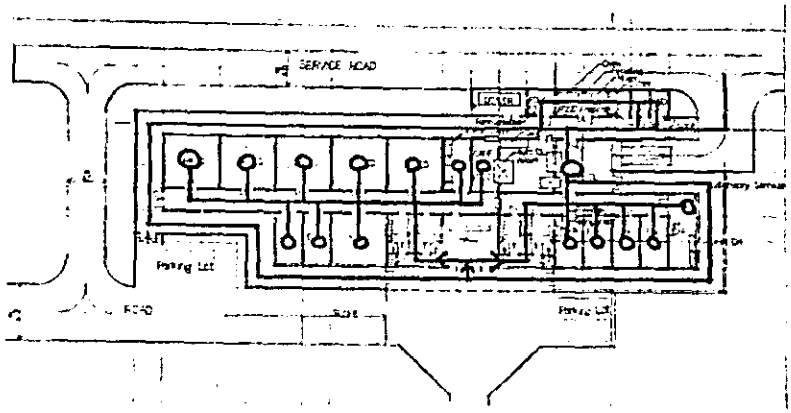


Fig 11 Tools and instruments flow

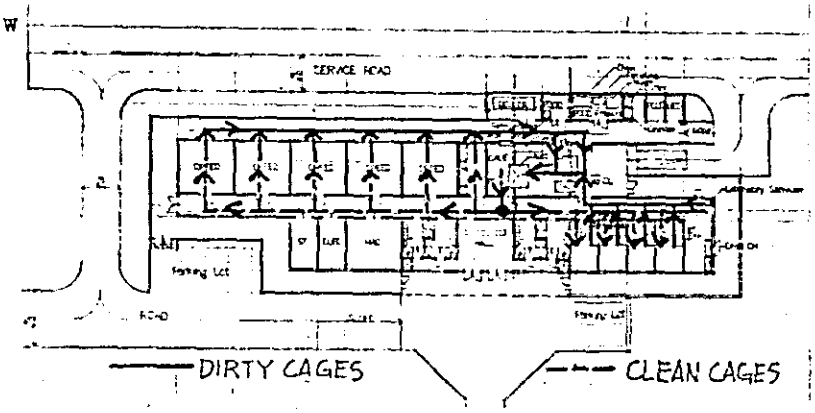
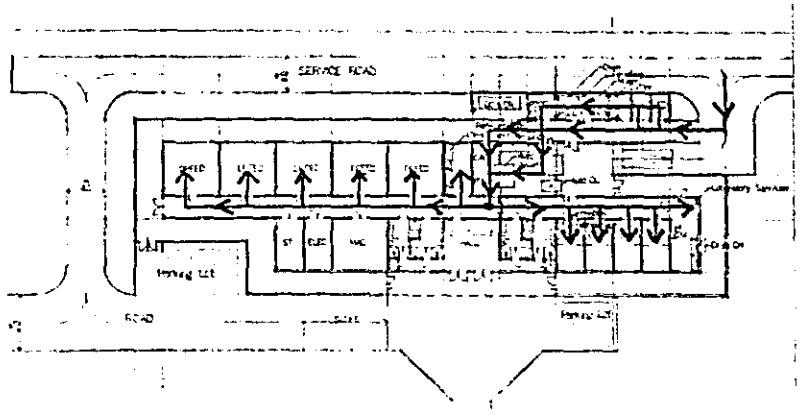


Fig 12 Feeds flow



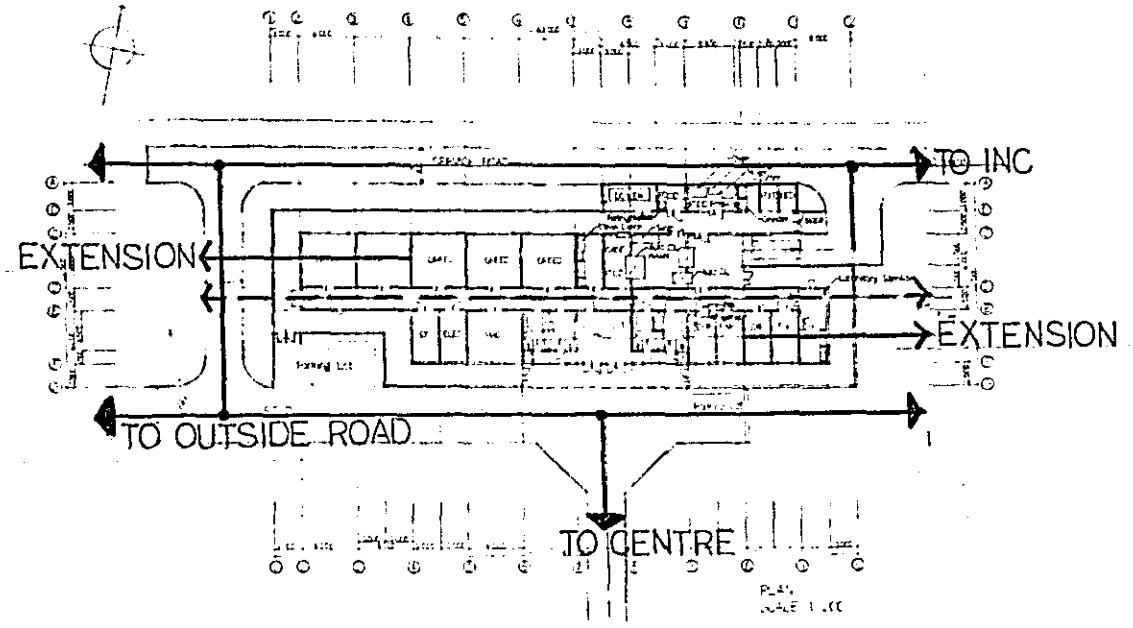
2-4-13 Traffic movement and functional diagram

Internal functions of animal rooms can be determined with the effective research activities as well as the animal house environment conformable with the requirements. Such internal functions closely related with an external traffice system will determine an entire functional system of the animal house. Also, a correlation between an axis of external traffic surrounding animal rooms and an axis of internal traffic may form a functional concept of the animal house. A traffic axis of internal functions being developed toward a direction same as that of external functions (roads) means that an entire building coping with the change of internal functions is at least in a flexible structure. As the result, an axis of flow of various items inside animal rooms will be established in parallel with an axis of external roads.

Internal functions will be divided into breeding room and laboratory on the main axis of clean corridor and contaminated corridor, and each room will be arranged centering around sterilizing and washing rooms. When the concepts on the distribution of these two functions are combined, a basic model of the animal house will be finalized.

Futhermore, the resultant internal functions of these animal rooms will be made accessible by the outsiders for the eventual reproduction in future. The following functional distribution is extensible. In other words, this is a concept indicating a system which, in future, will allow some variation of such factors that could hardly be determined at present.

FIG 13 Traffic system amd functional diagram

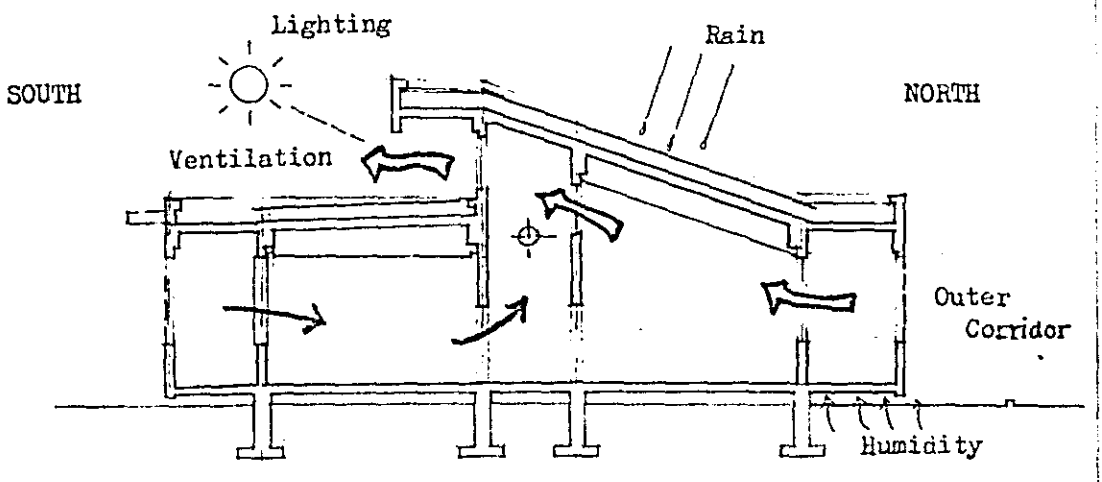


2-4-14 Model and materials

This very model decides the distribution of internal space, but it also has to be a factor clarifying its correlation with an external environment. Particularly, main factors deciding the model in the current project will be influenced with the environmental factors in Burma, for the natural environment (much rain, much moisture and high temperature) as well as social and economic environment (social custom, system and economic conditions, etc.) will have a significant meaning in determining the features of the project facilities.

