

Denpasar, it has requested Japan for project-type technical cooperation and grant aid assistance. The Japanese government decided to implement a Basic Design Study and the Japan International Cooperation Agency (JICA) dispatched Basic Design Study Teams I and II.

2-4-2 Outline of Request

The outline of the request for grant aid assistance, clarified through an analysis of the written request submitted in April 1991 by the Directorate of Special and Private Hospital, the Directorate General of Medical Care, Ministry of Health, and the results of the above-stated Basic Design Study Terms(I) & (II), can be summarized as follows:

(1) Objective

To respond to the increasing need for emergency medical care due to industrial accidents, to increase preparedness for major disasters and to respond to the demand for higher quality medical care services as a whole in East Indonesia, this project aims to improve the emergency medical unit of the hospital and to enhance its role as the main referral hospital in East Indonesia.

(2) Project Implementing Agency

Directorate General of Medical Care, Ministry of Health.

(3) Activity Plan

1) Emergency Medical Care

As the top referral hospital in East Indonesia, EMU serves as a tertial emergency care hospital.

2) Teaching/Training

As the teaching hospital in East Java EMU furnishes the training for medical students, residents, nursing students paramedical students and also to the young doctors and nurses.

3) Referral and Emergency Network

EMU will serve as the key station of the referral and emergency network.

4) Disaster preparedness

Referral and Emergency Communication network can be utilized as the control and communication means in disaster. Through daily task, EMU is trained and prepared for disaster.

(4) Project Site

In the compound of Dr. Soetomo Hospital in Surabaya.

(5) Building Facilities and Medical Equipments

1) The New Emergency Unit Building

Building : five stories with penthouse

Total floor area : 7,747.8m²

Facilities : reception room, triage room, first-aid and resuscitation room, diagnosis room, treatment room, operating room, intensive care room, radiological examination room, management and operation room, conference room (lecture room), medical office, machinery room, other rooms

Site : Approximately 4,360m² where the present emergency outpatients' building is located on the premises of the Dr. Soetomo Hospital.

2) Medical equipment:

Equipment for initial treatment (emergency treatment)

Equipment for emergency diagnosis and examination

Equipment for emergency surgical operations (surgical and delivery)

Intensive care equipment

Ambulances

Educational equipment (systems for monitoring surgical operations)

Other

CHAPTER 3 CONTENTS OF THE PROJECT

CHAPTER 3 OUTLINE OF THE PROJECT

3-1 Objective

Indonesia has made remarkable economic growth in recent years. However, the industrialization and urbanization that have swept the country have generated a number of medical service and health care problems. Among these, increased traffic and industrial accidents and treatment for such diseases as diphtheria, tetanus and dengue are creating a growing demand for emergency medical care services.

The Government of Indonesia is making efforts to improve the emergency medical service system and the wide-area referral system in Indonesia by renovating and improving the present emergency medical facilities, the communication systems, the transportation systems and the personnel training/education system for emergency medical care services.

The Dr. Soetomo Hospital (hereinafter referred to as RSS), located in Surabaya City, is not only an A-class hospital but also a top referral hospital in the Eastern Java area. The Emergency Unit (hereinafter referred to as the EMU) plays the pivotal role in providing emergency medical services to the entire East Java area. However, the current status of EMU is far from a satisfactory level due to the following reasons: Cramped and poorly-equipped medical facilities, the complicated flow in the clinical examination and treatment, a shortage of medical equipments and an insufficient emergency medical network.

To solve these imminent problems, the Government of Indonesia has drafted and formulated a project for the renovation of the EMU of RSS that aims to renovate and upgrade the current emergency medical facilities, the medical equipment and supplies, the present emergency medical service network and the personnel training for emergency medical service.

The objective of the project is to construct the facilities and to procure the necessary equipment for the implementation of the above-mentioned project and thereby contribute to the improvement of emergency medical services in Indonesia.

3-2 Study and Examination of the Request

3-2-1 Propriety and Necessity of the Project

Despite the extremely significant role of the EMU in the field of emergency medical services in Eastern Java and Eastern Indonesia, EMU is suffering from the inefficiency of the scattered emergency medical activities and the insufficient facility and equipment. First is to establish one gate system and effectuate one-gate system. Based on this system, triage function will work more effectively. Diagnosis and treatment facilities also need reinforcement.

Emergency network is unique and important features of EMU, which serves not only for the daily emergency services, but also for the disaster preparedness. It is extremely important to strengthen the functions of the EMU by renewing the existing facilities and equipment.

The realization of this project can be judged reasonable and necessary on the grounds that the EMU could spread the project's effectiveness throughout Indonesia since it could provide and exchange its research study findings with other medical institutions based on its educational and research activities in connection with its emergency medical services.

3-2-2 Examination of the Project's Relationship with Similar Projects

Though the functions are similar, EMU's geographical service area is different from the other two medical institutions founded under Japanese grant aid assistance. RSCM Emergency Medical Center (1986) in Jakarta and Sanglah Hospital Emergency Medical Center(1991) in Denpasar.

As mentioned above, the project can be used as a model for similar projects in the future because the emergency medical service activities carried out under this project will contribute to solidifying and strengthening the emergency medical treatment system in Surabaya and its environs and Eastern Java. In addition, it will serve to educate and train medical staff and personnel in the field of emergency medical service.

3-2-3 Examination of the Project's Components

As shown in Fig. 3-2-1, the shaded area corresponds to the EMU's flow of patients. EMU's operations and activities can be classified by the function and flow of work into the groups listed below.

- 1) First aid, triage, X-ray examinations, physiological and clinical examinations
- 2) Obstetrics/gynecology for emergency patients
- 3) IOU (intensive observation unit)

- 4) Surgical operations and central supplies
- 5) Education, research study on emergency medical services
- 6) Maintenance service and administration

The First Aid and Triage Section is the hub of the EMU's activities. From this section patients are transferred for surgical operations or special care and treatment in the IOU. In addition, because of the high risk of complications in pregnancy cases, all the deliveries need to be incorporated into the Emergency Medical Unit (EMU).

As part of this project, the EMU shall accept undergraduate students from the Medical Department of the National Airlangga University, for the purpose of providing teaching and training in emergency medical treatment.

Also, the administrative and maintenance departments shall be incorporated to help the above functions to run smoothly.

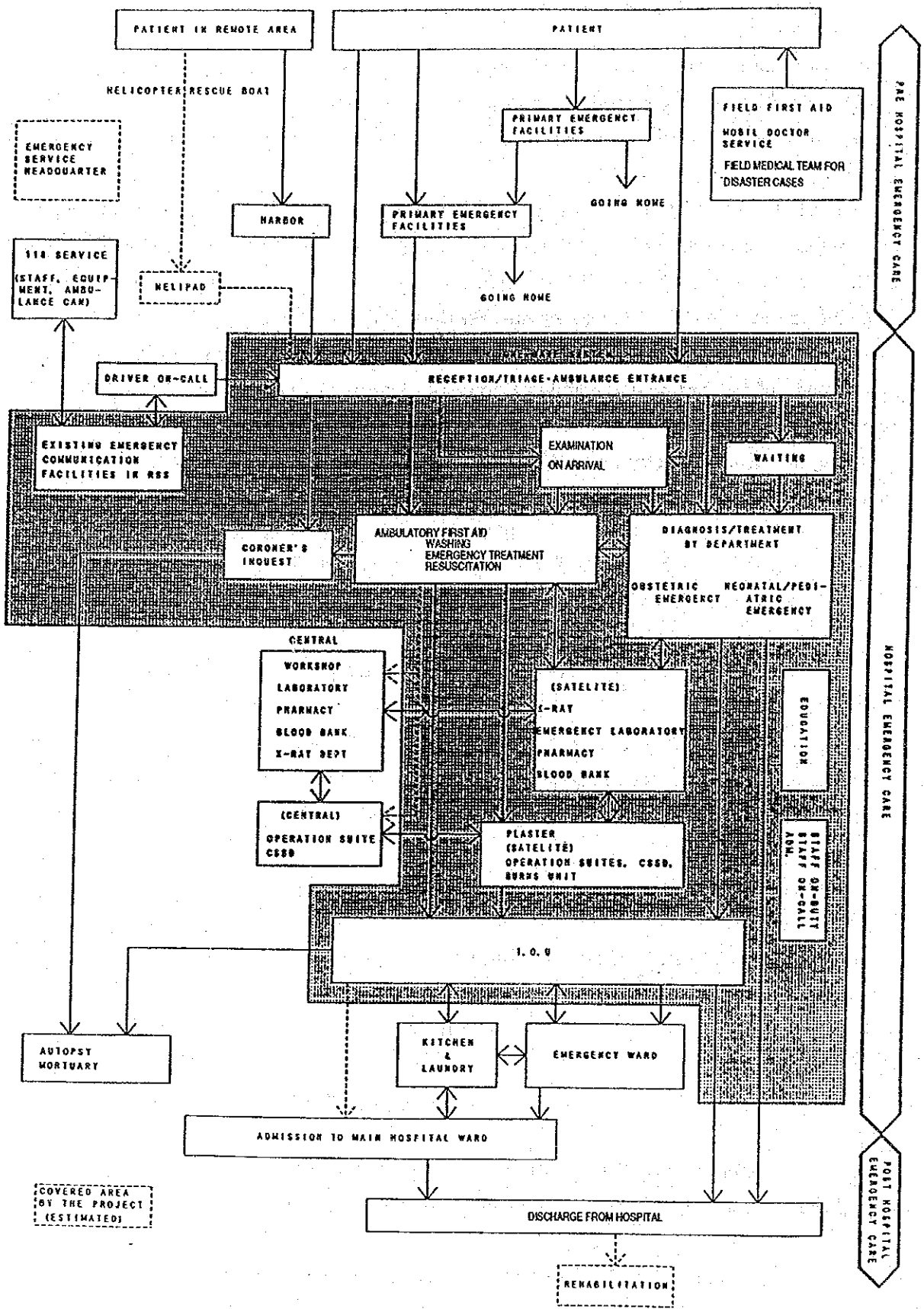


Fig. 3-2-1 The Flow of Patient (EMU)

3-2-4 Examination of the Project Operation Plan

(1) Personnel Plan

The existing EMU is operated by a work force totalling 358 people. It consists of 67 doctors, 177 nurses and 114 other staff members. (See Table 3-2-1)

Table 3-2-1 Staff Expansion Plan

| | Doctor | Nurse | Others | Total |
|------------------------|--------|-------|--------|-------|
| Present | 67 | 177 | 114 | 358 |
| At the time of Opening | 71 | 225 | 90 | 386 |

(Numbers intern are not included)

The proposed staff expansion plan by RSS envisioned a total staffs of 732, broken-down into 126 doctors, 374 nurses and 232 administrative staff to meet an increased number of beds and expanded operations at the renewed EMU. However, judging from the present conditions at the EMU, the proposed plan calling for an increase of 545 seems to be too large to manage for budgetary and recruiting reasons.

Based on the scale of the facilities and the scope of activities at the renewed EMU, the Team proposes that the present work force to be expanded to a total of 386. This proposal can be broken down into 71 doctors, 225 nurses and 90 administrative and supporting staff.

It will be necessary to increase the number of nurses in this EMU from the present 177 to 225 at the time of opening and to 310 by fiscal 2002. This is due largely to expansion of the IOU and the concentration of emergency functions and delivery services of obstetrics and gynecology in this EMU. In this plan it has been confirmed that a backup system consistent with the increase in personnel will be implemented by the Ministry of Health of Indonesia and that this increase in personnel will be possible since a nurses training school will be opened from June, 1993 in RSS.

Furthermore, the nurses and other personnel will basically be on a 3-shift basis whereas, the doctors will be on a 1-shift basis.

(2) Management/Budget Plan

Prior to the construction of the new EMU, it is necessary to demolish the existing emergency surgery building on the site. The cost of demolishing the existing facility is estimated at approximately 46,500,000RP(A). Also, the existing facility needs to be temporarily relocated to share the existing emergency medical building. The relocation cost is estimated at

approximately 100,000,000RP(B). The total cost of 146,500,000RP (A+B) is already allocated as the budget by the Government of Indonesia.

The hospital's operating costs, after the completion of the new EMU, is estimated by the Team as shown in Table 3-2-2. The EMU cost is estimated to be 3,110,080,800RP in 1995, which is 2.1 times as much as the annual budget of the existing EMU (1991/92), and about 12% of the hospital's gross budget. an amount possible to be borne by the Indonesian Government, Table 3-2-3 shows an outline of the EMU's budget for 1995 . Because the EMU operating cost adds up to 7.5% of the gross RSS budget in 1992, 12% is not an unrealistic figure.

Table 3-2-2 Projected Budget (Opening)

(x 1,000 Rps)

| | Income | Expenses |
|----------------------|---|---|
| Hospital | 5,197,500 (Income of the year 1992 times 1.35) | 25,645,448.4 <Estimated from 10% increase/year National & provincial Budget> (Income of the year 1992 times 1.3) |
| Emergency Department | <Medical fee increased by 50%> <Patients increase by 50%> 315,000 | 3,110,080.8 |

Table 3-2-3 Allocation of Budget

(X1,000 Rps)

| Item of expenditure | Present contribution to emergency department 1992/1993 | % contribution of the total hospital budget by department summary 1992/1993 | Projected budget for EMU 1995 |
|--------------------------|--|---|---|
| Pharmacy | 453,248 | 10 % | 735,000 |
| Logistic | 288,014 | 18.9 | [432,021 150,000 |
| Tech & Maintenance | 67,650 | 4.76 | 115,500 |
| Electrical & Power | 220,000 | 18.18 | 600,000 |
| Water Supply | 50,400 | 16.8 | 75,000 |
| Telephone | 2,715 | 7.2 | 14,000 |
| Personnel | 288,211.6 | 5.22 | Present condition Costs associated with increase in personnel 432,839.8 363,420.0 |
| Kitchen & Dietary | 104,483.6 | 8.1 | 192,300.0 |
| Total Budget Consumption | 1,474,722.2 | Percentage to the total budget of RSS: 7.5% | 3,110,080.8 |

3-2-5 Examination of Requested Facilities and Equipment

(1) Facilities

The facilities requested for the purpose of conducting emergency medical services, encompass the following areas: first aid, triage, obstetrics, gynecology, IOU, surgical operations/central supplies, education/research study on emergency medical treatment and administrative offices.

The new EMU shall be operated by the "one-gate-system" (the system of receiving emergency patients at one place and allocating them to appropriate divisions for further treatment) under the guidance of doctors who give proper advice on the allocation of patients.

One major factor in deciding on the scale of the new EMU facility is the number of patients, which can be predicted as follows:

The analysis of the past data, as in Figure 3-2-2 and Table 3-2-4, show the number of patients to be admitted and to be operated on will increase by approximately 5% annually. Therefore, the number of patients who are admitted and surgically operated upon will increase by 50% over the next 10 years. Based on this prediction, the Team will examine the requested facilities as follows:

1) First-aid Triage Section

On the average, 325 outpatients per day were accepted for both internal medicine and surgical treatment over the past five years from 1989 to 1991.

The first-aid and triage division, which is most important for emergency medical services, lacks space and faces a shortage of medical staff and equipment. Therefore, it is urgent to increase the qualified personnel and to renew and expand the facility to meet the increasing patients.

2) Obstetrics/Gynecology Department

Generally obstetrics and gynecology are not included in the emergency medical unit. However, they should be incorporated into the EMU as one of its divisions in view of a high incidence rate of abnormal deliveries and complications during pregnancy. Also, to increase staffing efficiency, all deliveries will be handled in the EMU. Mothers with normal deliveries will be transferred to the RSS OB ward after delivery.

The average number of Obstetrics/Gynecology patients (1987-1991) was as follows:

| | | | |
|--------------|----------|--------------------|-------|
| Outpatients | : 21/day | Operations: | 5/day |
| Hospitalized | : 12/day | Premature babies : | 2/day |

When the new EMU is completed, the number of patients is predicted to increase by 50% as follows:

| | | | |
|--------------|----------|------------------|---------|
| Outpatients | : 31/day | Operations | : 8/day |
| Hospitalized | : 18/day | Premature babies | : 3/day |

3) IOU (intensive observation unit)

Inpatients receive intensive observation in the IOU division, which is divided into IOU-1 that handles serious patients and IOU-2 that takes care of less serious ones. Also, individual rooms shall be installed for infectious diseases. The observation time is restricted to 24 hours after which patients will be sent to respective wards of RSS. Patients hospitalized for internal medicine and surgery, currently 35 a day, is estimated to increase to 52 a day in the future.

4) Operating Rooms/Central Supplies

At present there are four operating rooms in the EMU, where 13 surgical operations are performed daily. The number of operations allowed for one operating room is three per day. A minimum number of six rooms will be required to perform the 20 operations predicted per day.

The Central Sterilization Supply Department (CSSD) in EMU is responsible for the supply of all sterilized medical equipment and supplies and serves as branch of RSS CSSD where major portion of the sterilizing should be done.

5) Emergency Medical Care Teaching and Training

The importance of teaching and training in emergency medical treatment at EMU is to improve the medical treatment level as well as the education level of paramedics in the field of emergency medical services. There are 40 interns and 30 residents at one time and also there are 40 to 100 nurse students being trained at EMU. Thus, there is considerable necessity for lecture rooms which can accommodate 50 people, and a conference hall to accommodate 80 to 100 people for conferences or meetings.

(2) Medical Equipment

Most of the medical equipments requested are necessary for making basic diagnosis and medical treatment for emergency medical service activities. The medical equipment being used at the existing facilities have mostly become old or obsolescent and regarded as impossible to be transferred to the renewed EMU facilities for continued use.

The reasons they are requested are follows:

1) Triage Room (first examination)/Treatment Room

Equipment required in this department consists of: Basic diagnostic equipment (used for examining patients who need surgical treatment or suffer from ailments of the digestive organs, circulatory organs and respiratory organs) and several sets of treatment equipment and minor surgical operation instruments and tools.

