No. 4

BASIC DESIGN STUDY REPORT

ON

THE PROCUREMENT PROJECT OF MEDICAL EQUIPMENTS

FOR

SANJAY GANDHI POST GRADUATE INSTITUTE OF MEDICAL SCIENCES

IN

INDIA

AUGUST, 1986

JAPAN INTERNATIONAL COOPERATION AGENCY

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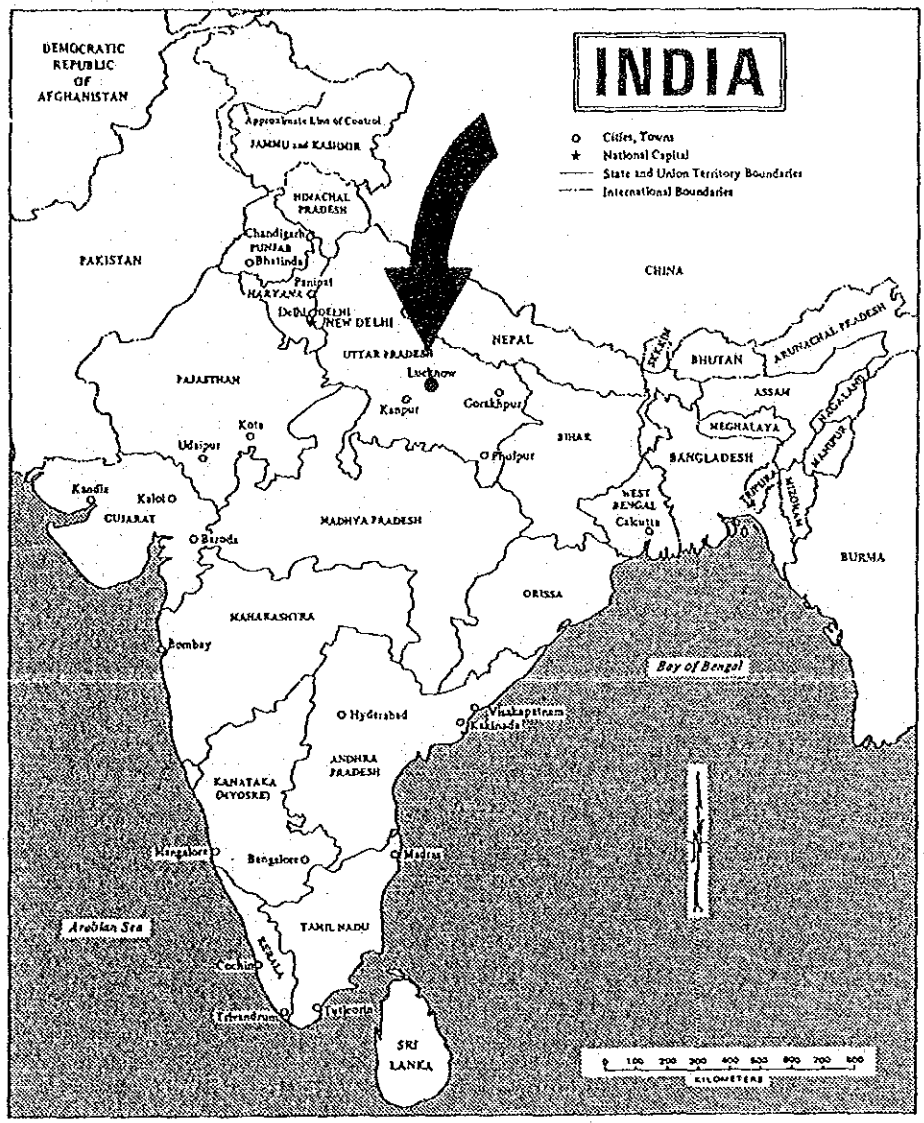
INDIA
Cities, Towns
National Capital
State and Union Territory Boundaries
International Boundaries
DEMOCRATIC REPUBLIC OF AFGHANISTAN
PAKISTAN
CHINA
NEPAL
BHUTAN
BANGLADESH
BURMA
SRI LANKA
Approximate Line of Control
JAMMU and KASHMIR
HIMACHAL PRADESH
PUNJAB
Chandigarh
Bhatinda
Panipat
HARYANA
Delhi
NEW DELHI
UTTAR PRADESH
Lucknow
Kanpur
Gorakhpur
RAJASTHAN
Kota
Udaipur
BIHAR
Phulpur
SIKKIM
ARUNACHAL PRADESH
ASSAM
NAGALAND
MEGHALAYA
MANIPUR
TRIPURA
MIZORAM
Kandla
Kalol
GUJARAT
Baroda
MADHYA PRADESH
WEST BENGAL
Calcutta
ORISSA
MAHARASHTRA
Bombay
Bay of Bengal
Hyderabad
Vishakapatnam
Kakinada
ANDHRA PRADESH
KARNATAKA (MYSORE)
Mangalore
Bangalore
Madras
TAMIL NADU
Arabian Sea
KERALA
Cochin
Trivandrum
Tuticorin
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KILOMETERS

PREFACE

In reponse to the request of the Government of India, the Government of Japan decided to conduct a basic design study on the Procurement Project for the Sanjay Gandhi Post Graduate Institute of Medical Sciences and entrusted the study to the Japan International Cooperation Agency (JICA), Jica sent to India the phase I study team headed by Dr. Masumi Oike, Director General, National Institute of Hospital Administration, Ministry of Health and Welfare from 2nd of February to 14th 1986, and the phase II study team headed by Dr. Yoshi Hirose, Director of Medical Technology Development from the Ministry was sent from 30th of March to 18th of April of the same year.

The team had discussions with the officials concerned with the Government of India and conducted field surveys at the project site area. After the team returned to Japan, further studies were made and the present report has been prepared.

I hope that this report will serve for the development of the Project and contribute to the promotion of friendly relations between two countries.

Finally, I wish to express my deep appreciation to the officials concerned with the Government of India for their close cooperation extended to the team.

August, 1986

Keisuke Arita

Keisuke ARITA
President
Japan International Cooperation Agency

Summary

Health and Medical Environment in India is in a critical state due to the qualitative and quantitative insufficiency of its medical services, especially human resources such as skilled physicians and nurses. In coping with this situation, the Government of India showed its determination to step up its health related policies, especially to establish a facility for post post graduate training to enhance the overall level of medicine of the nation, in its 5 year national development plan announced in 1983. The Sanjay Gandhi Post Graduate Institute of Medical Sciences (hereinafter called SGPGI), planned in line with the Government policy, is currently under construction with a total budget for the first phase of construction of 1,436 million rupees (approximately 30 billion yen) in Lucknow, capital of Uttar Pradesh State, the largest state in India having a population of 120 million. Construction is being fully supported by the central Government. The main function of the institution will to provide a wide range of post post graduate training for doctors and a similar high level of training for nurses, pharmacists and technologists for laboratory and X-ray. The first phase of the project includes the establishment of 6 specialities:

1. Neurology and Neuro-Surgery
2. Cardiology and Cardiovascular Surgery
3. Gastroenterology-Medical & Surgical
4. Urology and Nephrology-Medical & Surgical
5. Endocrinology
6. Genetics and Immunology

In the future a total of 19 highly specialized departments will be established to equip the institution with high levels of functions for research and the provision of medical services. Construction has progressed smoothly and each facility will be put into operation as they are completed one after another in 1986 and 1987. The first phase of construction is scheduled to be completed in December, 1987 making the institution fully operational.

The funs necessary for the construction are being raised on the part of India. Medical equipment is also to be procured in India in principle if it is produced in India. In reality, however, most of the equipment required is not produced in India and must be imported.

Under such circumstances, when Prime Minister Rajiv Gandhi visited Japan in November, 1985, he asked Prime Minister Nakasone to provide the project with grant aid from Japan. In response to the request the Government of Japan decided to conduct a basic design study and sent the first study team in the period from February 2 to February 14, 1986 and the second team in the period from March 30 to April 18, 1986 through JICA.

The team confirmed in India the content of the request made by the nation and checked the adequancy of the request, collected information and data concerning present status of health, medical services, medical facilities and human resources, and institutional and budgetary aspects of India for the implementation of the project. In addition, they visited medical services-related facilities and conducted hearings to grasp the general level of medicine of India. As far as SGPGI is concerned, they collected detailed information on its organization, operation systems, personal alloction, budget, buildings, equipment, etc..

Further, the team studied in detail situation of health and medical services of Uttar Pradesh State as well as Lucknow District, the content of the request and its priority, procedures necessary for shipment and customs clearance of equipment and the situation of agencies selling medical instruments to grasp feasibility of maintenance and services after installation. After returning to Japan the team analyzed the results from the viewpoint of the supply and demand of medical services and did detailed analyses of the plan presented by the Government of India. The following points form conclusin of the analyses.

1) SGPGI is a major project of the 7th 5 year plan aimed at drastically improving health and medicine in India and is of great interest to all people concerned and headed by Prime Minister Rajiv Gandhi.

2) It has been judged that the list of equipments Japan was requested to provide is adequate by and large in comparison with functions and the scale of SGPGI.

3) Construction of various facilities at the site has progressed in a steady manner in conformance with detailed schedules.

4) Responsible officials at the working level of the central and local Governments have committed themselves to be responsible and to take measures necessary for implementation of the planned aid.

The study Team prepared an optimum plan for the implementation of the aid in Japan and broke them down into that required for the first yeqr and the second year. In the first year basic equipments will be delivered mainly for hospital functions and in the second year, when staff have mastered the operations of the equipment in the first shipment, more advanced equipments will be provided according to the plan. This information has been put together as a result of the basic design study.

The ultimate results of discussions are given below in the form of a list of functions to be provided with Japanese equipment.

Department	First Year		Second Year	
	No.of Types	No.of Units	No.of Types	No.of Units
1.Neurology and Neuro-Surgery	10	37	6	7
2.Cardiology and Cardiovascular Surgery	5	8	5	10
3.Gastroenterology	4	14	4	7
4.Urology Nephrology	19	692	1	1
5.Endocrinology	26	29	15	15
6.Genetics and Immunology	57	533	33	43
7.Central Department				
1)Pathology	54	167	6	6
2)Radiology	19	26	12	16
3)Operation	29	128	0	0
4)I.C.U.	11	98	7	7
5)Ward	1	4	0	0
6)Physical	2	31	0	0
7)Central Supply	1	24	0	0
8)Autopsy	1	13	0	0
9)Animal House	0	0	0	0
10)Kitchen	0	0	0	0
11)Laundry	0	0	0	0
12)Medical Gas	0	0	0	0
13)Work Shop	6	36	8	8
14)Library	0	0	0	0
15)Administration	1	2	0	0
Total	246	1,842	97	120

The above-mentioned list consists of the things considered to be of absolute necessity for the time being for the accomplishment of the national project of India. This list will make possible the provision of advanced tertiary medical services not only in Uttar Pradesh State but also on a nation-wide basis. In addition, the quality of the institution will be comprehensively improved to reinforce the local medical systems. With regard to education and training, the institution will provide post post graduate education to supply highly trained human resources for medical services thereby enhancing the overall quality of local medicine. Also, by applying the results of advanced research and studies into clinical medicine in the future, provision of further advanced medicine will be made possible for contributing to the improvement of the level of medicine of the nation as a whole.

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ANNEX

I. Introduction

The problems in the health and medical environment of India are due to an imbalance between the ever-growing population of 750 million as of 1985, which is estimated to exceed 780 million now, accompanied by a growing number of patients, and the quality and quantity of available medical services. Insufficiency is most serious in the number of speciality physicians, nurses and other paramedical staff in addition to scarce medical facilities and beds.

In coping with this situation, the Government of India showed its determination to improve its health care policies including the establishment of an institution for post post graduate training of physicians and paramedical staff to enhance the overall level of medicine of the nation, in its 5 year national development plan announced in 1983.

Prior to this announcement, Uttar Pradesh State, the largest state of India with a population of 120 million, equivalent to the total population of Japan, established of the Sanjay Gandhi Post Graduate Institute of Medical Sciences in December, 1980 to provide advanced medical care for its people. Further, missions were sent to medical institutes in the U.S.A., U.K. and Sweden to grasp and discuss world trend and future directions of such types of institutions with aim of establishing a most advanced and modern facility to provide post post graduate training research work and medical services. As the result, the planned institution was decided to be made into a comprehensive medical center to be located in Lucknow, capital of Uttar Pradesh State, to train graduates including doctors, nurses, pharmacists, laboratory technologists and X-ray technologists, of 9 medical schools of the same state centering on the King George Medical College (Lucknow) and graduates of other schools in various parts of India.

It was also decided that a committee will be established from among professors of All India Institute of Medical Sciences and other leading medical people, to select professors to teach at SGPGI from among leading physicians and researchers from all over the nation as well as from those who are abroad and are interested in returning to India. The institute was decided to be equipped with super specialities to be made possible by a comprehensive center to promote research work, to foster human resources and to provide advanced medical services. The institute is scheduled to have 19 departments of

super specialities, out of which 6 departments will be completed in phase I, namely,

1. Neurology and Neuro-Surgery
2. Cardiology and Cardiovascular Surgery
3. Gastroenterology - Medical & Surgical
4. Urology and Nephrology
5. Endocrinology - Medical & Surgical
6. Genetics and Immunology

This is a State project of Uttar Pradesh, but is also considered to be national importance and a budget of 1,436 million rupees was appropriated by the Government of Uttar Pradesh for phase I. Construction started in 1982 and has steadily progressed slightly ahead of the original schedule. Construction will be partly completed in 1986 and operations will begin on a limited scale. Other facilities will be in operation one after another as they are completed in 1986 and 1987. Phase I is scheduled to be completed in December, 1987 making the institution full operational.

The institute will be run by the State Government and be supported by the Central Government of India. The cost of construction is to be fully borne by India and medical equipment are also planned to be domestically procured if they are manufactured in India. The clinical facility for out-patients to be opened shortly is said to be able to manage only with domestically procured equipment. However, other parts of the institute will definitely require advanced equipment which must be imported from overseas. The list of necessary equipment has been prepared by the institute. The list includes a substantial volume of Japanese advanced technology products as Japanese electronics were recognized due to the recent growing "Look East" movements despite close relations with U.K. and despite the fact that European equipment, especially British and German products, have been widely used because post graduate training is given mainly in U.K. and partly in U.S.A.

Consequently, when Prime Minister Rajiv Gandhi visited Japan in November, 1985, he called on Prime Minister Nakasone to request grant aid in this area, and later in this connection Mr. P.K. Kaul, Cabinet Secretary and Mr. D. Chatterjee, Joint Secretary, Ministry of Finance, visited Japan to officially make a request in conformance with Japan's principles of providing grant.

In response to the request, the Government of Japan decided to carry out a basic design study , and through JICA the first study team consisting of 9 members headed by Masumi Oike, Director General, National Institute of Hospital Administration, Ministry of Health and Welfare, was sent to India from February 2 to February 14, 1986.

The study team confirmed in India the content of the request made by the nation and checked the adequacy of the request, collected information and data concerning the present status of health and medical services, medical facilities and human resources, and institutional and budgetary aspects of India for the implementation of the project. In addition, they visited medical services-related facilities and conducted hearings to grasp the general level of medicine in India. As far as SGPGI is concerned, they collected detailed information on its organization, operation systems, personal allocation, budget, buildings, equipments, etc..

After returning to Japan the team analyzed the results from the viewpoint of the supply and demand of medical services and did detailed analyses of the plan presented by the Government of India. The following points form the conclusion of the analyses.

1) SGPGI is a major project of the sixth & seventh 5-year plan aimed at drastically improving health and medical care in India and is of great interest to all people concerned and headed by Prime Minister Rajiv Gandhi.

2) It has been judged that the list of equipment Japan was requested to provide is adequate by and large in comparison with functions and the scale of SGPGI.

3) Construction of various facilities at the site has progressed in a steady manner in conformance with detailed schedules.

4) Responsible officials at the working level of the central and local governments have committed themselves to be responsive and to take measures necessary for implementation of the planned aid.

The conclusion implies that this project should viewed positively at as a project for grant aid from Japan.

On the basis of the conclusion, the second study team was sent to India for a more detailed study from March 30 to April 18, 1986 having 7 members lead by Yoshi Hirose, Director, Office of Medical Technology Development, General Affairs Division, Ministry of Health and Welfare.

The second team studied, in detail, the situation of health and medical services of Uttar Pradesh State as well as Lucknow District, the content of the request and its priority, procedures necessary for shipment and customs clearance of equipment and the situation of agencies selling medical equipment to grasp the feasibility of maintenance and services after installation.

The study team prepared an optimum plan for the implementation of the aid in Japan and broke it down into the first year and the second year. In the first year, basic equipment will be delivered mainly for hospital functions and in the second year, when staff have masterred the operations of the equipment of the first shipment, more advanced equipment for research and hospital functions will be provided according to the plan. This information has been put together as the results of the basic design study for designing.

II. Background

(1) Health and Medical Conditions

1) Population

The population in India in 1985 was 753,705 thous. and tables 1, 2 and Figure 1 show the Population Structure by Sex and Year, Population Pyramid, Population Increasing Rate and Tendency of Population Distribution.

Firstly, according to Table 1, from 1971 to 1976, the rate of the population increase was 11.2% for male, 11.1% for female and total 11.2%. Between 1976 and 1981, the rate was 11.2% for male, 11.2% for female and total 11.2%, and between 1981 and 1985, total 10.0%, the average rate by year was 2.08%.

In Uttar Pradesh, between 1971 and 1985, the estimate of 2.14% of the rate by year shows almost the same tendency as of all India. Furthermore, the population, flowing into urban area is increasing which causes the increase of unemployment.

According to Table 3, Population by Sex and Year, Figure 1, Population Pyramid, the population pyramid in India forms "Juvenile type" which shows tendency of high rate of infant mortality and natural decrease of the population by aging.

Table 1: INCREASING RATE OF POPULATION BY YEAR

(Unit:Thous.)

year / sex	1971	increasing rate	1976	increasing rate	1981	increasing rate	1985
MALE	283,503	11.2 %	317,632	11.2 %	354,384	-	-
FEMALE	263,634	11.1 %	294,943	11.2 %	330,775	-	-
TOTAL	547,137	11.2 %	612,575	11.2 %	685,159	10.0 %	753,705
UTTAR PRADESH	88,205	11.1 %	98,125	11.3 %	110,862	11.0 %	122,166

Table 2: TENDENCY OF POPULATION DISTRIBUTION BY URBAN AND RURAL

Year	Urban	Rural
1941	13.9%	86.1%
1951	17.3%	82.7%
1961	18.0%	82.0%
1971	19.9%	80.1%
1981	23.3%	76.7%

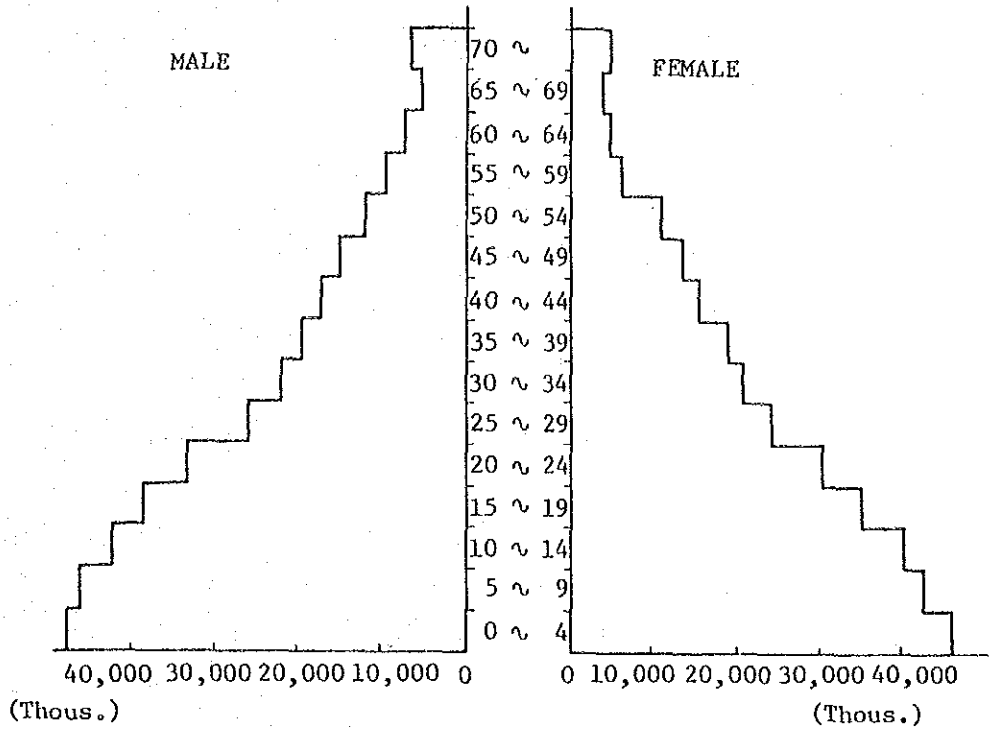


Figure 1 : POPULATION PYRAMID, 1981

Table 3 : POPULATION BY SEX, BY AGE

AGE	MALE (Thous.)	FEMALE (Thous.)	TOTAL (Thous.)	RATE (%)
0 ∿ 4	47,559	46,309	93,868	13.7
5 ∿ 9	46,094	43,662	89,756	13.1
10 ∿ 14	42,573	41,016	83,589	12.2
15 ∿ 19	39,314	36,054	75,368	11.0
20 ∿ 24	33,289	30,431	63,720	9.3
25 ∿ 29	26,602	25,470	52,072	7.6
30 ∿ 34	22,019	21,831	43,850	6.4
35 ∿ 39	19,515	18,854	38,369	5.6
40 ∿ 44	17,365	16,208	33,573	4.9
45 ∿ 49	15,900	13,562	29,462	4.3
50 ∿ 54	13,064	10,916	23,980	3.5
55 ∿ 59	10,585	8,599	19,184	2.8
60 ∿ 64	7,772	6,616	14,388	2.1
65 ∿ 69	5,646	4,631	10,277	1.5
70 ∿	7,087	6,616	13,703	2.0
TOTAL	354,384	330,775	685,159	100.0

2) Fertility, Mortality and Infant Mortality

Tables 4 and 5 show the tendency of fertility and mortality in Uttar Pradesh, India. Fertility and mortality in Uttar Pradesh was 39.6% and 16.3% per thous. in 1981.