Animals are quite sensitive by nature against their living environment, and thus the animal house has to be surrounded by an environment far more strict in every sense than that artificially created for facilities to be utilized by human beings. However, animal rooms subject to the current project plan will have to match the social and economic systems and well harmonize with the natural environment in Burma upon planning this particular facilities. This is a concept based upon the necessity of coping with the minimum requirements for an artificial environment to be created for animal rooms in this country.

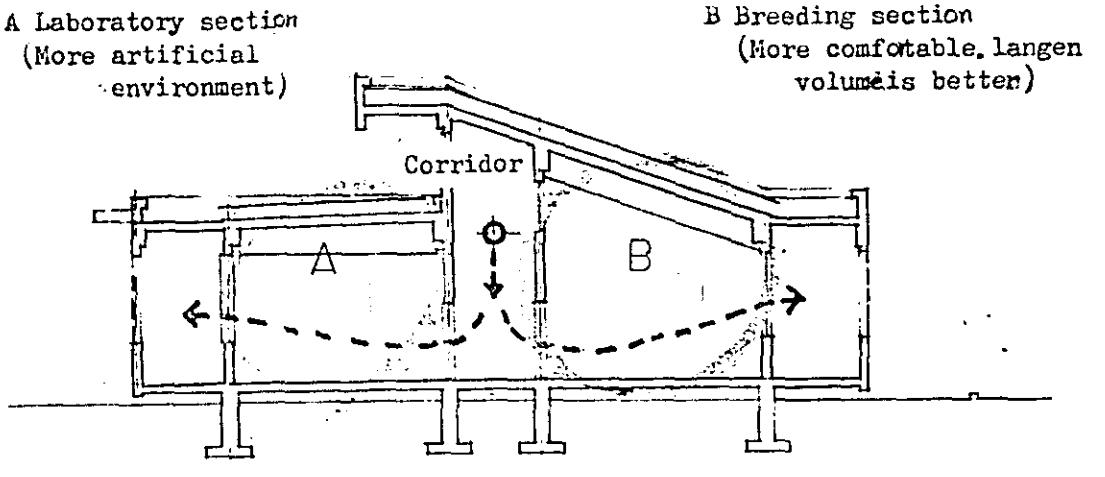
FIG 14 Building model and natural environment



Floor slab will be floated about 60 cm off G.L. so that the possible damage due to humidity or water could be minimized. The construction materials and model of animal houses are mutually supplementing. Just as much as the determination of a building model be influenced by various environmental factors in Burma, it is considered necessary to use as many local materials as possible (as long as environmental functions inside animal houses could be maintained).
(The above is judged from the actual results experienced in the past construction carried out for various facilities of the Biomedical Research Centre).

Most of materials to be used for the subject structure will be procured in Burma. As for finishing materials, the minimum quantity of materials such as paint, tile, etc. will be imported from Japan, and alminum sash, glass, steel door frame, instruments and equipment will also be obtained from Japan.

FIG 15 Building model and artifieial environment



2-5 Structural design

The subject structure, namely the basic concept of construction, should be determined by reproducing those plans for the existing facilities and the actual results obtained.

Unless various kinds of technical assistances of the Government of the Socialist Republic of the Union of Burma can be expected, the current project will never be materialized, and the same could be said to the additional construction of any facilities in future. Bearing this in mind, structural designs for the current project have been determined as follows.

The current project will be a reinforced concrete building of a Rahmen structure with a main framework consisting of beam and column, and bricks locally procured be used for both internal and external curtain type walls.
The wall will be resistant in its built for self load as well as external forces such as seismic intensity and wind pressure.

Whatever necessary calculations will be based upon various calculation standards which have been adopted to date by the Institute of Japanese Architects, and the methods currently being used in Japan will be applied to the calculation of allowable stress, elastic stress and proportioning, etc.

As for design loads (load and wind, etc.), the values given in Article 85 of the Building Standards Enforcement Ordinance of the Japanese Government will be applied. The lateral seismic coefficient value for earthquake load will be 0.15 which is given for the facilities now being constructed.

As the result of geological survey carried out for the site, sandy clay in the vicinity of G.L. - 1.50 m was found to be a supporting ground for which a foundation method will be employed. The drawings will be made on the assumption that the bearing capacity of ground is t/m^2 as the result of soil test (direct shear test). Sampling in the soil test was made at D.H. No. 1 as deep as 4'-6'. The bearing capacity of ground will be confirmed by plate loading tests to be carried out on the excavation surface.

The following materials will be used for the current project.

Concrete: Not less than Fc=150 kg/cm^2 in 4 weeks' compressive strength

Reinforcing steel:

Hot rolled steel bar (JIS G3112) equivalent to SD30

2-6 Equipment plan

The following are the elements which decide the equipment for animal houses, and the conditions related with these elements will be finalized with due consideration of various other factors in Burma.

1. Ventilation
2. Temperature
3. Humidity
4. Lighting
5. Disposal
6. Washing
7. Sterilization

2-6-1 Air conditioning and ventilation equipment

Breeding room and laboratory will be air conditioned. The removal of humidity will mainly be aimed at in the air conditioning system rather than the adjustment of temperature. Thus, air conditioner will be installed in each room. The cooled air will be led out to respective rooms by all- fresh-type of packaged air conditioner, and then air will be exhausted thereafter by ventilater.

Ceiling fans will be set in the rest of rooms and ventilating fans will be employed for a sterrlization section, while the natural wind be led into other rooms for ventilation. It is particulaly important to adjust the pressure so that the air will not be backflowed from either breeding room or laboratory to corridor.

Sterilization steam will be obtained by burning oil (A or B heavy oil). This steam can be used for cleaning laboratories for infectious disease and hot water for laboratory sinks.

2-6-2 Water supply, drainage and sanitary equipment

1. Water supply

The water supply pipe of the Research building will be divided and directly connected with a water pipe inside animal house.

2. Drainage

Storm water will be led out to ponds through street inlets along the building. Sanitary sewage, waste and experimental soil water will be stored in a distributing reservoir for about one day, and pumped up to a septic tank for the treatment. The drainage outside the building will be completed before starting the current project.

3. Gas

Gas will not be provided as the partial installations, and a gas generating apparatus will be brought in for the use whenever necessary.

4. Incineration

Incineration equipment will have to be capable of dispose approximately 50 kg of small animals per hour. Foundry pig iron will be used for the body of equipment since an oil burning system will be employed. Although it may have nothing to do with the function, a chimney as tall as 8 m will be erected for the purpose of removing smell.

5. Hot water supply

Electric heater will be used for boiling drinking water and steam for hot water to be supplied to laboratories. A mixing valve will be used for the supply of hot water to whichever places required. Hot water will not be supplied to washbasin or shower in the general rooms.

2-6-3 Electric power equipment

1. Receiving and transforming

A potential device installed in the building transforming about 250 KVA will supply 3 ϕ 4W 400V I ϕ 2W 230V and I ϕ 2W 110V for the electric light and laboratory electricity.
A breaker will be operated by an electromagnetic controller. Draft chamber, clean bench and refrigerator being connected with self-excited generator will be cut over automatically.

2. Feeder line and power equipment

Piping and wiring works will be carried out from electric switchboard to power controlling and electric light distributing boards, and wiring works from power controlling board to each electric motor will also be done.

3. Electric light and plug socket installations

Installation of lighting instruments, laboratory and general plug sockets as well as the required piping and wiring works will be done. Lighting for breeding room and laboratory will be around 300 lux and about 200 lux for other rooms. When the service be interrupted, power will be supplied for refrigerator and so on by a non-utility substation.

4. Telephone services

Telephones will be connected with a switchboard for section party telephones within a station yard which are now being planned to be installed in Research building and Library. Telephones will be installed in breeding, laboratory and control sections respectively.

2-7 Cost estimates

The construction cost was estimated on the following conditions in accordance with the estimated cost of respective machinery based upon preliminary designs.