In particular, it has been determined that cardiographs and endoscopes are medical instruments indispensable for diagnosing patients whose awareness has dropped to low level. The requested motorized traction unit, mainly used for the treatment of whiplash injuries, shall not be introduced in EMU because the treatment of this kind cannot be regarded as a part of the emergency treatment, and RSS also is already furnished with this kind of equipment.

2) Emergency Resuscitation Room

The equipment, instruments and materials requested, mainly used for life saving are for securing trachea, artificial respiration, cardioresuscitation and blood transfusions. The major equipment requested, such as defibrillators and artificial respirators, are judged reasonable. Also, the endotracheal tube sets, trachiotomy sets and blood transfusion sets should be regarded as reasonable. Operating tables, etc. shall be added to the above to make possible resuscitations and emergency operations in the room.

3) Clinical Examination

The equipment, to be furnished in the emergency clinical examination room, will vary depending on the quantity of emergency examinations received and the presence of night-duty staff at the RSS head hospital. As previously mentioned in section 2-3-4, the RSS's laboratory currently has such an enormous clinical examination work load that it impedes the joint work between it and the Emergency Department. Consequently, an analysis of an equipment and materials list for the Emergency Department of EMU, indicates that what is necessary for carrying out emergency examinations independently in a self-reliant way without asking for RSS's help, reflect the RSS's current predicament. The list which is considered reasonable consists of the examination equipment for blood gases, electrolytes, blood cells, urine, glass appliances.

The request for an automatic chemical analyzer is judged reasonable, since it enables multi-purpose measurements and is effective as a backup appliance when other examination apparatuses go out of order. However it should fall within the scope

of what is listed as the items necessary for conducting emergency clinical examinations.

4) Ophthalmological Department

This department requires treatment sets, minor surgical equipment, etc. for providing emergency treatment of outpatients on a 24-hour basis. In addition, to the mentioned above, an ophthalmodynamometer is listed as necessary equipment for making diagnosis, which is reasonable.

5) Otorhinolaryngological Department

This department is requesting a treatment unit, a nebulizer and small items necessary for diagnosis and treatment. The request is reasonable in view of this department's role in caring for outpatients who come to receive emergency treatment after 2 o'clock.

6) Radiological Department

Patients brought to the Emergency Department need to be examined under difficult conditions which differ from normal examinations because most of them are under an extremely low-level of awareness, are badly bleeding, have open wounds, or have many catheters attached to them. In such cases, precise examination data is hard to obtain by normal means. Therefore, an X-ray TV Unit, mobile X-ray Unit that can be used at in treatment rooms, IOU, etc. and one Surgical X-ray Unit (mobil) to be used in operating rooms are considered indispensable. Also, the introduction of a computer-assisted X-ray tomograph for filming the full length of a patient's body that enables also to obtain vivid pictures of the brain in a lying-on-the-back posture on the examination table is considered indispensable for patients afflicted with brain diseases and wounds which are on the increase.

Although two X-ray angiography machines are now in use at the RSS, none of this type of equipment is feasible because of the high maintenance cost and the high-level technology required for operating them efficiently.

An ultrasound diagnostic system which provides non-invasive techniques and excellent tomographic images necessary for the extraction of internal organs is an indispensable system in the emergency division. Its advantage is that it can be easily applied to serious patients.

7) Obstetrics and Gynecology Department

Treating device sets such as examination tables, treatment units, colposcopes and hemostats are essential items demanded in obstetrics and gynecology. An ultrasonic diagnosis device for fetal monitoring to diagnose the position and state of the unborn child to determine the degree of predelivery danger is also necessary and the demand for auxiliary devices such as examination lights is also deemed reasonable.

8) Labor Room

Requests for labor bed, delivery monitoring apparatus, maternity blood transfusion systems are deemed reasonable. Delivery monitoring apparatus for safe and positive delivery control is important. Devices for delivery will also be provided on labor beds so delivery will be possible in the labor room in case the delivery room is fully occupied.

9) Delivery Room

Requests for essential equipment such as delivery tables, delivery monitoring apparatus and vacuum extractor, and emergency treating devices such as resuscitation bags and infant warmers are considered reasonable. Furthermore, the delivery table will be of a type capable of coping with minor surgery in the event of an abnormal delivery.

10) Premature Babies' Room

Lack of therapy equipment can mean life or death to premature babies. A list of items requested shows incubators, a phototherapeutic apparatus for treating jaundice, resuscitation materials and blood transfusion materials are listed as necessary in this section. All are deemed reasonable. In addition, such small items as blood exchange sets and blood transfusion sets are judged indispensable and shall be added, though not requested.

11) Newborn Babies' Room

Beds for newborn babies, treatment tables, scales examination apparatuses are required for dealing with newborn babies in this room are all considered reasonable.

12) Nurse Station for Obstetrics/Gynecology Department

The Obstetrics & Gynecology IOU, the Delivery Room, Labor Room the Premature Babies' Room and the Newborn Babies' Room are under this Nurse Station's control. A list of requirements for the Nurse Station consists of the following obstetric/gynecological treatment apparatuses and materials, equipment.

Requests for nursing equipment such as medical examination sets, treatment devices sets, aspirators, medicine cabinets, refrigerators, liquid pumps and emergency treatment devices are considered reasonable.

13) Obstetrics & Gynecology IOU

An emergency resuscitation apparatus, an oxygen inhaler, an ultrasonic nebulizer and beds are the items listed as necessary and are considered reasonable.

14) Intensive Observation Units

Serious postoperative patients and serious cases of respiratory paralysis, awareness impediments, shock symptoms, etc. are monitored under intensive observation in this room. Since such serious patients' symptoms may show sudden changes, a list of requirements includes medical equipment and supplies for treating serious patients, a monitoring apparatus that analyzes physiological information and an apparatus that maintains physiological functions.

Major items, judged reasonable, are IOU beds, bedside monitors, artificial respirators, defibrillators, CO² monitors, etc.

15) Nurse Station in Intensive Observation Units

The Nurse Station controls the Intensive Observation Room. A list of items requested for this section includes equipment necessary for medical diagnosis and nursing, and is considered reasonable.

16) Operating Rooms

Multi-function operating tables that can cope with thoracic operations, abdominal operations and urological operations need to be installed in the four operating rooms. Also, operating tables of a multi-function type that can cope with orthopedic operations and surgical X-ray equipment are required to be installed in the other operating rooms. In addition, anesthetizers, suction pumps, monitors and surgical instruments are required. Furthermore, an electro surgical unit is necessary for styptic treatment, blood coagulation and incisions, and in cases of heart stoppage during a

surgical operation a defibrillator is essential. These requested items are considered reasonable.

17) Central Supply and Sterilization Department

Major equipment, instruments and tools required in this section are as follows:

An autoclave, used for sterilizing metal, glass, cloth and rubber instruments, and materials, including medicines, that can withstand extreme temperatures of around 120 degrees Celsius, an ethylene oxide sterilizer used for sterilizing rubber gloves, catheters, syringes and endoscopes which are prone to deformation by heating, an ultrasonic sterilizer used for removing stains (blood, chemical substances) from complicated-form surgical instruments and glass appliances. In addition, work tables, cupboards and lockers for storing sterilized surgical instruments, appliances and materials need to be supplied.

18) Maintenance Equipment

Since RSS is provided with a wholesome workshop, the minimum equipment required by EMU for emergency use and simple repairs is requested. The equipment requested, consisting of general implements for normal use in the emergency section, implements for electronic devices and also special measuring instruments such as oscilloscopes and MAS meters for repairing X-ray diagnosis equipment, ultrasound diagnosis equipment and patient monitors, was judged reasonable.

19) Ambulance

At present EMU has five ambulances for use in its emergency medical activities. Two of them were donated from France in 1976 and the rest were donated by domestic enterprises in 1980 and 1985, respectively. All of them have become markedly worn out through many years of use and repeated repairs. They are in the state of being unable to function fully as ambulances. It is necessary to replace these old ambulances by new cars.

20) Equipment for Teaching and Training

RSS is presently serving as an educational hospital for the National Airlangga University and is conducting clinical training for medical students relative to emergency treatment. In this plan, EMU will be in overall charge of clinical training in the emergency treatment field in each section. Video equipment for

observing surgery, overhead projectors for use in lectures, slide projectors and TV monitors are also planned for more effective clinical training.

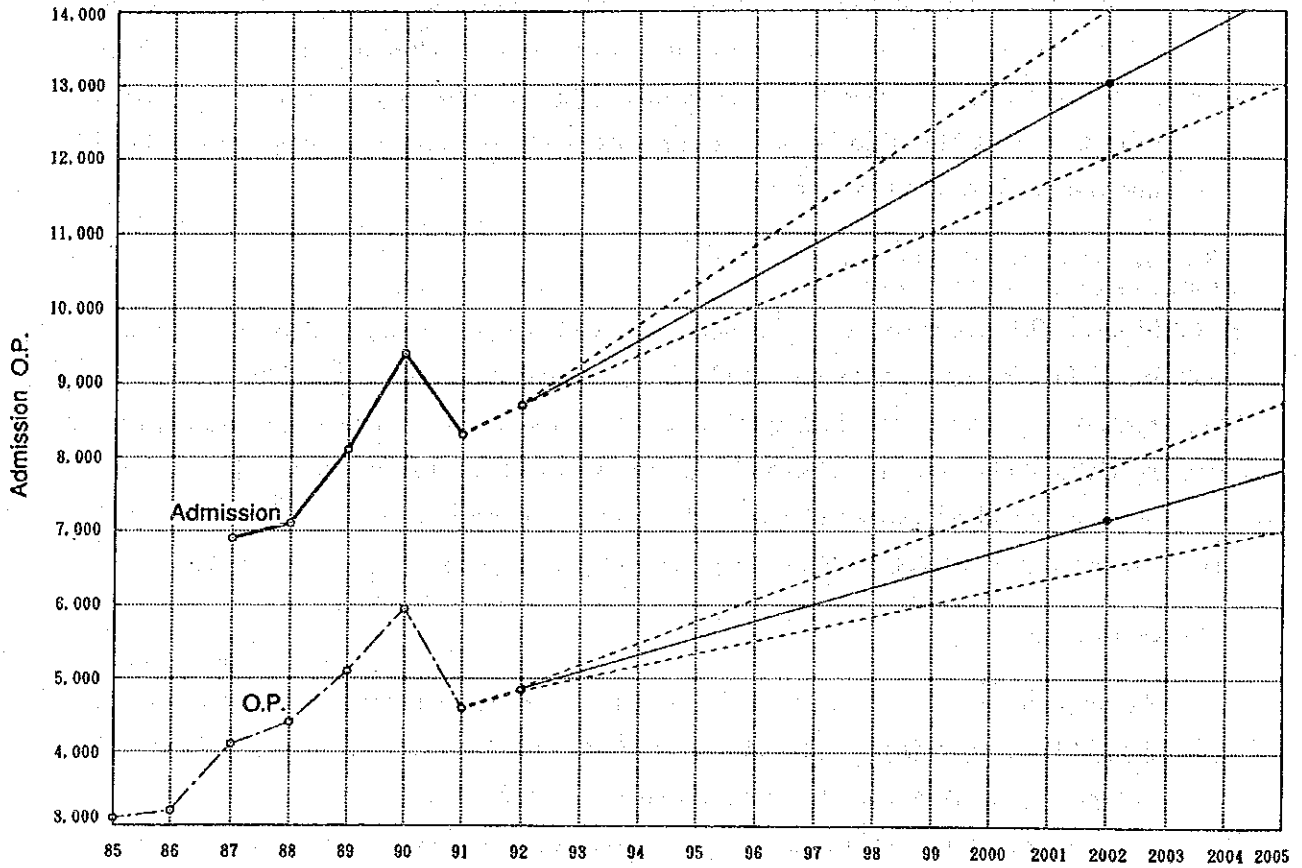


Fig. 3-2-2 Future Increase of the Emergency Patients in EMU

Table 3-2-4 Emergency Patients in EMU

() : patients per day

| | 1987 | 1988 | 1989 | 1990 | 1991 | Average | Projected |
|---|-----------------|-----------------|-----------------|-----------------|-----------------|----------------------------|-----------|
| a. Outpatients | | | | | | | |
| Surgery | 37,217 (102) | 35,639 (98) | 35,697 (98) | 36,441 (100) | 32,895 (90) | (97) | (150) |
| Internal Medicine (incl. Pediatrics) | 84,204 (231) | 91,635 (251) | 85,226 (233) | 79,890 (219) | 74,858 (205) | (228) | (300) |
| Ob/Gyn | 8,216 (23) | 8,472 (23) | 7,659 (21) | 7,352 (20) | 7,454 (20) | (21) | (25) |
| b. Admitted | | | | | | (annual increase 5%) | |
| Surgery | 6,918 (19) | 7,143 (20) | 8,071 (22) | 9,348 (26) | 8,235 (23) | (22) | (33) |
| Internal Medicine (incl. Pediatrics) | 5,353 (15) | 5,472 (15) | 4,357 (12) | 5,005 (14) | 3,084 (8) | (13) | (20) |
| Ob/Gyn | 2,598 (7) | 2,651 (7) | 2,418 (7) | 2,338 (6) | 2,460 (7) | (7) | (12) |
| Premature Baby | 895 (2) | 914 (3) | 844 (2) | 878 (2) | 945 (3) | (2) | (3) |
| c. Number of Operation | | | | | | (annual increase 5%) | |
| Surgery | 4,084 (11) | 4,356 (12) | 5,051 (14) | 5,921 (16) | 4,595 (13) | (13) | (20) |
| Ob/Gyn | 1,950 (5) | 1,880 (5) | 1,680 (5) | 1,595 (4) | 1,835 (5) | (5) | (8) |

Projected: Anticipating 50% Increase of Average in Those Five Years.

3-2-6 Necessity of Technical Cooperation

The Dr. Soetomo Hospital (RSS) is one of the few A-class national hospitals in Indonesia and also plays the role of an educational hospital for medical students studying at the National Airlangga University. Its medical services and treatment level enjoy an extremely good reputation in Indonesia. The hospital surpasses other medical institutions in developing emergency medical services and treatment and has a well-organized system of controlling the medical equipment and supplies, though still insufficiently-equipped and furnished. It is desirable to introduce project-type technical cooperation for the purpose of enhancing the position of the EMU as a model facility that performs the duties of "clinical examinations," "medical treatment activity," "top referral activity" and "medical staff's teaching and training activity," and also complies with this project's objectives. Further, it would enhance the significance of the project under the government's grant aid assistance and serve to raise the medical service/treatment level in Indonesia as well.

3-2-7 Basic Policy for Cooperation

As a result of the above-mentioned examination of the request, it has been judged appropriate to implement the project in the form of grant aid assistance from the Government of Japan. Consequently, the basic design for the project will be carried out on the assumption that the project is implemented under Japanese grant aid assistance. However, it is considered to be appropriate to change some parts of the request of the Government of Indonesia, as stated in "3-2-3 Examination of the Project's Components" and "3-2-5 Examination of the Facilities and Equipment Requested."

33 Outline of the Project

3-3-1 Execution Agency and Management System

As shown in Fig. 3-3-1, this project is to be implemented by RSS under the Directorate of Private and Special Hospitals and the Province of East Java. 90% of the EMU's doctors are employees of the Ministry of Education and Culture, and because RSS functions as an educational hospital for Airlangga University, the remaining EMU staff members belong to the Ministry of Health and to the Province.

Since EMU is one of the department of RSS, it will be supported by the physicians of each specialities of the hospital. (See Fig. 3-3-1)

As explained in 3-2-4(1), plans are to operate new EMU with an initial staff of 386 and to increase this to 514 by the year 2002. The breakdown is shown in Tables 3-3-1 and 3-3-2.

It will be necessary to increase the number of physicians by 4, from 67 to 71, at time of opening of the project and to 89 by the year 2002 and a further increase of 18 thereafter.

It will also be necessary to increase the number of nurses by 45 from 99 to 144 at time of opening of the project and a further increase of 48 by the year 2002. It will also be necessary to increase the present 78 assistant nurses by three and a further increase of 27.