The figures for all India are lower than the above. Figure 2 shows the tendency of natural growth rate as the result of fertility and mortality.

Since 1978, fertility and mortality remain similarly and natural growth rate showed the same tendency.

Figure 3 shows the tendency of infant mortality in all India. Since 1970, the same tendency of increasing and decreasing was repeated and mortality in 1970 and 1978 remained almost unchanged.

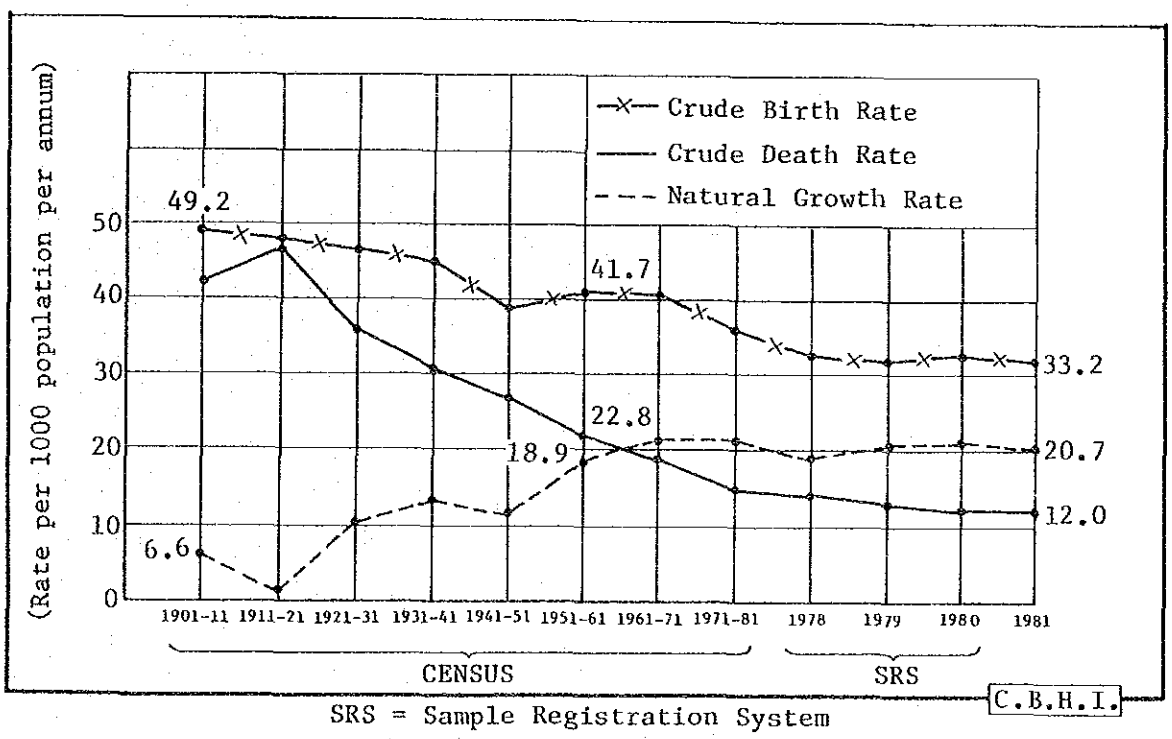
Table 4 : FERTILITY

		1978	1979	1980	1981
ALL INDIA	URBAN	27.8	28.3	28.1	27.2
	RURAL	34.7	34.3	34.6	34.7
	TOTAL	33.3	33.1	33.3	33.2
UTTAR PRADESH	URBAN	32.0	32.1	33.0	31.5
	RURAL	41.6	40.7	40.3	40.8
	TOTAL	40.4	39.6	39.4	39.6

(per Thous. Pop.)

Table 5 : MORTALITY

		1978	1979	1980	1981
ALL INDIA	URBAN	9.4	8.4	8.0	7.9
	RURAL	15.3	13.9	13.5	13.6
	TOTAL	14.2	12.8	12.4	12.5
UTTAR PREDESH	URBAN	13.4	10.1	10.3	9.9
	RURAL	21.2	17.1	17.6	17.3
	TOTAL	20.2	10.2	16.6	16.3



SRS = Sample Registration System

Figure 2 Birth Rate, Death Rate and Natural Growth Rate in India 1901 - 1981

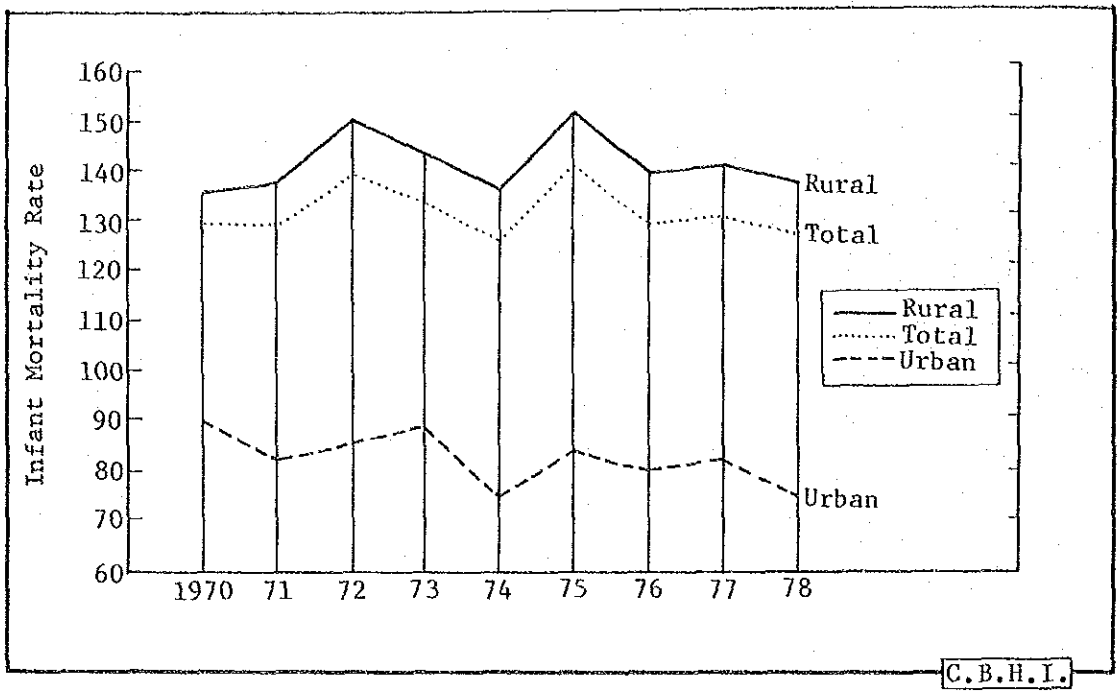


Figure 3 Infant Mortality Rate 1970 - 78

3) Causes of Death and Tendency of Diseases

Diseases are classified by the causes of death as follows: Table 6 shows that infectious diseases and parasitosis are most common, followed by diseases, conditions and signs of circulatory system, additionally unclear diseases as well as prenatal diseases, diseases of respiratory system, injury and poisoning intoxication, and diseases of digestive system.

These diseases are often caused by malnutrition and poor hygienic conditions.

(Table 6)

PERCENT DISTRIBUTION OF DEATHS BY SEX FOR DIFFERENT MAJOR CAUSE GROUPS TO TOTAL DEATHS IN EACH AGE GROUP—ALL INDIA (UNDER THE SCHEME OF MEDICAL CERTIFICATION OF CAUSE OF DEATHS)—1979

Major Cause Groups	Sex	Age in years								
		Under 1 year	1—4	5—14	15—24	25—44	45—64	65 +	A.N.S.	Total
1	2	3	4	5	6	7	8	9	10	11
I	Male	18·90	41·38	34·30	28·16	30·55	21·76	12·60	33·65	24·16
	Female	19·13	42·33	34·97	23·11	27·70	17·17	8·51	32·94	22·62
II	Male	0·04	0·69	2·38	2·40	3·80	7·37	6·27	7·09	4·00
	Female	0·04	0·41	1·62	1·32	5·14	11·11	4·69	9·00	3·92
III	Male	2·20	5·71	2·00	0·94	1·16	3·07	3·81	3·83	2·63
	Female	2·30	7·22	2·58	0·87	1·28	4·42	4·50	2·57	3·12
IV	Male	0·38	1·92	3·50	2·27	1·60	1·46	1·86	2·16	1·55
	Female	0·50	1·88	3·63	3·22	3·37	2·63	2·91	2.92	2·44
V	Male	0·004	0·01	0·05	0·07	0·24	0·25	0·11	0·17	0·14
	Female	0·01	—	0·06	0·10	0·16	0·09	0·04	0·12	0·07
VI	Male	3·79	11·90	11·20	5·10	2·93	1·96	1·93	4·07	3·97
	Female	3·81	10·85	13·27	3·81	3·40	2·36	1·75	6·31	4·48
VII	Male	0·63	1·29	4·78	7·76	13·17	29·44	34·90	15·74	16·55
	Female	0·72	1·28	5·33	7·76	11·82	29·67	36·48	12·85	14·40
VIII	Male	11·60	16·30	6·86	3·72	4·04	6·23	10·50	7·53	8·08
	Female	12·55	17·69	7·83	2·76	3·54	5·77	12·43	7·13	8·76
IX	Male	1·81	4·63	5·81	7·09	10·40	8·49	4·34	10·73	6·43
	Female	1·48	3·93	4·74	5·31	6·93	5·79	2·66	6·89	4·33
X	Male	0·19	0·89	1·49	2·10	1·91	1·97	3·27	1·82	1·72
	Female	0·13	0·64	1·80	1·67	1·91	1·92	2·09	1·75	1·41
XI	Male	—	—	—	—	—	—	—	—	—
	Female	—	—	0·14	13·15	9·38	0·35	—	0·12	3·30
XII	Male	0·19	0·16	0·17	0·26	0·18	0·17	0·15	0·35	0·18
	Female	0·22	0·14	0·14	0·25	0·19	0·25	0·22	0·23	0·21
XIII	Male	—	0·07	0·11	0·08	0·09	0·06	0·08		0·06
	Female	0·01	0·01	0·12	0·06	0·14	0·16	0·15	0·23	0·10
XIV	Male	4·32	1·22	1·31	0·69	0·34	0·17	0·11	0·26	1·17
	Female	3·91	0·90	1·12	0·71	0·47	0·19	0·12	0·35	1·20
XV	Male	49·62	—	—	—	—	—	—	—	9·58
	Female	49·77	—	—	—	—	—	—		10·44
XVI	Male	5·80	9·48	12·12	14·16	12·65	11·40	16·29	0·86	11·30
	Female	4·84	8·35	10·53	12·03	10·54	12·70	19·90	0·70	11·00
XVII	Male	0·53	4·35	13·91	25·18	16·94	6·20	3·78	11·94	8·48
	Female	0·58	4·37	12.07	23·87	14.03	5·42	3·55	15·89	8·20
TOTAL	Male	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00
	Female	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00	100·00

Major Cause Groups

I Infective and parasitic diseases
II Neoplasms
III Endocrine, Nutritional and Metabolic diseases
IV Diseases of Blood and Blood forming organs
V Mental disorders.
VI Diseases of the nervous system and sense organs
VII Diseases of the circulatory system
VIII Diseases of the respiratory system
IX Diseases of the digestive system
X Diseases of Genito-urinary system
XI Complications of pregnancy, child-birth and the puerperium
XII Diseases of the skin and subcutaneous tissue
XIII Diseases of the musculoskeletal system and connective tissue
XIV Congenital Anomalies
XV Certain causes of perinatal morbidity and mortality
XVI Symptoms and Ill-defined conditions
XVII Accidents, poisonings & violence (External Cause/Nature of Injury)

(2) Medical Conditions

1) Medical Organization

The Ministry of Health and Family Welfare of India consists of the Department of Health and the Department of Family Welfare. The Department of Health functions through the Directorate General of Health Services with 70 subordinate offices. The Directorate General of Health Services renders technical advice on all medical and public health matters.

The Department of Family Welfare deals with family welfare matters.

The Secretary of the State in the Ministry is in over-all charge of the Department of Family Welfare. There is an additional Secretary and Commissioner for this Department. On the technical side of the Department, the following Divisions are functioning:-

1. Programme Appraisal, Cordination and Training and Sterilisation Division
2. Technical Operations Division
3. Maternal and Child Health Division
4. Evaluation and Intelligence Division
5. Mass Education and Media (including Population Education) Division
6. Contraceptive Marketing Division
7. Transport Division
8. Projects Division (Area Projects)

There are 21 subordinate offices located at various places of the country and they function directly under the Ministry. The Ministry is also administratively concerned with 32 autonomous statutory bodies and three public sector undertakings.

SGPGI, which is the object of the project, is sponsored under the State Government of Uttar Pradesh and also supported by the Ministry of Health and Family Welfare of India.

2) Health and Medical Care System

Health and medical care facilities in India are divided into areas of on the contrary governmental and private. All governmental

facilities for ordinary people any charges are not collected. Private hospitals for the wealthy-classes have their systems of charges. There is no national health insurance policy, although some voluntary health insurance is just starting.

According to the Health and Medical Care System of the Ministry of Health and Family Welfare, all India is divided into 31 States and Union Territories. At the bottom of the Medical Care System, there are dispensaries without beds but with doctors and facilities where traditional treatment is implemented by doctors trained in the Indian medical system and in Homoeopathy. Primary health care is covered by the above facilities.

Secondary health care and higher care are implemented by national, regional, private and voluntary hospitals.

At the top of the system, university hospitals are established in order to render tertiary health care.

A post graduate institute is planned to implement the tertiary health care and cover post graduate course. In Delhi All India Institute of Medical Sciences has already been set up and such institutes are being set up in some of the bigger States.

3) Medical Facilities

Medical facilities in India, as stated before, are classified into three types, i.e., governmental (national regional), private and voluntary facilities.

Table 8 shows a comparison of the number of facilities and beds in Uttar Pradesh State and in all India.

Especially the following fact should be noted that the number of beds per 10 thous. is only 7.1 in all India and 4.1 in Uttar Pradesh State which means less than one tenth of Japan.

Table 7: NUMBER OF HOSPITALS, CLINICS, BEDS BY HOLDS (1984)

CRITERIA \ HOLDS		NATIONAL	MUNICIPAL	PRIVATE	TOTAL
HOSPITAL	NUMBER	3,521	386	3,250	7,157
	BEDS	335,332	24,412	137,171	496,915
CLINICS	NUMBER	1,129	3,402	6,438	21,130
	BEDS	26,501	3,750	5,306	35,557

Table 8: NUMBER OF HOSPITALS BY BED SCALE (1983)

CRITERIA \ BEDS		0~25	26~50	51~75	76~100	101~200	201~300
ALL INDIA	NUMBER	2,799	1,243	366	322	514	193
	BEDS	35,393	46,977	23,133	29,648	74,257	47,596
UTTAR PRADESH	NUMBER	358	138	59	40	71	14
	BEDS	4,928	5,333	3,691	3,609	9,883	3,400

4) Medical Personnel

As shown in Table 9, the number of medical personnel in India is as follows: 268,712 physicians, 8,656 dentists, 162,875 nurses and 80,012 auxiliary nurses.

Table 10 shows the comparison of the number of medical personnel per 100 thous. people as follows;
Physicians for all India 39, for Uttar Pradesh 20 (for Japan 135), dentist for all India 1, for Uttar Pradesh 0.4 (for Japan 48), nurses for all India 24, for Uttar Pradesh 6 (for Japan 235), auxiliary nurses for all India 2, for Uttar Pradesh 8 (for Japan 221).

The said tables show that the number of medical personnel in India is seriously insufficient.

Table 9: NUMBER OF MEDICAL PERSONNEL (1981)

	Physician	Dentist	Nurse	Aux·Nurse
India	268,712	8,656	162,875	80,012
Uttar Pradesh	23,885	444	7,919	10,184

Table 10: COMPARISON OF NUMBER OF MEDICAL PERSONNEL

(Per 100,000)

		Physician	Dentist	Nurse	Aux·Nurse
*3	India	39	1	24	12
*3	Uttar Pradesh	20	0.4	6	8
*4	Japan	135	48	235	221

*3 Data in 1981

*4 Data in 1982

5) Medical Education and Training Program

In India, Homoeopathy and Medical System are widely prevailing but Western Medical Sciences are also very popular even in rural areas. In urban areas it outstrips the popularity of the other two systems.

Therefore, for medical education, there are three kinds of Medical College coping with Western style and those with Homoeopathic and Indian systems.

In India, there are 106 Medical Colleges of Modern Medicine and in Uttar Pradesh where Sanjay Gandhi Post Graduate Institute of Medical Sciences is located, there are 9 Medical Colleges, two of which are national and the remaining 7 are of the State. Number of students in National Colleges is 50 for a school year, including a number of foreign students but the number of women is extra. In case of State Colleges the number of students is 55-191 for a school year. One of the State Universities, Agra University, includes 10 Homoeopathic Medical Colleges spread over the State and 12 Indian medical courses. The above Homoeopathic Colleges have 25-50 students for a school year. In Uttar Pradesh with the population of 120 million, every year 920 medical students and 270 Homoepathic medical students graduate.
In the following statement, explanation is attached on the Medical College but not on Homoeopathic Medical College. Qualification for admission required for those over 17 years old and 12 years of schooling, completion of scientific courses, as well as with excellent remarks of the same.

Educational and training term is 5 years and 6 months, including internship. After graduation, MBBS is obtained and thereafter post graduate studies are available in all 9 Colleges. This degree is called MD & MS. After this courses for Super Specialities, where DM or Diploma is given, are available. Sanjay Gandhi Post Graduate Institute of Medical Sciences is one of the leading State Institutes, where post post graduate courses are implemented and mainly graduate students of 9 universities in Uttar Pradesh will be accepted.

The team observed King George Medical College which is in Lucknow, founded in 1911.

The buildings are divided by Department except the central outpatient. Lecture rooms are located in each Department. The students in a school year are 190. Post graduate courses are implemented in each Department and 28 post graduate courses are available in various specialities.

The team observed All India Institute of Medical Sciences, New Delhi, which possesses big influence over Indian Medical Sciences. While modern equipments are available in all departments, they seem to be not sufficient, compared with leading hospitals in Japan, where modern equipments are arranged. However, staff concerned, many of them have studied in U.K. or U.S.A. etc. after graduation of Indian Universities and they have abilities to implement advanced medical care. Therefore, to implement SGPGI activities, they will give effective support for them.

When advanced medical equipments will be provided by the Government of Japan under this project, the team considers that the training of doctors or engineers, who will use the equipments, is required. While Indian side is requesting for doctors training of short term and for engineers training of long term, Japanese side is pleased to receive them and to despatch experts. As the reciepient facilities, the University hospital, or National hospital, where the advanced equipments are prepared, are recommendable as well as the manufacturers of the said equipments.

6) Medical Research

Regarding Medical Research, all institutes are supported by Indian Council of Medical Research (ICMR). Therefore, Sanjay Gandhi Post Graduate Institue will be supported by the Council.

As table 11 shows, there are 17 Permanent Institutes and Centers, 7 Advanced Research Centers and 7 Regional Research Centers. Their studies are expanded into various fields. The network of the Institutes in India are shown in figure 4.