1. Site will be flatly levelled and no obstacles be remained on the ground.
2. Power and service water supply for the construction works will be available on the site.
3. Ordering will be made in the same manner as was done for the 1st and 2nd term constructions.
4. Machinery installed for the 1st and 2nd term construction could be used continuously.
5. Aggregate, cement, lumber, brick, slate and floor tile, etc. will be procured in the Socialist Republic of the Union of Burma.
6. Materials and machinery will be free from duties same as those obtained for the 1st and 2nd term constructions.
7. Price rise will be absorbed to some extent.

Total sum of cost: ¥

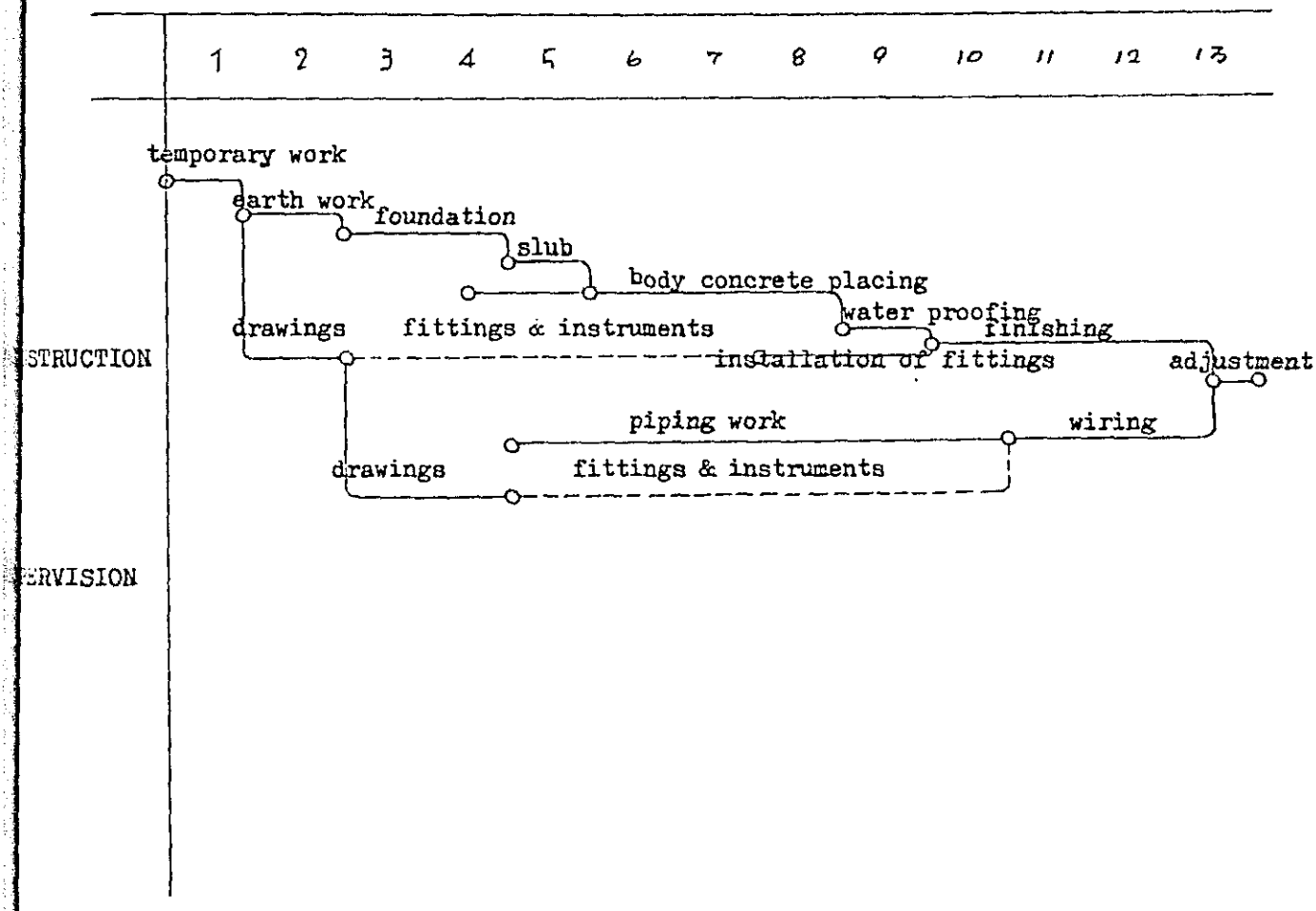
Details:

1. Construction work
2. Electric installation work
3. Machinery & equipment installation work
4. General outdoor work
5. Designing & supervision cost

2-8 Working schedule

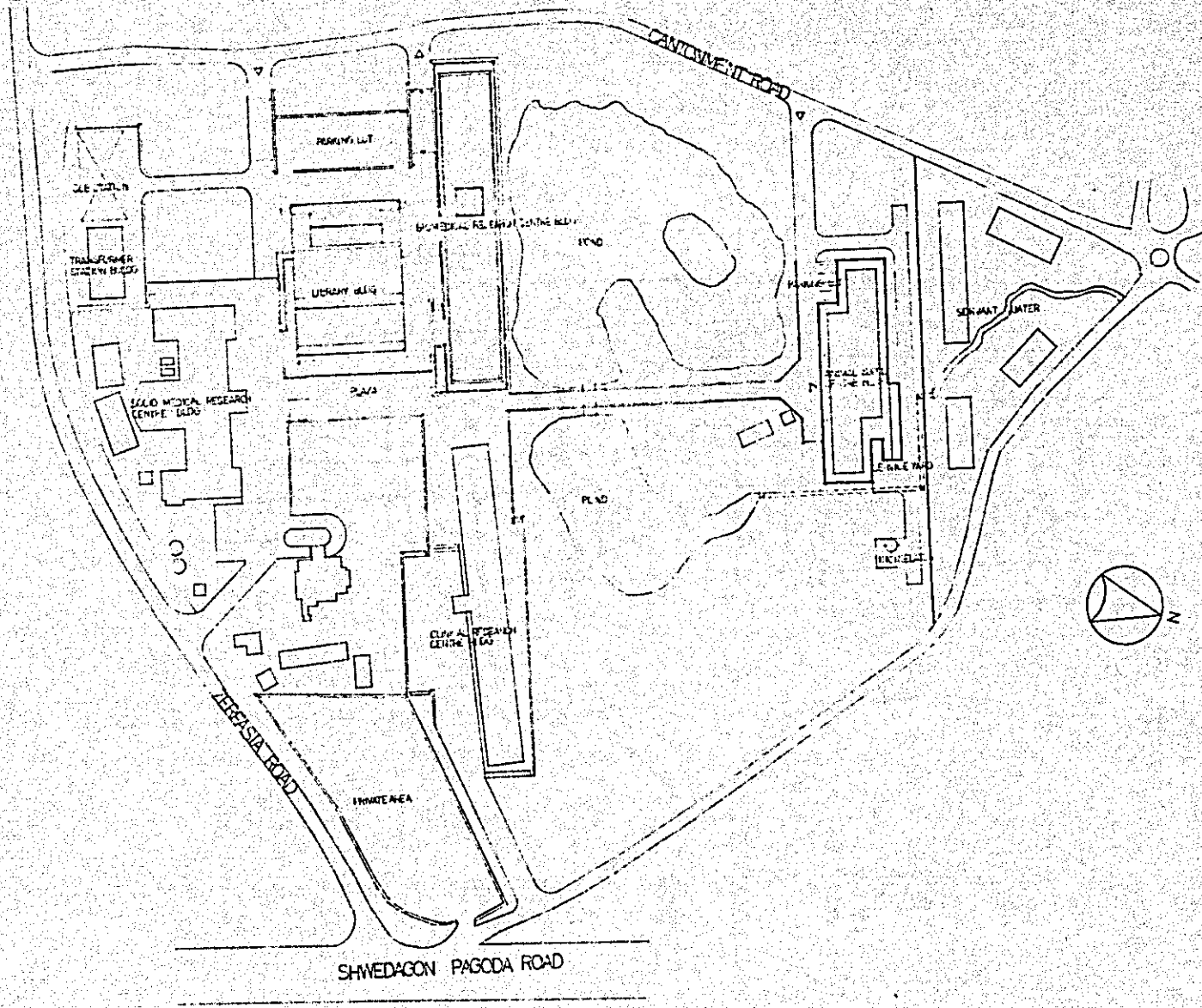
When form materials be procured smoothly, there won't be heavy delays in the working process schedule of the current project related with the Biomedical Research Centre in Burma. It will be possible to obtain such specific products as fittings, instruments and equipment from Japan along with the construction schedule. As for concrete placing, 60~70 m^3/day will be the maximum level in view of the results obtained in the 1st and 2nd term constructions. Form building and reinforcement works may take 3 times than that generally executed in Japan.