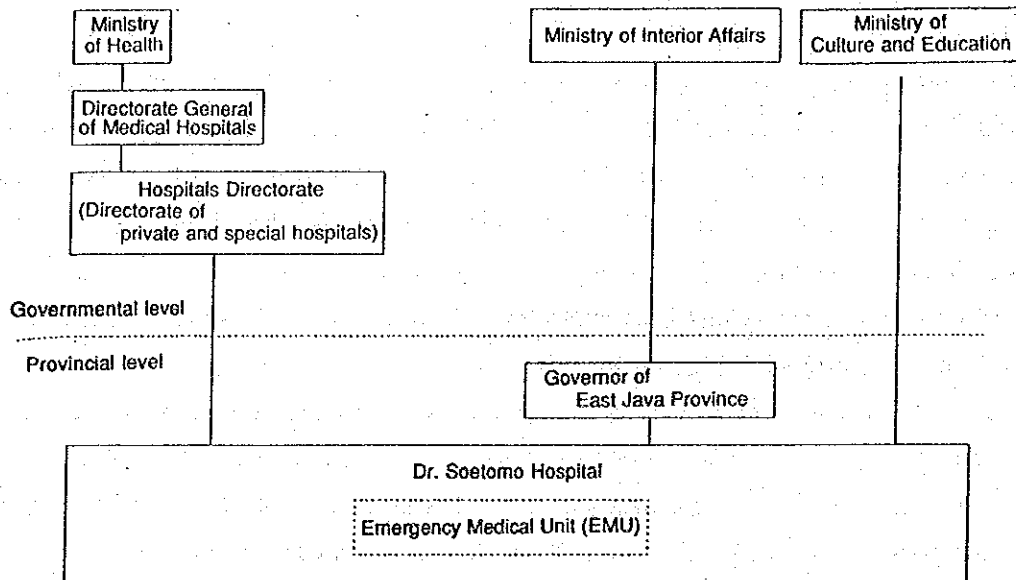


Fig. 3-3-1 Organization System (RSS)

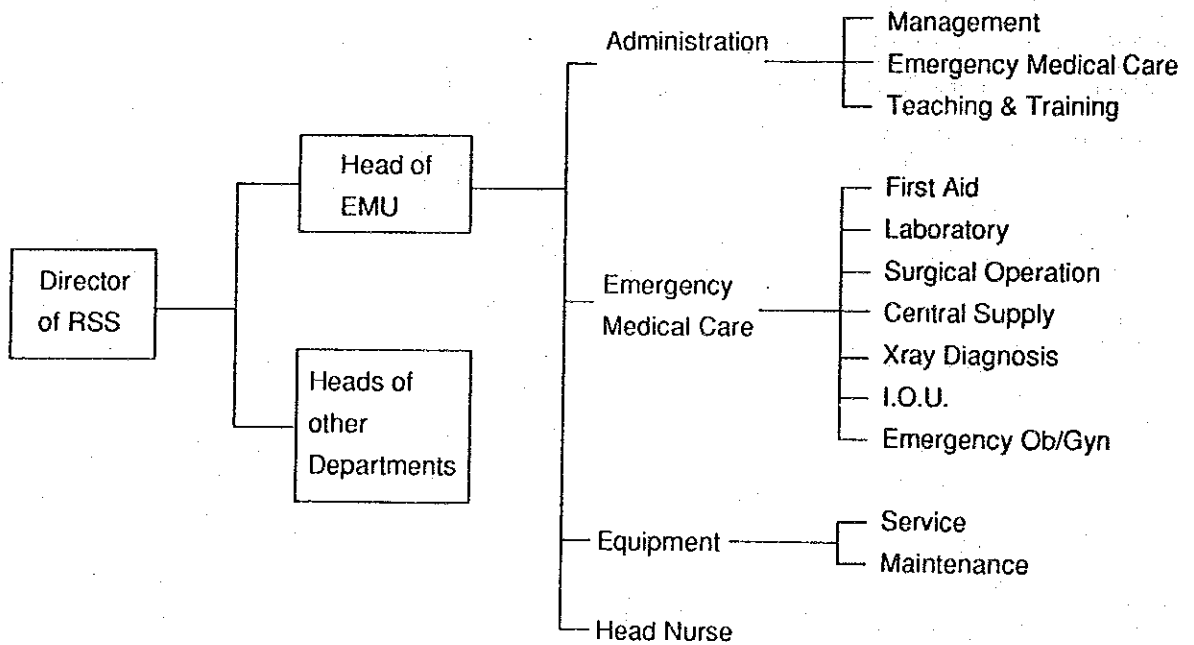


Fig. 3-3-2 Management System (EMU)

Table 3-3-1 Manpower Plan

| | Present | Opening/1995 | Target Year/2002 |
|-----------------------------------|---------|--------------|------------------|
| Doctor (Interns are not included) | 67 | 71 | 89 |
| Nurse | 99 | 144 | 192 |
| Asst. Nurse | 78 | 81 | 108 |
| Administrator | 24 | 8 | 12 |
| Radiology Tech + Asst. | 11 | 6 | 8 |
| Medical Engineer | • | 6 | 8 |
| Engineering (Electric & Mechanic) | 4 | 6 | 8 |
| Pharmacist | 8 | 6 | 8 |
| Analyst (Laboratory) | 9 | 11 | 16 |
| Logistic | • | 20 | 28 |
| Radio Communication | 5 | 6 | 8 |
| Maid | 45 | 15 | 21 |
| Total | 358 | 386 | 514 |

The number of people required for each department and room is calculated from the functions involved. The values shown in Table 3-3-2 were obtained by multiplying with the number of rotations required to realize a 24-hour system. Full time physicians, and duty physicians that are not required to be in the hospital on a full-time basis, although they may be on an on-call basis, are not included in the rotation. Interns that are on 24 hour duty are also not included. Therefore, the total number of people on duty will be 231 and the number of people considered for rotation will be 546.

3-3-2 Plan of Activity

Activities at respective sections and of the EMU are outlined as follows:

(1) Diagnosis/Treatment Activities in the Emergency Medical Services

1) Diagnosis and Treatment

In the EMU, diagnosis and treatment activities are conducted on a 24-hour basis, and it also gives medical services for outpatients after 2 o'clock in the afternoon.

It is estimated that the number of patients of internal medicine, surgical, pediatric and ob/gyn will be 450 a day when this project is completed, 50% increase over the current number. Since, the number of patients who require emergency obstetric treatment for reasons of abnormal delivery and complications is more than a half of total deliveries, all deliveries will be treated in EMU to avoid the duplication of midwives and nurses.

In addition to medical examination and initial treatment, minor surgical operations will be conducted in this section to provide initial surgical treatment.

2) IOU

Patients shall be placed under intensified care and observation in the IOU ward on a 24-hour basis and shall then be sent to their respective ward at the RSS for further care and treatment. For effective treatment, the IOU division shall be divided into IOU-1 which handles relatively serious patients and IOU-2 which treats less serious cases. In addition to the 6 or 7-bed room, individual rooms of a single bed type shall be installed in IOU-2 so that patients who need an isolated environment can be accommodated.

3) Surgical Operations and Delivery of Babies

The number of cases who receive surgical operations is estimated at 20 per day and the number of deliveries is estimated at 8 per day. Treatment and operations at the EMU shall be performed without relying on assistance from RSS.

4) X-ray, Physiological and Clinical Examinations

X-ray, TV X-ray, CT scan, electrocardiographs, ultrasound, endoscopes and other clinical examination instruments shall be introduced into this department. EMU shall be able to function independently with the above mentioned equipment.

5) Support sections

Since the EMU shall obtain services and support in the fields of medical supplies, laundry, kitchen and M/E maintenance from RSS, it will have only substations for these services.

(2) Top Referral Activity

As the nucleus of the hospitals and medical institutions responsible for emergency medical services in East Java and the eastern district of Indonesia, the EMU will accept the serious emergency cases from those areas. In addition, it will be engaged in the following activities: transportation of patients, supply/reception of medical information, medical staff and materials in emergency cases.

(3) Training Activity of Medical Staff

As an educational institution, RSS accepts students from the Medical School (6-year course) of the National Airlangga University located adjacent to RSS. The medical students are assigned to the training programs based on the curriculum for two years when they are in the 5th and 6th year. A total of 300 students ($150 \times 2 = 300$), 150 in each year, will be put through the training in accordance with the following curriculum:

Training is centered on internal medicine for 5th year trainees with 48 weeks of practical training per year being compulsory. Of these, two weeks of emergency internal medical treatment and one week of emergency pediatrics are obligatory.

Similarly, two weeks of emergency surgery, four weeks of emergency anesthetics and four weeks of obstetrics and gynecology are obligatory for 6th year trainees.

The EMU is the place where medical research reports and findings are made known by experts and researchers. It also plays the role as a key station which provides other hospitals and medical institutions in Indonesia with up-to-date medical information.

(4) The EMU's Role in Emergency Medical Services after Natural Disasters

The EMU will function as the main medical institution when large-scale natural disasters occur in Eastern Java and the eastern part of Indonesia. The network of emergency radio communication systems with a base station located at the EMU, will be indispensable for supporting medical staff in remote areas, dispatching emergency medical services and in making referrals for patients when large scale disasters occur.

3-3-3 Outline of the Project Site

(1) Project Site

The Dr. Soetomo Hospital Project site is located east of Surabaya City. The hospital, with 1,544 beds, is a large-scale general hospital consisting of 17 departments which provides medical services and functions as an educational hospital for the Medical School of the National Airlangga University. Eighty-five buildings ranging from one to four stories are laid out functionally on the 16.6 hectare hospital compound. The site where the EMU is planned to be constructed is situated in the west corner of the hospital compound facing the Dharmawangsa Street. The site area is about 5,300 square meters, and the EMU's surgery building is currently located on it.

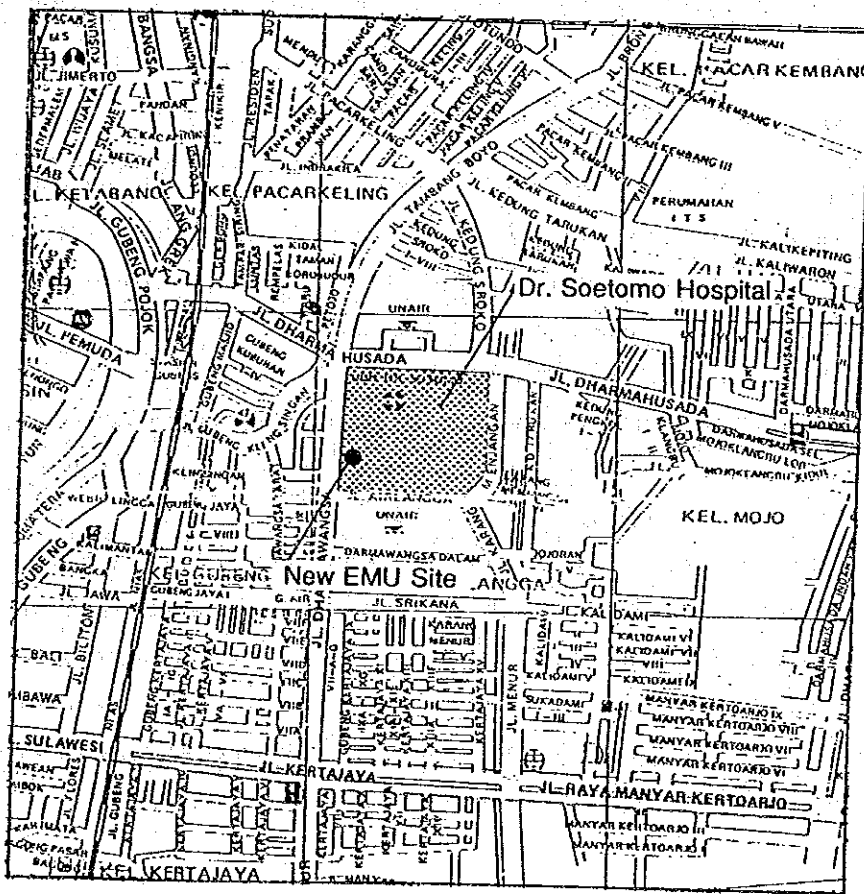


Fig. 3-3-3 Map of Construction Site and Its Surrounding Area

(2) Infrastructure

1) Water Supply

The water supply system within the hospital premises depends mostly on city water with the exception of wells that partly supply water for specific purposes. The four concrete water tanks, with a total storage capacity of 1,500 m³, are installed underground and can store city water taken through two 6-inch-diameter pipes from the city water trunk buried underneath Dharamwangsa Street. The stored water is supplied through the loop-like network of pipes buried throughout the hospital premises by the four pressurized pumps furnished with three pressure tanks.

The quantity of water supplied amounts to 1,800 m³ per day and the water pressure is currently maintained at 3 kg/cm². This shows the quantity of water supply and the water pressure are sufficient for the existing facilities. The available data indicates that the city water's quality is slightly unclear, tinted and not enough chlorine residue.

2) Drainage

Sewage goes to the waste water treatment facility, through the sewage pipes, after it undergoes a primary treatment in the septic tanks installed in each building. The waste water treatment facility, located in the south-east corner of the hospital premises, treats all sewage discharged from the hospital.

The waste water treatment facility has a capacity of 200m³ per day. The drainage is discharged after biological treatment to the level of 25 ppm for BOD. Judging from the data that the drainage is actually discharged at a level of 16 ppm for BOD it can be said that the drainage is properly controlled at Dr. Soetomo Hospital.

Other drainage, together with rain water, is discharged into the open canals within the premises and flows together with the biochemically treated sewage that flows in at the final stage. Although the two round settling tanks are installed in the open canals for the purpose of disposing of sediments and partly acting as a temporal buffer during heavy rainfall, they do not seem to function so effectively in view of the fact that the flow of the drainage and rain water actually bypass the tanks.

3) Gas

LPG is generally used as the energy source since no city gas service is available. At present, at Dr. Soetomo Hospital, LPG is used as the energy source in the kitchen.

4) Electricity

Electricity of 3ø 3W 20 kV 50 Hz is supplied from the Electric Power Public Corporation (PLN) by overhead wires to the substation on the hospital premises. After the voltage is dropped to 10 kV at the substation, the 10 kV electricity is supplied to the six auxiliary substations located within the hospital premises to be supplied to each building load after it is further dropped to 380-220V. In addition, the emergency power generator and UPS facility (uninterrupted power supply system) currently installed at RSS function as important facilities to supply power to such critical zones as the Central Operating Room and ICU in case of power failure.

In view of the fact that the substation has no room in its transformer capacity and the auxiliary substations have no room for expansion, the installation of an additional auxiliary substation that directly takes in 20 kV of electricity is necessary for supplying the power required at the EMU. Also, it is necessary to introduce an emergency power generating facility and a UPS facility as well for the same reasons. In introducing an independent power generating plant, special attention should be paid to the smooth operation of the plant and a sufficient capacity should be maintained to cope with frequent power failure accidents.

5) Telephone

Through the telephone exchange installed at Dr. Soetomo Hospital, all the facilities are interconnected by room-to-room extensions. The four telephones that enable direct dialing to the emergency number "118" are used for emergency communications. The existing telephone exchange has become deteriorated and is to be replaced within the next few months. However, since the introduction of additional telephone equipment to EMU is not planned, it is necessary to introduce a telephone exchange to EMU that is connected with the telephone exchange at the main hospital, RSS.

3-3-4 Outline of Facilities and Equipment

On the premise that Japan's grant aid assistance will be extended to the project, an outline of the facilities and equipment which are judged appropriate to include within the framework of the project, based on the examination results as already discussed in the foregoing paragraphs under Chapter 3-2 "Examination of Project Feasibility," is as follows:

(1) Facilities

The floor area of major facilities, and the rooms required.

- Emergency medical unit building : Approximately 7,600m²
- Machine rooms : Approximately 200m²

Total: 7,800m²

Table 3-3-3 Department, Section and Room

| | | |
|---|--|--|
| 1F Emergency Triage/Diagnosis Treatment Department | Divisions for infectious outpatients and non-infections outpatients a) Pharmacy b) Examination c) Radiological Division d) Administration | Reception/waiting lounge/consultation/treatment/resuscitation room/minor operating room/record room a) Pharmacy b) Physiological examination room/blood- collecting room/urine-collecting room c) X-ray room/control room/X-ray film reading room d) Disaster prevention center/mortuary |
| 2F Emergency Obstetrics/Gynecology Department | | Consultation room/treatment room/delivery room/first stage bed area/nurse station /IOU/premature babies' room |
| 3F IOU (Intensive Observation Unit) | | IOU-1 (serious cases)/nurse station IOU-2 (non-serious cases)/nurse station Doctors' lounge/linen storage |
| 4F Emergency Education/Research Study Department | Education and research study division Administration division | Lecture room/conference room/library Center Chief Room/medical staff room/canteen/radio room/ lockers |
| 5F Emergency Surgical Operation Department | | Operating rooms/lockers/preparation room/storage for medical equipment, supplies and linen, etc. |
| Building for machines. | | Independent power generator room/substation |

Table 3-3-4 List of Main Equipment

| Section | Required Main Instruments |
|---|---|
| 1) Diagnostic and treatment room, and pharmacy | Examination Bed, diagnostic and treatment set, emergency operation instrument set, wheel stretcher, plaster bandage table, instrument cabinet, electrocardiograph, fiber optical gastro-duodenoscope, fiber optical bronchoscope, drug cupboard, treatment bet |
| 2) Emergency analeptics and temporary operation | Ventilator, resuscitater, defibrilator, low pressure continuous suction unit, oxygen tent, laryngoscope, tube inserting tracheal, infusion pump, pulse oximeter, external pacemaker, instrument cupboard, small operation instrument set, treatment bed |
| 3) Clinical examination | Blood bank refrigerator, medical refrigerator, desk top type centrifuge, urine analyzer, microscope, auto-chemical analyzer, blood cell counter, blood gas analyzer, electrolyte analyzer, spectrophotometer, incubator, hemoglobin meter, distillation apparatus |
| 4) Ophthalmology | Diagnostic unit, refractometer, funds camera, instrument set for ophthalmology |
| 5) E.N.T. | Diagnostic unit, nebulizer, instrument set for E.N.T. |
| 6) Radiology | General diagnostic X-ray TV unit, computerized whole body CT scanning unit, movable X-ray unit, C-arm X-ray unit for surgery, ultrasound diagnostic equipment, automatic film processor |
| 7) Obstetrics and gynecology | Gynecologic ultrasound diagnostic equipment, fetal monitor, obstetric-gynecologic treatment unit, examination bed, treatment instrument set |
| 8) Labor room | Labor bed, fetal monitor, irrigator stand, infusion pump |
| 9) Delivery room | Delivery bed, vacuum extractor, fetal monitor, instrument set |
| 10) Immature foetus room | Incubator, light therapy unit, infusion pump, resuscitation bag |
| 11) Pediatrics, neonatal | Neonatal monitor, infant warmer, examination instrument set, electrocardiograph, treatment instrument set, weighing scale , ultrasonic nebulizer, infant treatment table, examination lamp |
| 12) Nurse station for obstetrics and gynecology | Diagnostic instrument set, sphygmomanometer, film illuminater, boiling sterilizer, oxygen mask, instrument table, irrigator stand, drug cupboard, instrument cabinet, suction unit, treatment instrument set, ice maker, medical refrigerator |

| Section | Required Main Instruments |
|--|---|
| 13) Obstetrics and gynecology ward | Standard bed, oxygen inhaler, portable resuscitator, ultrasonic nebulizer, suction unit |
| 14) Intensive observation unit | ICU bed, bed-side monitor, ventilator, defibrillator, cardiac output computer, infusion pump, syringe pump, ultrasonic nebulizer, pulse oximeter, CO ₂ -monitor electrocardiograph, electroencephalograph, resuscitator, external pacemaker, dialysis equipment, heating-cooling mattress, irrigator stand |
| 15) Nurse station for intensive observation unit | Examination instrument set, sphygmomanometer, boiling sterilizer, film illuminator, instrument cabinet, treatment instrument set, drug cupboard, ice maker, medical refrigerator, dressing table |
| 16) Operation | Universal operating table, anesthesia machine, suction unit, electric surgical unit, patient monitoring unit, operation instrument set, CO ₂ -monitor, Heating cooling mattress, defibrillator, Blood warmer,, infusion pump, irrigator stand, instrument table, |
| 17) Central supply room | High pressure steam sterilizer, small type steam sterilizer, ethylene oxide gas sterilizer, surgical glove conditioner, ultrasonic cleaner, working table |
| 18) Maintenance tool and instrument | Tool set, oscilloscope, working table |
| 19) Ambulance | Ambulance car |
| 20) Tools and instrument for education | Overhead projector, slide film projector, video camera, TV-monitor |
| 21) Telecommunication Equipment | VHF transceiver 25W, antenna transceiver for ambulance, 25W portable transceiver, transmitter with antenna. |

3-3-5 Maintenance and Management Plan

(1) Maintenance and Management System

The maintenance and management of the hospital facilities and medical equipment can be classified into maintenance by the hospital staff and maintenance by engineers outside the hospitals.