Table 11:

ICMR(Indian Council of Medical Research) MAIN INSTITUTE

1) Permanent Institutes/ Centres

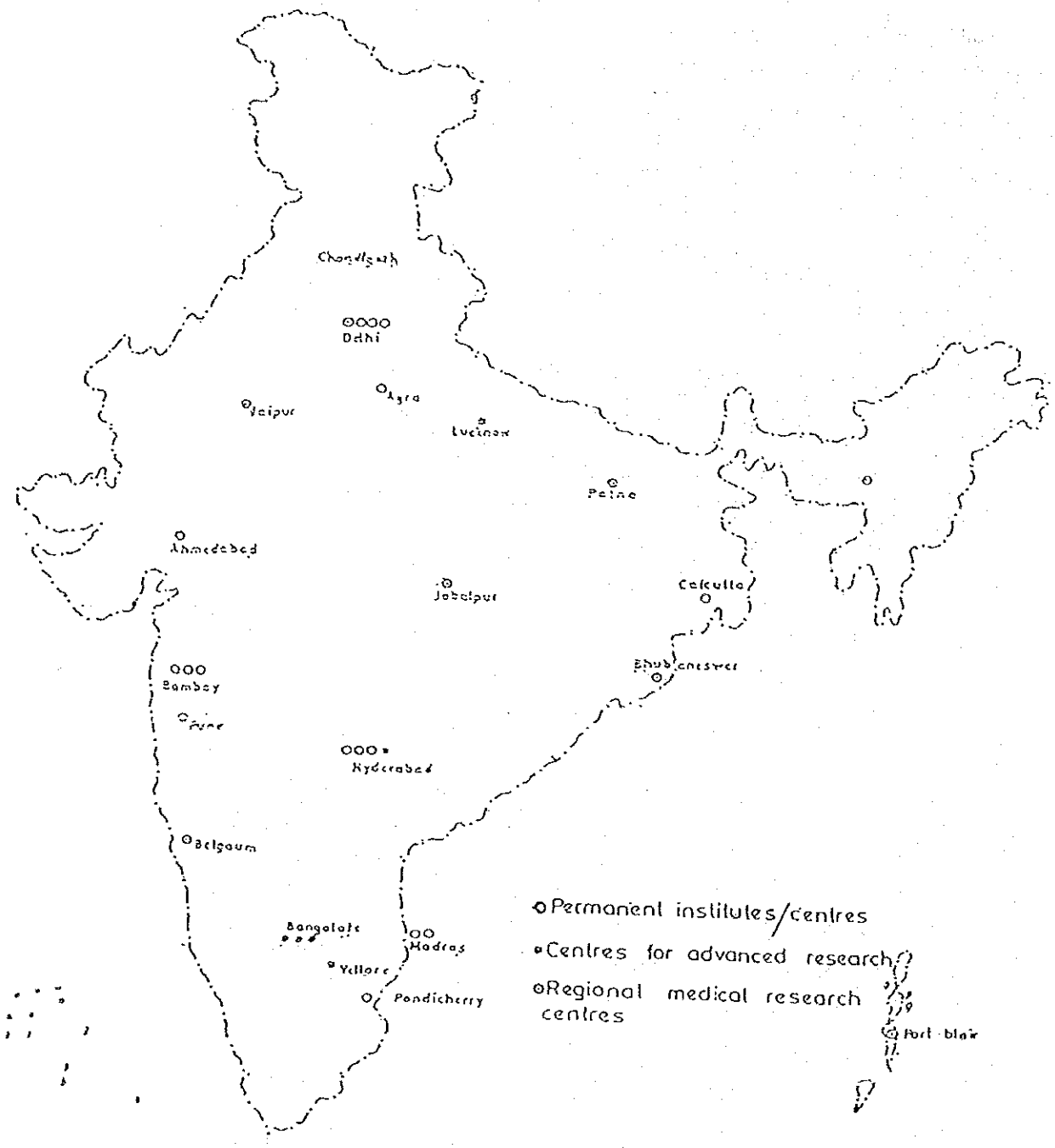
1. National Institute of Nutrition
2. National Institute of Virology
3. Institute for Research in Reproduction
4. Tuberculosis Research Centre
5. Blood Group Research Centre
6. National Institute of Cholera and Enteric Disease
7. Institute for Pathology
8. National Institute of Occupational Health
9. Vector Control Research Centre
10. Laboratory Animal Information Service
11. Food and Drug Toxicology Research Centre
12. Central JALMA Institute for Leprosy
13. Malaria Research Centre
14. Institute for Research in Medical Statistics / ICMR
15. Institute for Research in Medical Statistics
16. Cytology Research Centre
17. Enterovirus Research Centre

2) Centres for Advanced Research

1. Centre for Advanced Research in Reproductive Biology
2. Centre for Advanced Research in Genetics and Cell Biology
3. Centre for Advanced Research in Neuropharmacology
4. Centre for Advanced Research in Virology
5. Centre for Advanced Research in Community Phychiatry
6. Centre for Advanced Research in Haematology
7. Centre for Advanced Research in Neurobiochemistry

3) Regional Medical Research Centres : 7 Institutions

Figure 4: NETWORK OF INSTITUTE, ICMR



(3) Conception and Present Condition of Sanjay Gandhi Post Graduate Institute of Medical Sciences (SGPGI)

1) Conception of the Plan

SGPGI, aiming at the top level in every field of medical care and medical research, is planned to establish an institute for to play a leading role not only in Uttar Pradesh or India but also in the world. The staff such as professors are being selected. SGPGI is finally planned to have 19 special research departments in future.

1. NEUROCOLOGY AND NEURO-SURGERY
2. CARDIOLOGY AND CARDIOVASCULAR SURGERY
3. GASOROENTEROLOGY
4. UROLOGY NEPHROLOGY
5. ENDOCRINOLOGY
6. GENETICS AND IMMUNOLOGY
7. RESPIRATORY MEDICINE THORACIC SURGERY
8. ONCOLOGY
9. NUTRITIONAL DISEASES
10. TROPICAL DISEASES
11. FAMILY PLANNING
12. COMMUNITY MEDICINE EPIDEMIOLOGY
13. INFECTIOUS DISEASES MICRO-BIOLOGY
14. HAEMATOLOGY
15. DERMATOLOGY
16. RHEUMATOLOGY
17. CLINICAL PHARMACOLOGY
18. BIO-ENGENEERING UNITS
19. HOSPITAL ADMINISTRATION

Organization of SGPGI is shown on Figure 14 and 15. As shown in Figure 14, SGPGI includes electricity board, post & telegraph & communication, police service and fire service.

Table 15 shows that SGPGI has 6 supporting departments, which are hospital, engineer, horticulture & forest, financial officer, dean and administrative officer. Under the hospital,the following supporting divisions are allocated: nurse, laundry, pharmacy, kitchen, animal house and hospital records.

Specialities of SGPGI in phase I consist of 6 departments: Neurology and Neuro-Surgery, Cardiology and Cardiovascular Surgery, Gastroenterology, Urology and Nephrology, Endocrinology and Genetics and Immunology.

In phase II 6 departments will be added: Respiratory, Oncology, Nutritional Diseases, Tropical Diseases, Family Planning and Community Medicine and Epidemiology.

Furthermore, in phase III 7 departments of Infectious Diseases and Microbiology, Haematology, Dermatology, Rheumatology, Clinical Pharmacology, Bio-Engineering and Hospital Administration. Thus, ultimately 19 departments will be established.

At present there are 8 doctors, 16 paramedical staff and 88 persons in administration. Further, appointments have been offered to 8 Heads of Departments of the institute and 30 technicians. Post of 42 faculty members and 60 technicians have been advertised. Details of further faculty, technicians, nurses etc. will be decided, when Heads of the Department will join. It is projected that there will be approximately 250 faculty members, an equal member of training doctors will come and the overall staff at the end of phase I will be more than 2500.

As a result of discussions among various specialists of SGPGI, six departments from the first to the sixth have been selected for development in phase 1. For selection of above departments, two selection criteria were taken into consideration which are (1) development of each expertise can contribute to medical care and (2) morbidity and mortality will be restricted.

Furthermore, the following points were also pointed out as detailed reason for selection.

The 1st Department, Neurology and Neuro Surgery

In all India, there are 115 prominent neurosurgeons but only 5 in Uttar Pradesh. In this State, there are only two hospitals which have neurology and neuro-surgery, i.e., King George Medical College in Lucknow and Benaras Hindu University in Varanasi. These hospitals are poorly equipped. Taking into account the important role of this Department, as well as situation of this speciality in the State, this field is selected as one of urgent necessities.

The 2nd Department, Cardiology and Cardiovascular Surgery

The occurence of serious coronary heart disease is estimated to be 0.9% and we presume there would be about one million cases suffering from ischaemic heart disease in Uttar Pradesh. Some of them do require operation to improve their physical abilities.

In North India, occurrence of rheumatic heart disease is very high (0.17% of total population), and severe valvular disease occures among 11 to 16 year old children (1.2%). Valve replacement surgery is effective for the said disease.

The team presumes that there may be a hundred thousand patients in the State who need Cardiac Surgery. There are only one hospitals where such operations can be implemented in Uttar Pradesh, whereas in Bombay there are 13 hospitals with such a high technology.

The 3rd Department, Urology, Nephrology

In India, there are a lot of people for whom dialysis unit is necessary. It is supposed to be urgently necessary to cultivate skillful doctors in the field of dialysis kindney transplant, urinary tract surgery, etc. of international level.

The 4th Department, Gastroenterology - Medical & Surgical

There are many cases of viral hepatitis and hepatocirrhosis in

India. They have almost no idea to prevent or cure it. No action against the above diseases has been taken yet.

It is of urgent necessity to correspond develop of radiological and endoscopic techniques which are very useful for diagnosis and treatment of Digestive disease, as well as to put them to practical use.

The 5th Department, Endocrinology

About 2% of the population of Uttar Pradesh suffers from goiter. Other endocrine diseases are also serious. In the field of diagnosis for endocrine disease a remarkable progress has been made in recent years. However, it requires advanced equipments and technique. In Uttar Pradesh, there is no facility to satisfy the above requirements. Furthermore, it is necessary to train the personnel and to master the technology of endcrine surgery.

The 6th Department, Genetics and Immunology

Study for Genetics and Immunology is making remarkable progress. But in India, they have not put much effort in applying this progress to the disease by abnormal gene and by abnormal immunity.

Considering from the trends of diseases in India, infectious diseases including tuberculosis and leprosy are still serious and malnutrition due to poverty is also very serious. In order to improve Indian economical situation, family planning for population control is required. As a consequence, the 9th Dept. (Nutritional Diseases), the 10th Dept. (Tropical Diseases), the 11th Dept. (Family Planning), the 12th Dept. (Community Medicine, Epidemiology), the 13th Dept. (Infectious Diseases) and so on necessary be established at SGPGI as soon as possible. On the other hand, National Institutes concerned with the above diseases had been already established (See Table 11).

Under such circumstances for phase I 6 Departments from the 1st to the 6th are selected.

Figure 5 : ORGANIZATION CHART (SGPGI)

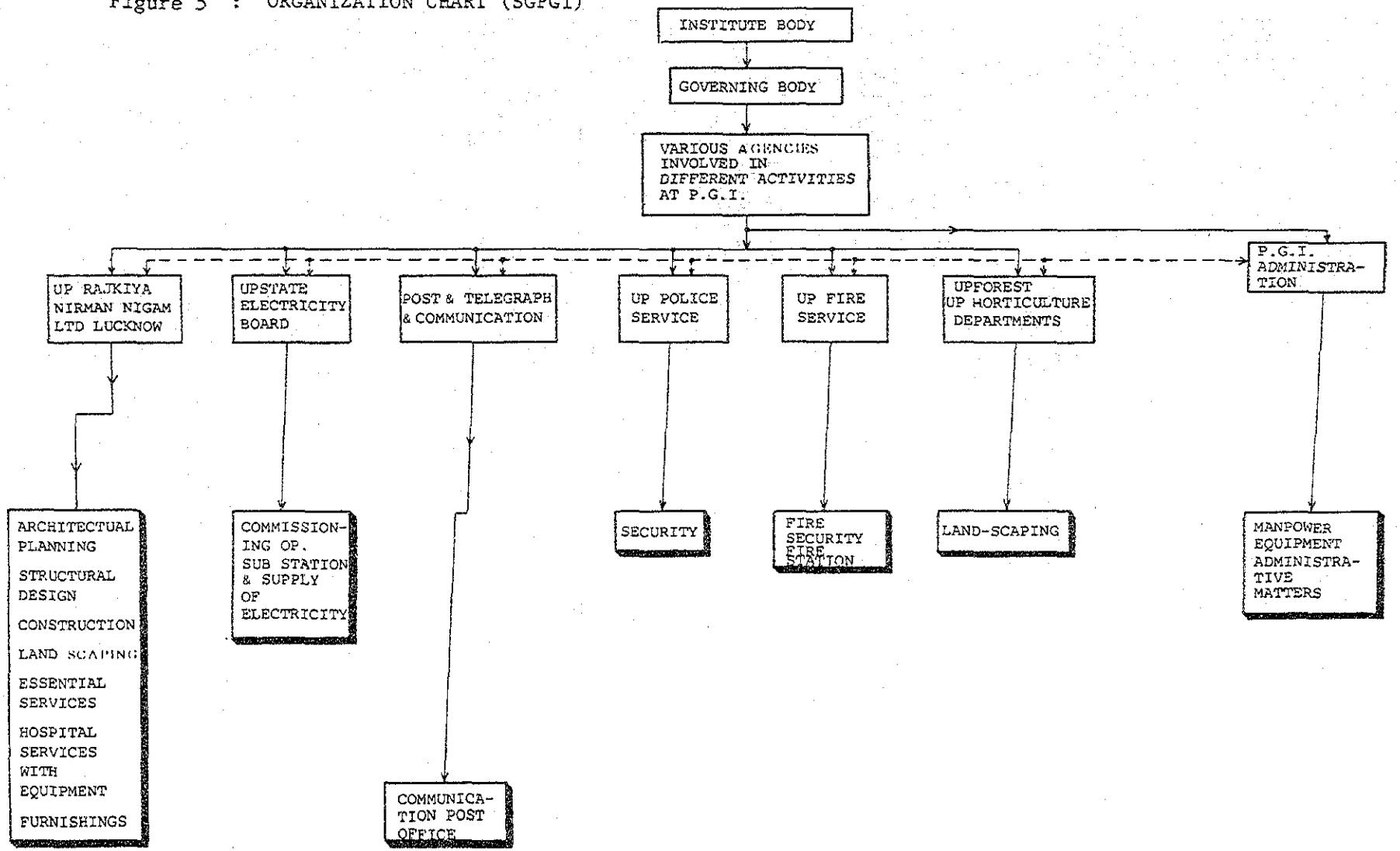


Figure 6 : SUPPORTING SYSTEM (SGPGI)

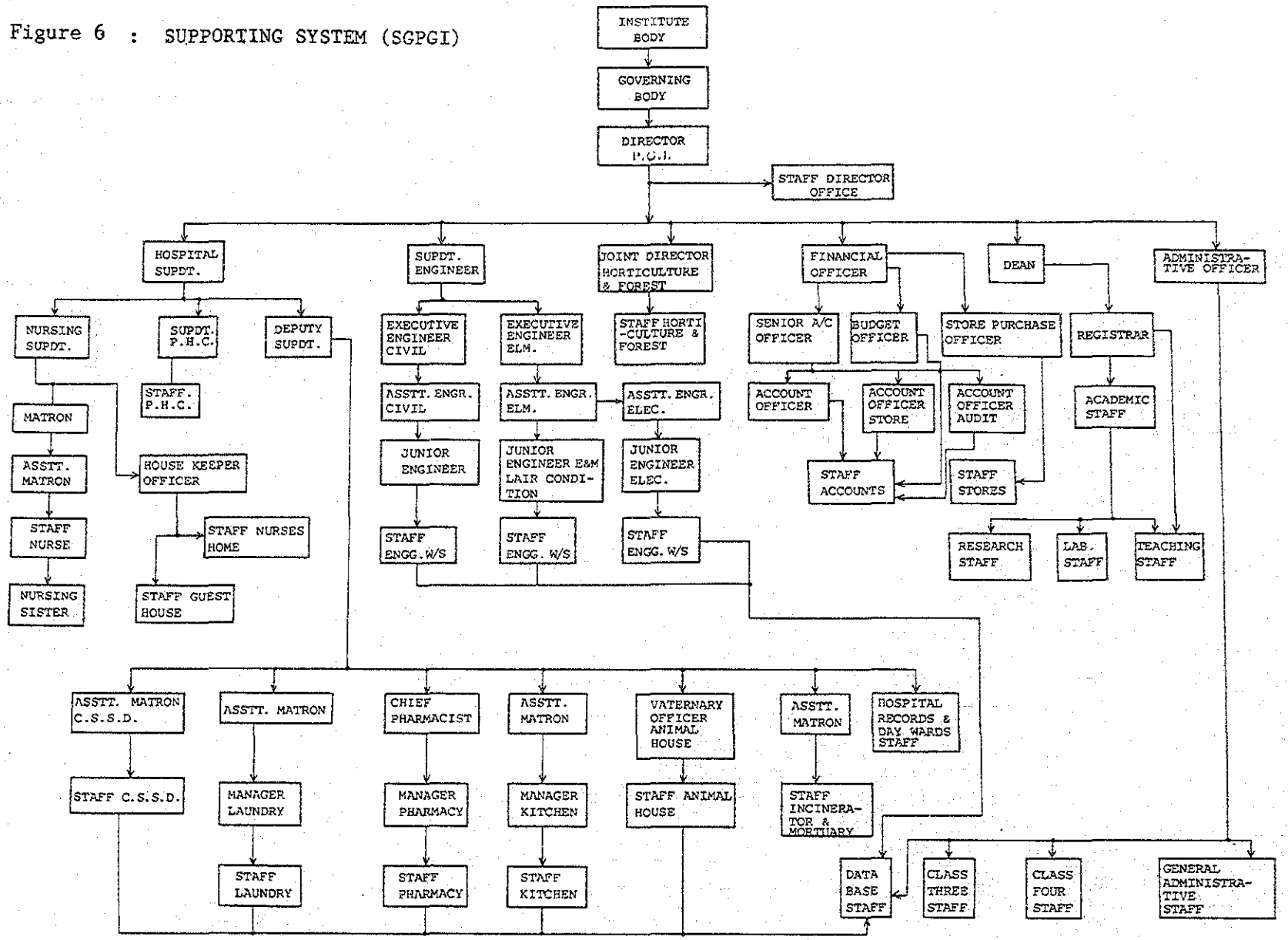


Figure 7 : COMPOSITION OF STUDY AND DIAGNOSIS FUNCTION (Phase I - III)

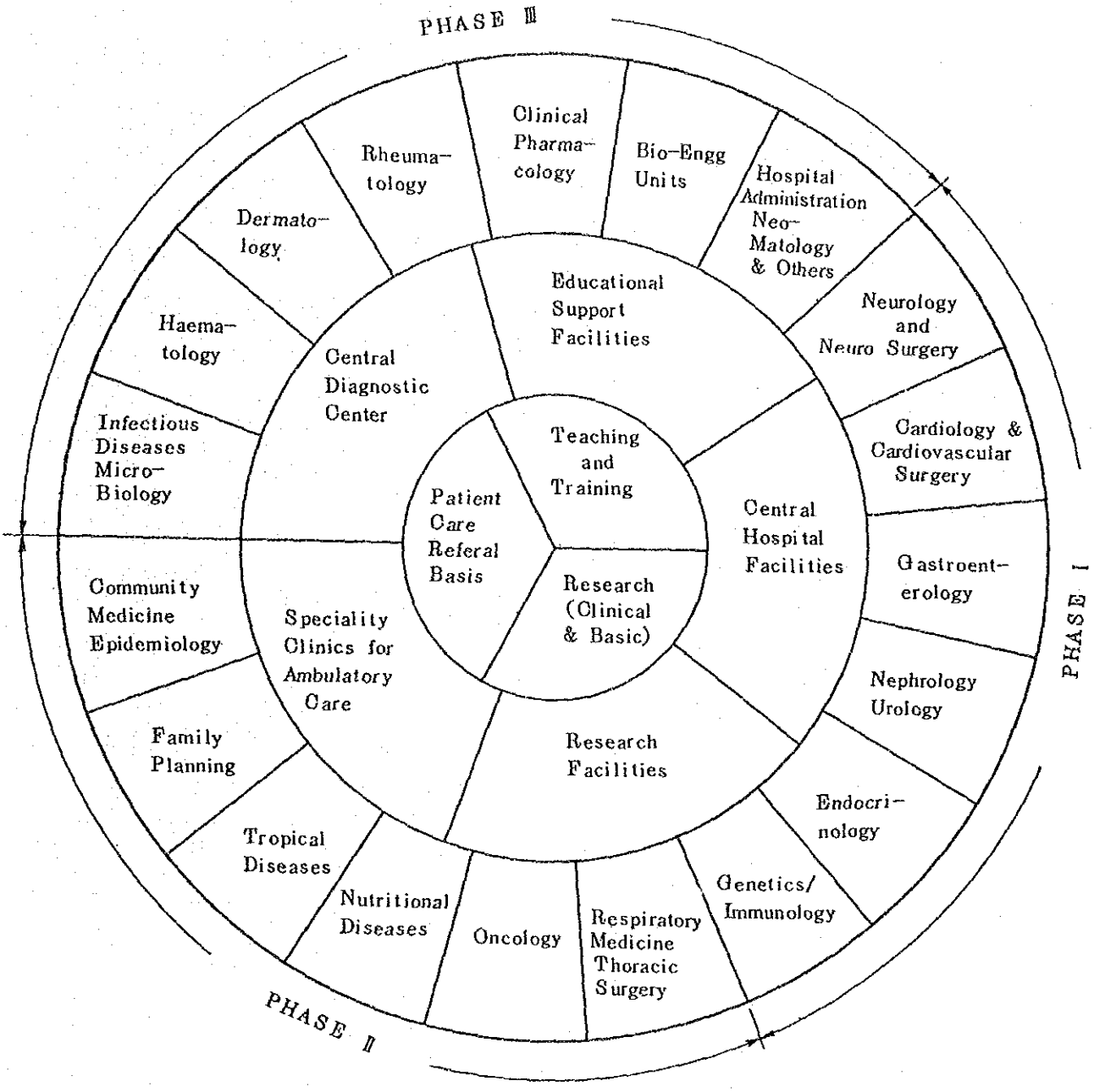


Table 11 : PLAN OF STAFF ALLOCATION

SL. No.	Particulars	TIME												TOTAL
		April 86			July 86			Oct. 86			Jan. 87 to July 87			
		Medical	Para Medical	Adminis-trative	Medical	Para Medical	Adminis-trative	Medical	Para Medical	Adminis-trative	Medical	Para Medical	Adminis-trative	
1.	30 Bedded Hospital	5	16	-	3	-	-	-	-	-	-	-	-	24
2.	O.P.D.	-	-	-	-	38	56	-	-	-	-	-	-	94
3.	Day-Care Ward	-	-	-	3	19	-	2	19	-	-	-	-	43
4.	Medical-Record	-	-	-	-	-	2	-	-	-	-	-	-	2
5.	Neuro-Sciences	-	-	-	7	9	15	7	7	9	6	-	-	60
6.	Cardiac Sciences	-	-	-	5	9	15	6	7	9	4	-	-	55
7.	Renal Sciences	-	-	-	6	9	15	6	7	9	2	-	-	54
8.	Gastroentrology	-	-	-	5	9	15	5	7	9	2	-	-	52
9.	Endocrinology	-	-	-	3	9	15	5	7	9	-	-	-	48
10.	Genetic/Immunon	1	-	-	3	10	15	4	7	9	-	-	-	49
11.	Continuing Medical	-	-	-	1	-	-	2	-	-	-	-	-	3
12.	Pathology & Radiology	2	-	-	13	18	19	11	31	19	7	31	11	162
13.	Anaesthesia	-	-	-	3	-	-	1	11	-	1	10	-	26
14.	OT's (11 Nos.)	-	-	-	-	-	-	1	94	95	-	80	88	358
15.	Wards	-	-	-	-	-	-	79	278	45	106	434	80	1022
16.	Dialysis	-	-	-	-	7	-	-	-	-	-	-	-	7
17.	Other Hospital Support Services	-	-	-	1	14	-	2	21	86	-	7	58	189
18.	General Adminis-trative Staff	-	-	88	-	-	84	-	-	93	-	-	39	304
19.	Teaching Staff	-	-	-	-	-	-	-	-	50	-	-	-	50
	Total Manpower (Quarterly)	8	16	88	53	151	251	131	496	442	128	562	276	2602
	Cumulative Manpower	8	16	88	61	167	339	192	663	781	320	1225	1057	