WORKING SCHEDULE

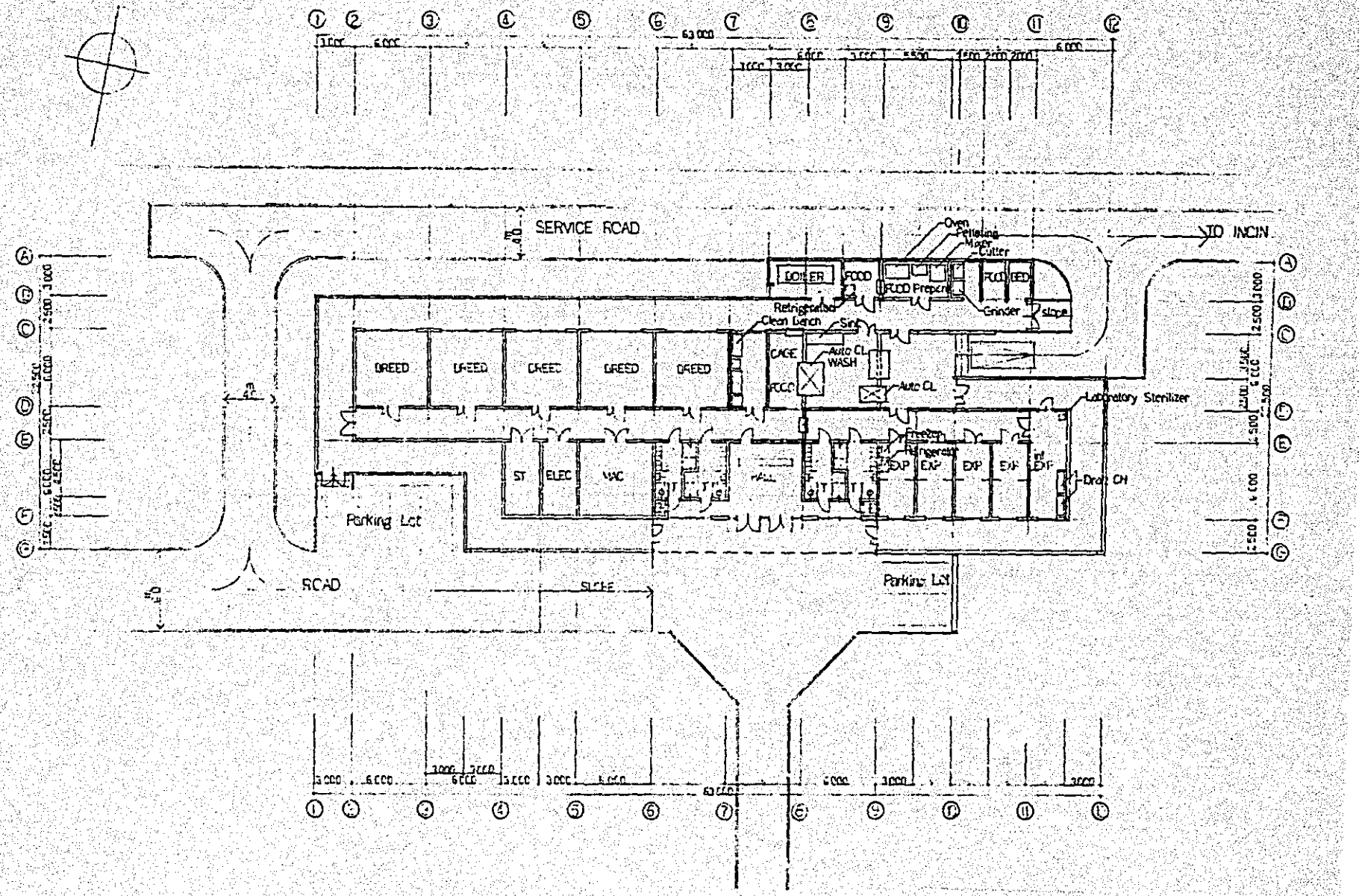


2-9 SITE PLAN

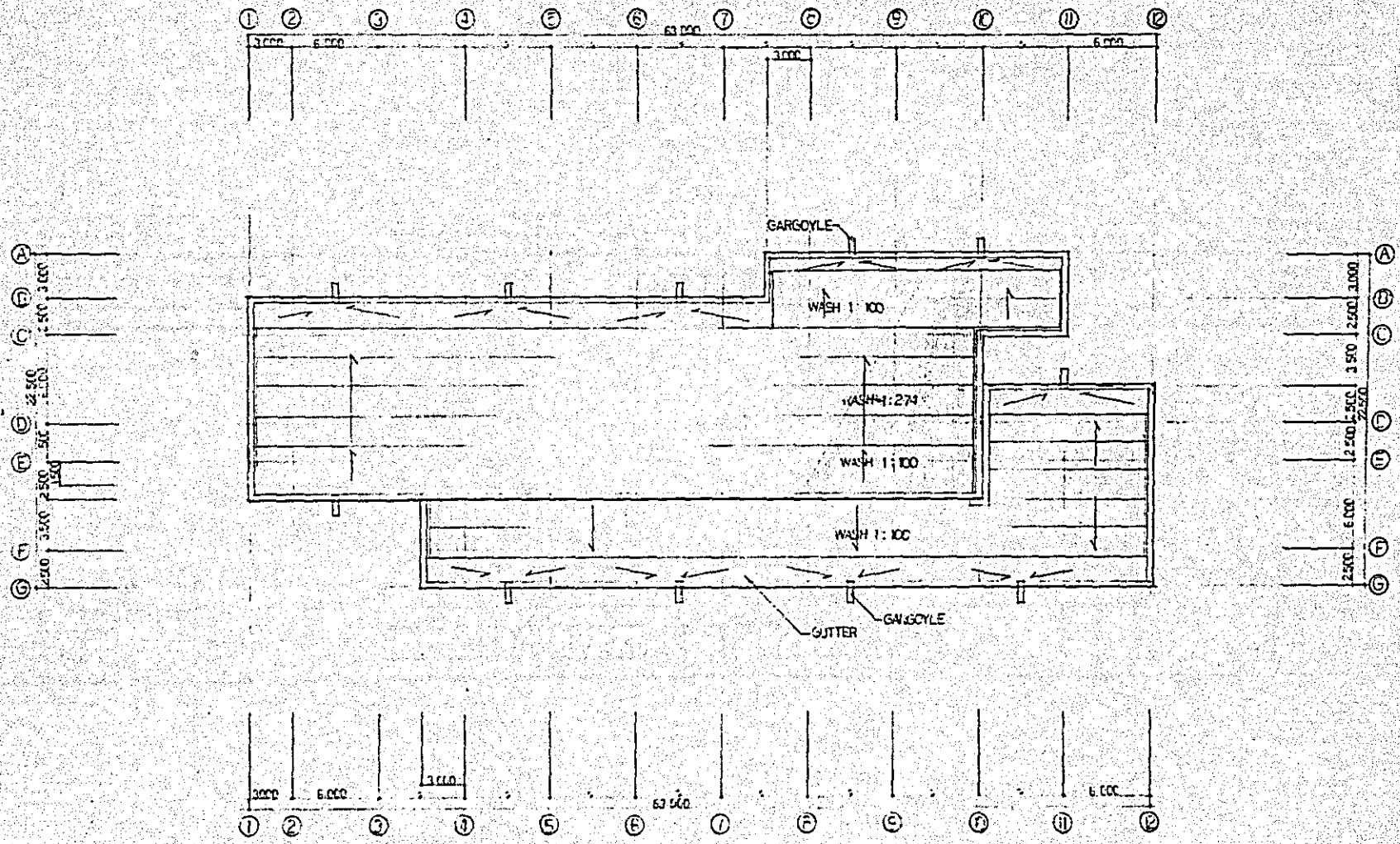
2-9-1



2-9-2 GROUND FLOOR



2-9-3 ROOF



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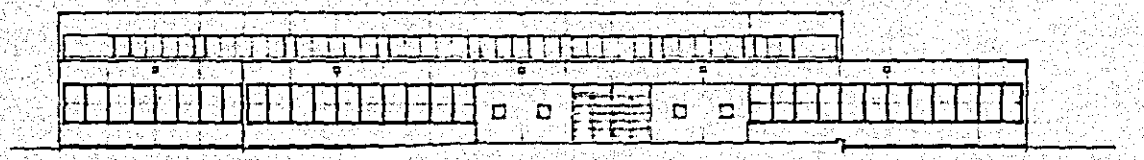
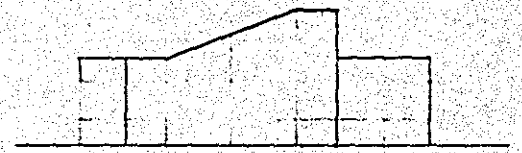
2-9-4 ELEVATION