1) Maintenance and Management by Hospital Staff

<Facilities>

The scope of maintenance and management includes routine cleaning, routine maintenance check, security check of the medical facilities, equipment, which are basically conducted in accordance with the manuals and instructions provided by the suppliers, including measures against minor troubles such as leakage of water. If major troubles that are difficult to be dealt with should occur, the facility or equipment in trouble shall be repaired by the supplier.

<Medical equipment and supplies>

Doctors, nurses and medical technicians are responsible for the maintenance of the medical equipment which are daily used for treating patients. In the event troubles occur and hospital staff are unable to cope with, the repair work shall be conducted by the engineers or technicians depatched from suppliers.

To perform the above-mentioned maintenance and management tasks, it is necessary to assign eight people as facility maintenance/management personnel and two people in charge of maintenance/management of equipment. In addition, it is necessary to properly control the documents such as manuals and instructions for the buildings, facilities, machines, medical equipment, and instruments so that a list of items to be checked for daily maintenance and management relating to the hospital facilities, machines and equipment can be prepared, including a list of telephone numbers necessary for getting in touch with the manufacturers, suppliers, vendors and agents in case of emergency. Also, it is necessary to have a maintenance and management manual for the above-mentioned purposes.

2) Maintenance by engineers outside the hospital

Elevators are required to receive periodical checks by engineers for security reasons. The maintenance of elevators shall be consigned to the manufacturers or their agents for periodical check and inspection.

Some of the medical equipments need to be contracted for maintenance to the manufacturers or to their agents.

3) Training for operating facilities and equipment

Generally guidance on manuals and instructions is given immediately before the completion of construction work or delivery of equipment. However, some of them require a considerable amount of knowledge to properly operate them. Therefore, hospital maintenance staff are required to obtain how-to-operate knowhow during installation, even while the construction work is in progress at the site, including trouble-shooting and repair methods.

(2) Expenses for Operation and Maintenance

Itemized expenses for operating and managing the EMU, after the completion of the Project, are shown below:

Table 3-3-5 Expenses for EMU at the Time of Opening and in 2002 FY

| | At the time of Opening RP | 2002 FY RP |
|---------------------------|---------------------------|---------------|
| Pharmacy | 520,753,000 | 679,062,000 |
| Transportation | 576,028,000 | 576,028,000 |
| Equipment and Maintenance | 440,880,000 | 492,648,000 |
| Electricity | 211,708,000 | 276,067,000 |
| Water | 28,980,000 | 37,790,000 |
| Telephone | 13,190,000 | 17,200,000 |
| Meals | 114,066,000 | 148,742,000 |
| Sub total | 1,905,605,000 | 2,227,537,000 |
| Personnel Cost | 311,982,000 | 406,825,000 |
| Total | 2,217,587,000 | 2,634,362,000 |

The expenses for operating and managing the hospital are to be borne by the Government of Indonesia and Eastern Java Province. A budgetary deficit will also be filled by a revised budget. Due to the fact that the hospital serves as an educational institution for medical school students, the Doctors' salaries are paid by the Ministry of Education and Culture.

A detailed estimate of the hospital's annual operation and maintenance expenses at the time of opening of the new EMU have been worked out as follows:

① Pharmacy: 520,753,000 RP/year

The number of inpatients at the departments of surgery, internal medicine and obstetrics/gynecology in 1991 was 47 a day and the number of inpatients predicted in the future is 54 a day. An estimated annual budget for this division has been calculated on the basis of the 1992 budget (453,248,000 RP) as follows:

$$453,248,000 \text{ RP/year} / 54 \text{ (patients)} \times (47 \text{ patients}) = 520,753,000 \text{ RP/year}$$

② Transportation of patients: 576,028,000 RP/year

Ambulances were despatched 2,550 times in 1991 in response to calls for emergency medical services, an average of seven times a day.

Based on the assumption that it would be possible to double the number of ambulances dispatched in 1991 if capabilities are strengthened, the estimated annual budget will be:

$$288,014,000 \text{ RP/year} \times 2 = 576,028,000 \text{ RP/year}$$

③ Maintenance of Facilities and Medical Equipment 440,880,000 RP/year

1) Maintenance of buildings: 36,900,000 RP/year

- Based on the present data that annual overall facility/building maintenance costs 3,500 RP per square meter (the expenses of maintaining the interior/ exterior of buildings, water-proof roofs, electricity/ water supply facilities, air conditioning facilities, repairs and parts replacement), maintenance costs can be figured as follows:

$$7,800 \text{ m}^2 \times 3,500 \text{ RP/m}^2/\text{year} = 27,300,000 \text{ RP/year}$$

- The maintenance/inspection costs for elevators:

$$800 \text{ 000 RP/month} \times 12 \text{ months} = 9,600,000 \text{ RP/year}$$

2) Maintenance of medical equipment/supplies: 349,500,000 RP/year

The costs can be largely classified into two. One is cost for daily consumables such as reagent, and ion exchange resin, used in distillers, and two is repair and maintenance cost for periodical check or in troubled case.

The medical equipment supplied by this Project includes such as reagent, consumables and spare parts sufficient to cover the needs for approximately one year. After having consumed them, a budget for replenishing such items needs to be calculated in a manner discussed in the following paragraphs.

The total cost for such items is estimated at:

- Reagent and consumables: 131,900,000 RP/year

- a. Reagent for clinical examination:

$$100,000 \text{ tests} \times 650 \text{ RP (average unit cost)} \dots\dots\dots = 65,000,000 \text{ RP}$$

- b. X-ray film cost:
10,000 sheets × 2,300RP (average unit cost).....= 23,000,000 RP
- c. Artificial hemo dialyzer:
500 pieces × 22,500RP (average unit cost)= 11,250,000 RP
- d. Recording paper:
100 packs × 18,000RP (average unit cost).....= 1,800,000 RP
- e. Electrodes for monitoring:
2,000 pieces × 1,200RP (average unit cost).....= 2,400,000 RP
- f. Other: 28,450,000 RP
- Gross Total: 131,900,000 RP

• Maintenance and administration costs:..... 217,600,000 RP/year

Approximately 2.5% of the cost of machines to be introduced have been earmarked for space parts, maintenance contracts, etc. with supplies.

3) Charges for medical gas: 54,480,000 RP/year

Based on the expanded facilities of EMU, the monthly consumption of medical use gases such as oxygen and nitrous oxide (laughing gas) has been estimated as follows:

<Monthly consumption>

- Oxygen: 7m³ cylinder × 80/month
- Current rate: 2,000 RP/m³
- Nitrous oxide: 30-kg cylinder × 12/month
- Current rate: 9,500 RP/kg

<Monthly charges>

- Oxygen: 2,000 RP/m³ × 7m³/cylinder × 80 = 1,120,000 RP/month
- Nitrous oxide: 9,500 RP/m³ × 30kg/cylinder × 12 = 3,420,000 RP/month
- Total monthly charges: 4,540,000 RP/month

<Yearly charges>

4,540,000 RP/month × 12 months = 54,480,000 RP/year

④ Electricity: 211,708,000 RP/year

1) Electricity charges:..... 205,120,000 RP/year

According to the power supply standards of the Public Power Corporation (PLN) in Indonesia, the electricity rate system currently applied to Dr. Soetomo Hospital is reported as follows:

- Number : 4
- Classification : S-4/TM
- Basic rate : 4,860 Rp/KVA/month
- Meter rate : WBP (18:00-22:00)..... 245.0 Rp/KWH
- LWBP (hours other than the above) 98.5 Rp/KWH

⑥ Telephone charges:..... 13,190,000 RP/year

An estimated use of telephone circuits is as follows:

City exchange area: 5 minutes/call 50 calls/day

Out-of-town lines (Zone 4: 300-1,000 km): 5 minutes/call

5 calls/day City exchange area: $100 \text{ RP}/3 \text{ minutes} \times 5 \text{ minutes} \times 50 \text{ calls/day}$
 $= 8,300 \text{ RP/day}$

Out-of-town lines: (5 minutes \times 60 seconds/minute)

$4 \times 100 \text{ RP} \times 5 \text{ calls/day} = 37,500 \text{ RP/day}$

Thus, the daily telephone charges will be in total: 45,800 RP/day

From the above estimated annual telephone charges can be calculated as follows:

$45,800 \text{ RP/day} \times 30 \text{ days/month} \times 12 \text{ months/year} \times 0.8 = 13,190,000 \text{ RP/year}$

⑦ Meals:..... 114,066,000 RP/year

Based on the 1992 budget, the annual budget for providing hospital staff and patients with meals is estimated to increase in proportion to the ratio of the increase in the number of patients and staff as follows:

$104,483,600/(47 + 291) \times (54 + 315) = 114,066,000 \text{ RP/year}$

⑧ Personnel expenses:..... 311,982,000 RP/year

Based on the 1992 budget, the personnel expenses have been calculated by taking into account the staff members to be increased at the renewed EMU facilities. Doctors have been excluded since they are paid by the Ministry of Education and Culture. Pay hikes, which naturally need to be taken into account, were ignored because it is a unpredictable factor.

$288,211,600 \text{ RP/year}/291 \text{ persons} \times 315 \text{ persons} = 311,982,000 \text{ RP/year}$

The number of patients at the time of opening is estimated as 1.15 times that of 1992, and the patients in 2002 is estimated as 1.5 times that of 1992.

Since the expense is supposed to increase proportionately, the expense in 2002 is $(1.5/1.15=)1.304$ times the expense of 1995.

However ② transportation and ③-1) maintenance of building does not relate to the patient increase, and so they remain same as 1995. The budget for 2002 is shown in Table 3-3-5.

CHAPTER 4 BASIC DESIGN

CHAPTER 4 BASIC DESIGN

4-1 Basic Design Policies

Based on the analysis of the project, in CHAPTER 3 OUTLINE OF PROJECT, the basic design for the project was decided by taking into consideration the specific environmental conditions around the site and the local conditions.

(1) Considerations on natural conditions

1) Site

The project site occupies the south-west corner of the 16-hectare Dr. Soetomo Hospital (RSS) compound that faces Dharmawangsa Street. To cope with torrential rainfall in the rainy season, it is proposed to install a rain water disposal facility on the project site. Also, it is suggested that a tree-planting or landscaping plan be introduced to enhance the hospital environment.

2) Wind

The average wind velocity in Surabaya City is 2.2 meters per second with minimal fluctuations through the year. It is suggested that a natural ventilation system, based on the specific local climate and meteorological conditions, be introduced since it could save air conditioning expenses and will and also bring about natural comfort to staff and patients.

3) Rain

The average annual precipitation in Surabaya City is 1,567 mm (average: 1982-1991), but during the rainy season, an enormous amount of rainfall accompanied by strong winds is common for a short period of time. The installation of balconies or eaves wide enough to prevent the rain from coming into rooms or wards is also proposed.

4) Sunshine

Surabaya City, situated close to 7 degrees south latitude, receives sunshine from both south and north. It is proposed that special attention be paid to the roof-top heat insulating material for protection from strong sunshine. Also, the openings of buildings facing the south and north as well should be protected with eaves and louvers against direct sunshine.

5) Climate and humidity

The monthly average temperature in Surabaya City is 26-28 degrees Celsius. The temperature varies within the range of 24-33 degrees Celsius on a day-to-day basis. The humidity is stable at 72%-80% all the year round. To secure comfortable living space without relying on an air conditioning system, it is necessary to design a plain/sectional plan for an effective ventilation system.

(2) Considerations on social conditions

EMU facility being planned to be renewed and expanded under this project primarily aims to deal with emergency medical treatment. Since treatment at the polyclinic closes at 2 o'clock in the afternoon at RSS, the EMU is expected to function as a general hospital after hours. One of the noteworthy characteristics of Indonesian society is that many family members accompany patients when they are hospitalized, which also needs to be taken into consideration.

(3) Local regulations and approvals

The buildings and facilities shall comply with the regulations set forth in the urban planning standards, building standards and fire-proof standards enforced by Surabaya City and the corresponding standards and regulations in Japan as well.

Since the construction site for this project is located in the city of Surabaya, it is necessary to get permission from the city authority for the construction of the buildings and facilities, even though the project is executed under the Japanese Government's grand aid assistance. This will necessitate the Directorate General of Medical Care, Ministry of Health to obtain the necessary permit for the construction of the building from the authorities concerned, through a local registered architect/consultant.

(4) Utilization of local subcontractors, construction machines and materials

It is possible to use locally manufactured products and materials except for the highly sophisticated items. In other words, most of the labor, the construction materials and equipment can be procured from local subcontractors and suppliers. From the long term viewpoint after project completion, it is advisable to make use of the local construction methods, and locally available products and materials for this project.

As for medical equipments, since they are rather sophisticated items, most of them will have to be supplied from Japan. In that case, it is recommended to select the equipments which can be

serviced and maintained by local agent. Basically beds, bolsters and ordinary furniture shall be procured locally.

(5) Maintenance and management

In order to reduce the overall maintenance and management costs, it is desirable to introduce a ventilation system by natural wind without relying on machines. The air conditioning system shall be introduced into the following sections: emergency triage section (only treatment rooms), IOU (only IOU-1 and individual single-bed rooms), operating room/central supply and sterilization, emergency obstetrics/gynecology section (only treatment rooms, neonatal rooms, and individual single-bed rooms) lounges for doctors and nurse stations. A natural ventilation system shall be employed for the common-use areas to reduce the running costs.

Also, durable and weather-proof materials shall be used as interior and exterior materials for buildings and facilities for the same purpose.

4.2 Examination of the Basic Design Conditions

4.2-1 Facilities

The facility to be constructed under the project will be a 5-story building and is so designed to function most effectively by classifying the hospital's functions into five departments and arranging them on each floor as follows:

(1) **Emergency Triage Division (first diagnosis, examination)**

Triage room, consultation room, operating room, X-ray room, CT room, laboratory room, endoscope room

(2) **Emergency Obstetrics/Gynecology Department**

Examination room, treatment room, delivery room, labor area, newborn babies' room, premature babies' room

(3) **IOU (Intensive Observation Unit)**

IOU-1, IOU-2

(4) **Education and Administration Department**

Lecture room, training room, medical office, radio communication room, canteen, administrative office, lockers, etc.

(5) **Operating Room**

Operating room, preparation rooms for operation, cleansing room, storage for medical equipment

4-2-2 Determination of the Facility Scale

Dr. Cipto Mangunkusumo Hospital in Jakarta, which has similar functions and scale to those of the planned EMU facility, and the Japanese standards for floor space in medical facilities (Source: Academy of Architecture of Japan) have contributed to determining the proper size of the EMU facility. Each space in the 5-story building has been decided by taking into consideration the layouts for installing the necessary equipment.

(1) First floor — Triage, X-ray, laboratory

Emergency diagnosis and treatment relating to internal medicine and surgery shall be provided on this floor. 450 patients a day shall be seen in the consultation room. On the basis of a diagnosis/treatment time of 30 minutes per case, the number of booths necessary for conducting diagnosis and treatment on a 24-hour basis is as figured below:

$$450 \div 24 \text{ (hour)} \times 0.5 \text{ (hour)/patients} + 2 \text{ (isolation room)} = 12$$

The treatment room, the resuscitation room and the minor operating room shall be used to accommodate patients during the peak hours of the day. A wider floor space will be required for the triage room when anticipating the incoming patients during the occurrence of large-scale natural disasters. Adjacent to the Triage Room, the X-ray and laboratory facilities shall be installed. CT scan and X-ray TV (general X-ray films) necessary for triage shall be installed in the X-ray section together with the related rooms. Other X-ray diagnosis will be entrusted to the main hospital. The clinical test shall be limited to what are necessary for emergency purpose, and other laboratory tasks shall be entrusted to the main hospital, RSS.

The pharmacy with access to the outside and is open for 24 hours, will be necessary for the convenience of patients who come to receive prescribed medicines from outside. A wider space needs to be allotted for the waiting lounge for the family of the patients.