Table 12 : EXPENDITURE INCURRED DURING THE SIXTH FIVE YEAR PLAN

Year	Revenue	CAPITAL		Equipment		Periodwise Total	Commulative Expenditure
		Buildings	Others	Imported	Indegenous		
1	2	3	4	5	6	7	8
1980-81	0.013	-	-	-	-	0.013	0.013
1981-82	0.251	-	-	-	-	0.251	0.264
1982-83	0.337	14.260	1.068	-	-	15.665	15.929
1983-84	0.789	35.284	6.206	-	-	42.279	58.208
1984-85	0.856	113.771	0.544	-	-	115.171	173.379
TOTAL (until March 31, 1985)	2.246	163.315	7.818	-	-	173.379	
TOTAL (until Dec. 31, 1985)	3.65	239.561	17.887	-	-	261.107	
ANTICIPATED EXPENDITURE DURING THE SEVENTH FIVE YEAR PLAN							
1985-86	5.695	200.00	27.204	158.968	24.673	416.54	589.919
1986-87	25.699	220.000	8.713	182.755	9.672	446.839	1036.758
1987-88	71.287	100.685	12.311	-	-	184.283	1221.941
1988-89	98.000	-	-	-	-	98.000	1319.041
1989-90	117.000	-	-		-	117.000	1436.041
GRAND TOTAL (for 7th Plan)	317.681	520.685	48.228	341.723	34.345	1262.662	
GRAND TOTAL for Phase I (for 6th + 7th Plan)	319.927	684.000	56.046	341.723	34.345	1436.041	
GRAND TOTAL for Phase II & III	1300.73	1638.00	39.054		623.932	2431.059	
GRAND TOTAL for Phase I+II+III	450.00	232.20	95.10		1000.00	3867.10	

2) Contents of Facilities

SGPGI, which is the objective Institute of this project, is located in the south of Lucknow in Uttar Pradesh State (at a distance of about 500km from Delhi) and is planned at the site of 220 ha., newly developed in the rural area along the State highway, far from about 15km from the center of the city and is expected to be a big research educational town.

This research educational town is composed of six parts of facilities, which are hospital and research center, hospital related facilities, dormitory, residence, communal facilities (stores, community center, restaurants, bank, post office, fire station, police station, schools,, guest house, etc.) and accomodation for patients families. The plan is intended to be flexible on the whole, namely, each facility will be able to cope with the future extention and renovation. Green zone is arranged around the site for purpose of better environment.

Now each facility is under construction. Administrative building, guest house, dormitory for nurses and students, bank and a part of residence have been already constructed. The administrative building and guest houses are already available. School, accomodation for patients' families, restaurant, stores and community center will be nearly completed.

The construction of facilities for medical services started in January 1984. The work is well underway. Primary care center (30 beds) had been already completed and will come in operation in 1986. The construction of outpatient unit, research divisions and service divisions will be completed in December 1986. For central diagnosis dept. and 120 beds out of 600 of ward will be completed in December 1986.

Each facility will be successively managed as soon as buildings are completed. All construction work will be completed in February 1987. Furthermore, wards will be added continuously. There will be 600 beds at the end of in phase I and 1,800 beds at the end of phase III.

In this procurement project, equipments shall be implemented only in facilities for medical services of SGPGI. The facilities are located in the north-east of the research educational town and is planned in front, about 300 meters from the gate. They are composed of low buildings which have outpatient unit, central diagnosis dept., research dept. and service dept. as well as tall builldings, ward dept. The total floor area is 67,862 sq. m. Contents of facilities of each department are as follows:

Outpatient unit - Two stories above the ground with floor area of 7,876 sq. m. Outpatient unit.

Central diagnosis dept. - Two stories above the ground with floor area of 9,856 sq. m. - Dialysis unit, ICU, Radiology and operation unit.

Research dept. - Three stories above the ground with floor area of 14,300 sq. m. Neurology and Neuro Surgery, Cardiology and Cardiovascular Surgery, Gastroenterology, Nephrology and Urology, Endocrinology, Genetics and Immunology.

Ward - Ten stories above the ground with floor area of 26,400 sq. m. each floor with 60 beds, total 600 beds.

Service division - Mainly one-story, partly two stories, with floor area of 4,400 sq. m. consisting of Kitchen, Pharmacy, Laundry, Central Warehouse, Air Conditioning Control Room, Electric Generator Room.

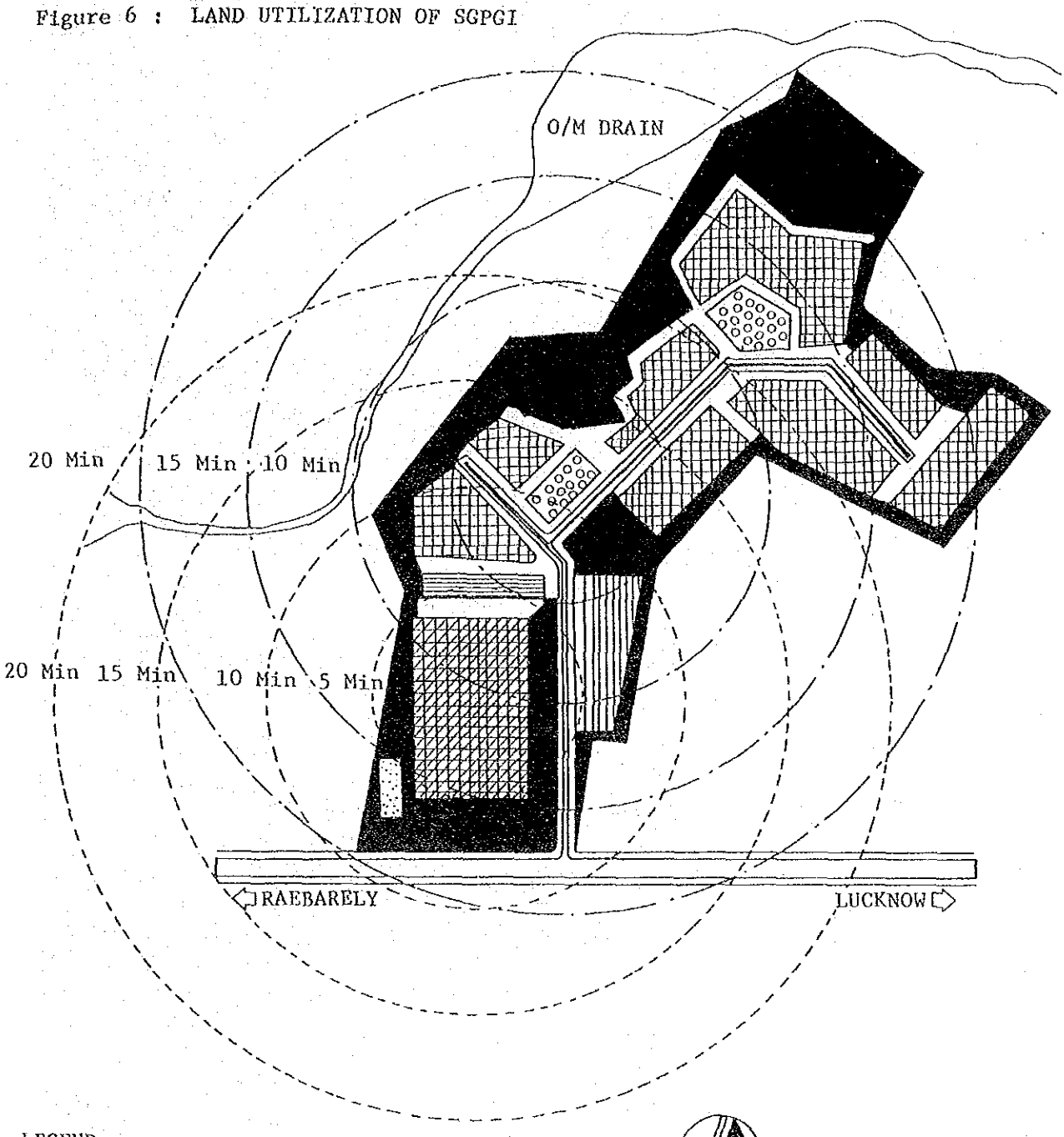
Other - Two stories above the ground with floor area of 5,030 sq. m. for passage/corridor.

Each facility is planned to be flexible on the whole which enables future extension and renovation. The ceiling of the main gallery is of double slabbed construction and the attic is used for concentrated piping zone. On the outer wall, vartical and horizontal shafts for piping are provided so as to supply energy to equipments easily.

The structure of the buildings is of ferro-concrete and a rigid frame structure. On the floor, joist slab (with small beams) is adopted. Walls are mainly built of bricks, part of which is made of ferro-concrete. The joist slab is contained with small beams so that the layout of heavy apparatus is to be planned freely. However, in case of super-heavy apparatus, the weight of which is beyond the limits, a reinforcement of its construction is difficult. As small beams are not thick enough, regarding ceiling type apparatus (for example, shadowless lamp, X-ray apparatus, etc.) it is necessary to bury anchors beforehand.

Fortunately as the construction for operation dept. and X-ray dept. is just starting, the team suggested that the construction should be stopped once and restart after the completion of the layout of equipments.

Figure 6 : LAND UTILIZATION OF SGPGI



LEGEND

- MAIN HOSPITAL ZONE
- HOSPITAL SERVICE ZONE
- RELATIONS ACCOMMODATION ZONE
- RESIDENTIAL ZONE
- HOSTELS ZONE
- COMMUNITY FACILITIES ZONE
- INTENSIVE LANDSCAPING ZONE

0 0.5 1 1.5 kM
DISTANCE SCALE

0 5 10 15 20 Minutes
TIME SCALE

Figure 9 : SITE PLAN

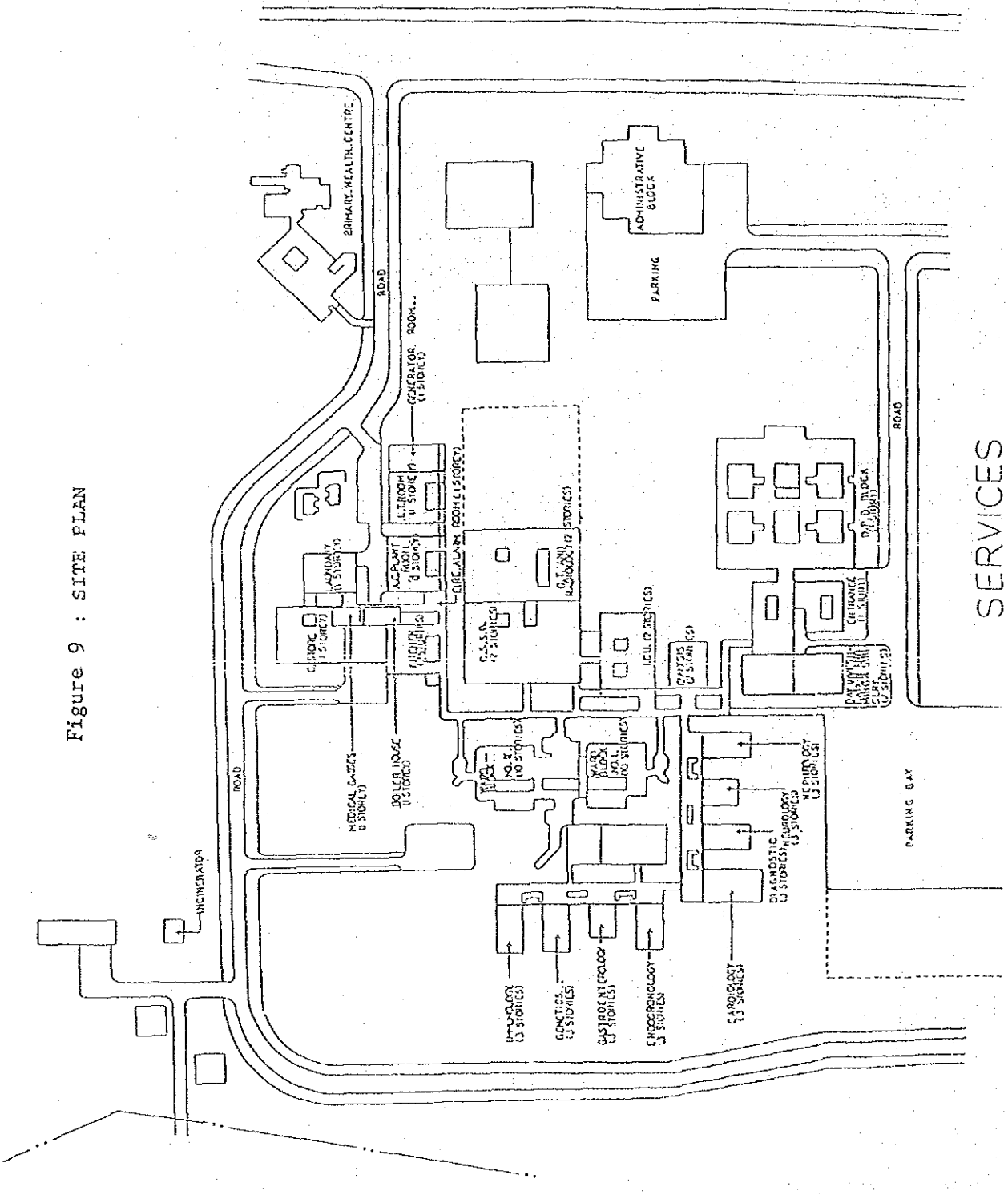


Figure 10 : LAND

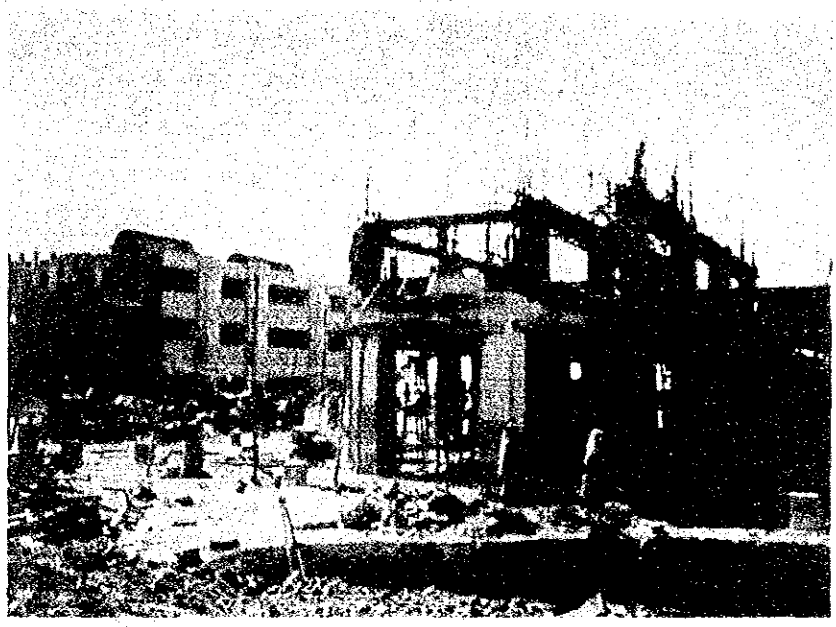


Figure 11 : CONSTRUCTION

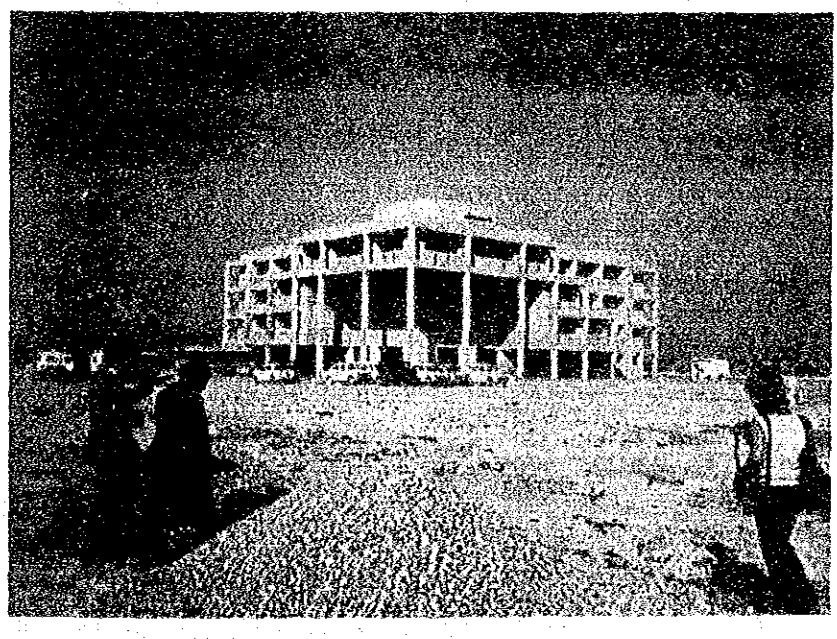


Figure 12 :
ADMINISTRATION BUILDING

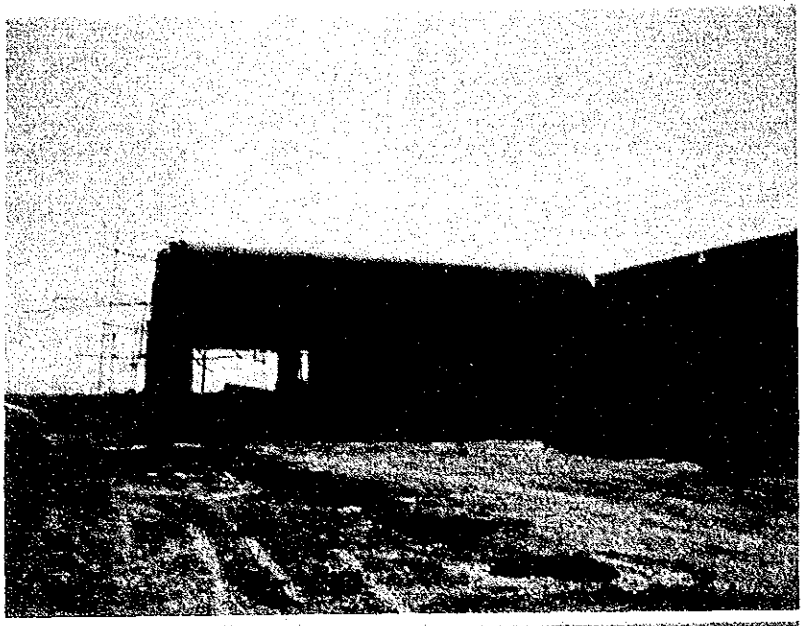


Figure 13 :
ENTRANCE OF DEPARTMENT OUTPATIENT

Figure 14 :
INSIDE OF OUTPATIENT DEPT.

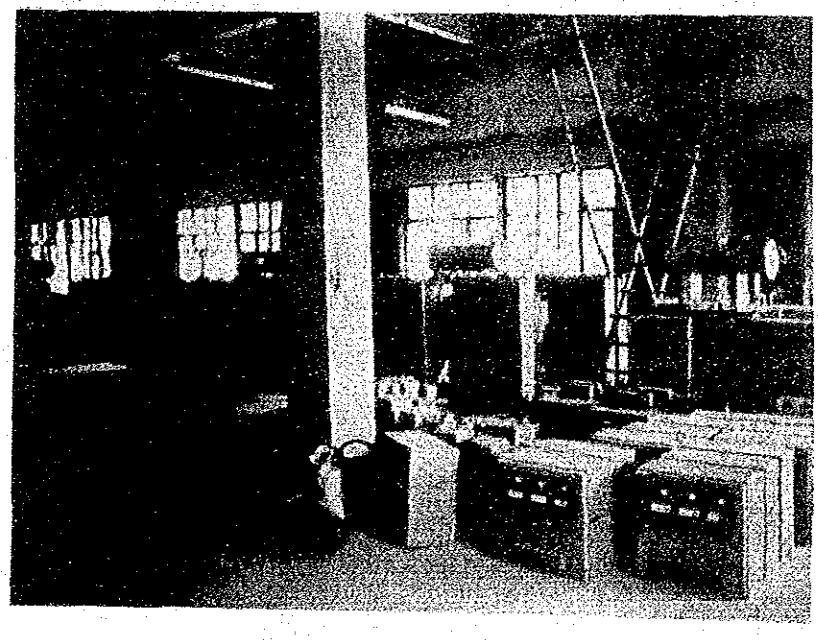


Figure 15 :
INSIDE OF ELECTRICITY DEPT.