S

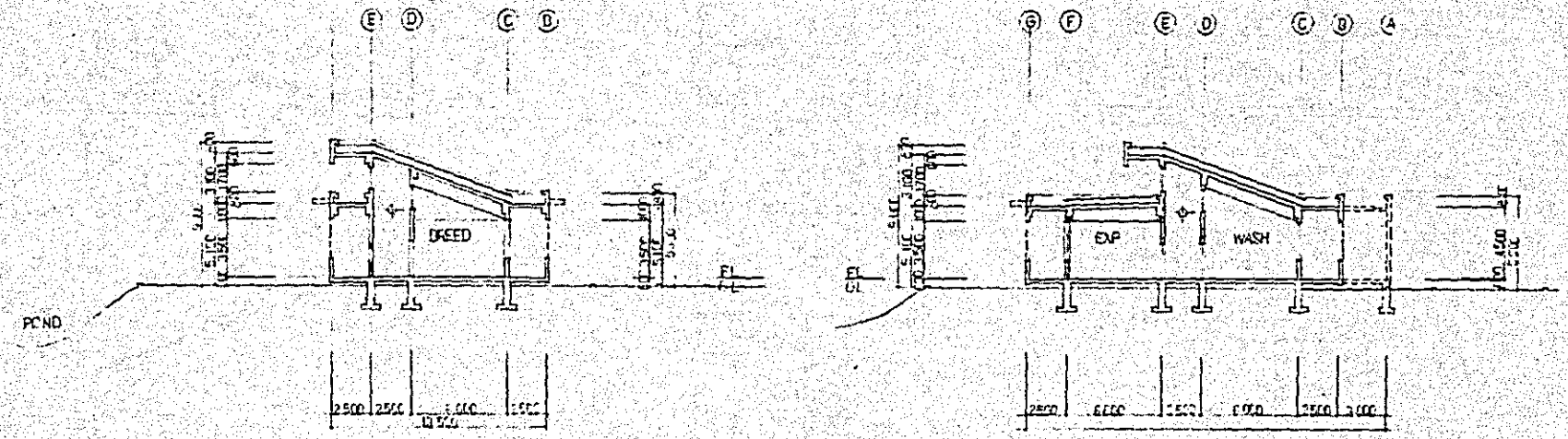
E

N

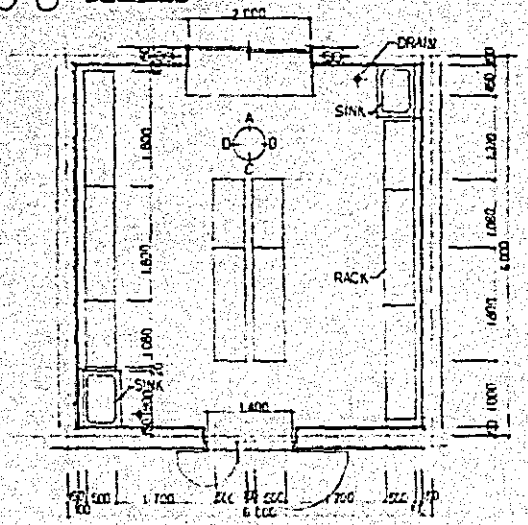


W

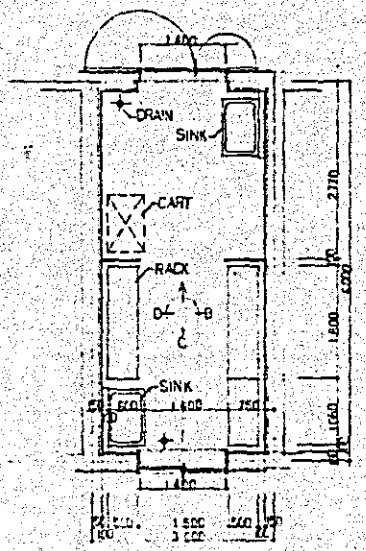
2-9-5 SECTION



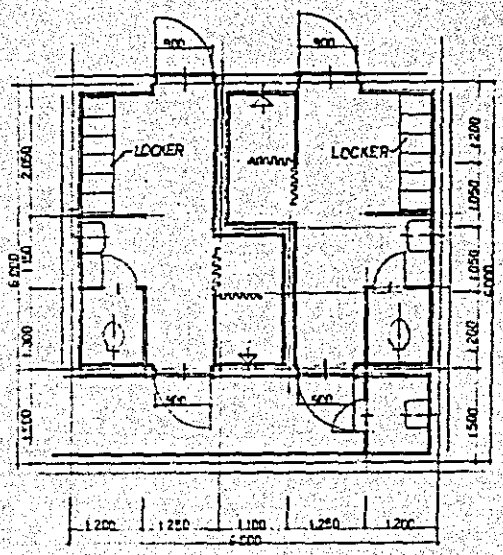
2-9-6 DETAILS



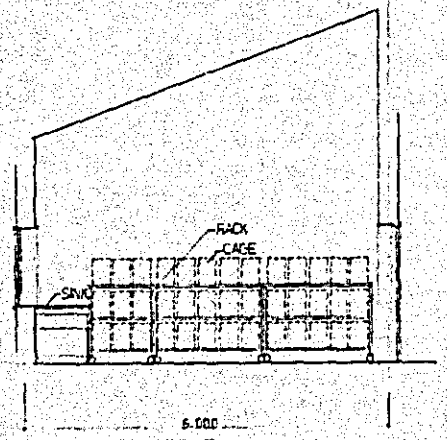
BREEDING ROOM (in case of Rabbit)



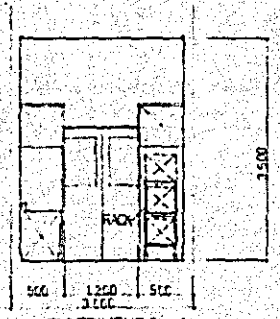
EXPERIMENT ROOM (in case of Rat or Mouse)



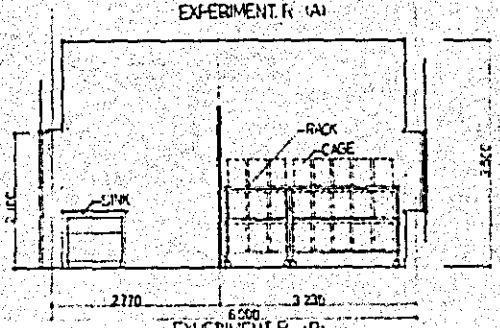
WATER SECTION



BREEDING R (D)