Table Room List at 1st Floor

| Room | Quantity | Planned floor area m ² | Remarks |
|-----------------------------|----------|-----------------------------------|---|
| Entrance hall | 1 | 317.68 | |
| Triage | 1 | 132.48 | To be used as when disaster occurred |
| Treatment room 1 | 1 | 92.16 | For internal medicine, 9.6m ² /bed × 6 beds = 57.6m ² |
| Treatment room 2 | 1 | 110.31 | For surgery, 10m ² /bed × 6 beds = 60m ² |
| Soiled utility 1 | 1 | 6.88 | For internal medicine |
| Soiled utility 2 | 1 | 6.88 | For surgery |
| Storage preparation 1 | 1 | 23.84 | For internal medicine |
| Storage preparation 2 | 1 | 19.36 | For surgery |
| Plaster room | 1 | 15.36 | |
| E.N.T.: Ophthalmology | 1 | 9.30 | |
| Optometry | 1 | 16.74 | |
| Operation room | 1 | 22.00 | Usable too for diagnosis |
| Resusciation | 1 | 22.00 | Usable too for diagnosis |
| Medical record 1 | 1 | 15.36 | For internal medicine |
| Medical record 2 | 1 | 15.36 | For surgery |
| Control room | 1 | 49.12 | |
| Dark room | 1 | 8.96 | Dark room is equipped with automatic film processing unit, and also manual film processing set. |
| CT scan | 1 | 26.46 | |
| X-ray | 1 | 17.28 | |
| X-ray TV | 1 | 17.20 | |
| Spare room | 1 | 16.80 | |
| Laboratory | 1 | 48.45 | Including blood bank system. Test should be executed for emergency case only. |
| Endoscopy | 1 | 21.42 | Should be located near the X-ray radiographic room equipped with TV system. |
| Echo & Cardiograph | 1 | 16.32 | |
| Dr's room | 1 | 30.40 | |
| Pantry | 1 | 11.52 | |
| Security | 1 | 16.80 | |
| Waiting | 1 | 43.68 | |
| Pharmacy | 1 | 55.55 | 24 hours open because of dispensary pharmacy |
| Rest room for administrator | 1 | 25.94 | |
| Stretcher room | 1 | 22.10 | |
| Mortuary | 1 | 24.15 | |
| Medical gas | 1 | 20.10 | |
| Storage | 3 | 37.06 | |
| Staircase/EV (staff) | | 41.47 | |
| WC (staff) | 1 | 34.03 | For male: urine – 2, Stool – 2. For female: stool – 2 |
| Staircase/EV(general use) | | 28.68 | |
| WC (general use) | 1 | 34.16 | For male: urine – 2, Stool – 2. For female: stool – 2 |
| WC (use for handicapped) | 1 | 4.84 | |
| Pipe space | | 10.32 | |
| Corridors - Miscellaneous | | 301.83 | |
| Sub-total | | 1,790.35 | |

(2) Second floor - Obstetrics/Gynecology Department

Since the majority of the women coming to RSS for delivery will require surgery for abnormal deliveries or complications, all deliveries will be handled in this section. Although gynecological diseases requiring emergency diagnosis and treatment are handled in the EMU, general gynecology is handled in the main hospital. In the case of normal deliveries, the patients are transferred to the ward in the main hospital two hours after the delivery.

In addition to the obstetrics/gynecology room, there are one labor and two delivery rooms. The reason to have two delivery rooms is to cope with the patients with infectious diseases and complications. Also, IOU, the born babies' room and premature babies' room will be necessary.

Table Room List at 2nd Floor

| Room | Quantity | Planned floor area m ² | Remarks |
|----------------------------|----------|-----------------------------------|--|
| Ob/Gn Outpatient | 1 | 43.68 | |
| Preparation room 1 | 1 | 5.84 | |
| Preparation room 2 | 1 | 5.84 | |
| Delivery 1 | 1 | 24.00 | Considering infected complication. |
| Delivery 2 | 1 | 24.00 | Considering infected complication. |
| First stage bed area | 2 | 63.00 | Four persons/room x 2 rooms = 8 beds Considering infected complication. |
| Room 1 (IOU 1) | 1 | 52.16 | |
| Room 2 (IOU 2) | 1 | 50.17 | 8 beds |
| Room 3 (IOU 3) | 1 | 46.27 | 6 beds |
| Separated room | 2 | 36.76 | 6 beds To be used as isolated room. |
| Premature baby | 1 | 15.00 | One bed/room x 2 rooms = 2 beds |
| Neonatal | 1 | 15.50 | 5 beds for infant |
| Nurse station 1 | 1 | 24.00 | 5 incubators should be equipped. |
| Nurse station 2 | 1 | 30.00 | |
| Conference | 1 | 22.52 | |
| Dr's room | 1 | 28.00 | |
| Changing room | 2 | 24.44 | |
| Rest room for nurses | 1 | 15.00 | |
| Storage | 1 | 21.84 | |
| Linen | 1 | 21.84 | |
| Pantry | | 21.84 | |
| Waiting | | 80.00 | Should have wide space because of many family attendants to come together. |
| Soiled utility | 3 | 19.27 | |
| Storage | 2 | 45.80 | |
| Staircase/EV (staff) | | 42.02 | |
| WC (staff) | 1 | 31.86 | For male: urine - 2, stool - 2, For female: stool - 2 |
| Staircase/EV (general use) | | 30.63 | |
| WC (general use) | 1 | 34.16 | For female: stool - 5 |
| Eps. ps | | 10.32 | |
| Corridors-Miscellaneous | | 418.93 | |
| Sub-total | | 1,304.69 | |

(3) Third floor - IOU (Intensive Observation Unit)

On this floor IOU-1 and IOU-2 are to be installed. IOU-1 is the section for the cases with serious symptoms, while IOU-2 accommodates the cases with less serious symptoms. IOU-2 will be separated into small rooms on the basis of six persons per room. In principle, the time for intensive observation and care at IOU is limited to 24 hours, and after that when it is necessary, patients will be sent to their respective wards in the main hospital of RSS.

Table Room List of 3rd Floor

| Room | Quantity | Planned floor area m ² | Remarks |
|-------------------------------------|----------|-----------------------------------|---|
| IOU (Intensive observation unit) -1 | 1 | 262.08 | 12 beds. Should be same level as intensive care unit (ICU) because severe cases are to be received. |
| Nurse station 1 | 1 | 24.00 | |
| Rest room for nurses 1 | 1 | 11.20 | |
| Dr's room 1 | 1 | 9.00 | |
| Changing room 1 | 1 | 4.20 | |
| Changing room 2 | 1 | 4.20 | |
| Private room (IOU-2) | 4 | 73.53 | One bedroom X 4 rooms = 4 beds |
| Room 2 (IOU-2) | 1 | 52.16 | 8 beds |
| Room 3 (IOU-2) | 1 | 50.17 | 7 beds |
| Room 4 (IOU-2) | 1 | 46.27 | 7 beds |
| Nurse station 2 | 1 | 30.00 | * For mild cases, and whole patients room should be observed from nurse station. |
| Communication room | 1 | 22.52 | Send instruction to emergency location by radio. |
| Rest room for doctors | 1 | 28.00 | |
| Rest room for nurses 2 | 1 | 15.00 | |
| Storage -Linen | 1 | 21.84 | |
| Pantry | 1 | 21.84 | |
| Waiting | 1 | 80.00 | Should have wide space because of many family attendants to come together. |
| Soiled utility | 1 | 13.66 | |
| Storage | 1 | 21.39 | |
| Stair case/EV (staff) | | 42.02 | |
| WC (staff) | 1 | 31.86 | For male: urine - 3, stool - 2. For female: stool - 2 |
| Stair case/EV (general use) | | 30.63 | |
| WC (general use) | 1 | 34.16 | For male: urine - 2, stool - 2. For female: stool - 2 |
| Eps. ps | | 10.32 | |
| Corridors - Miscellaneous | | 375.49 | |
| Sub-total | | 1,315.54 | |

(4) Fourth floor - Education/Administration

A room used for conducting education on emergency medical services shall be large enough to accommodate 50 people maximum. A conference room, training room and storage for equipment and materials are required for this department. The conference room also needs to be used as a place where research findings on emergency medical services can be made known. Also, the installation of a library that contains books and reference materials concerning emergency first aid medical services is mandatory.

The Administration Department shall consist of maintenance/administrative offices, a room for doctors, etc. The installation of a room that accommodates 10 doctors and a room that accommodates (41) administrative people will be necessary.

Table Room List at 4th Floor

| Room | Quantity | Planned floor area m ² | Remarks |
|--------------------------------------|----------|-----------------------------------|---|
| Lecture room | 1 | 112.60 | 1.1m ² /person × 100 persons |
| Conference 1 | 1 | 47.48 | 1.0m ² /person × 50 persons |
| Conference 2 | 1 | 47.48 | 1.0m ² /person × 50 persons |
| Library | 1 | 47.48 | |
| Room for training tools | 1 | 23.74 | |
| Room for clinical history | 1 | 23.74 | |
| Spare room | 1 | 23.74 | |
| Dining room | 1 | 45.20 | |
| Pantry | 1 | 27.15 | |
| ME room | 1 | 23.74 | Depends on location of equipment and instruments. |
| ME chief room | 1 | 23.74 | For chief of instrument section, 20m ² /person |
| Night duty | 1 | 27.34 | 5m ² /person × 5 persons |
| On-call chief room | 1 | 27.83 | For chief of on-call team, 20m ² /person |
| Dr's room | 1 | 55.92 | 5m ² /person × 10 expert physicians |
| Computer room | 1 | 28.00 | Depends on location of equipment and instruments. |
| Room for head nurse | 1 | 26.62 | For head nurse, 25 m ² /persons |
| Room for chief of the Center | 1 | 27.34 | For chief of the Center, 25m ² /person |
| Room for chief of the administrative | 1 | 25.65 | For chief of the administrative, 25m ² /person |
| Conference room | 1 | 27.83 | Reception room for Center chief and administrative chief |
| Office | 1 | 24.42 | 6m ² /person × 4 staffs |
| Changing room (M) | 1 | 26.62 | 0.35m ² /person × 76 persons |
| Changing room (F) | 1 | 50.07 | 0.35m ² /person × 143 persons |
| Shower room | 2 | 5.50 | |
| Lounge | 1 | 86.94 | |
| Storage | 2 | 40.56 | |
| Stair case/EV (staff) | | 42.02 | |
| WC (staff) 1 | 1 | 31.86 | For male: urine - 3, stool - 2 For female: stool - 2 |
| Stair case/EV (staff) | | 22.26 | |
| WC (staff) 2 | 1 | 34.16 | For male: urine - 3, stool - 2 For female: stool - 2 |
| Eps. ps | | 10.32 | |
| Corridors • Miscellaneous | | 382.80 | |
| Sub-total | | 1,450.15 | |

(5) Fifth floor - Surgical Operation Room

Emergency surgical operations such as craniotomy, fracture operations, celiotomy, medium-scale common operations and obstetric operations are performed in this department. Based on the estimated number of operations of 20 a day, six operating rooms shall be installed on this floor on the basis of: $20 \text{ operations} \div 3 = 6.6 \text{ room}$. Since 3 operations per day per room is the maximum of 4 operations are possible in a day.

It is important to separate the corridors into clean and contaminated, and to use the operation rooms accordingly.

The patients who were operated will be sent to IOU immediately after the operation. A substation of the Central Supplies and Sterilization will be at the EMU and the most of the work should be handled in the Central Supply and Sterilization in Main Hospital.

Table Room List at 5th Floor

| Room | Quantity | Planned floor area m ² | Remarks |
|-----------------------|----------|-----------------------------------|--|
| Preparation (Patient) | 1 | 33.28 | } 3 operations/day, room × 6 rooms = 18 operations. Maximum: 4 operations/day. room. |
| Operation room 1 | 1 | 43.68 | |
| Operation room 2 | 1 | 43.68 | |
| Operation room 3 | 1 | 43.68 | |
| Operation room 4 | 1 | 46.27 | |
| Operation room 5 | 1 | 50.17 | |
| Operation room 6 | 1 | 52.12 | } For operation room 1 For operation rooms 2 and 3 For operation room 4 For operation rooms 5 and 6 |
| Preparation room 1 | 1 | 21.84 | |
| Preparation room 2 | 1 | 43.68 | |
| Preparation room 3 | 1 | 21.04 | |
| Preparation room 4 | 1 | 52.12 | } Anesthesia machines and those instruments should be separated with instruments. |
| Storage (equip.) | 1 | 19.33 | |
| Storage (linen) 1 | 1 | 21.84 | } 0.35m ² /person × 74 persons + 4.5m ² for shower and lavatory |
| Storage (linen) 2 | 1 | 25.44 | |
| Cleaning room | 1 | 74.36 | |
| Storage clean | 1 | 43.64 | |
| Nurse station 1 | 1 | 23.75 | |
| Nurse station 2 | 1 | 15.68 | |
| Dr's room | 1 | 24.72 | |
| Shower room (M) | 1 | 30.52 | |
| Shower room (F) | 1 | 29.98 | |
| Soiled utility | 1 | 26.56 | |
| Storage | 2 | 41.72 | |
| EV machine room | 1 | 17.75 | |
| Stair case/EV (staff) | 1 | 38.06 | |
| Stair case/EV | | 20.31 | |
| EPS. PS | | 8.26 | |
| Miscellaneous | | 702.12 | |
| Sub-total | | 1,615.60 | |

(6) Penthouse Floor/Annex Building

The facility-related equipment and machines will be installed on the penthouse floor and the annex building as follows:

A list of Rooms Installed On Penthouse Floor A List of Rooms Installed In Separate Building (Machinery Room, etc.)

Table Room List of Penthouse Floor

| Room | Quantity | Planned floor area m ² | Remarks |
|-------------------------|----------|-----------------------------------|---------|
| EV machine room (staff) | | 46.16 | |
| Pump room | | 14.96 | |
| Staircase | | 19.84 | |
| Miscellaneous | | 7.04 | |
| Sub-total | | 88.00 | |

Table Room List for Other Wards

| Room | Quantity | Planned floor area m ² | Remarks |
|----------------|----------|-----------------------------------|---------|
| Generator room | | 69.92 | |
| Electric room | | 91.20 | |
| Machine room | | 47.12 | |
| Sub-total | | 208.24 | |

| | |
|--------------|------------------------------|
| TOTAL | 7772.57 m² |
|--------------|------------------------------|

4-2-3 Criteria for Selecting Medical Equipment

Since RSS is regarded as a top referral hospital in eastern Indonesia, the criteria for selecting medical equipment has been examined on the premises, that EMU should be properly equipped due to its role as the tertiary emergency hospital in Indonesia and a model hospital in the field of emergency medical service.

The selection of medical equipment shall be made by taking into account the following points:

- (1) Basically, equipment which is frequently used for emergency medical service should take precedence. (For example, surgical operation instruments, incubators, thin artery removers, patient-monitors and resuscitators)
- (2) In view of the necessity to keep the medical equipment in good condition and ready for use at all times at the first-aid division, equipment that is easy to check, maintain and use by doctors, nurses and even by paramedic specialists shall be selected. In this sense, similarity with the operation of the equipment now in use shall be taken into consideration when selecting equipment.
- (3) The medical equipment shall not be chosen by the price alone. The following factors shall be taken into account: if an after-service network is firmly established in Indonesia for the equipment selected, or the equipment is easy to maintain and repair, the suppliers guarantees prompt supply of consumables or spare parts.
- (4) When selecting equipment for clinical examinations, it should be noted that accuracy in measurement is a decisive factor for selecting equipment in emergency medical services which requires quick diagnosis and treatment.
- (5) Certain types of medical equipment (ultrasound diagnostic apparatus and blood gas analyzer) susceptible to voltage fluctuations and water quality shall be accompanied by protective equipment such as a voltage stabilizer.
- (6) Since the RSS is an educational hospital, the equipments for education and research should be added.

43 Basic Facility Plan

4-3-1 Layout Plan

(1) Site conditions

The construction site occupies the south-west corner of the RSS compound facing the Dharmawangsa Street where the existing building for emergency surgery is located.

Incidentally, there is a regulation which states that the exterior wall surface line of a building must not override and come within the length of half the width of the road ($24.75\text{m} \times 1/2 = 12.325\text{m}$) that faces the building from the boundary of the site.

(2) Layout Plan

When a hospital's functions are complex, it is essential to arrange facilities on the site so as to ensure that the complex hospital functions work smoothly and in close correlation with one another.

In laying out the building, it is important to pay special attention to various kinds of flows such as patients, visitors, hospital staff and service and make sure not to cause intermixture among them. And also it is important to consider the site conditions and the characteristics in planning the site layout and the building shape.

Judging from the road conditions and the traffic conditions in the surrounding districts, the main entrance of the hospital shall be located on the north-west side of the site that faces the Dharmawangsa Street because an approach from this direction to the hospital is a major movement line for both patients and staff.

Also, the annex building (machines are installed) shall be located between the surgery building on the east side and the planned building. A vehicle approach for maintenance to the annex building shall be made from the north side. A service movement line for entry and exit from the pantry for food delivery and the medical gas workshop shall be installed on the south side separately from the general movement line on the north-west side. A parking lot space shall be provided near the entrance on the south side for vehicles coming into the mortuary.