The team has investigated the facilities of SGPGI with regard to especially large-sized apparatus, such as air conditioning system, ventilators, water supply and draining system, electric system, and matters which will affect sensitive medical equipments. As the ducts are to be laid along outer walls with ample space, installation of equipments does not have big problems. At present the equipments to be installed have not been decided yet, and piping has been arranged in each building but not been connected to each room inside yet. Therefore, the team suggested the piping work shoule be completed before the installation of equipments.

i) Air conditioning and ventilation system

Lucknow is located in lat. 26 degree N. (almost the same latitude as Hongkong) and 113 meters above sea level. The average temperature of summer season (from April to September) is 33 degree C and sometimes in winter season (from December to February) it becomes 12 degree C. From July to September it is in the highest and can go up to 42 degree C., while average humidity is 65%. Average humidity in other seasons is 43%. Air conditioning systems of these facilities are planned under this climatic condition.

(Air Condition Arrangement Term)

	OPEN AIR		INTERIOR	
	(DRY BULB)	(WET BULB)	(DRY BULB)	(REL.HUMIDITY)
SUMMER (MAY)	42.8 ℃	26.1 ℃	Operating Room 22.3 ℃ ± 1.1 Other's 23.9 ℃ ± 1.1	55% ± 5%
MONSOON (AUG)	34.4 ℃	27.7 ℃	Operating Room 22.3 ℃ ± 1.1 Other's 23.9 ℃ ± 1.1	55% ± 5%
WINTER (JAN)	8.9 ℃	6.1 ℃	21 ℃ 23.9 ℃	55% ± 5%

Generally in India buildings are planned without air conditioning systems and instead of them natural airing through their high ceilings is provided.

In case of SGPGI, air conditioning systems are arranged only at places where it is consideed to be absolutoly neccessary. Regarding air conditioning system, cooling and hot water is supplied from the main plant to each air conditioner and fan coil unit and cool and hot air are supplied from each equipment to each room through ducts.

air conditioned area	about	15,000 m^2
air conditioned load		1,350 RT.
freezer		4.50 RT. x 3
cooling device		2
air conditioner		39

Air Conditioned Room		Ventilated Frequency
2nd story	Operating Room	25 times / H (all fresh
1st story	Nuclear Medicine	2 "
"	Radiology	2 "
"	Dialysis Unit	2 "
2nd story	ICU	2 "
"	Day Investigation	2 "
1,2,3 story	Diagnostic Lab.	2 "
"	Neulogy, Cardiology Lab.	2 "
"	Nephrology, Gastroenterology, Genetics-Immunology Lab.	2 "
from 1st to 10 story	Private Ward (60 bedded)	Ventilated Quantity 85m^3/ h
2nd story	Library	once / h
1st story	Diagnostic Record	"
"	Lecture Room	"

ii) Water Supply and Drain System

(a) Water Supply System

Well sinking had been done on three spots on the site. Pumps lift water to two high-level tanks with 800m3 capacity. Water is supplied to each facility by its gravity. On the other hand, for emergency cases of hospital, one more well is planned in order to supply to the spots in hospital from under ground tank of 500m3 capacity at need. Water-supply population, water-supply quantity, source of water supply, water-supply pressure, materials of pipes and water treatment are as follows:

① Water-Supply Population

	site area	Water-Supply Population	
first term	340 acre	Residence	13,530
	(137.6 ha)	Hospital and attached facilities	4,000
the last	550 acre		50,000

② Water-Supply Quantity

First Term	340 acre	5,400 m^3/ day
・Details of First Term		
・Hospital 600 bedded (including OPD)		340 m^3/ day
・Air Condition, Boiler		660 m^3/ day
・Hospital Attached Facilities		850 m^3/ day
・Residence, Community's Facilities, Road Cleaning, Ohters		3,400 m^3/ day
・Fireplug		150 m^3/ day
・Water-Supply Quantity	Total	5,400 m^3/ day

③ Source of Water-Supply

High-level Water Tank	2	800 m^3 / piece
Water Tank	1	500 m^3 / piece
Well	4 (preparation 1)	
Casing Caliber		200 mm
Depth		110 m and 120 m
Spew Quantity		113 m^3/h and 88 m^3/h
Pump Working Hours		16 hours

④ Water-Supply Pressure

Water-Supply Pressure	2 kg / cm^2
End of the Longest Water-Supply Pressure	1.7 kg / cm^2

⑤ Materials of Service Water Pipe

PVC Pipe	Caliber 250mm and below	Exterior
Asbestos-covered Pipe	Caliber 300mm through 350mm	Exterior
Cast Iron Pipe	Caliber 500mm and above	Exterior
Zinc Gilt Pipe		Interior

⑥ Water Treatment

It is planned to set sterilizing system which pours Hypochlorite.

(b) Water Treatment

SGPGI plans to arrange a water purification system by Hypochlorite. The result of the examination of water shows hardness of water is rather high and, bacillus and colon bacillus are detected. The team considers there is a possibility that waste water is flowing into supplied water.

Indian side explained their intention to arrange water softner and purification apparatus in future, considering some of the equipments which are supposed to be affected by water condition.

Drainage in the hospital is divided into dirty water, miscellaneous draining water and rainwater. Drainage from RI is treated by an independent system and conducted to draining pipes. Drainage from outside is planned to flow into sewage disposal facilities through control tank. This water is discharged to the river.

① Draining System

Draining of Hospital and Residence
Underground Water

② Draining Quantity

80 % of the amount of water supplied
Underground Water 1,500 liter / ha
(0.15 liter / m^2)

③ Draining Quantity Pump-uped of Draining Control Tank

	Average Draining Quantitv	Moment Draining Quantity	Underground Water	Moment Total Draining Quantit
first phase (340 acre)	4.8 ℓ / sec.	168 ℓ / sec.	30 ℓ / sec.	198 ℓ / sec.
last phase	5.8 ℓ / sec.	204 ℓ / sec.	11 ℓ / sec.	215 ℓ / sec.

④ Draining Control Tank

Inside Diameter	9 m
Depth	9.5 m
Drain Pump	5 pieces
Moment Working	3 pieces
Dry Season's Working	2 pieces

⑤ Draining Treatment

Airation Tank	42 m X 42 m x 3.45 m (H)
Deposit Tank	Inside Diameter 18 m x 3.5 m (H)

⑥ Water Analysis

		(standard value)
BOD	20 mg / liter	30 mg / liter
SS	50 mg / liter	100 mg / liter
pH	6.15	5.53

iii) Steam Supply System

Steam is planned to be supplied to central supply, laundry and kitchen from the boiler room in Service Section.

Steam Boiler Capacity - 3,000 kg/h

iv) Medical Gas System

Medical gases, oxygen, nitrous oxide, compressed air, vacuum etc. are planned to be supplied by central piping system and provided to wards, radiology unit, operating room, ICU, Dialysis unit, Outpatient Dept. from Medical Gas Unit. The capacity of medical gas is as follows:

① Oxygen Manifold

General use	40 pieces + 40 pieces
Emergency use	20 pieces + 20 pieces

② Nitrous Oxcide Manifold

General use	8 pieces + 8 pieces
Emergency use	2 pieces + 2 pieces

③ Smoking Pump	7.5 HP	3 pieces
④ Compressing Pump	10 HP	2 pieces

v) Electric System

Voltage of electricity is dropped from 132 KV to 11 KV at the central power station of UPSEB located out side of north-central of the site. Voltage will be dropped further from 11 KV to 220 V at the substation and is supplied to each building. One of the said electric system is applied for hospital electricity and then electricity is supplied to each block. Because of frequent breakdown, independent electric power units are prepared. An electric generator of 2,500 KWA is applied for hospital. Since this substation is not equipped with AVR, medical equipment, which is affected by voltage change, should be provided with AVR respectively. Considering frequent thunder in India, lightning rods are planned also. The capacity of each transformer in each ward is as follows:

Administration section, Exterior illumination - 630 KVA
Outpatient unit, Day care unit - 400 KVA
Operation unit, Radiology unit - 630 KVA x 2
(Operation room, Radiology unit, ICU, Dialysis unit)
Wards (I, II) - 630 KVA
Library - 400 KVA
Neulogy, Nephrology, Cardiology, Diagnosis unit - 400 KVA
Gastroenterology, Endocrinology, Genetics-immunology unit - 630 KVA
Primary health centre - 630 KVA
Service section - 400 KVA
Air conditioning unit - 1,000 KVA x 4
Total - 9,380 KVA

In SGPGI electricity is supplied at stable condition, different from city central, shere break down is frequint. Table 13 is a data, obtained from 10:52 to 12:01 in 7 Feb., 1986 at Administrative Unit on the site survey. Average voltage is 235.6V - 237.1 V and the standard deviation is 4.7 - 5.1 (voltage fluctuation +- 10.2V = +- 4.3%), at minimum 215 V, at muximum 255 V. Regarding frequency, average is 48.6 Hz - 49.1 Hz, standard deviation 0.42 - 0.76 (frequency fluctuation +- 1.52%. Considering the above data, the team considers that eqipments will not be affected by the electric condition after installation.

Table 13 : TEST RESULTS OF ELECTRICITY CONDITION

(AT ADMINISTRATION BUILDING, SGPGI, Feb 2, 1986)

```
** LINE REPORT **

SANJAY GANDHI PGI
START=86/ 2/ 7 10:52:53


10:52 - 11:13
VOLTAGE
 MEAN= 237.0 V SD=   4.7
 MIN= 215 V   MAX= 250 V
 SAG=         0 TIMES
 SURGE=       0 TIMES
FREQUENCY
 MEAN= 48.6 Hz SD=  0.67
 MIN= 47 Hz  MAX= 50 Hz


10:52 - 11:30
VOLTAGE
 MEAN= 237.1 V SD=   5.1
 MIN= 215 V   MAX= 255 V
 SAG=         0 TIMES
 SURGE=       0 TIMES
FREQUENCY
 MEAN= 49.0 Hz SD=  0.76
 MIN= 47 Hz  MAX= 51 Hz


11:30 - 12: 1
VOLTAGE
 MEAN= 235.6 V SD=   5.0
 MIN= 215 V   MAX= 249 V
 SAG=         0 TIMES
 SURGE=       0 TIMES
FREQUENCY
 MEAN= 49.1 Hz SD=  0.42
 MIN= 48 Hz  MAX= 50 Hz
```

Table 14 : TEST RESULTS OF WATER CONDITION

(SAMPLE FROM TOP AT ADMINISTRATION BUILDING,SGPGI,FEB 7,1986)

TEST ITEM	TEST RESULT	STANDARD
Turbidity	None	Below 2 Degree
Color	Clear	Below 5 Degree
Smell	None	No Smell
pH	8.5	5.8~8.6
Nitrite	0 ppm	Below 10 ppm
Ammonium	0.8 ppm	———
Remained Chlorine	0 ppm	Above 0.1 ppm
Iron	0.2 ppm	Below 0.3 ppm
Zinc	0.8ppm	Below 1.0 ppm
Hardness	235	Below 300
General Bacillus	+++	Below 100
Colon Bacillus	+	No Appear

3) Operational Budget

The overall outlay of the project from Indian side is Rs. 1436,041 million. Out of this Rs. 173,379 million have been spent during the Sixth Five Year Plan (1980-85). The remaining expenditure is anticipated during the Seventh Plan (1985-90). At the end of phase I, the revenue expenditure is anticipated to be Rs. 117 million for the year 1989-90.

(4) Procedure and Contents of the Request

Firstly, Indian representatives requested equipments for 6 departments and equipments for Central Department, where equipments are commonly-used. The team discussed with Indian representatives about organization of department and relation among departments.

The team classified equipment into A and B categories. While priority A includes indispensable equipments for role and function of the institute, priority B includes necessary equipments for further reseaching activities and medical services.

SGPGI intends to provide tertiary medical services and advanced studies. The requested equipments contain advanced CT scanner. Autoanalyser etc., some of which are not produced in Japan but in the third countries.

For advanced equipment, they requested, education and training shall be projected. Training should be given at the installation of equipments but on the other hand by long-term-training should be given technical cooperation program between India and Japan.

The team should take note the importance of technology transfer in order to operate equipments smoothly. The layout plan of radiology, operation and ICU is not convenient for centralization. Following the advice of the team, the institute shows their intention to change its plan.

(Table 15)

1. Neurology and Neuro-Surgery Amplification of study, training and surgery. Equipment for diagnosis and study (Electroencephalograph, Evoked EEG monitor, Slit lamp microscope, Illuminated perimeter, etc.) Equipment for treatment (Electroencephalograph for operation, Cordotomy unit)
2. Cardiology and Cardiovascular Surgery Study in the field of Cardiology. Study and implementation of Cardiovascular surgery. Equipment for diagnosis and study (Electrocardiograph, Echocardiograph, etc.). Fiberscope. Equipment for treatment (Pace maker analyser, etc.).
3. Gastroenterology Study, training and implementation of surgical treatment. Equipment for diagnosis, study and treatment (Gastrointestinal fiber-scope, etc.).
4. Urology Nephrology Study, training and implementation of surgical treatment, especially implementation of kidney tranplant. Equipment for diagnosis and study (Urethroscope, etc.) Equipment for treatment (Dialysis machine, Kidney stone lihotriptor).
5. Endocrinology Study, training and implementation of medical care. Equipment for diagnosis and study (HbA1C analyser, Gamma Counter, ELISA reader, etc.). Equipment for treatment (Insulin pump)

6. Genetics-Immunology Study, training and implementation of clinical technology. Equipment for diagnosis (Gamma counter, Amino acid analyser). Equipment for study (DNA sequencing computer, Microscope with image analyser, etc.).
7. 7-1) Pathology Centralisation of activities in laboratory. Equipment for Laboratory (Multi-channel auto-analyser, Automatic blood cell analyser, Automatic differential counter, Blood gas analyser, Platelet aggregation meter, etc.
7-2) radiology Equipment for X-ray diagnosis (Whole body CT scanner, Angiographic unit system, X-ray TV unit, etc.) Equipment for Nuclear diagnosis (Gamma camera, Gamma counter, etc.) Ultrasonic diagnostic equipment (Ultrasound equipment) Equipment for X-ray therapy (Linear accelerator, Simulator etc.)
7-3) Operation Centralisation of operational activities Equipment for operation (Operating light, operating table, Anesthesia machine, Laser surgical unit, Electro surgical unit, Surgical system, etc.) Equipment for neuro-surgery, cardiovascular surgery, urological surgery
7-4) I.C.U. Care for high risk patients (of internal medicine and post-operation. Equipment for physiological examination. (ECG Monitor, Central Monitoring System, etc.) Equipment for resusciation (Defibrillator, Pace-maker, Infusion pump, etc.) Equipment for emergency (Blood gas analyser, Automatic analyser, etc.)

7-5) Ward Intensification for immature infant care. Equipment for ward (Incubator, Sphygmomanometer, etc.)
7-6) Physical Improvement of physical therapy. Equipment for diagnosis (Pulmonary function complete system, etc.) Equipment for training (Hubbard Tank, Paraffin bath, etc.)
7-7) Central Supply Centralisation of sterilisation Equipment for sterilisation (Autoclave, Ultrasonic washer, High-speed steam steriliser, Glove washer, etc.)
7-8) Autopsy Implementation of pathological study Equipment for autopsy (Morgue refrigerator, Autopsy table, Equipment for autopsy etc.)
7-9) Animal House Improvement of experimental system by animals. For future planning.
7-10) Kitchen Implementation of food service for pacients Equipment for kitchen (Automatic washer, Cooler, Food transport trolley, Cooker, etc.).
7-11) Laundry Centralisation of laundry service. Equipment for laundry (Washing machine, Dryer, etc.).

7-12) Medical Gas Central wupply of Medical Gas. Equipment for Medical Gas (Liquid nitrogen production plant). Other equipment (Incinerator)
7-13) Workshop Amplification of maintenance system. Upkeep tools and equipment for measurement (Oscilloscope, Digital tester, Drill, etc.).
7-14) Library Centralisation of literatures of medical sciences For future planning.
7-15) Administration Amplification of administrative services. Equipment for Administration (Communication System). Equipment for Educational Service (Photographic equipment, Audio-visual equipment, etc.).

III. Contents of the Project

(1) Purpose

Based on the requested list of equipments for SGPGI, the team has implemented Basic Design of the Project in order to enable the Government of India to establish comprehensive system of the Institute and the Hospital and to improve health and medical care system and education and training system of medical personnel not only in Uttar Pradesh State but also on the nation wide basis, considering the conditions of Hospital, management system, roll and function and conformity to the future plan.

This procurement project aims to provide indispensable equipments and related installation and instruction works within the following departments under the grant aid of the Government of Japan.

6 specialities:

1) Neurology and Neuro-Surgery, Cardiology and Cardiovascular Surgery, Gastroenterology, Urology and Nephrology, Endocrinology, Genetics and Immunology.

Central Department:

2) Clinical Laboratory, Radiology, Operation, ICU, Ward, Physical, Central, Autopsy, Animal House, etc..

3) Others: Medical Gas, Work Shop, Administration

(2) Evaluation of Request

Regarding the contents of the request, the Team in phase I has discussed with the representatives of SGPGI (Director, Staff members and advisors of the Institute) on the requested equipments. After returning to Japan, catalogues of equipments of Japanese origin have been collected.

The team in phase II explained about the equipments and discussed about the contents in detail.

After returning to Japan the equipments have been classified into A and B according to priority. Further the equipments of priority A are divided into the equipments for basic function of the hospital which will be provided in the first year and the equipments for further intensification, which will be provided in the second year. The equipments of priority B will be future issue.

Table 16 : LIST OF EQUIPMENT

DEPARTMENT	A	B
1. Neurology	1. EEG System 2. EMG 3. Fundus Camera 4. Ultra Sonography 5. Eyeshaking Test 6. Codatomy Unit 7. Telemetry Pressure 8. Others 20	(i) Evoked Response Audiometry (ii) Perimeter (iii) Others 16
2. Cardiology	1. ECG 2. Holter Monitoring System 3. Echo-Cardiograph 4. Pace Maker Analyzer 5. Others 7	(i) Others 4
3. Gastro-entrology	1. Upper Gastro-Endoscope 2. Duodeno-Endoscope 3. Colonoscope 4. Video Endoscope 5. Others 8	(i) Endoscopic Ultrasound (ii) Others 5
4. Urology	1. Hemodialysis System 2. *Kidney Stone Disintegration 3. Others 20	(i) *Electron Microscope (ii) Ultrasonic Distuption
5. Endocrinology	1. Gumma Counter 2. Scintilation Counter 3. Liquid Chromatography 4. Column Chromatography 5. Elisa Equipment 6. Others 40	1. Others 25
6. Genetics-Immunology	1. Liquid Scintilation Counter 2. Gamma Counter 3. Multi Gamma Counter 4. Phagocytosis Measurement 5. FPLC 6. HPLC 7. Image Analysis System 8. Hematology Counter - ELISA Apparatus - Cyto Fluorometer - Cell Sorter 9. Liquid Nitrogen Handling System 10. Others 115	1. Column Chromatography 2. Aerofuge 3. Inverted Microscope (Special) 4. Loop Cinerator 5. Emission Spectrometer 6. Others 30

DEPARTMENT	A	B
7. Central Department	1. Automated Differential Analyzer	1. ELISA Apparatus
(1) Pathology	2. 20ch Automated Analyzer	2. Liquid Chromatograph
	3. Single/Multi Auto Analyzer	3. Gas Chromatograph
	4. Blood Gas Analyzer	4. Others 32
	5. Electrolyte Analyzer	
	6. Spectrometer	
	7. Blood Cell Analyzer	
	8. Electron Microscope	
	9. Others 62	
(2) Radiology	1. Whole Body CT	1. Head CT
	2. Cardio Angiography (DSA)	2. Cobalt Therapy
	3. Cerebral Angiography (DSA)	3. Planning System
	4. Abdominal Angiography	4. Multi Detector
	5. Computer Radiography	5. Beta Counter
	6. Buckey Radiography	6. NMR CT
	7. X-ray TV (Gastra)	7. PET
	8. X-ray TV (Myelography)	8. Thyroid Uptake
	9. X-ray TV General	9. T 99 Generator
	10. Skull Radiography	10. Others 5
	11. Ultrasound	
	12. Linear Accelator	
	13. After Loading	
	14. Simulator	
	15. Gamma Camera	
	16. Gamma Counter	
	17. Others 19	
(3) Operation	1. Operation Light	(i) Others 15
	2. Operating Table	
	3. *Anesthesia Machine	
	4. Electro-Surgical Unit	
	5. Operating Microscope	
	6. Radiography Equipment	
	7. *Clean Room Equipment	
	8. LASER Surgical Unit	
	9. Ultrasonic Surgical Unit	
	10. Others 35	
(4) ICU	1. *Monitor	(i) Ion Analyzer (Ca, MG)
	2. *Central Monitoring System	(ii) Coagulation Profiler
	3. Ventillator	(iii) Others 15
	4. Polygraph	(iv) *Single/Multi Automated Analyzer
	5. Portable Defibrillator	
	6. ICU Bed	
	7. Blood Gas Analyzer	
	8. Electrolyte Analyzer	
	9. Hematology Analyzer	
	10. Automatic Blood Pressure Monitor	
	11. Others 22	

DEPARTMENT	A	B
(5) Ward	1. Ward Equipment	
(6) Physical Medicine	1. Others 2	
(7) Central Supply	1. Autoclave 2. Ultrasonic Washer 3. ECG Sterilizer 4. Others	
(8) Autopsy	1. Others	
(9) Animal House		(i) Cages, Rearing Unit (ii) Animal House (iii) Facility Equipment (iv) Radiography (v) Scintilation Counter (vi) Respirator (vii) Angiography (viii) Others 33
(10) Kitchen	1. Others	
(11) Laundry	1. Others	
(12) Medical Gas	1. Liquid Nitrogen Plant	(i) Liquid Helium Recovery System (ii) Others
(13) Workshop	Others 32	
(14) Library		Binding Equipments Microfilm Equipments Others
(15) Administration	1. Communication System 2. Mainframe Computor System (or 25 Mini-computers) 3. Photography Equipment 4. Others 5	

The equipments are classified into two groups which are for Speciality Dept. and Central Dept. The former includes the following six departments, i.e., Neurology and Neuro-Surgery, Cardiology and Cardiovascular Surgery, Urology and Nephrology, Gastroenterology, Endocrinology, Genetics and Immunology. In the above departments, medical reseach and clinical medicine are provided, as well as medical education and training.