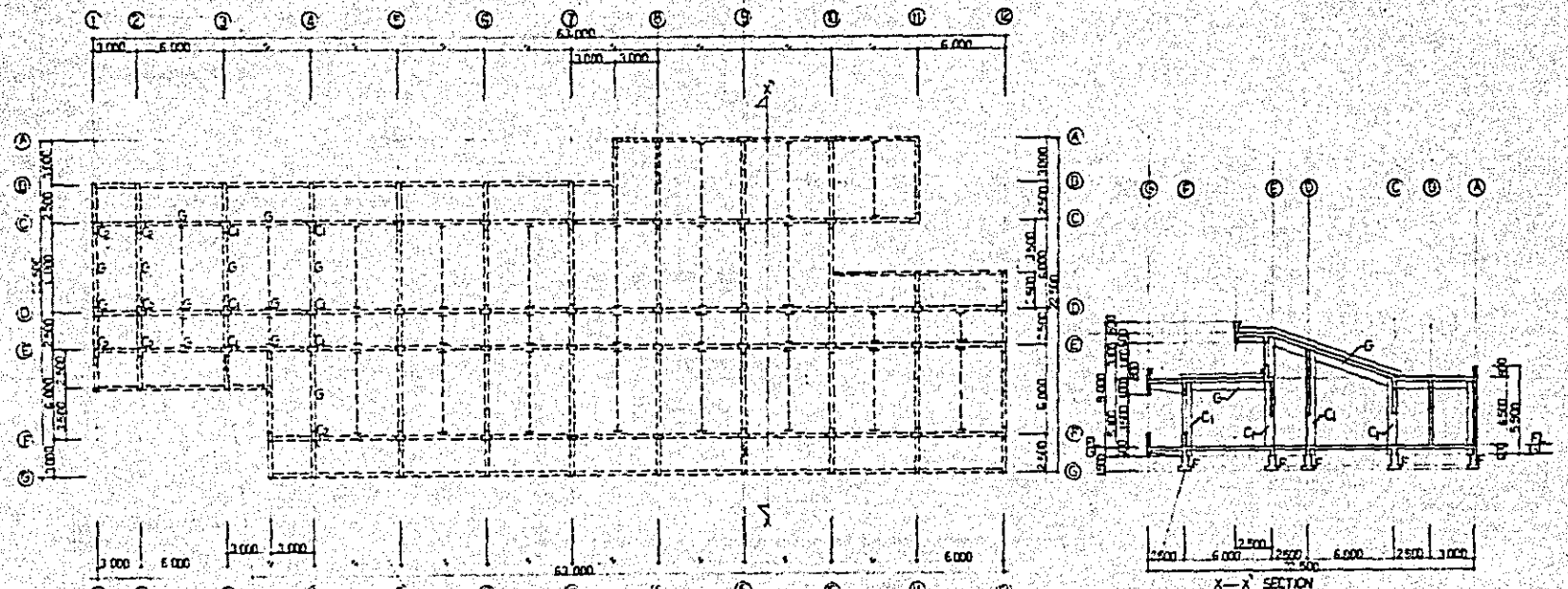


EXPERIMENT R (A)

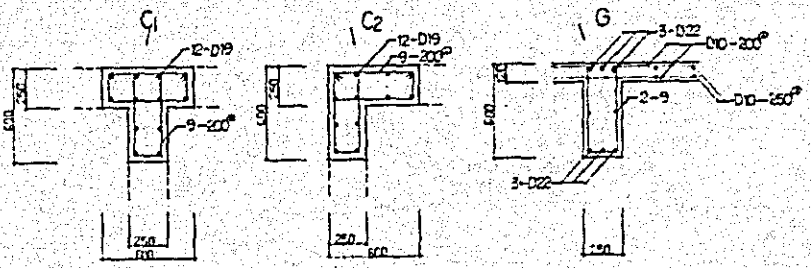


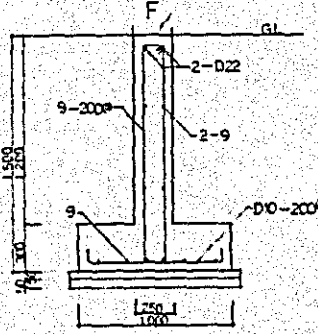
EXPERIMENT R (D)