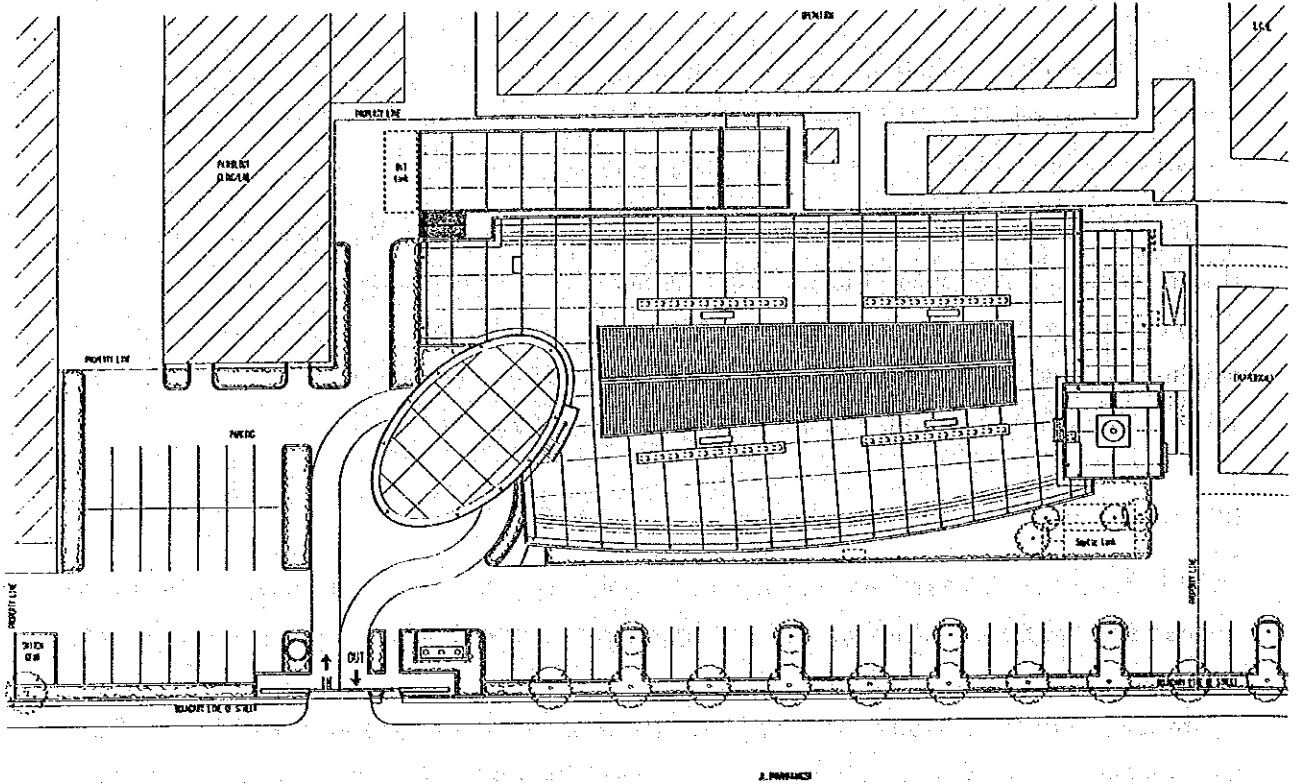


Fig. 4-3-1 Building Layout

4-3-2 Architecture Plan

(1) Floor Layout

The layout concept for each floor is shown below:

1) First floor

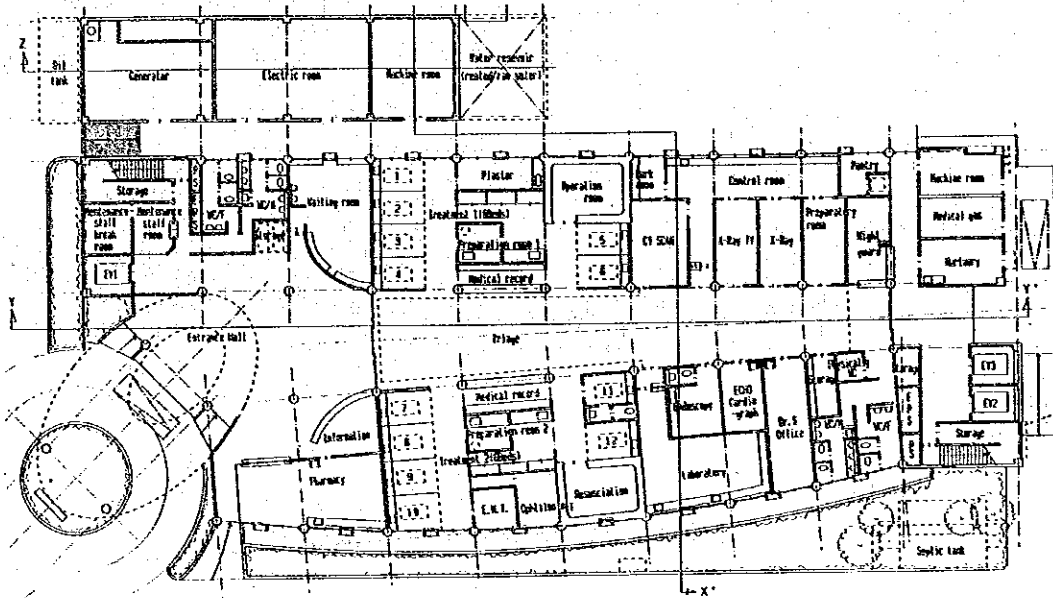


Fig. 4-3-2 First Floor Layout

Emergency patients receive diagnosis and treatment on the first floor. Patients enter the hospital from the north west and are taken via the triage section to either the operating room or to the resuscitation room depending on the case. When necessary they are also taken to the X-ray room on the south side of the triage room, the CT scan room or the laboratory room for farther diagnosis and treatment. The vertical movement line is divided into two cores: one for patients family and the other for staff and patients core.

A delivery access to the Central Supplies Center and the Pantry on the fifth floor will be the south entrance on the first floor. The entrance to the mortuary that enables cars to pull in is also located on the south side.

2) Second floor

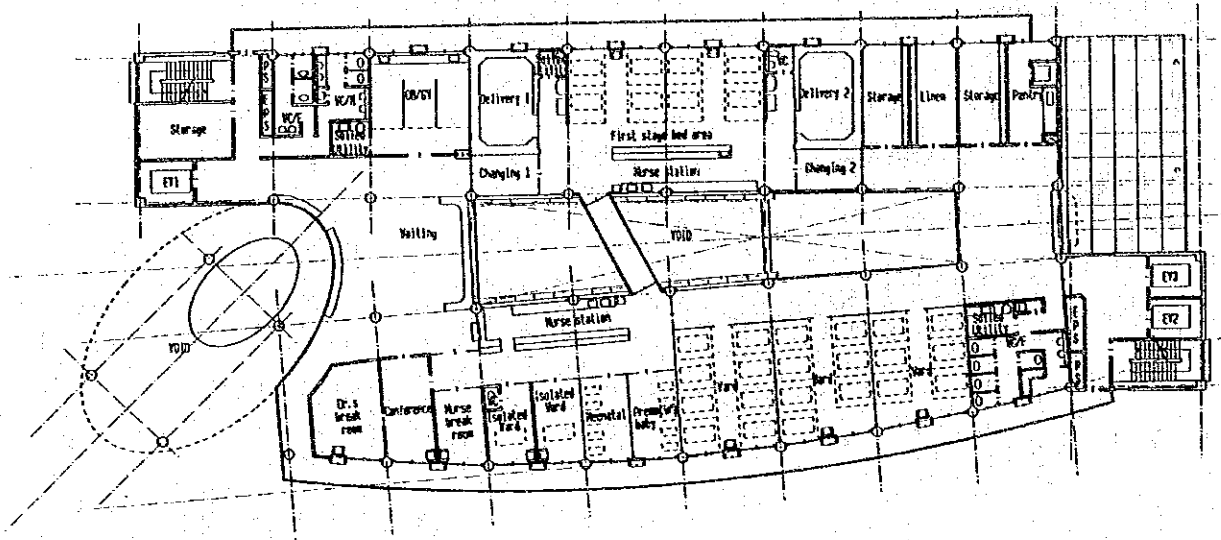


Fig. 4-3-3 Second Floor Layout

The Obstetrics/Gynecology Department is located on the second floor. The labor room and the delivery rooms are situated on the eastern side of this floor. Also the examination and treatment-room for the OB/GYN outpatients are located on the east side. On the west side, there will be IOU for women, rooms for premature and neonatal.

3) Third floor

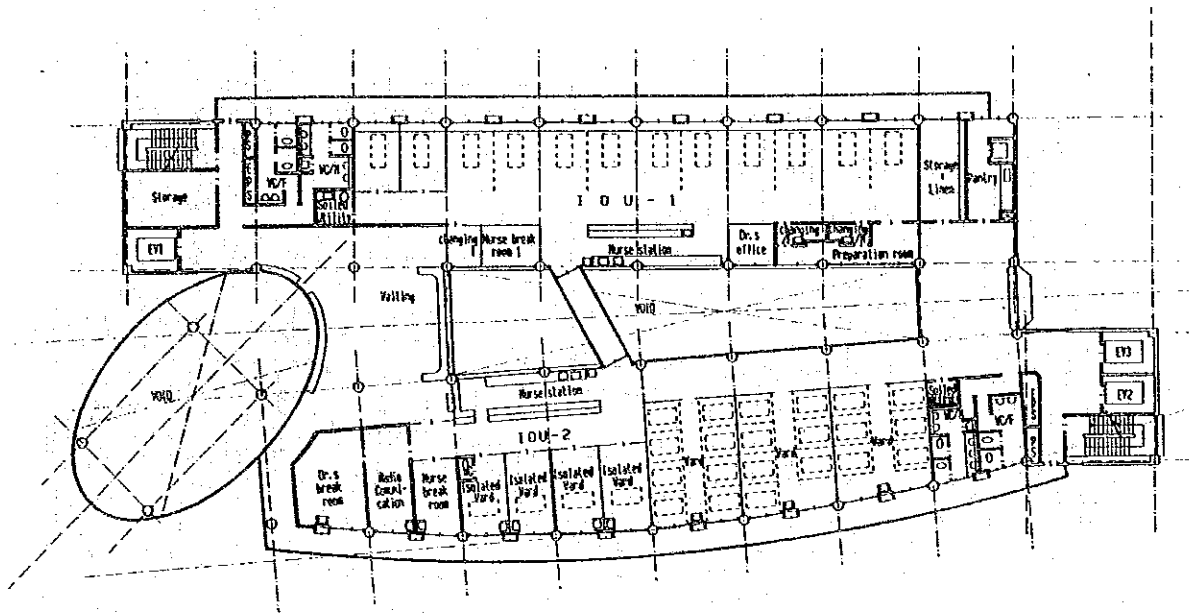


Fig. 4-3-4 Third Floor Layout

IOU is to be installed on the third floor. IOU-1 located in the eastern block accepts severe cases, IOU-2 in the western block consists of a large room with 6 ~ 8 beds and single rooms which are used for cases of infectious diseases and patients who desire single room.

Staff and patients have separate access from the first floor. Families who come to see patients use stairs or an elevator that lead only to waiting area on second and third floors. The passage on the atrium side is partitioned for administrative reasons and is closed to visitors, but it is possible for visitors to see the inside of the ward from the balcony.

4) Fourth Floor

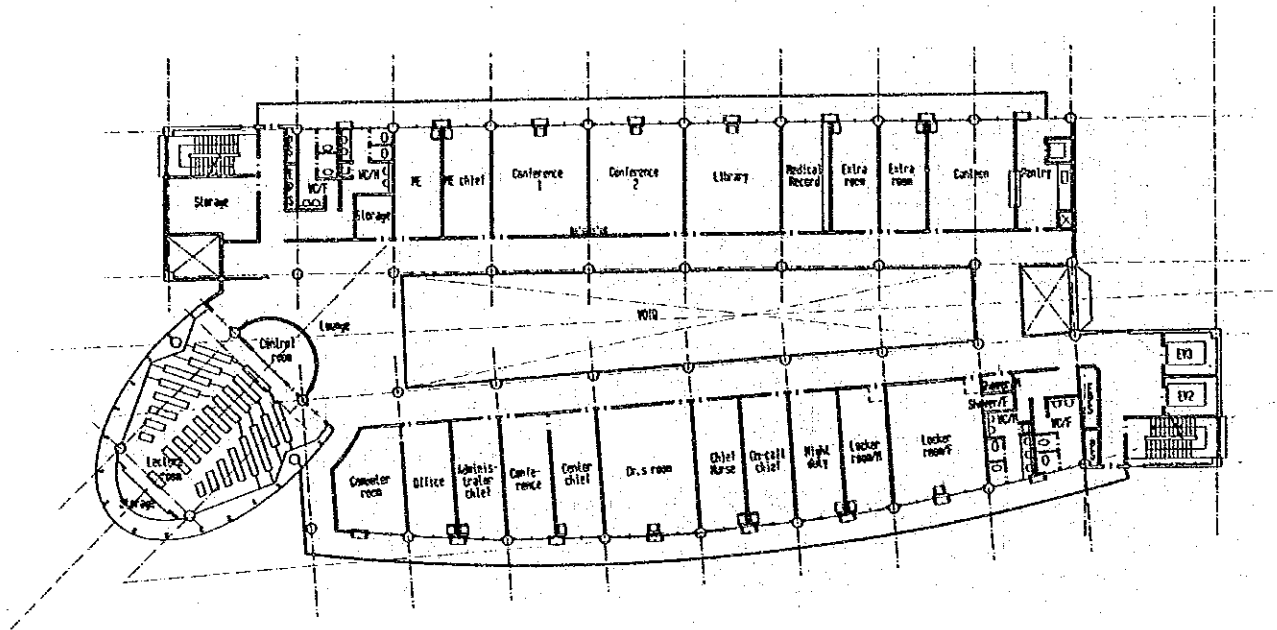


Fig. 4-3-5 Fourth Floor Layout

The rooms for education on emergency medical service and administration are to be installed on this floor and are to have access from the staff exclusive core.

In order to ensure natural ventilation, no walls are installed in the passage that runs through this floor from south to north. A lounge, that plays a cushioning role, shall be installed to ease congestion when a large number of participants gather. There are a Conference Room and a Lecture Room that can accommodate 60-80 people. A room for chief of on-duty staff, a room for doctors and a room for radio communication will be installed adjacent to these two rooms for conferences and lectures so that communication can be secured among staff in case of emergencies.

5) Fifth floor

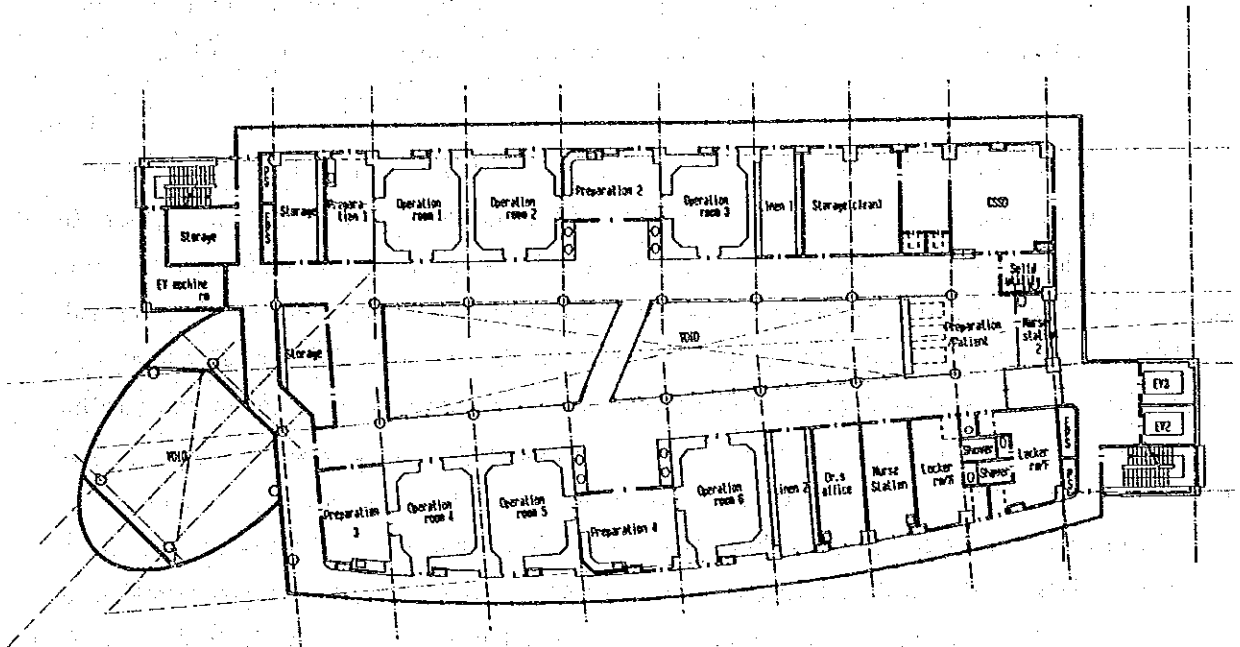


Fig. 4-3-6 Fifth Floor Layout

Emergency operations are performed on the fifth floor. The layout shall ensure that the patient flow, and that of doctors, nurses and sterilized medical equipment and supplies before and after operations should be separated. Doctors and nurses take off their contaminated surgical gowns in the operating room and return to the changing room.

Medical equipment and supplies necessary for operation are supplied via CSSD to the operating room and the preparation room through the corridors kept clean and sanitary.

Special care and attention should be paid to washrooms, shower rooms and balconies installed for common use for the following reasons:

It is customary in Indonesia to use water in a tub furnished inside the washroom or shower room for cleaning after discharge or for bathing sometimes. Unless water in such a tub is kept clean and sanitary, dengue mosquitoes might grow or health-hazard

A faucet for a flush toilet will be installed on the lower part of the washroom wall so that hands can be washed with tap water.

An exit will be installed on the balcony of the second and third-floors to enable family members who come to see patients to go out through the balconies from the waiting lounge. Also, both ends of the balcony are designed to be connected to the core part, which functions as an effective means of a fire escape or disaster evacuation.

(2) Section and Elevation

The installation of wide eaves or balconies that protrude to make sufficient shade by preventing the sunshine and rainfall is mandatory. At the same time, it is essential to have comfort in a tropical climate by making allowance for the height of each story so as to provide sufficient space for each room. The height of each story for the new EMU building shall be 4 meters. However, the first floor shall be placed 1.0 meter above the ground for the flooding during the rainy season. In order to utilize the natural ventilation to its maximum, no wall shall be placed at the end of the north and south corridors.

Elevation of the building hints that balconies are a key point in designing the exterior of the building. Balconies will match the exterior view of the building that has a curved facet toward the road by highlighting the horizontal line of the balcony. In view of the building's role as an emergency hospital, it should have an exterior view of the surrounding environment but also easily perceived by passersbys from the road.