The equipments for the above departments will be installed in phase I.

The Central Departments with Clinical Laboratory, Radiology, Operation, ICU, Ward and Physical Therapy etc. and Service Departments which consists of Central Supply, Autopsy, Animal House, Kitchen, Laundry, Medical Gas, Workshop, Library and Administration, etc..

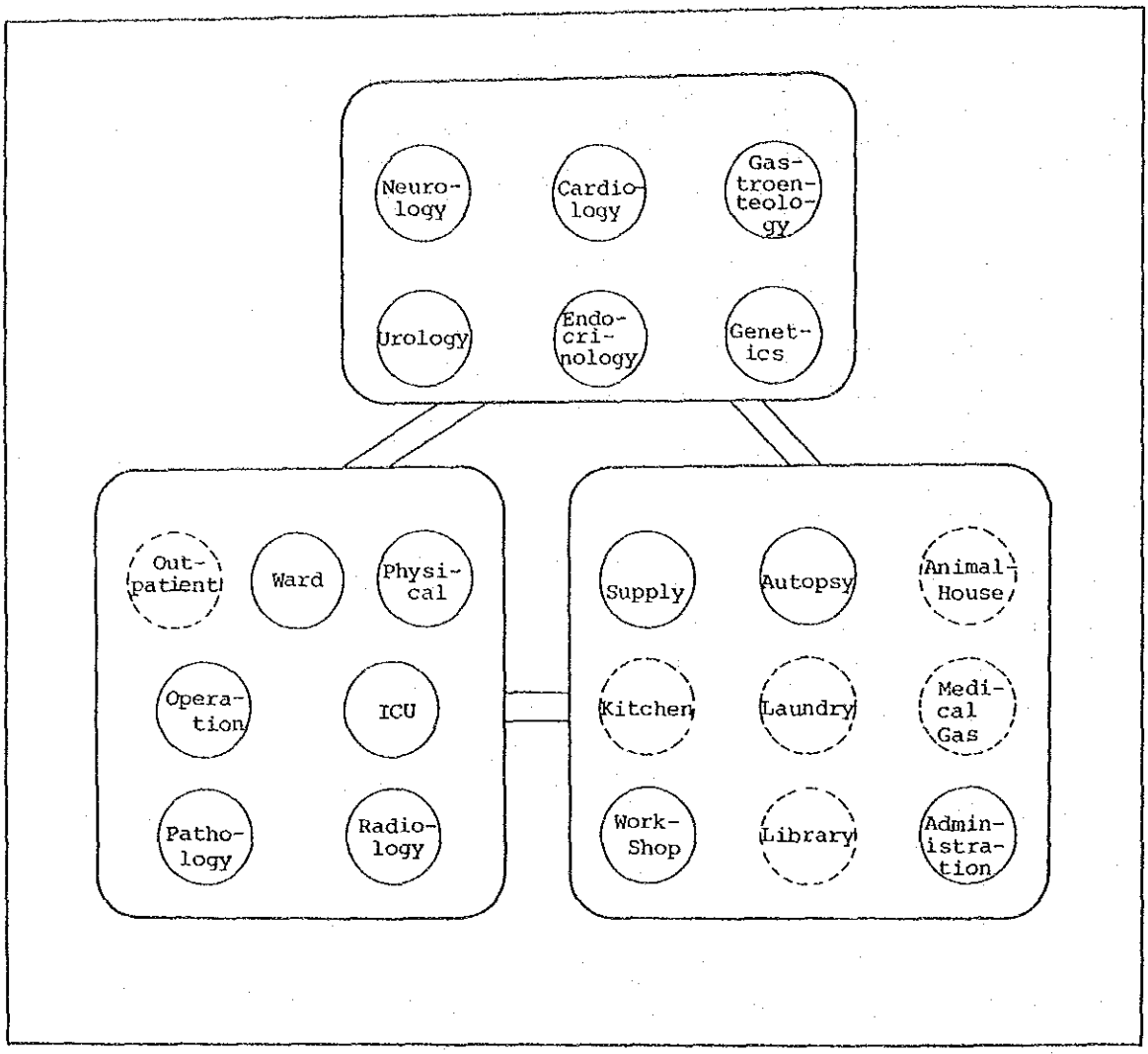
Usually, in India, each department keeps its independency and every department works without any intervention as in Europe.

However, from the points of view of effective operation of equipments, and of high-advanced organization for Laboratory, Radiology and Operation, the above type does not seem to be appropriate, because of the difficulty of control of funds.

However, in case of SGPGI, the representatives of India had observed facilities in U.S.A. and some project staff have experiences of majoring in the system engineering in U.S.A.. Therefore, the institute is carefully designed in order to keep community and collaboration of departments.

On the other hand, comprehensive function of such facilities is restricted by the department of the lowest capability and capacity. Therefore, the total balance among departments should be duly examined. In this Basic Design the equipments are selected so that each department shall become at an equal level, considering the systematization of Central Department which has the possibility of foiling an effective operation.

Figure 16 : COMPOSITION OF EQUIPMENTS



1) Role, Function and Future Plan of the Institute

As stated beforehand, SGPGI is planned to be a post post institute, an advanced medical research institute and hospital of tertiary medical care and ultimately to become a comprehensive institute of medical sciences as well as a general medical service center not only in Uttar Pradesh State but also on the nation wide basis.

The team considers that this procurement project has an enough appropriateness as a grant aid project because there is no deviated item from the above-mentioned purpose of SGPGI in the requested equipments.

2). Conditions of Facilities

The Team considers that there is no serious problem concerned with the installation of equipments for the following reasons.

i) The facilities of SGPGI are newly constructed and the structure of them are designed or are to be designed with regard to the installation of equipments.

ii) The layout plan of the facilities for Operation Dept., ICU, Radiology are to be modified so that the equipments to be donated shall be utilized effectively in accordance with a advice of the team about the systematic flow planning of staff and goods in facilities.

iii) The team confirmed through the site survey that the construction is proceeding without problems, supported by the excellent technology.

3). Operation System

The team examined the operation system of SGPGI in the light of staff allocation and technical level. The majority of staff of the Institute has been selected in April 1986.

Since SGPGI is planned to be a leading institute of all India in future, the specialists are nominated from nation-wide through the previous selection by the committe, which are mainly composed of the members of All India Institute of Medical Sciences known as the best institute in India. Therefore, totally two thousand excellent staff are expected in phase I.

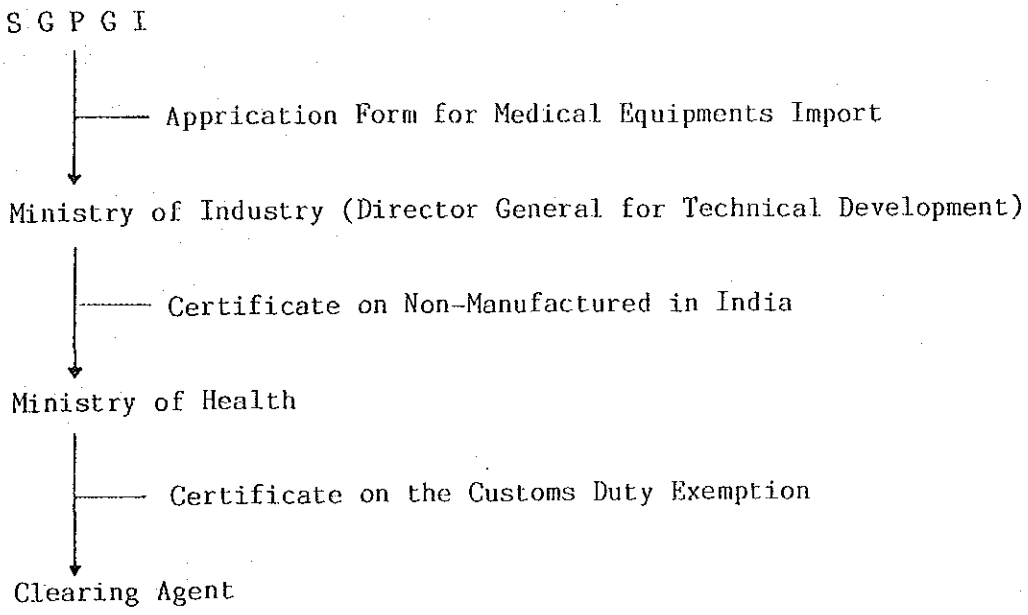
Regarding the technical level of the staff, doctors and other medical personnel have experiences of studying innovative technology in U.K. and U.S.A.. Furthermore, almost all of the requested equipments are supposed to be operated at the present technical level in India. Under the above conditions the team considers that the Institute has few problems in operation of the equipments. While Indian specialists are acquainted with equipments of European countries, such as U.K., West Germany, Sweden, etc., they have few experiences to operate Japanese equipments.

Taking into consideration of the above foctors, the team considers that it would be more effective if further cooperation of despatch experts from Japan to India or acceptance of Indian doctors and allied medical personnel for training is projected basides on-the-job-training at the installation of the equipments.

4). Compatibility with Indian Equipments

The Government of India controls imports of foreign-made equipments as far as similar types are produced domestically. For X-ray apparatus with low capacity, 1-channel ECG equipments for outpatient unit, etc., they are produced in India and shall be procured domestically. The hospital with 30 beds to be opened in 1986 will be equipped completely with Indian products. The requested equipments do not overlap with the above items and are supposed to function collaboratively.

For customs clearance procedure should be taken to obtain approval of tax-free treatment. This procedure is proposed by SGPGI and OGL (Open General Licence: Tax-Free Treatment) will be given.



(3) Outline of the Project

1) Implementation Body

The implementation body concerned with this procurement project in India is SGPGI itself. While the required works for transportation, installation and on-the-job training of equipments shall be provided by Japanese side, some works related to installation, such as construction of facilities, arrangement of electricity, piping works, etc. shall be provided by SGPGI.

Since SGPGI is established by Uttar Pradesh State, State Ministry of Health shall supervise the progress of the project. On the other hand, it is required to obtain approval and verification concerned with the project from Ministry of Health and Family Welfare and Ministry of Finance in accordance with the relationship between both Governments.

2) Outline of Equipments

Outline of Equipments to be procured is shown on the following Table (a duplicate of Table 15)

1. Neurology and Neuro-Surgery Amplification of study, training and surgery. Equipment for diagnosis and study (Electroencephalograph, Evoked EEG monitor, Slit lamp microscope, Illuminated perimeter, etc.) Equipment for treatment (Electroencephalograph for operation, Cordotomy unit)
2. Cardiology and Cardiovascular Surgery Study in the field of Cardiology. Study and implementation of Cardiovascular surgery. Equipment for diagnosis and study (Electrocardiograph, Echocardiograph, etc.). Fiberscope. Equipment for treatment (Pace maker analyser, etc.).
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4. Urology Nephrology Study, training and implementation of surgical treatment, especially implementation of kidney tranplant. Equipment for diagnosis and study (Urethroscope, etc.) Equipment for treatment (Dialysis machine, Kidney stone lihotriptor).
5. Endocrinology Study, training and implementation of medical care. Equipment for diagnosis and study (HbA1C analyser, Gamma Counter, ELISA reader, etc.). Equipment for treatment (Insulin pump)

6. Genetics-Immunology Study, training and implementation of clinical technology. Equipment for diagnosis (Gamma counter, Amino acid analyser). Equipment for study (DNA sequencing computer, Microscope with image analyser, etc.).
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7-3) Operation Centralisation of operational activities Equipment for operation (Operating light, operating table, Anesthesia machine, Laser surgical unit, Electro surgical unit, Surgical system, etc.) Equipment for neuro-surgery, cardiovascular surgery, urological surgery
7-4) I.C.U. Care for high risk patients (of internal medicine and post-operation. Equipment for physiological examination. (ECG Monitor, Central Monitoring System, etc.) Equipment for resusciation (Defibrillator, Pace-maker, Infusion pump, etc.) Equipment for emergency (Blood gas analyser, Automatic analyser, etc.)

7-5) Ward

Intensification for immature infant care.
Equipment for ward (Incubator, Sphygmomanometer, etc.)

7-6) Physical

Improvement of physical therapy.
Equipment for diagnosis (Pulmonary function complete system, etc.)
Equipment for training (Hubbard Tank, Paraffin bath, etc.)

7-7) Central Supply

Centralisation of sterilisation
Equipment for sterilisation (Autoclave, Ultrasonic washer, High-speed steam steriliser, Glove washer, etc.)

7-8) Autopsy

Implementation of pathological study
Equipment for autopsy (Morgue refrigerator, Autopsy table, Equipment for autopsy etc.)

7-9) Animal House

Improvement of experimental system by animals.
For future planning.

7-10) Kitchen

Implementation of food service for pacients
Equipment for kitchen (Automatic washer, Cooler, Food transport trolley, Cooker, etc.).

7-11) Laundry

Centralisation of laundry service.
Equipment for laundry (Washing machine, Dryer, etc.).

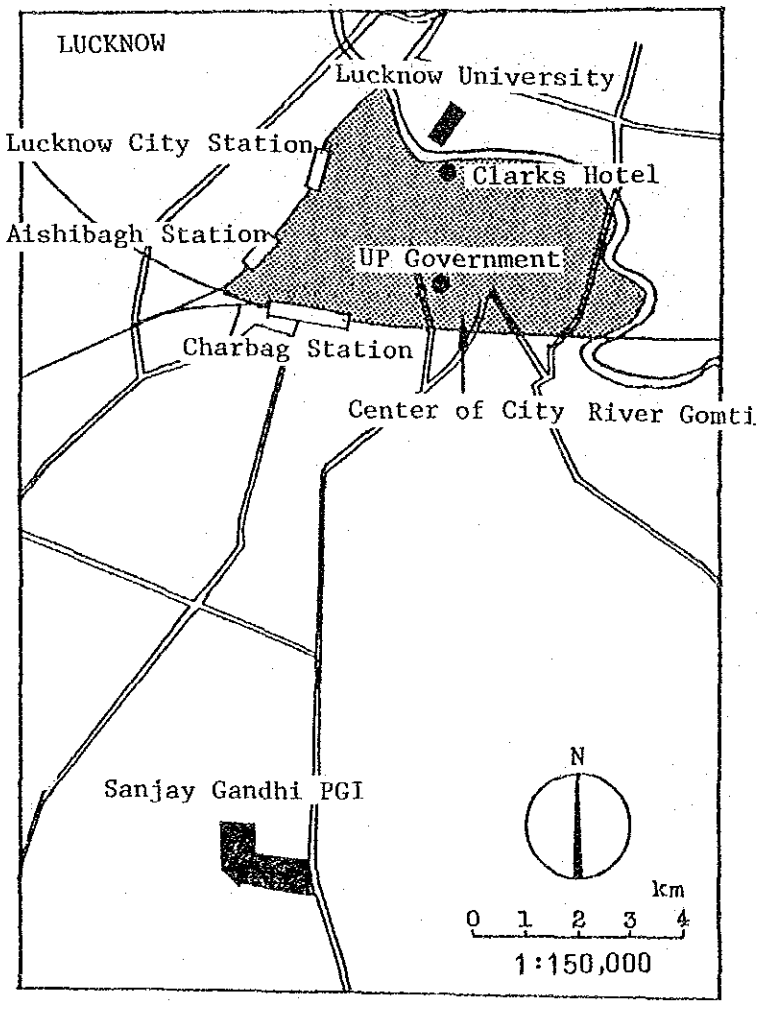
7-12) Medical Gas Central wupply of Medical Gas. Equipment for Medical Gas (Liquid nitrogen production plant). Other equipment (Incinerator)
7-13) Workshop Amplification of maintenance system. Upkeep tools and equipment for measurement (Oscilloscope, Digital tester, Drill, etc.).
7-14) Library Centralisation of literatures of medical sciences For future planning.
7-15) Administration Amplification of administrative services. Equipment for Administration (Communication System). Equipment for Educational Service (Photographic equipment, Audio-visual equipment, etc.).

3) Outline of Site

SGPGI, which is the objective Institute of this project, is located in the south of Lucknow in Uttar Pradesh State (at a distance of about 500km from Delhi) and is planned at the site of 220 ha., newly developed in the rural area along the State highway, far from about 15km from the center of the city and is expected to be a big research educational town.

This research educational town is composed of six parts of facilities, which are hospital and research center, hospital related facilities, dormitory, residence, communal facilities (stores, community center, restaurants, bank, post office, fire station, police station, schools,, guest house, etc.) and accomodation for patients families. The plan is intended to be flexible on the whole, namely, each facility will be able to cope with the future extention and renovation. Green zone is arranged around the site for purpose of better environment.

(Figure 17)



4) Technical Cooperation

The level of Indian physicians and technologists to operate medical equipments seems to be fairly high, judging from the fact that advanced devices such as CT, NMR and angiography are in wide use in India. However, the greatest care should be taken in accepting the equipments, because the list of the equipments includes computer radiology devices and cell sorters which have never been introduced into India at the moment and more advanced type of ultrasonic diagnosis system and gamma cameras, compared with the introduced type in India. Furthermore, since SGPGI is planned to be a medical center of the highest level in India, full application of advanced devices shall be required.

During the study in India, it was requested to provide technical cooperation from Japan to India so that Indian physicians and other specialists may master advanced diagnostic methods, medical research and application technique of equipments after installation of equipments and for exchange of results of medical researches between India and Japan. The requested cooperation includes dispatch of Japanese experts to India, study and training of Indian physicians and paramedical staff in Japanese institutions (hospitals, laboratories etc.) and training of technologists in Japan. The study team considers that it is desirable to provide such cooperation because equipments from Japan will be utilized more effectively, if Indian people master advanced application technique and diagnostic methods, which will raise the level of medical services in the country and enable the people to get medical care services in wide range. Thus the team recommends technical cooperation planned in parallel with this procurement project.

IV. Basic Design

On the basis of the results of the study the team clarified the basic conditions of the procurement of medical equipments and completed basic design.

(1) Design Policy

The team selected the equipment, taking account of the following points:

1. Structure is strongly built, trouble is few and maintenance is easy.
2. Operation is simple, so that long term training may not be required.
3. Running cost is low.
4. Frequency in use is high and effectiveness is high.
5. The equipment should be optimum to the number of patients and skill of medical personnel in the present and future plans.
6. Regarding the equipments for diagnosis, treatment, laboratory and medical research, effectiveness for education and training should be considered.
7. The equipments for physiological examination should be operated speedily and should not give much pain to patients with "fail safe" system and safety for patients and operators.
8. Counter measure against stoppage of power supply is considered.
9. Installing work for equipments should be kept at minimum.

(2) Contents of Basic Design

The item of equipment is shown on the basic design list by department and items and contents of conditions are as follows:

1) Department of installation: The department where the equipment will be installed. When plural departments use the equipment commonly, the department which administers this equipment.

2) Name of equipment: General term of the equipment

3) Purpose of introduction: The purpose of introduction of the equipment is classified into four as follows:

1. Diagnosis and treatment
2. Research
3. Education
4. Others

4) Frequency in use: Expected frequency in use is classified into three as follows:
   1. Using the equipment at least once a day (estimated)
   2. Using the equipment at least once a week (estimated)
   3. Using the equipment at least once a month (estimated)

5) Necessity of installation and instruction:
   Equipments, which require installation and instruction are classified into four as follows:
   1. Installation and instruction are required.
   2. Only instruction is required.
   3. Only installation is required.
   4. Neither installation nor instruction is required, but operation manual and service manual are required.

Furthermore, regarding main equipments in the project, detailed contents as well as remarks are given under. The team selected the equipments and classified them into Group A in order to achieve medical care, research and training on a high level.
Regarding equipments, which are requested for further intensification of functions (which are classified in Group B), the team excluded them from the basic design. Then, the team selected the equipments for the first year, which are necessary for initial operation of hospital and other equipments have been selected for the second year, which are necessary for further amplification of functions.

1. Neurology and Neuro-Surgery

Since the above department executes diagnosis with the object of study of causes and cure of diseases of nervous system, the equipments such as: EEG, EMG, Slit Lamp Microscope etc. are selected for the first year. For the second year EEG Monitor, Evoked Responce Apparatus etc. are selected so as to intensify physiological function of the Institute.

2. Cardiology and Cardiovascular Surgery

For the first year Electrocardiograph, Ultrasound Diagnosis Apparatus as well as Fiberscope are selected to execute basic examination of heart and lung. For the second year Radio-electrocardiograph and Pacemaker Analyser etc. are selected to intensify physiological function.