19

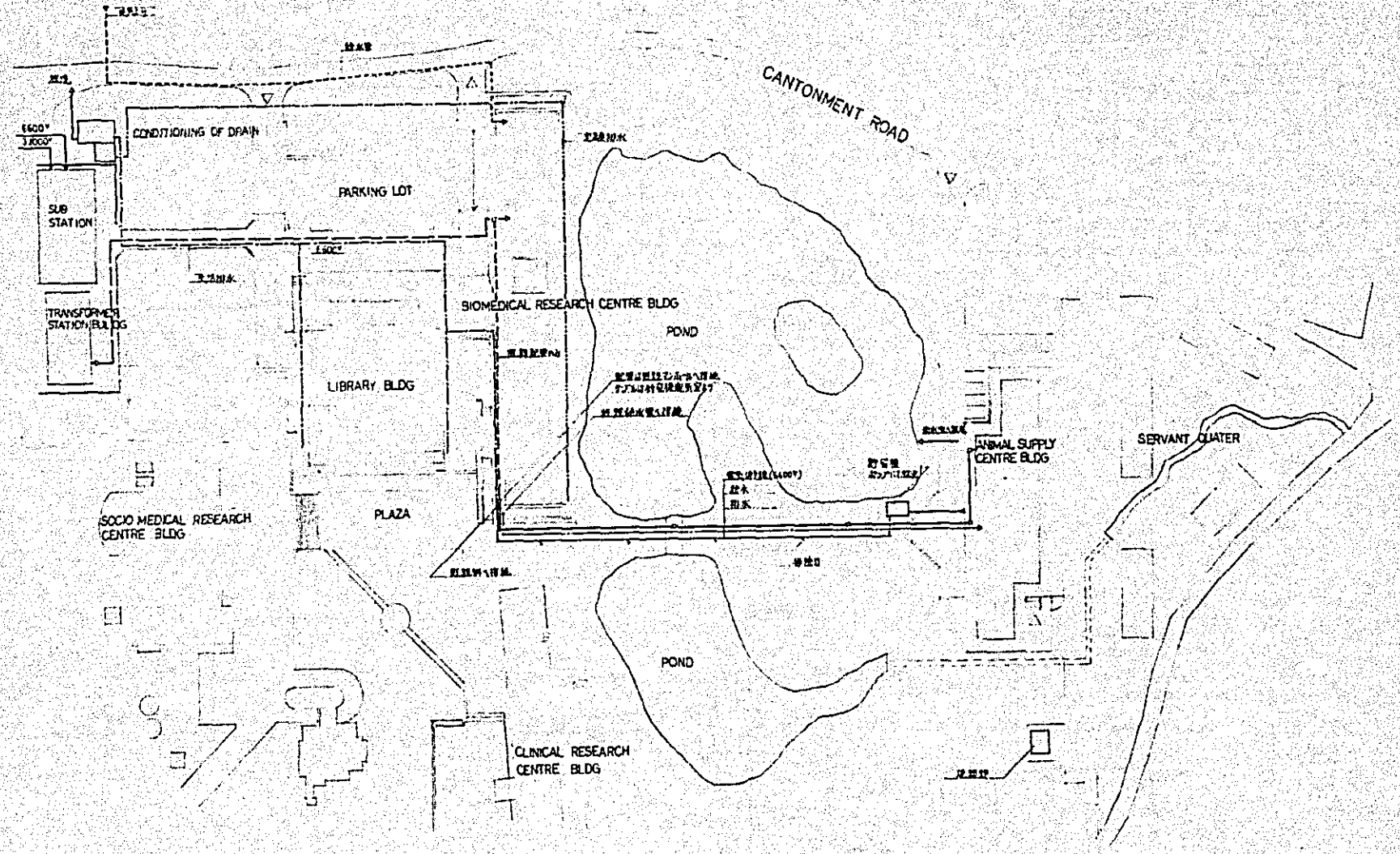


X—X' SECTION

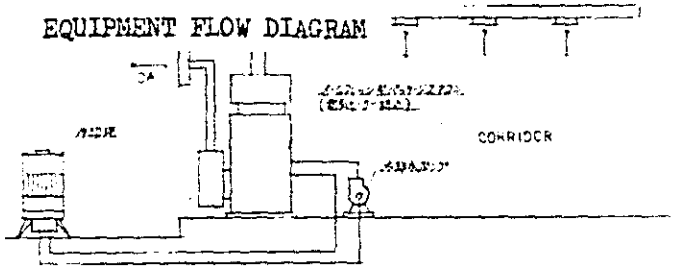

C1
12-D19
9-200
C2
12-D19
9-200
G
3-D22
D10-200
D10-250
2-9
3-D22

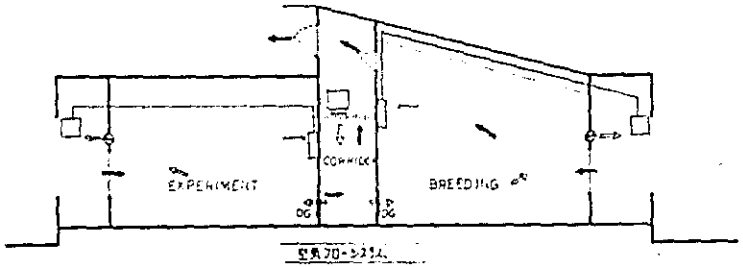

F
G1
2-D22
9-200
2-9
9
D10-200

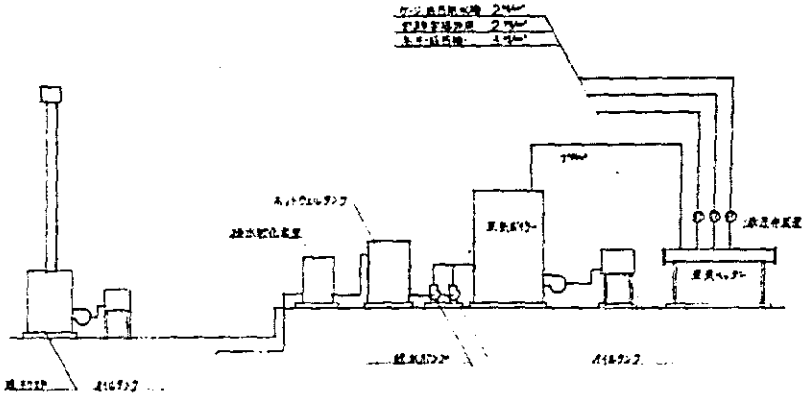
2-9-8 EQUIPMENT ALLOCATION

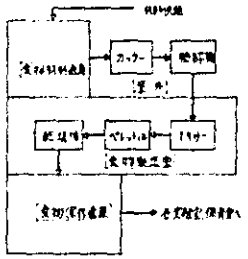


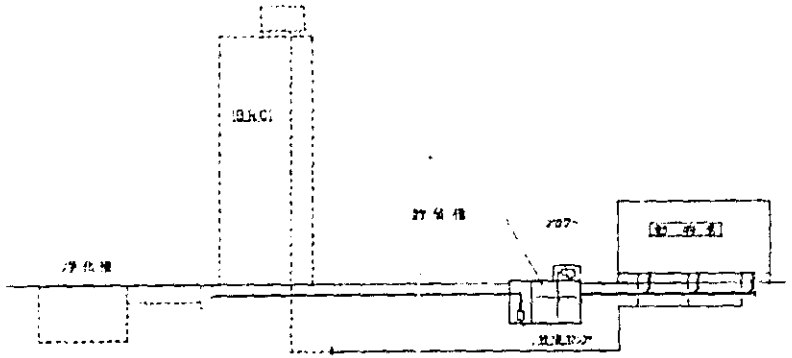
2-9-9 EQUIPMENT FLOW DIAGRAM

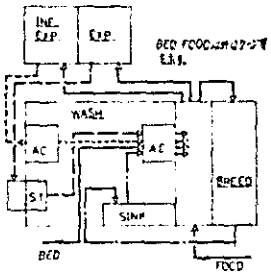


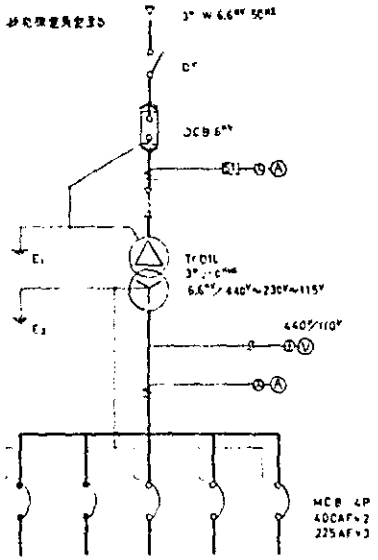












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CHAPTER 3 Project site and problems related therewith