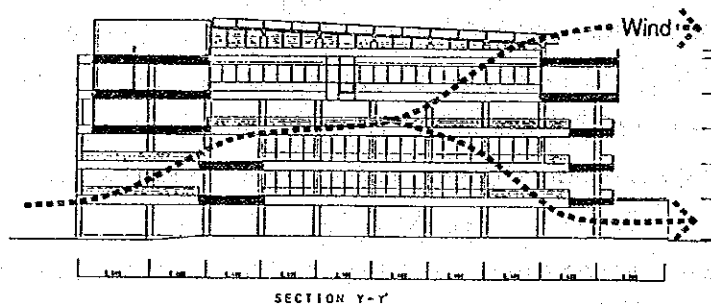


Fig. 4-3-7 Cross-Sectional Layout

(3) Vertical Transportation Plan

The installation of three elevators (one for visitors and two for staff and patients) is being contemplated. One elevator for visitors goes up to the third floor, while two elevators for staff and patients go up to the fifth floor. The lifting speed is 60 m/s, which makes it possible to lift passengers from the first floor to the fifth in 17 seconds, enabling speedy transportation of patients. The installation of two elevators for patients and staff is for the convenience of maintenance and troubles.

A dumbwaiter will be introduced for the pantry. It will greatly contribute to lifting food materials to the pantry on each floor as an effective means of transportation.

(4) Structural Plan

1) Basic concept

Like Japan, Indonesia is seismically active and to date, many earthquakes have hit the country. The new EMU building shall be a reinforced concrete structure with earthquake-proof reinforced walls so it will be sturdy enough to resist natural disasters such as earthquakes and typhoons without damaging the function of the hospital. The standard span shall be 6.4m × 9.6m. An atrium will be built on the south and north axis. The two buildings will be linked by slabs and/or concrete floor boards. In designing the structure, such local characteristics as climate, construction conditions, cost and other related factors shall be taken into consideration.

2) Foundation

According to the boring pillar diagram (Figure 4-3- 8), the geologic formation of the ground underneath the site shows that the layers from the ground level to a depth of 18 meters are of soft and weak clay, while the layers from the ground level to around 26 meters are composed of hard, sandy layers, which shall be used as the sustaining layer for the foundation of the buildings. To avoid noise and vibrations in the hospital compound, the foundation work shall be conducted by the on-site concrete piles placing method which features less noise and vibrations.

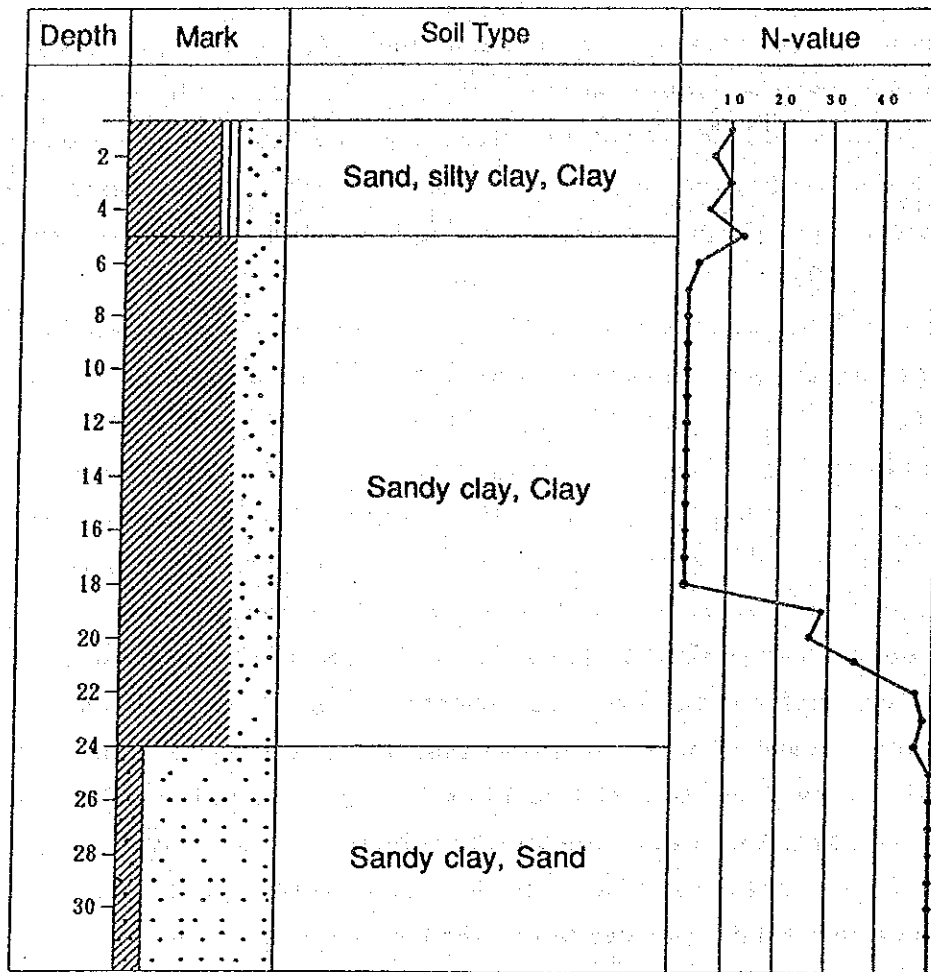


Fig. 4-3-8 Soil Investigation

3) Structure design

• Materials to be used

All the structural materials shall be procured locally and shall meet the Indonesian industrial standards (SII) in terms of stress allowance degree.

Concrete : $F_c = 180-210\text{kg/cm}^2$

Iron bars: Locally manufactured (SD 345)

• Dead loads

Dead loads shall be figured out on the basis of the structural materials and finishing materials to be actually used.

- Live loads

Live loads shall comply with the Indonesian structure design standards and the Japanese Building Standards. Major live loads applicable are as shown in the following table.

Table 4-3-1 Live Load

| | For floor (kg/cm ²) | For build-in structure (kg/cm ²) | For earthquake (kg/cm ²) |
|---------------------------|------------------------------------|---|---|
| Office Diagnostic room | 300 | 180 | 80 |
| Patient room | 180 | 130 | 60 |
| Mechanical equipment room | 500 | 300 | 150 |
| Roof | 100 | 60 | 30 |

- Seismic power

Seismic shearing power coefficients can be obtained from the following equation:

$$V = C \cdot I \cdot Wt$$

C : Regional coefficient (Zone 4, C=0.05)

I : Building use coefficient (Hospital: 1.5)

Wt : Building seismic weight

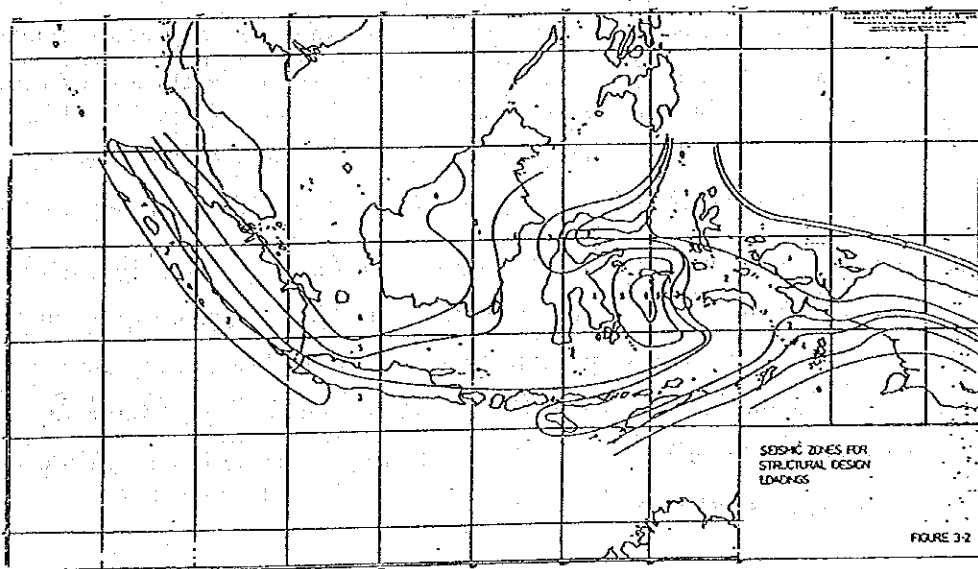


Fig. 4-3-9 Regional Coefficient Map

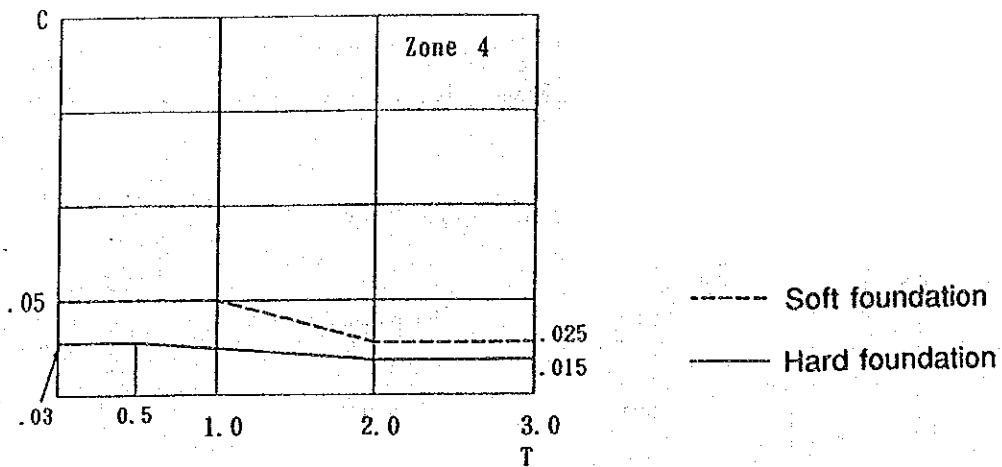


Fig. 4-3-10 Regional Coefficient in Zone 4 by Type of Ground

(5) Electrical system plan

1) Power supply system

One circuit of 3-phase 3-wire 20 KV electricity branched off from the existing main power supply system shall be extended to the substation room in the new EMU building. Transformers and switchboards enough to cover an estimated consumption of 800 KVA shall be installed to supply power to each load.

The Indonesian standard voltage of 3-phase 4-wire 380-220V shall be used to supply power at the new facility. A diesel generator set shall be installed in case of emergencies. Incidentally, the installation of an automatic voltage regulator (AVR) and an uninterruptible power supply system (UPS) shall be examined because some medical equipment requires constant frequency and voltage accuracy with an anti-power failure device.

2) Lights and receptacles systems

The luminous intensity level for the lights installed shall comply with the JIS standards and shall be determined by taking into account the rules and customs in Indonesia. Fluorescent lamps that excel in efficiency shall be mainly used.

Receptacles of a round 2-pin type with an earth terminal, a type commonly used in Indonesia, shall be employed and installed in accordance with the specifications of the electrical appliances to be used.

Table 4-3-11 Average Design Lighting Levels in Principle Rooms

| Type of Room | Design Light Level (lux) |
|---------------------------|--------------------------|
| Operating rooms | 750 |
| Treatment rooms | 400 |
| Offices and meeting rooms | 400 |
| Examination rooms | 300 |
| Wards | 150 |

3) Lightning protection and grounding systems

A lightning protection system shall be installed by planting rooftop rods or conductors to protect the building and the facility from the falling of a thunderbolt. Also, grounding facilities shall be installed to meet the requirements of electrical appliances that need to be grounded.

4) Telephone system

A telephone exchange with sufficient capacity shall be introduced at the new EMU facility and linked to the existing exchange at Dr. Soetomo Hospital. The cable laying work to MDF at the EMU building and the remodeling work of the existing telephone exchange necessary for the cable connection shall be conducted at the expense of the Government of Indonesia.

5) Public address system

The public address system to be installed at the new EMU facility shall be furnished with an amplifier powerful enough to make common and emergency announcements heard clearly compoundwide within the entire facility. Also, the installation of a local public address system used for paging patients or visitors individually at the reception desk or the dispensary window shall be examined.

6) Master TV antenna system

Master TV antennas shall be installed and several outlet terminals shall be furnished in administrative offices, education/research study rooms, etc. Two types of antennas (VHF and SHF) shall be examined.

7) CCTV system

A closed circuit TV system shall be introduced for teaching and training purposes and a video camera shall be furnished in the operating room so that an on-going operation can be monitored on a display in the teaching room.

8) Intercom system

A nurse-call intercom system will link the nurse station with each IOU bed. A simultaneous talking mode shall be employed on a one-circuit-per-bed basis. An intercom system shall also be installed in the machine rooms for maintenance purposes.

9) Battery-operated clock system

The battery-operated clocks shall be furnished in the necessary rooms.

10) Paging system

A pocket-bell paging system shall be introduced to call doctors within EMU facility.

11) Radio telecommunication system

In connection with the transfer of the radio telecommunication system, presently installed at the ICU building of Dr. Soetomo Hospital, to the new EMU building, the system shall be renovated and strengthened by introducing a new repeater that enables direct communication with hospitals in Eastern Java Province. A system that also enables communication with ambulances shall be introduced. An antenna system required for the improved radio telecommunications, shall be installed. The relocation of the existing radio telecommunication system and the installation of the repeater system shall be made at the expense of the Government of Indonesia.

12) Automatic fire alarm system

Installation of an automatic fire alarm system that automatically detects an occurrence of fire shall serve to detect a fire at an early stage and to prevent the damage from spreading. An automatic gas leakage detector shall be installed at the places where handle inflammable gas. In principle, the installation of such alarms and detectors shall comply with the Fire Services Act in Indonesia and if necessary, the corresponding act in Japan.

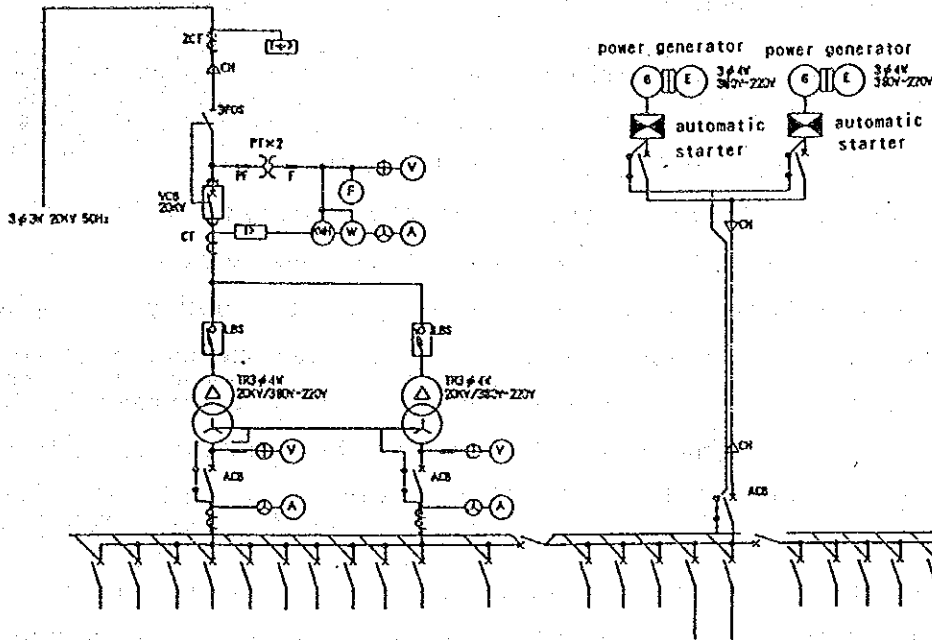


Fig. 4-3-11 Power Supply System

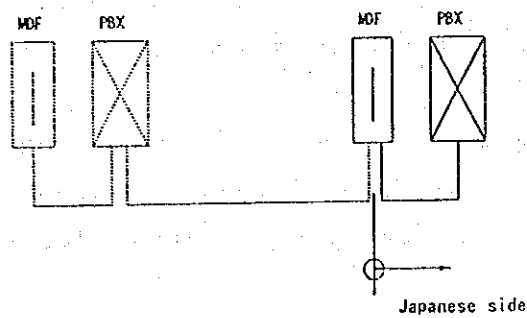


Fig. 4-3-12 Telephone System

(6) Public System Design

1) Water supply system

The water supply system relies on city water, which is supplied from the existing water supply plant at the Dr. Soetomo Hospital through the loop pipes to be stored in the water reservoir tank installed adjacent to the EMU building.

A filter needs to be installed to remove slight turbidity, color and odor. The filtered water is lifted to the elevated water tank and to be supplied to each floor by gravity. The water reservoir tank is installed above the ground for sanitary reasons. A double tank type will be provided for both the water reservoir tank and the elevated water tank because suspension of the water supply must be avoided at any time of the year. According to the data obtained, the water supplied from the Dr. Soetomo Hospital seems to contain chlorine residue. To cope with this, a chlorine sterilizer system needs to be installed.

As for the water supply for medical equipment that requires specially-treated water (sterilized water and distilled water), the system that produces such treated water shall be individually installed to meet with the demand at each section.

2) Hot water supply system

An electric hot water heater shall be provided to meet the demand for hot water in such places as shower rooms and pantries.

3) Drainage system

In view of the fact that the existing sewage treatment plant installed at the Dr. Soetomo Hospital functions sufficiently, soil and drainage which will be discharged from the new EMU facility shall be disposed of by utilizing the existing sewage treatment plant.

Soil and drainage shall be guided through the drainage main pipe to the sewage treatment plant at the hospital after the primary treatment in the septic tank.

The quality of the water discharged after treatment from sewage treatment plant is 25 ppm BOD.

Miscellaneous drainage is at the present time discharged without chemical treatment together with rain water. It shall be, however, primary treated at the new EMU plant before it is discharged. Rain water is discharged into the existing open drainage.

Figure 4-3-13 shows the schematic diagram of the water supply and drainage system.

4) Sanitary equipment installation system

The selection of sanitary equipment shall be made by paying special attention to the local conditions. Especially, since ceramic sanitary products are fragile, it is highly desirable to obtain local products and adopt both Asian and Western types.

5) Fire fighting system

Indoor hydrants, hydrants value for firemens and fire extinguishers shall be installed in compliance with the regulations and standards in Indonesia. In principle, the existing outdoor hydrants will be used.

6) Gas supply system

Gas shall be used as the energy source for kitchens and pantries.

7) Medical gas supply system

An exclusive central gas supply system will be provided. Outlets for oxygen, nitrous oxide (laughing gas), compressed air and vacuum will be installed in operating rooms, delivery rooms, IOU rooms and wards. Table 4-3-12 shows the locations of outlets.