3. Gastroenterology

For the first year Gastrointestinal Fiberscope etc. are selected to implement examination, biopsy, and cure of digestive organs. For the second year fiberscopes are listed. However, they are applicable for multi-departmental-use. Furthermore, equipments for education and training are also added, such as educational model of endoscope.

4. Urology and Nephrology

For the first year the equipments of Hemodialysis System and accessories. Urethroscope etc. are also listed for endoscopy examination and cure. For the second year Kidney Stone Distintegration Apparatus etc. are added to multify the therapeutic measures in the Institute.

5. Endocrinology

For the first year Exophthalmometer, Ophthalmoscope, Insulin Pump and Respirator are selected for diagnosis and cure. On the other hand equipments for initial study such as Flame Photometer, Fluoro Spectro Photometer, etc. are added. For the second year, HbA1C analyser, Liquid Scintillation Counter and Liquid Chromatograph, which are effective for advanced study, are selected.

6. Genetics-Immunology

For Genetics-Immunology the same type of equipments were requested as for Endocrinology and Pathology. Such equipments are collected in Pathology. For the first year basic equipments and instruments: Electrophoresis Apparatus, Microscope, Centrifuge and Incubator are listed for in order to start the basic research in the Institute.

For the second year the advanced type of equipments such as: Scintilation counter, Liquid Chromatography, Image Analysis System, Cyto Fluorometer, Cellsorter etc. are listed for advanced research in the Institute.

7. Central

Central department has a roll and a function to manage human staff and materials effectively by centralization of common works in each department, as well as to support basic services of the Hospital. Therefore, as far as the equipments with high frequincy in use, they are listed in phase I.

1) Pathology

The equipments for Pathology with high frequency in use are intended to be introduced for the first year. For the first year Automated Differential Analyser, Single-Multi Auto Analyser, Blood Gas Analyser, Electrolyte Analyser, Spectrometer, Blood cell Analyser, Automatic Differential Leukocyte Counter etc., which bring rapid process of pathological specimen, are included. Spectrophotometer, Flame Photometer, Fluoro Spectro Photometer etc., for pathological inspections in manual or semi-automatic operation are added. Furthermore, basic apparatus and equipments for laboratory such as Centrifuge, Microscope, etc., are selected. For the second year Electron Microscope, etc. are selected in order to cope with demand of advanced clinical laboratory.

2) Radiology

Of late X-ray equipments became advanced and complicated by the introduction of electronics and computer. On the other hand, the Institute has been newly established and composed of staff, each of whom has different experience in operation of equipments in different facility from others. The team entertains some fear that the introduction of all the equipment requested from Indian side will lead to confusion of the Hospital. In the light of the conditions, basic X-ray diagnostic apparatus such as whole body CT, abdominal Angiography, X-ray TV Unit, etc., and Portable X-ray Diagnositic Apparatus, Ultrasound Apparatus, etc. are selected for the first year.

For the second year the advanced type of X-ray diagnostic

apparatus, Angiography, Cerebral Angiography and Computer X-ray Apparatus and the advanced type of X-ray therapeutic apparatus, Linear Accelerator, After Loading, Simulator, etc.,are selected.

3) Operation

Equipments of Operation are expected to be operated frequently and are required to be installed in clean zone. Therefore, equipments are selected for the first year to be installed in completed facilities.

For Operation Theatre, general surgical equipments such as Operating Light, Operating Table, Anaesthesia Machine, Electro-Surgical Unit, etc., advanced equipments such as Ultrasonic Surgical Unit, Laser Operational Epuipments, Heart Lung Machine and other special equipments for Neuro surgery and Urological Surgery are selected.

4) ICU

For ICU, indispensable equipments such as Monitors are listed for the first year. As for equipments for emergency, they are listed for the second year. Then, for the first year, ICU Monitor, Central Monitoring System, Arrhythimia Monitor, Ventillator, Nebulizer, Infusion Pump, ICU Bed etc., for high risk patients and Blood Gas Analyser for emergency are selected. Monitors for Ward are collected in this department since these equipments require centralized administration.

5) Ward

Equipments for ward are selected for the first year, because the equipments are necessary from the opening of the Institute.

6) Physical

Equipments for the unit of Physical Therapy, rehabilitation and Pulmonary Function Test Complete System, which are effective for recovery of patients are listed for the first year.

7) Central Supply

Central Supply, executing sterilization of medical equipments and instruments, is important for the prevention of infection in honpital. the equipments for centrl sterilization are selected for the first year.

8) Autopsy

Autopsy is very important for clinical study, and therefore, basic equipments for autopsy are selected for the first year.

9) Animal House

Equipments for animal house are not selected, bucause it would be coming up in future.

10) Kitchen

The team excluded equipments for Kitchen from the list for the following reasons.

i) Typical Indian kitchen equipments, not available in Japan, would be required to cook in Indian style.

ii) Equipments for Kitchen are not considered to be a medical equipment.

11) Laundry

The team excluded equipments for Laundry for the following reasons.

i) The long-term-training would be required to master the complete operation, because the laundering with machine is not accustomed to in India.

ii) Equipments for Laundry are not considered to be a medical equipment as stated in 10) Kitchen.

12) Medical Gas

Generators for medical gases are requested, but not listed for the following reasons.

i) Japanese manufatures are reluctant to export them, because they have no service station in India.

ii) The special modifications would be required for adopting to bulbs in India.

13) Workshop

The equipments for maintenance and repair of medical equipments are selected. For the first year Oscilloscope, Digital Multimeter, which are basically necessary for Workshop, are included and for the second year measuring machines such as Digital Storage Oscilloscope, Logic Analyzer , etc. are listed.

14) Library

Since ;the design concept of Library has not been clear at the moment, equipments for Library are excluded.

15) Administration

For Administration Office Machines such as Photographic Equipment, Copy Machine , etc. are selected. Computer System of large capacity is requested. However, the above apparatus is not selected because it is not considerd to be a medical equipment and Japanese firms have no service network for maintenace.

(3) Required Works Related to Installation of Equipments

Renovation of the facilieties is not be required since the facilities are constructed newly and layout and structure are designed with regard to the installation of the equipments.

The construction cost of facilities is borne by Indian side. Regarding works for electricity, water supply and drainage and piping for steam, wiring and piping works up to outlets in each room shall be implemented by Indian side and further extension from outlets to equipments shall be implemented by Japanese side.

BASIC DESIGN LIST FOR SANJAY GANDHI POST GRADUATE INSTITUTE First Stage

1. Neuro-Sciences

No.	Equipment Name	Type of Equipment	No of Unit	Object-ive	Freq Use	Inst Trng
1	8ch Portable EEG Machine	Physiological Test, Monitors	1	①②③	①	④
2	18ch & 2 Marker ch. EEG Machine	Physiological Test, Monitors	1	①②③	①	④
3	4ch EMG Machine	Physiological Test, Monitors	1	①②③	②	①
4	Slit-Lamp Microscope	Diagnosis,Treat-ment Equipment	1	①②③	①	④
5	Illuminated Perimeter	Diagnosis,Treat-ment Equipment	2	①②③	①	④
6	Mydriatic Type Eye Fundus Camera	Diagnosis,Treat-ment Equipment	1	①②③	①	④
7	Audiometer (General)	Diagnosis,Treat-ment Equipment	3	①②③	①	④
8	Applanation Tonometer (Hand)	Diagnosis,Treat-ment Equipment	2	①②③	①	④
9	Halogen Ophthalmoscope	Diagnosis,Treat-ment Equipment	16	①③	①	④
10	Halogen Diagnostic Set	Diagnosis,Treat-ment Equipment	9	①③	①	④

BASIC DESIGN LIST FOR SANJAY GANDHI POST GRADUATE INSTITUTE First Stage

2. Cardiac-Sciences

No.	Equipment Name	Type of Equipment	No of Unit	Object-ive	Freq Use	Inst Trng
1	1ch ECG	Physiological Test, Monitors	4	①②③	①	④
2	3ch ECG (Portable)	Physiological Test, Monitors	1	①②③	①	④
3	3ch ECG (Standard)	Physiological Test, Monitors	1	①②③	①	④
4	Echocardiograph	X-ray Diagnosis, Ultrasonic Equip	1	①②③	①	①
5	Broncho Fiberscope	Endoscopic Equipment	1	①	③	④

BASIC DESIGN LIST FOR SANJAY GANDHI POST GRADUATE INSTITUTE First Stage

3. Gastroenterology

No.	Equipment Name	Type of Equipment	No of Unit	Object-ive	Freq Use	Inst Trng
1	Upper Gastrointestinal Fiberscope	Endoscopic Equipment	3	①②	②	④
2	Duodeno Fiberscope	Endoscopic Equipment	2	①②	②	④
3	Lower Gastrointestinal Fiberscope	Endoscopic Equipment	3	①②	②	④
4	Endoscopes	Endoscopic Equipment	7	①	①	④

4. Nephrology-Urology

No.	Equipment Name	Type of Equipment	No of Unit	Object-ive	Freq Use	Inst Trng
1	Haemodialysis Machine	Hemodialysis Equipment	8	①②	①	①
2	Dialyzers & Arterio Venous Lines	Hemodialysis Equipment	200	①②	①	①
3	Automatic Peritoneal Dialysis Machines	Hemodialysis Equipment	6	①②	①	①
4	Multipoint Dialysers	Hemodialysis Equipment	5	①②	①	①
5	Central Water Supply for Dialysis	Hemodialysis Equipment	2	①②	①	①
6	Revers Osmosis Equipment, 10 Dialysis	Hemodialysis Equipment	1	①②	①	①
7	Booster Pump Systems w/Automatic Cut-off	Hemodialysis Equipment	1	①②	①	①
8	Acute Peritoneal Dialysis Catheters	Hemodialysis Equipment	10	①②	①	④
9	Chronic Tenckhoff Catheters (PD Cathetera)	Hemodialysis Equipment	420	①②	①	④
10	Dialyzer Re-use Machine	Hemodialysis Equipment	1	①②	①	①
11	Blood Pump	Hemodialysis Equipment	5	①②	①	①
12	Extra Heparin Infusion Pumps	Hemodialysis Equipment	6	①②	①	①
13	Portable Bed Scales for Dialysis Patients	Hemodialysis Equipment	2	①②	①	④
14	Dialysis Weigh Bed	Hemodialysis Equipment	12	①②	①	①
15	Dialysis Chairs	Hemodialysis Equipment	4	①②	①	④
16	Cystoscope	Endoscopic Equipment	3	①②③	①	④
17	Paediatric Cystoscope	Endoscopic Equipment	2	①②③	①	④
18	Resectoscope Complete Set	Endoscopic Equipment	2	①③	①	④
19	Pediatric Resectoscope Set	Endoscopic Equipment	2	①②③	①	④

BASIC DESIGN LIST FOR SANJAY GANDHI POST GRADUATE INSTITUTE First Stage

5. Endocrinology

No.	Equipment Name	Type of Equipment	No of Unit	Object-ive	Freq Use	Inst Trng
1	UV/VIS Spectrophotometer (Double Beam)	Analytical Instruments	1	①②	①	③
2	Spectro-Photofluórometer	Analytical Instruments	1	①②	③	①
3	Dextrometer	Automated Analyzers	1	①②	①	④
4	PH Meter	Analytical Instruments	1	①②	②	④
5	Polyacrylamid Gel Electrophoresis Apparatus	Electrophoresis, Chromatography	1	①②	③	④
6	Densitometer w/ Recorder	Electrophoresis, Chromatography	1	①②	②	③
7	Thin Layer Chromatography Equipment	Electrophoresis, Chromatography	1	①②	②	④
8	Fluorescence Microscope	Microscopes	1	①②	③	④
9	Exophthalmometer	Diagnosis,Treat-ment Equipment	1	①②	①	④
10	Ophthalomoscope	Diagnosis,Treat-ment Equipment	1	①②	①	④
11	2ch Insulin Pump	Diagnosis,Treat-ment Equipment	1	①②	②	②
12	Water Bath	Analytical Equipment	1	①②	①	④
13	Incubator, Waterbath	Analytical Equipment	1	①②	①	④
14	Automatic Incubator, Dilutor, Dispenser	Analytical Equipment	1	①②	③	④
15	Electronic Balance	Analytical Instruments	1	①②	①	④
16	Metabolic Shakers	Analytical Equipment	1	①②	③	④
17	Automatic Syringe	Analytical Equipment	4	①②	①	④
18	Vacuum Pumps	Analytical Equipment	1	①②	①	④
19	General Purpose Low-speed Refrigerated Centrifuge	Centrifuges	1	①②	①	③
20	CO2 Incubator	Analytical Equipment	1	①②	②	③
21	Deep Freezer (-20°c)	Analytical Equipment	1	②	①	③
22	Fume-Hood for RIA	Analytical Equipment	1	②	③	③
23	Water Still	Analytical Equipment	1	②	①	③
24	Beta Scintillation Counter	Nuclear Medicine Equipment	1	①②	③	①

BASIC DESIGN LIST FOR SANJAY GANDHI POST GRADUATE INSTITUTE First Stage

6. Genetics-Immunology

No.	Equipment Name	Type of Equipment	No of Unit	Object-ive	Freq Use	Inst Trng
25	ELISA Apparatus	Automated Analyzers	1	①②	①	①
26	High Speed Refregerated Centrifuge	Centrifuges	1	①②	①	③

6. Genetics-Immunology

No.	Equipment Name	Type of Equipment	No of Unit	Object-ive	Freq Use	Inst Trng
1	Ophthalmic Eqipment	Diagnosis,Treat-ment Equipment	5	①②③	①	④
2	Hand Held Fundus Camera	Diagnosis,Treat-ment Equipment	2	①②③	①	④
3	Nephelometer	Analytical Instruments	1	①②③	①	④
4	Micro-Flow Spectrophotometer	Analytical Instruments	1	①②③	①	③
5	Double Beam Recording UV-Vis Spectrophotometer	Analytical Instruments	2	①②③	①	③
6	Spectrofluorometer for Clinical Chemistry	Analytical Instruments	1	①②③	①	①
7	Atomic Absouption Spectrophotometer	Analytical Instruments	1	①②③	①	①
8	Electrophoresis Equipment	Electrophoresis, Chromatography	2	①②③	①	④
9	Cellulose Acetate & Immuno-electrophoresis	Electrophoresis, Chromatography	1	①②③	①	④
10	Multiphor Complete System	Electrophoresis, Chromatography	2	①②③	①	④
11	Cell Electrophoresis Apparatus	Electrophoresis, Chromatography	1	①②③	①	④
12	Densitometer	Electrophoresis, Chromatography	1	①②③	①	③
13	Thin Layer Chromatography Equipment	Electrophoresis, Chromatography	1	①②③	①	④
14	Routine Binocular Bright Field Microscope	Microscopes	14	①②③	①	④
15	Inverted Microscope (Routine)	Microscopes	5	①②③	①	④
16	Hematocrit Centrifuge	Centrifuges	2	①②③	①	④
17	General Centrifuge	Centrifuges	8	①②③	①	④
18	CO2 Incubator	Analytical Equipment	10	①②③	①	③
19	BOD Incubator (Cooled Incubator)	Analytical Equipment	1	①②③	①	③
20	Incubator, Low Temperature	Analytical Equipment	1	①②③	①	④
21	Incubator	Analytical Equipment	1	①②③	①	④
22	Refrigerater Chromatography Chamber	Analytical Equipment	1	①②③	①	③
23	Refrigerater (with see-through door)	Analytical Equipment	1	①②③	①	④
24	Water Purification System	Analytical Equipment	1	①②③	①	③

7. Central 1)Pathology

No.	Equipment Name	Type of Equipment	No of Unit	Object-ive	Freq Use	Inst Trng
25	Liquid Handling System	Analytical Equipment	51	①②③	①	④
26	Automatic Diluter/Dispenser	Analytical Equipment	2	①②③	①	④
27	Micropipettes	Analytical Equipment	5	①②③	①	④
28	Multichannel Micropipettes	Analytical Equipment	14	①②③	①	④
29	Universal Pipetting Aid	Analytical Equipment	6	①②③	①	④
30	Fume Hood, Portable/Table	Analytical Equipment	6	①②③	①	④
31	Touch Mixer	X-ray Diagnosis, Ultrasonic Equip	20	①②③	①	④
32	Shaker for Separatory Funnel	Analytical Equipment	2	①②③	①	④
33	Ice Machine, flaked Ice	Analytical Equipment	4	①②③	①	③
34	Mixer, Magnetic	Analytical Equipment	20	①②③	①	④
35	Water Bath, Low Temperature	Analytical Equipment	2	①②③	①	④
36	Water Bath, Shaking	Analytical Equipment	2	①②③	①	④
37	Oven	Analytical Equipment	6	①②③	①	④
38	Vacuum Oven	Analytical Equipment	2	①②③	①	④
39	Pipet Dryer	Analytical Equipment	1	①②③	①	④
40	Heating Blocks	Analytical Equipment	20	①②③	①	④
41	Timers w/Alarm	Analytical Equipment	72	①②③	①	④
42	Digital Stop Watch	Analytical Equipment	72	①②③	①	④
43	Ultrasonic Cleaner	Analytical Equipment	4	①②③	①	④
44	Misc. Tissue Culture Equipment	Analytical Equipment	1	①②③	①	④
45	Clean Bench	Analytical Equipment	1	①②③	①	③
46	Ultrasonic Pipet Washer	Analytical Equipment	2	①②③	①	④
47	Vacuum Pump	Analytical Equipment	8	①②③	①	④
48	Homogenisers (Grinder)	Analytical Equipment	12	①②③	①	④

7. Central 1)Pathology

No.	Equipment Name	Type of Equipment	No of Unit	Object-ive	Freq Use	Inst Trng
49	Micro Tube Mixer	Analytical Equipment	6	①②③	①	④
50	Stirrers	Analytical Equipment	6	①②③	①	④
51	Magnetic Stirrer w/Hot Plate	Analytical Equipment	20	①②③	①	④
52	Blood Cell Counter-Routine Laboratory	Analytical Equipment	54	①②③	①	④
53	Slide Warmer	Analytical Equipment	2	①②③	①	④
54	Electronic Balance	Analytical Instruments	26	①②③	①	④
55	PH Meter (.01)	Analytical Instruments	12	①②③	①	④
56	PH Meter (.001)	Analytical Instruments	2	①②③	①	④
57	Water Demineralizer / Still	Analytical Equipment	4	①②③	①	③

7. Central 1)Pathology

No.	Equipment Name	Type of Equipment	No of Unit	Object-ive	Freq Use	Inst Trng
1	Multi-Channel Analyser	Automated Analyzers	1	①②③	①	①
2	Single ch-Multiple Chemistry Analyser	Automated Analyzers	1	①②③	①	①
3	Blood Gas Analyser	Automated Analyzers	1	①	①	①
4	Sodium/Potassium/Chrolide Analyser	Automated Analyzers	1	①	①	①
5	Calcium/Magnesium Meter	Automated Analyzers	1	①	①	④
6	Spectrophotometers w/UV Attachment	Analytical Instruments	1	①	①	③
7	Visual Range Spectrophotometer	Analytical Instruments	3	①	①	④
8	Dispenser	Analytical Equipment	1	①	①	④
9	Digital Diluter /Pipetter	Analytical Equipment	1	①	①	④
10	Laboratory Centrifuge	Centrifuges	2	①	①	④
11	Blood Cell Analyser	Automated Analyzers	1	①	①	①
12	Hematocrit Centrifuge	Centrifuges	2	①	①	④
13	Differential Leukocyte Counter	Analytical Equipment	12	①	①	④
14	Digital Clot Timer	Analytical Instruments	1	①	①	④
15	Platelet Aggregation Meter	Analytical Instruments	1	①	①	④
16	Micro Centrifuge	Centrifuges	1	①	①	④
17	Low-speed Refrigerated Centrifuge	Centrifuges	1	①	①	③
18	Gel Electrophoresis	Electrophoresis, Chromatography	1	①	①	④
19	Densitometer	Electrophoresis, Chromatography	1	①	①	③
20	Autosera Dot	Analytical Instruments	1	①	①	④
21	Colony Counter	Analytical Instruments	1	①	①	①
22	Phase Contrast Microscopes	Microscopes	1	①	①	④
23	Fluoroscence Microscopes	Microscopes	1	①	②	④
24	High-speed Refrigerated Centrifuge	Centrifuges	1	①	①	③

7. Central 2)Radiology

No.	Equipment Name	Type of Equipment	No of Unit	Object-ive	Freq Use	Inst Trng
25	CO2 Incubator	Analytical Equipment	1	①	①	③
26	Anaerobic Incubator	Analytical Equipment	1	①	①	③
27	Biohazard Hoods	Analytical Equipment	1	①	①	③
28	Deep Freezer (-85°C)	Analytical Equipment	3	①	①	④
29	Tissue Homogeniser	Analytical Equipment	2	①	①	④
30	Tissue Processor	Analytical Equipment	1	①	①	①
31	Cytocentrifuge	Analytical Equipment	1	①	①	①
32	Slide Stainer	Analytical Equipment	1	①	①	④
33	Ultra Processor	Analytical Equipment	2	①	①	①
34	Cryomicrotome	Analytical Equipment	1	①	①	③
35	Ultra Microtome	Analytical Equipment	1	①	①	④
36	Large Sect. Microtome	Analytical Equipment	1	①	①	④
37	Binocular Research Microscope (Special)	Microscopes	1	①	①	④
38	Binocular Research Microscope	Microscopes	16	①	①	④
39	Binocular Laboratory Microscope	Microscopes	10	①	①	④
40	Digital Balance	Analytical Instruments	4	①	①	④
41	PH Meter	Analytical Instruments	2	①	①	④
42	Magmetic Stirrer	Analytical Equipment	6	①	①	④
43	Touch Mixer	Analytical Equipment	4	①	①	④
44	Micro Tube Mixer	Analytical Equipment	2	①	①	④
45	Ultrasonic Pipet Washer	Analytical Equipment	2	①	①	④
46	Bottle Washer	Analytical Equipment	5	①	①	③
47	Glassware Dryer	Analytical Equipment	3	①	①	④
48	Water Demineraliser /Stills	Analytical Equipment	2	①	①	③