3-1 Site and surrounding roads

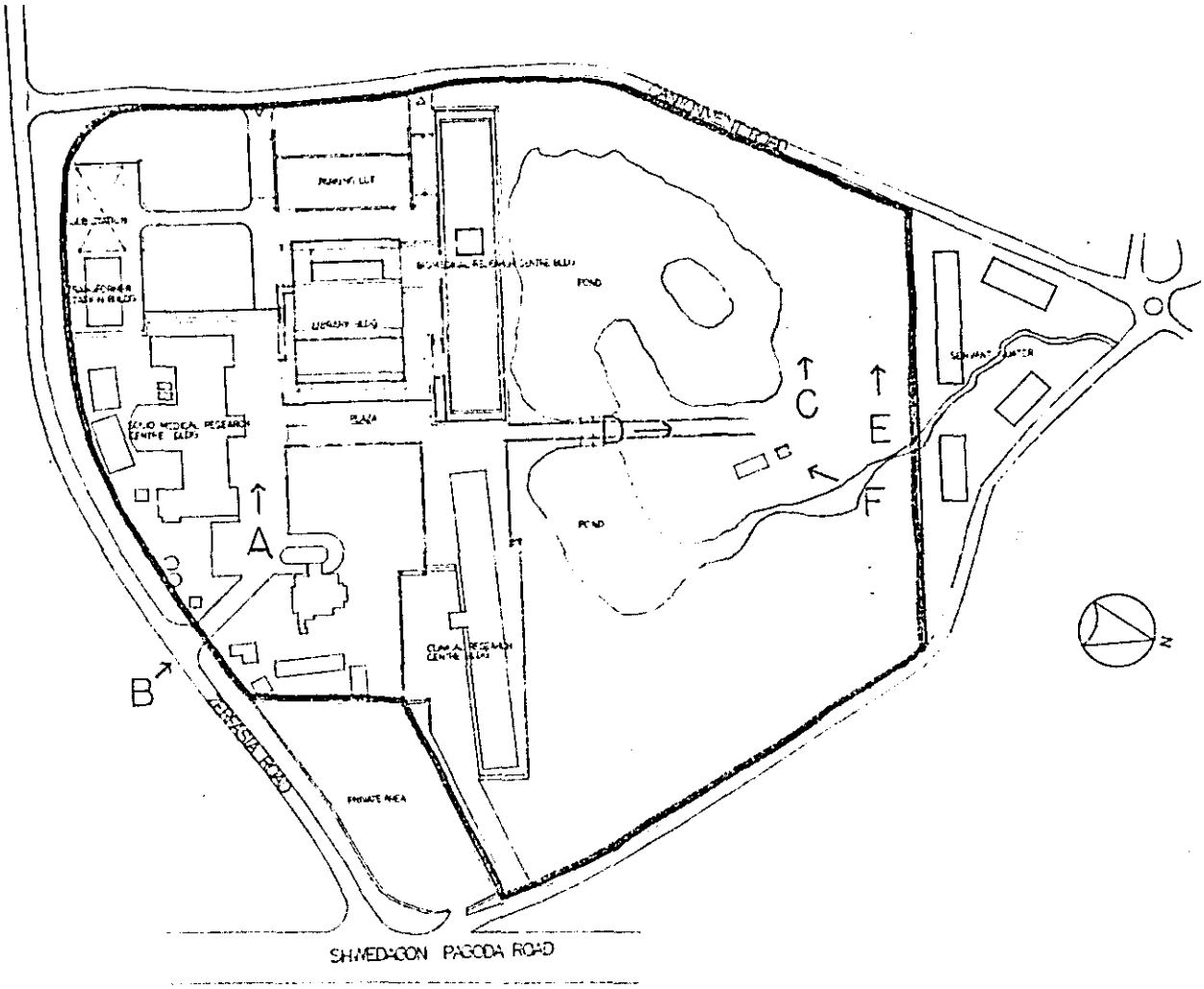
3-2 Site and ground

3-3 Water supply and drainage

3-4 Gas

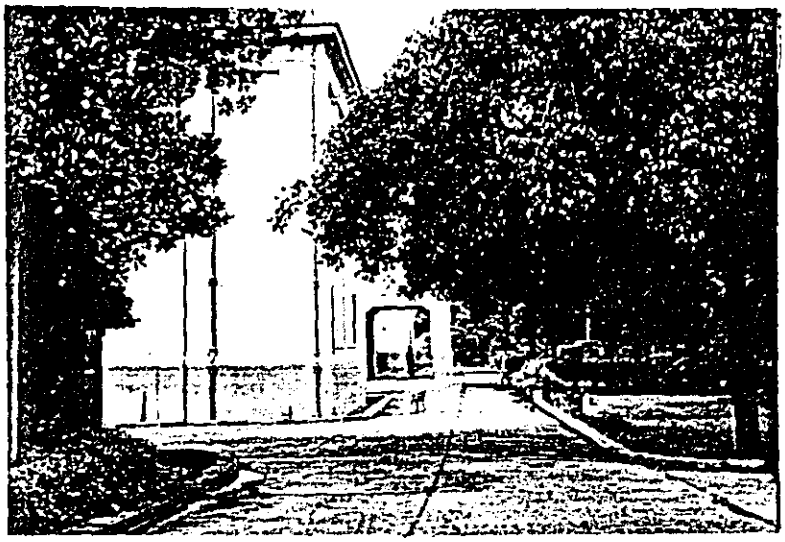
3-5 Electricity

Existing construction site



Photographs taken on the site

A



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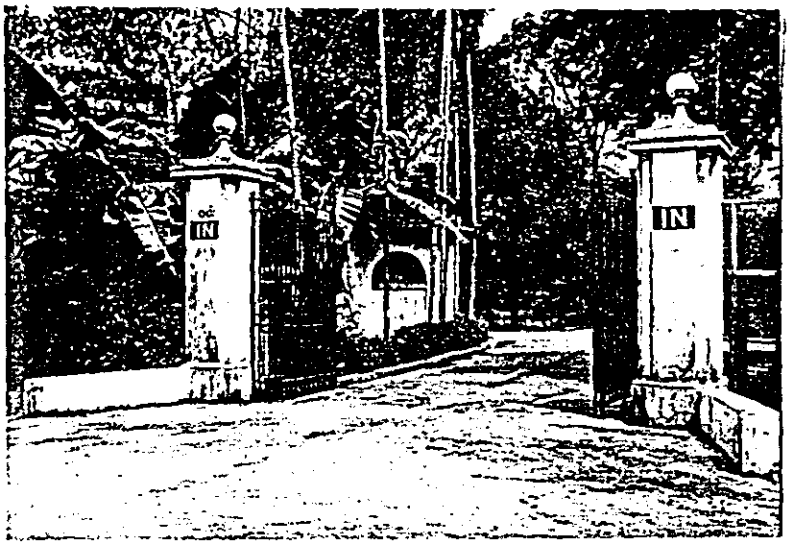
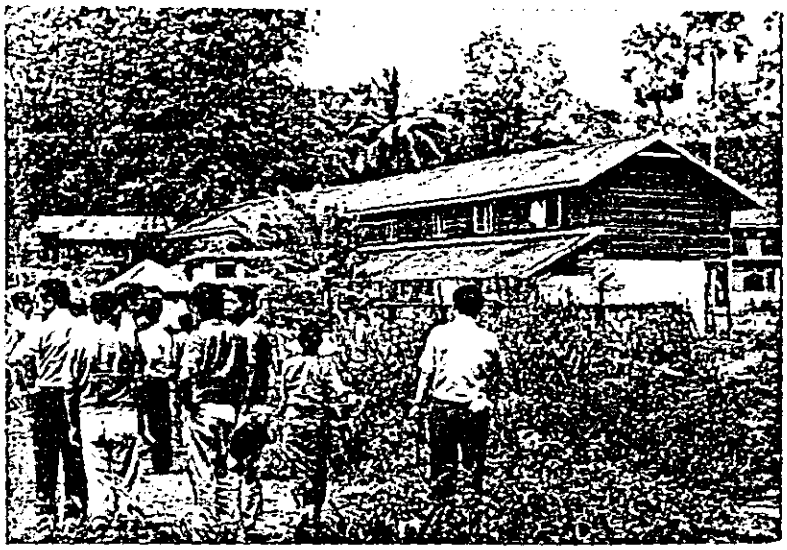


C

D

E



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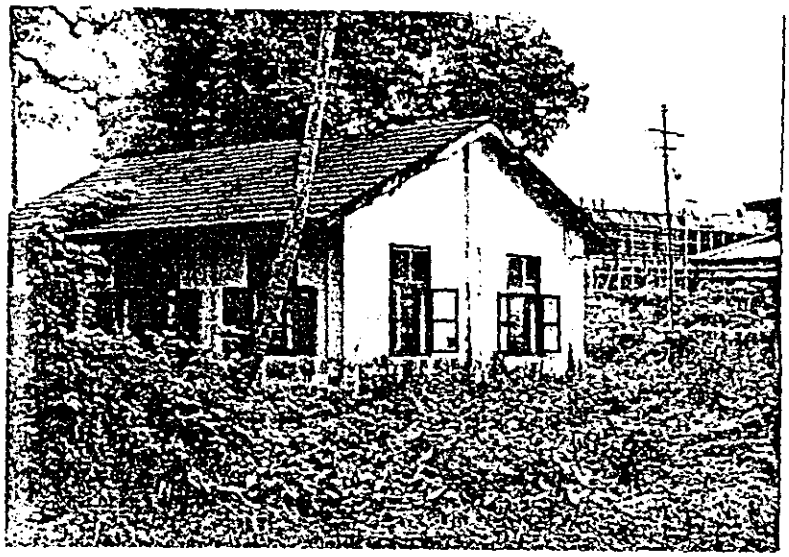

3-1 Site and surrounding roads

The building site with an area of approximately 3.6 ha. is about 2 km north-northwest from Sule Pagoda, the centre of the city, or about 1.8 km northwest from Rangoon Central Station, being sandwitched between Shwedagon Pagoda street on the East side and Uwise street on the West.

The entire site for the Medical Research Centre is in the favourable natural environment, on the northern part of which is located Cantonment Gardens and nearby Ahlone street stands Shwedagon Pagoda. Centering around the site, there are living districts where two or three-story group houses and residences are being scattered.

As is shown in a site map, the flat area is extremely limited when the ponds are excluded, and the south-western part of the site is a sector now being levelled for the construction.

Since most of the roads surrounding the site are not paved at present, they have to be paved along with the construction of the Biomedical Research Centre. Particularly, as every access inside the site is as wide as 6 m on the drawing, the minimum width of surrounding roads to be paved has to be over 6 m.

3-2 Site and ground

The following is the result of ground survey carried out on the site by Construction Corporation in 1973.

Items subject to the above survey:

1) Boring - 3 places (DH-1 71', DH-2 60.5', DH-3 60.5')

2) Impact test (Shelby tube was employed)

3) Soil exploration (ASTM method was adopted)

   a. Moisture content, densities, grain-size accumulation curve

   b. Direct shear test

Test results

Location of holes drilled in the site ground and the results of impact penetration test are given in an attached sheet.

According to the above data, the site ground as deep as GL-71' can largely be divided into the following three layers.

The first layer down to GLO-25' is reddish brown clay silt showing medium stiff, and the minimum value of cohesive strength was (C)2.5$^{t}/m^{2}$ and an internal friction angle was 23^{o} between GL-4' and GL-6' at DH-1 and DH-3 where direct shear tests were carried out.

The second layer as deep as GL-25' and GL-50' was consisted of greyish silty clay where the number of hammer blows was increased up to 10-30 times per feet.

The third layer below GL-50' was consisted of bluish clayey silt, where the number of hammer blows had even exceeded 40 times per feet.

The layers below GL-4' had shown considerably favourable conditions over the entire bored area, and no layer with particularly weak strength had existed.

Therefore, judging from the result of direct shear tests carried out on the first clayey silt layer, sufficient ground strength (10.0 t/m^2 in a long term) could be expected, and thus, it is possible for the current project to make direct basic designing without further consideration.

3-3 Water supply and drainage

Water obtained from deep wells on the Military Base in a distance of about 2.5 km from the project construction site will be filtrated and sterilized in the Research building and pumped up thereafter to a water tower before water supply be made to each sector.

The volume of water is 15 tons which will be a sufficient amount to be supplied to other facilities. Both the sanitary sewage and waste from Research and Library buildings now being constructed will be treated in the sanitation facilities to 60 ppm B.O.D. and discharged to public drainages. The experimental waste from Research building will be treated with medical fluids and discharged to sewage pipes through water condition, , while the drainage of waste and sanitray sewage from the existing building is separately linked with sewage pipes.

3-4 Gas

As is already mentioned, city gas supply is not available at present, and butane propane gas, by-product of oil refinery, is not also obtainable due to the circumstances on the part of the Socialist Republic of the Union of Burma. Thus, gaseous kerosene has to be supplied instead to those places where the gas supply is indispensable for research purposes. However, because of the absence of gasification equipment for a large volume of kerosene, its supply can not be centralized. Therefore, it is recommendable to use as much electricity as possible for small-sized autoclave, hot water heater and kitchen equipment.

3-5 Electric power

Substation now being constructed will receive 6,600 V and 33,000 HV from Electric Power Supply Corporation and will distribute 6,600 V to each building covered under the current project. Since the Biomedical Research Centre needs stable supply of electric power, self-excited generator will be installed in the substation building, and its generating output will be 250 KVA.

Cables transmitting Electricity