7. Central 2)Radiology

No.	Equipment Name	Type of Equipment	No of Unit	Object-ive	Freq Use	Inst Trng
49	Ice Cube Maker	Analytical Equipment	3	①	②	③
50	Timer	Analytical Equipment	8	①	①	④
51	Small Equipment	Analytical Equipment	34	①	①	③
52	Laminar Flow Benche	Analytical Equipment	6	①	①	③
53	Audio-visual Equipment	Administration, AV Equipment	3	①②③	①	④
54	ELISA Apparatus	Automated Analyzers	1	①	②	①

7. Central 2)Radiology

No.	Equipment Name	Type of Equipment	No of Unit	Object-ive	Freq Use	Inst Trng
1	Whole Body CT Scanner	X-ray Diagnosis, Ultrasonic Equip	1	①②③	①	①
2	Biplane Abdominal Angiographic Unit w/D.S.A.	X-ray Diagnosis, Ultrasonic Equip	1	①②③	②	①
3	Bucky Radiography & Planigraphy	X-ray Diagnosis, Ultrasonic Equip	1	①②③	①	①
4	Remote Controlled Unit for Gastroenterology	X-ray Diagnosis, Ultrasonic Equip	1	①②③	①	①
5	Myelography Unit	X-ray Diagnosis, Ultrasonic Equip	1	①②③	①	③
6	X-Ray Unit for Skull Radiography	X-ray Diagnosis, Ultrasonic Equip	1	①②③	①	③
7	Urological X-Ray Diagnostic Unit	X-ray Diagnosis, Ultrasonic Equip	1	①②③	①	③
8	Pediatric X-Ray Equipment	X-ray Diagnosis, Ultrasonic Equip	2	①②③	②	③
9	Mammography Unit	X-ray Diagnosis, Ultrasonic Equip	1	①②③	②	③
10	Mobile Condensor Discharge High Power Unit	X-ray Diagnosis, Ultrasonic Equip	3	①②③	①	③
11	Mobile C-arm Image Intersifier	X-ray Diagnosis, Ultrasonic Equip	3	①②③	①	③
12	Ultra Sound Unit	X-ray Diagnosis, Ultrasonic Equip	1	①②③	①	①
13	Ultra Sound Equipment Convex/linear	X-ray Diagnosis, Ultrasonic Equip	1	①②③	①	①
14	Portable Ultra Sound Unit (Linear/Sectors)	X-ray Diagnosis, Ultrasonic Equip	2	①②③	①	①
15	Ultrasound Unit Convex/linear for Genetic Lab	X-ray Diagnosis, Ultrasonic Equip	1	①②③	②	①
16	Mobile Ultra Sound Unit (Linear/Sectors)	X-ray Diagnosis, Ultrasonic Equip	1	①②③	①	①
17	Densitometer & Sensitometer	Nuclear Medicine Equipment	1	①②③	②	④
18	Dark Room Accessories	X-ray Diagnosis, Ultrasonic Equip	2	①②	①	③
19	Misc. Instruments Equipment for Radiology	X-ray Diagnosis, Ultrasonic Equip	1	①②	①	③

7. Central 3)Operation

No.	Equipment Name	Type of Equipment	No of Unit	Object-ive	Freq Use	Inst Trng
1	Operating Light	Surgical Operat-ion Equipment	16	①②③	①	③
2	Operating Table	Surgical Operat-ion Equipment	12	①②③	①	③
3	Anaesthesia Machine/Monitor/Polygraph	Surgical Operat-ion Equipment	14	①②③	①	①
4	Electro Surgical Unit	Surgical Operat-ion Equipment	9	①②③	①	④
5	Operating Microscope	Surgical Operat-ion Equipment	3	①②③	②	③
6	CO2 Monitor/Blood Pressure Monitor	Surgical Operat-ion Equipment	6	①②③	①	③
7	Washer Steriliser	Facility Other Equipment	1	①	②	③
8	Infusion Pump	Surgical Operat-ion Equipment	7	①	①	④
9	Sternal Saw	Surgical Operat-ion Equipment	2	①	②	④
10	Intra-Native Bulloon Pump	Surgical Operat-ion Equipment	1	①	②	④
11	Electromagnetic Flow Meter	Surgical Operat-ion Equipment	1	①	②	④
12	Heart Lung Machine	Surgical Operat-ion Equipment	2	①	③	①
13	Defibrillator	Surgical Operat-ion Equipment	3	①	③	④
14	Oxymeter (On-line and for Sample Studies)	Surgical Operat-ion Equipment	2	①②	③	④
15	Endomyocandial Biopsy Catheter	Surgical Operat-ion Equipment	8	①②③	③	④
16	Heart Valves	Surgical Operat-ion Equipment	4	①	②	④
17	Magnification Loupe w/Fiberoptic Illuminator	Surgical Operat-ion Equipment	6	①	②	④
18	Stryker Operations Chair	Surgical Operat-ion Equipment	15	①	②	④
19	Electrocorticography Machine	Surgical Operat-ion Equipment	1	①	②	④
20	Ultrasonic Surgical System	Surgical Operat-ion Equipment	1	①	③	①
21	Laser Nd YAG	Surgical Operat-ion Equipment	1	①	②	④
22	Laser CO2	Surgical Operat-ion Equipment	1	①	②	④
23	General Neurosurgical Instrument	Surgical Operat-ion Equipment	1	①	②	④
24	Microsurgery Instruments	Surgical Operat-ion Equipment	3	①	②	④

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7. Central 4)ICU

No.	Equipment Name	Type of Equipment	No of Unit	Object-ive	Freq Use	Inst Trng
25	Brain Self Retaining Retractor	Surgical Operat-ion Equipment	2	①	②	④
26	Instrument & Equipment	Surgical Operat-ion Equipment	1	①	②	④
27	Micro-Neurosurgical Equipment	Surgical Operat-ion Equipment	1	①	②	④
28	Electro Surgical Unit for T.U.R.	Surgical Operat-ion Equipment	2	①	②	④
29	Urological Endoscopy Table	Endoscopic Equipment	2	①②③	①	④

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7. Central 4)ICU

No.	Equipment Name	Type of Equipment	No of Unit	Object-ive	Freq Use	Inst Trng
1	Multichannel Monitors (ICU)	Physiological Test, Monitors	22	①②③	①	①
2	Multichannel Monitors (Ward)	Physiological Test, Monitors	7	①②③	②	①
3	Arrhythimia Monitor	Physiological Test, Monitors	2	①②③	②	①
4	Central Monitoring System	Physiological Test, Monitors	4	①②③	①	①
5	Ventillators (Intensive Care)	Diagnosis,Treat-ment Equipment	5	①	①	①
6	Nebulizer	Diagnosis,Treat-ment Equipment	5	①	①	④
7	Incubators (Infant)	Diagnosis,Treat-ment Equipment	3	①	③	①
8	Portable Defibrillator	Diagnosis,Treat-ment Equipment	9	①	②	④
9	Microtransfuser	Diagnosis,Treat-ment Equipment	18	①	①	④
10	Special Intensive Care Beds	Diagnosis,Treat-ment Equipment	22	①	①	③
11	pH & Blood Gas Analyser	Automated Analyzers	1	①②	①	①

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7. Central 5)Ward

No.	Equipment Name	Type of Equipment	No of Unit	Object-ive	Freq Use	Inst Trng
1	Equipments for Ward	Diagnosis,Treat-ment Equipment	4	①②③	①	④

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7. Central 6)Physical

No.	Equipment Name	Type of Equipment	No of Unit	Object-ive	Freq Use	Inst Trng
1	Equipment for Physical Medicine & Rehabilitation	Diagnosis,Treat-ment Equipment	30	①②③	②	③
2	Pulmonary Function Complete System	Physiological Test, Monitors	1	①②③	②	①

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7. Central 7)Supply

No.	Equipment Name	Type of Equipment	No of Unit	Object-ive	Freq Use	Inst Trng
1	Equipment for Central Supply Room	Facility Other Equipment	24	①②	①	①

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7. Central 8)Autopsy

No.	Equipment Name	Type of Equipment	No of Unit	Object-ive	Freq Use	Inst Trng
1	Equipment for Autopsy Room	Analytical Equipment	13	②③	②	③

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7. Central 9)Animal House

No.	Equipment Name	Type of Equipment	No of Unit	Object-ive	Freq Use	Inst Trng

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7. Central 10)Kitchen

No.	Equipment Name	Type of Equipment	No of Unit	Object-ive	Freq Use	Inst Trng

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7. Central 11)Laundry

No.	Equipment Name	Type of Equipment	No of Unit	Object-ive	Freq Use	Inst Trng

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7. Central 12)Medical Gas

No.	Equipment Name	Type of Equipment	No of Unit	Object-ive	Freq Use	Inst Trng

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7. Central 13)Work Shop

No.	Equipment Name	Type of Equipment	No of Unit	Object-ive	Freq Use	Inst Trng
1	Digital Oscilloscope, Double Beam, 100MHz	Facility Other Equipment	1	④	③	④
2	Osilloscope, 10MHz	Facility Other Equipment	3	④	③	④
3	Digital Multimeter 4-1/2 Digit	Facility Other Equipment	3	④	③	④
4	Digital Multimeter (Portable) 3-1/2 Digit	Facility Other Equipment	10	④	③	④
5	Solder Iron & Aspirator & Stand (Solder Station)	Facility Other Equipment	18	④	③	④
6	Test Zigs for Various Instruments Mother Board	Facility Other Equipment	1	④	③	④

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7. Central 14)Library

No.	Equipment Name	Type of Equipment	No of Unit	Object-ive	Freq Use	Inst Trng

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7. Central 15)Administration

No.	Equipment Name	Type of Equipment	No of Unit	Object-ive	Freq Use	Inst Trng
1	Photographic Equipment	Administration, AV Equipment	2	①②③	②	①

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1. Neuro-Sciences

No.	Equipment Name	Type of Equipment	No of Unit	Object-ive	Freq Use	Inst Trng
1	Compressed Spectral Array EEG Monitor	Physiological Test, Monitors	1	①	①	①
2	8ch EMG Evoked Potential	Physiological Test, Monitors	1	①②③	②	②
3	Electric / Pneumatic Craniotome	Diagnosis,Treat-ment Equipment	1	①	①	④
4	Combined Retractor & Handrest	Diagnosis,Treat-ment Equipment	1	①③	①	④
5	Telemeter Intracranial Pressure Monitor	Diagnosis,Treat-ment Equipment	1	②	③	④
6	Automatic Stryker Quadriplegic (Bed) Frame	Diagnosis,Treat-ment Equipment	2	①	①	④

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2. Cardiac-Sciences

No.	Equipment Name	Type of Equipment	No of Unit	Object-ive	Freq Use	Inst Trng
1	3ch ECG (Computer Analysis)	Physiological Test, Monitors	2	②③	①	①
2	24 hrs Holter Monitoring System	Physiological Test, Monitors	5	①②③	①	①
3	Multichannel Monitor & Recorder	Physiological Test, Monitors	1	①②	①	①
4	Cardiac Telemetry System (4bed)	Physiological Test, Monitors	1	①	①	③
5	Pacemaker System Analyser	Physiological Test, Monitors	1	①②	③	①

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3. Gastroenterology

No.	Equipment Name	Type of Equipment	No of Unit	Object-ive	Freq Use	Inst Trng
1	Upper Gastrointestinal Panendoscopes	Endoscopic Equipment	2	①②	②	④
2	Teaching Aids for Endoscopy	Endoscopic Equipment	1	③	②	④
3	Choledocho Fiberscopes	Endoscopic Equipment	2	①②	③	④
4	Video Endoscopes	Endoscopic Equipment	2	①②	③	①

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4. Nephrology-Urology

No.	Equipment Name	Type of Equipment	No of Unit	Object-ive	Freq Use	Inst Trng
1	Ultrasonic Kidney Stone Lihotriptor	Diagnosis,Treat-ment Equipment	1	①③	①	①

5. Endocrinology

No.	Equipment Name	Type of Equipment	No of Unit	Object-ive	Freq Use	Inst Trng
1	HbA1C Analyser	Automated Analyzers	1	①②	①	③
2	High Performance Liquid Chromatography	Electrophoresis, Chromatography	1	①②	③	③
3	Column Chromatography Equipment	Electrophoresis, Chromatography	1	①②	③	③
4	Fast Protein, Polypeptide Liquid Chromatography	Electrophoresis, Chromatography	1	①②	③	①
5	Sonnicators (Ultrasonic Tissue Processer)	Analytical Equipment	1	①②	①	③
6	High Speed Low Temperature Centrifuge	Centrifuges	1	①②	③	③
7	Vacuum Ovens	Analytical Equipment	1	①②	②	③
8	Refrigerated Chromatography Chamber	Analytical Equipment	1	②	②	③
9	Deep Freezer (-80°c,General)	Analytical Equipment	1	②	①	③
10	Cryomicrotome	Analytical Equipment	1	①②	②	③
11	Tissue Processor	Analytical Equipment	1	①②	②	①
12	Muffle Furnance	Analytical Equipment	1	①②	①	④
13	Ultrasonic Cleaner	Analytical Equipment	1	①②	①	④
14	Pipet Washer	Analytical Equipment	1	①②	①	④
15	Fume Hood	Analytical Equipment	1	②	②	③

6. Genetics-Immunology

No.	Equipment Name	Type of Equipment	No of Unit	Object-ive	Freq Use	Inst Trng
1	Liquid Scintillation Counter	Nuclear Medicine Equipment	1	①②③	①	①
2	Gamma Counter	Nuclear Medicine Equipment	1	①②③	①	①
3	Multigamma	Nuclear Medicine Equipment	1	①②③	①	①
4	Phagocytosis Investigation System	Analytical Instruments	1	①②③	①	①
5	Fast Protein Liquid Chromatography System	Electrophoresis, Chromatography	1	①②③	①	③
6	Preparative HPLC	Electrophoresis, Chromatography	1	①②③	①	③
7	Gas Liquid Chromatograph	Electrophoresis, Chromatography	1	①②③	①	③
8	DNA Sequensing Computer	Analytical Instruments	1	①②③	①	①
9	Fluorescence Microscope-Rejected Light	Microscopes	1	①②③	①	④
10	Research Microscope w/Image Analysis system	Microscopes	1	①②③	①	①
11	Inverted Microscope (Specialty)	Microscopes	1	①②③	①	④
12	Low-speed Refrigerated Centrifuge	Centrifuges	2	①②③	①	③
13	High-speed Refrigerated Centrifuge	Centrifuges	2	①②③	①	③
14	Cyto Centrifuge	Analytical Equipment	1	①②③	①	①
15	Aerofuge	Centrifuges	1	①②③	①	③
16	Ultralow Deep Freezer	Analytical Equipment	6	①②③	①	④
17	Freeze Dryer	Analytical Equipment	1	①②③	①	③
18	Semi-automated 8 Parameter Blood Cell Counter	Automated Analyzers	1	①②③	①	①
19	Auto Sera Dot	Analytical Instruments	1	①②③	①	④
20	ELISA Reader	Automated Analyzers	1	①②③	①	①
21	Sera Washer	Analytical Equipment	1	①②③	①	④
22	Cytofluorometer	Automated Analyzers	1	①②③	①	①
23	Colony Analyser System	Automated Analyzers	1	①②③	①	①
24	Ultrafilteration Equipment	Analytical Equipment	1	①②③	①	③

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7. Central 1)Pathology

No.	Equipment Name	Type of Equipment	No of Unit	Object-ive	Freq Use	Inst Trng
25	Automatic Staining Machine	Analytical Equipment	1	①②③	①	①
26	Laboratory Air Cleaner	Analytical Equipment	1	①②③	①	④
27	Safety Cabinet	Analytical Equipment	1	①②③	①	④
28	Fraction Collector	Analytical Equipment	2	①②③	①	④
29	Peristal Pump	Analytical Equipment	1	①②③	①	④
30	Centrifugal Evaporator	Analytical Equipment	1	①②③	①	③
31	Speed Vacuum Concentrator	Analytical Equipment	1	①②③	①	④
32	Refractometer	Analytical Equipment	3	①②③	①	④
33	Slide Cleaner (Vibrator)	Analytical Equipment	1	①②③	①	④

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7. Central 1)Pathology

No.	Equipment Name	Type of Equipment	No of Unit	Object-ive	Freq Use	Inst Trng
1	Transmission Electron Microscope	Microscopes	1	①	③	①
2	Preparative Ultra Centrifuge	Centrifuges	1	①	②	③
3	Inverted Microscope	Microscopes	1	①	①	④
4	Polarising Microscopes	Microscopes	1	①	①	④
5	Accessory Equipment for EM	Analytical Equipment	1	①	③	④
6	Spray Dryer	Analytical Equipment	1	②	③	③

7. Central 2)Radiology

No.	Equipment Name	Type of Equipment	No of Unit	Object-ive	Freq Use	Inst Trng
1	Biplane Cine Cardioangiographic w/D.S.A.	X-ray Diagnosis, Ultrasonic Equip	1	①②③	②	①
2	Biplane Cerebral Angiographic Unit w/D.S.A.	X-ray Diagnosis, Ultrasonic Equip	1	①②③	②	①
3	Mass Chest X-Ray Equipment	X-ray Diagnosis, Ultrasonic Equip	1	①②③	②	③
4	Computed Radiographic System	X-ray Diagnosis, Ultrasonic Equip	1	①②③	①	①
5	Projectors, TV/Video Tape Recorder/Screen	Administration, AV Equipment	4	②③	②	④
6	Linear Accelerator & Dosimeter	Radiological Treatment Equip.	1	①②	③	①
7	After Loading Bracky Therapy Unit	Radiological Treatment Equip.	1	①②	③	①
8	Teletherapy Simulator	Radiological Treatment Equip.	1	①②③	②	①
9	Gamma Camera	Nuclear Medicine Equipment	2	①②③	①	①
10	Automatic Gamma Multisample Counter	Nuclear Medicine Equipment	1	①②	①	①
11	Isotope Dose Calibrator & Reference Source	Nuclear Medicine Equipment	1	①②	②	④
12	Cine Film Developing Apparatus	X-ray Diagnosis, Ultrasonic Equip	1	①②	①	③

7. Central 3)Operation

No.	Equipment Name	Type of Equipment	No of Unit	Object-ive	Freq Use	Inst Trng

7. Central 4)ICU

No.	Equipment Name	Type of Equipment	No of Unit	Object-ive	Freq Use	Inst Trng
1	Ion Analyser	Automated Analyzers	1	①②	①	①
2	Oxymeter	Automated Analyzers	1	①②	①	④
3	8 Parameter Semiautomated Haematology Analyser	Automated Analyzers	1	①②	①	①
4	Osmometer	Analytical Instruments	1	①②	①	④
5	Microscope	Microscopes	1	①②	①	④
6	Centrifuge	Centrifuges	1	①②	①	④
7	Clinical Spectrophotometer	Analytical Instruments	1	①②	①	④

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7. Central 5)Ward

No.	Equipment Name	Type of Equipment	No of Unit	Object-ive	Freq Use	Inst Trng

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7. Central 6)Physical

No.	Equipment Name	Type of Equipment	No of Unit	Object-ive	Freq Use	Inst Trng

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7. Central 7)Supply

No.	Equipment Name	Type of Equipment	No of Unit	Object-ive	Freq Use	Inst Trng

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7. Central 8)Autopsy

No.	Equipment Name	Type of Equipment	No of Unit	Object-ive	Freq Use	Inst Trng

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7. Central 9)Animal House

No.	Equipment Name	Type of Equipment	No of Unit	Object-ive	Freq Use	Inst Trng

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7. Central 10)Kitchen

No.	Equipment Name	Type of Equipment	No of Unit	Object-ive	Freq Use	Inst Trng

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7. Central 11)Laundry

No.	Equipment Name	Type of Equipment	No of Unit	Object-ive	Freq Use	Inst Trng

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7. Central 12)Medical Gas

No.	Equipment Name	Type of Equipment	No of Unit	Object-ive	Freq Use	Inst Trng

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7. Central 13)Work Shop

No.	Equipment Name	Type of Equipment	No of Unit	Object-ive	Freq Use	Inst Trng
1	Digital Storage 2ch Oscilloscope w/Recorder	Facility Other Equipment	1	④	③	④
2	Logic Analyzer w/Universal Test Board	Facility Other Equipment	1	④	③	④
3	Portable Oscilloscope	Facility Other Equipment	1	④	③	④
4	Ultrasonic Cutter	Facility Other Equipment	1	④	③	④
5	Cable Fault Locator	Facility Other Equipment	1	④	③	④
6	Digital Transient Recorder	Facility Other Equipment	1	④	③	④
7	Personel Computer /2 Disk /Printer	Facility Other Equipment	1	④	③	④
8	Logic Test Probe (Analyser)	Facility Other Equipment	1	④	③	④

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7. Central 14)Library

No.	Equipment Name	Type of Equipment	No of Unit	Object-ive	Freq Use	Inst Trng

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7. Central 15)Administration

No.	Equipment Name	Type of Equipment	No of Unit	Object-ive	Freq Use	Inst Trng