Table 4-3-12 Rooms Equipped with Medical Gas Facilities

| Section | Type of Room | Kind of medical gas | | | |
|---------------------------------|---|---------------------|---------------|----------------|------------|
| | | Oxygen | Nitrous oxide | Compressed air | Aspirating |
| First Aid | Temporary operating | ○ | ○ | ○ | ○ |
| | Resuscitating room | ○ | ○ | ○ | ○ |
| X-ray | CT room | ○ | | | ○ |
| | X-ray and X-ray with TV system | ○ | | | ○ |
| Laboratory | Rooms for endoscope | ○ | | ○ | ○ |
| | Rooms for ultrasound/electrocardiograph | ○ | | ○ | ○ |
| Emergency obstetrics gynecology | Laboring room | ○ | ○ | ○ | ○ |
| | Rooms for immature foetus | ○ | | ○ | ○ |
| | Rooms for new-born | ○ | | | ○ |
| I.O.U. | I.O.U | ○ | | ○ | ○ |
| Operation | Operating room | ○ | ○ | ○ | ○ |
| | Operating labor room | ○ | | ○ | ○ |

8) Sewage treatment plant

Soil and miscellaneous drainage shall be discharged after they are temporarily treated in the septic tank by means of sediments and septic treatment. A concrete tank that is buried underground shall be used.

(7) Air Conditioning and Ventilation System Plan

The air conditioning and ventilation system in the new EMU facility shall have the following:

- i) To adapt to natural conditions such as sunshine, temperature and wind direction
- ii) To secure purity required for a medical facility
- iii) To reduce operating costs
- iv) To introduce a system that can readily cope with the situation when machine and equipment are out of order
- v) To select machines and equipment easy to operate and maintain

1) Air conditioning system

The installation of air conditioning systems shall be restricted to the rooms that require such systems for the functional reasons. A separate type of air-cooled air conditioner shall be introduced (See Figure 4-3-14). The indoor unit shall be installed on the ceiling or wall, while the outdoor unit on the upper part of the balcony. A highly efficient filter shall be installed for the rooms that require a high purity level such as operating rooms, delivery rooms and IOU wards. A list of the rooms that require an air conditioning system is shown below:

- 1st floor : Treatment rooms, preparation rooms, pharmacy, CT room, X-ray room, endoscope room, cardiograph room
- 2nd floor : Delivery rooms, preparation rooms, premature babies' room, IOU for OB-GYN and other female patients, neonatal babies' room
- 3rd floor : IOU rooms
- 4th floor : Lecture room, practice room, computer room
- 5th floor : Operating rooms, preparation rooms

2) Ventilation system

The rooms that are not furnished with air conditioners shall be ventilated by natural means or mechanical ventilation. The building shall be arranged and located at the spot where it could make the most of the strong east-west wind that blows abundantly all through the year in Surabaya. A ventilation opening shall be installed in the central part of the building to enhance the ventilation effect. On a windy day in particular the ventilation opening is expected to contribute to enhancing the ventilation effect by means of this natural wind benefit since more wind blows in through the opening. A ceiling-type fan shall be installed in the waiting lounge to stimulate the air-cooling effect by the force of wind.

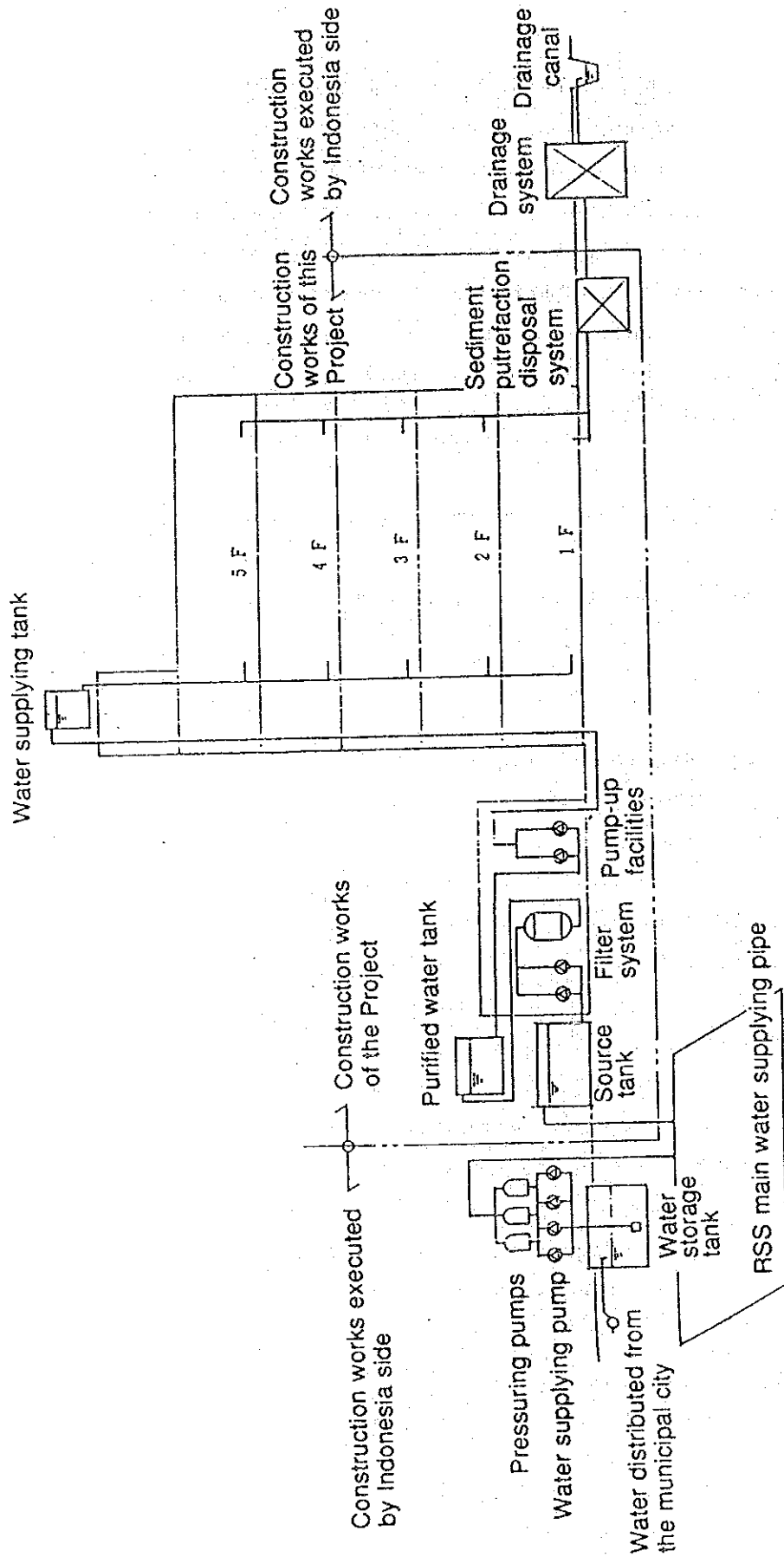
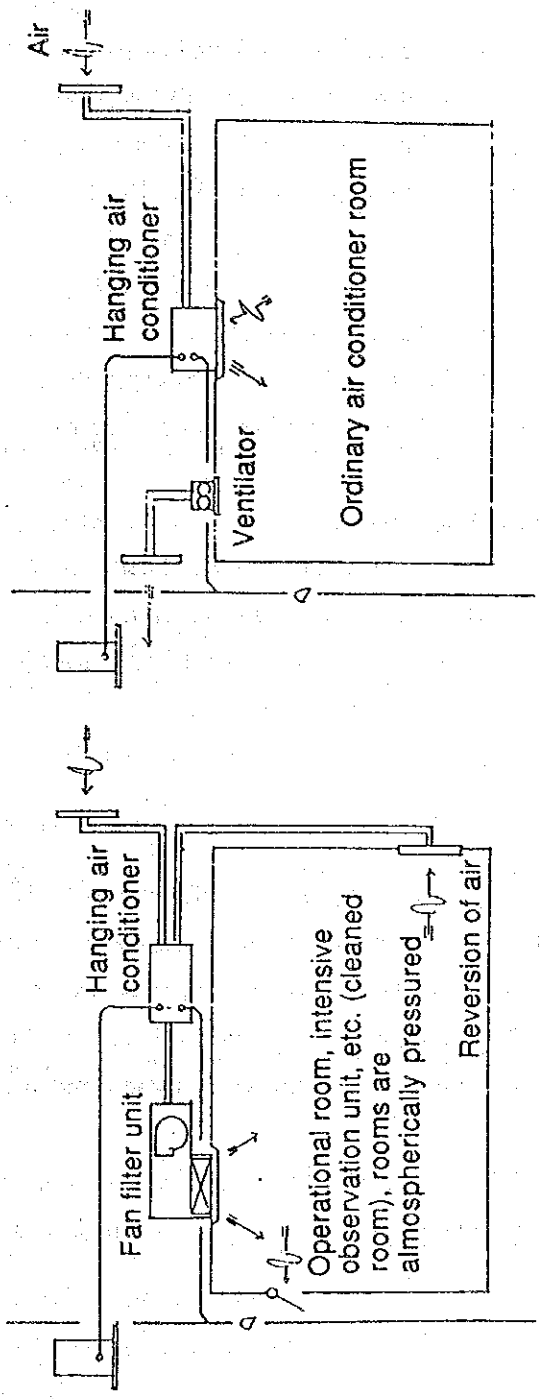


Fig. 4-3-13 A Schematic Diagram of Water Supply and Drainage System



Air conditioner System for Operation Room, IOU, etc. Air Conditioner System for Ordinary Room

Fig. 4-3-14 A Schematic Diagram of Air Conditioning System

(8) Construction material plan

Taking ease of maintenance and management into consideration, building materials and methods indigenous to Indonesia will be selected for this project.

1) External finishing material

① External walls

Outdoor tiles will be used for finishing the external walls of core sections such as on the 1st and 2nd floors and the EV shaft. Emulsion paint will be used externally on the 2nd, 3rd and 4th floors for water proofing and moisture proofing. Crystallized glass with superior durability and ease of maintenance will be used for the 5th floor.

② Roof

The highly reliable construction method of asphalt waterproofing with covering concrete will be used for the roof. High density foam polyethylene will also be used for heat insulation to improve comfort in the top floor surgery room.

③ Doors and Sash

Taking the temperature in Indonesia into consideration, heat resistant aluminum sash will be used for the external fittings. Wood will be principally selected for the internal fittings with the exception of doors of the surgery department and places where it will be bumped by stretchers. Stainless steel will be used on these doors since durability is required.

2) Interior finishing material

① Floor

To maintain sanitation, ceramic tiles that can be easily cleaned will be used in rooms where there is fear of infection such as the diagnosis room, treatment room, IOU and hallway. Terrazo tile, produced in Indonesia, is unsuitable since it is easily stained by polluted water. Cement mortar finished flooring will be used for toilet and shower rooms, examination rooms, operating rooms and lavation room where water is used.

Although mosaic tile is generally used, it will not be used in this project since it is prone to become unsanitary from formation of mold in the joints because of humidity.

② Walls

For ease of cleaning, calcium oxalate boards will be used on the walls of the diagnosis room, treatment room and the IOU, where there is a possibility of infected matter adhering to the walls. The walls of offices and living quarters will be finished with vinyl chloride resin enamel paint.

③ Ceiling

Use of perforated boards, that can become the breeding place of germs, will be avoided and the ceiling will be finished principally with gypsum board paint for a smooth surface. Aluminum louvers will be used on outside corridors for the purpose of concealing piping in the ceiling.

4-3-3 Equipment Planning

(1) Policy of equipment planning

Consider the following points when selecting medical equipment.

- 1) Give priority to medical equipment required for emergency treatment and equipment with high frequency of usage.
- 2) Select equipment that is recognized in Japan as being dependable in the emergency medical treatment fields.
- 3) Select equipment that is solidly constructed and is easy to use and maintain.
- 4) Select equipment which function and performance can be easily maintained into consideration of the maintenance system and supply of expendable and replacement parts.
- 5) Select equipment with the lowest possible operating cost.
- 6) Select instruction manuals and repair manuals that are as complete as possible.

(2) Consumable equipment parts

There is certain types of medical equipment which require a considerable amount of consumables. Basically, expenses for these consumables are indispensable for the smooth operation of the facility. A one year supply of these consumables will be included in this project for smooth a start.

(3) Operation of the equipment and training

Since an increasingly high level of skill is required for recent medical equipment, minimum training required for operation of the equipment will be given at time of installation.

(4) Outline of equipment selected in each section

1) Examination, first aid treatment and dispensary

Basic medical equipment will be acquired for initial emergency first aid and diagnosis and treatment centered on surgery and internal medicine. Electrocardiographs and endoscopes are planned together with accessory equipment such as display units as they are effective as educational equipment.

2) Emergency resuscitation and minor surgery

Equipment and tools for lifesaving and for emergency minor surgery are planned. The emergency resuscitators planned will be the manual type, not automatic, in consideration of safety in use.

3) Clinical examination

Basic equipment to conduct biochemistry, blood, urine and bacteria examinations is planned because it enables complete emergency examination to be conducted separately from the central examination ward of the hospital. Frequent omission of inspection and cleaning, of examination equipment, before and after use, and problems due to misoperation were observed. Therefore, a complete explanation of use must be given when installing the equipment.

4) Ophthalmology

Equipment such as an ophthalmologic unit, fundus camera and treating apparatus sets are planned for emergency diagnosis and treatment.

5) Department of otolaryngology

Otolaryngology treatment unit.

Equipment required for emergency treatment.

6) Department of radiology

Since speedy and accurate image inspection is required in the emergency ward, in addition to the general photographing equipment, X-ray TV equipment and a C-arm surgery X-ray equipment that can be used during surgery are planned. A computer controlled tomography unit for the overall body, which is important for medical service and training, is provided in the tertiary life-saving center for medical services, education and training. Non-invasive ultrasonic diagnosis equipment is also planned.

Maintenance of radiation and ultrasonic equipment is important, therefore, in addition to thoroughly explaining operation at time of installation, the equipment will be selected from manufacturers in Indonesia which have adequate maintenance abilities.

7) Obstetrics and Gynecology

Equipment such as treatment units required for diagnosis and treatment is necessary. Equipment will focus on the type which can determine the degree of danger, diagnose and monitor the position and state of the fetus and an equipment for diagnosing emergency patients with abnormal labor.

8) Labor room

Plan equipment required such as labor tables and delivery monitoring systems.

9) Delivery room

Plan equipment to cope with emergency deliveries including abnormal deliveries.

10) Premature infant room

Plan treatment equipment such as incubators and fluid transfusion pumps, and also resuscitation equipment.

11) Pediatrics and newborns

Plan equipment required for pediatric diagnosis, treatment and measurement and also basic equipment for newborns such monitors, etc.

12) Obstetrics and gynecology nurse station

Provide an outpatient delivery area and an obstetrics and gynecology area and plan equipment for treatment and nursing.

13) Obstetrics and gynecology IOU

Plan ward equipment such as beds, urinals and sterilizers and emergency treating equipment such as resuscitators and suction units.

14) Intensive observation unit

Plan bedside monitors for monitoring post operation patients and emergency patients, artificial respiratory machines and defibrillators for emergency treatment, and suction units and ultrasonic nebulizers as auxiliary devices.

15) Intensive observation unit nursing station

Plan equipment centered on nursing such as carts for doctor's rounds, medicine shelves and ice making machines.

16) Surgery department

Since many operations performed at the EMU are on patients who lack medical information and sometimes there are drastic changes in patient information,, equipment can not be prepared beforehand.

Basic equipment such as anathesia machines, suction units and electrosurgical units shall be planned for each operating room. However, common use equipment is planned for infrequently used machines such as body temperature lowering and dehumidifying equipment.

17) Central supply

Equipment for basic sterilization, matching the material and shape of items requiring sterilization after use are planned. A high pressure steam sterilizer will be built with the boiler and a separate boiler will not be recommended.

18) Maintenance tools

Since this hospital has a workshop, the minimum necessary tools will be planned. Equipment planned are general tool sets and tool sets for electronic devices regularly used in the emergency section, and instruments such as oscilloscopes for repairing X-ray diagnosis systems, ultrasonic diagnosis systems and patient observation monitors.

19) Ambulance

Four ambulances will be planned since the present five are considerably old.

Two ambulances will be provided with emergency treatment equipment such as sterilizing units and resuscitation equipment, and two will be used mainly as ambulances for transporting patients.

20) Educational equipment

A video set for operations, overhead projectors, slide projectors and TV monitors for teaching and training purposes are to be included.

(5) Proposed Equipment and Instruments are as follows:

Table 4-3-13 Main Medical Instrument List

| No. | Instruments |
|--|--------------------------------|
| 1st Floor (For diagnosis, treatment, pharmacy) | |
| 1. | Examination bed |
| 2. | Diagnostic instrument set |
| 3. | Small operation instrument set |
| 4. | Stretcher |
| 5. | Plaster bandage table |
| 6. | Instrument cabinet |
| 7. | Drug cabinet |
| 8. | Medical refrigerator |
| 9. | Esophagoscope |
| 10. | Bronchoscope |
| 11. | Duodenoscope |
| 12. | Gastroscope |
| 13. | Colonoscope |
| 14. | Light source unit |
| 15. | Electro surgical unit |
| 16. | Endoscope instrument set |
| 17. | Wheel chair |

| No. | Instruments |
|--|--------------------------------------|
| 1st Floor (for emergency resuscitation, operations) | |
| 1. | Ventilator |
| 2. | Defibrillator |
| 3. | Pulse oximeter |
| 4. | Infusion pump |
| 5. | Treatment bed |
| 6. | Film illuminator |
| 7. | Anesthesia machine |
| 8. | External pacemaker |
| 9. | Instrument cabinet |
| 10. | Low pressure continuous suction unit |
| 11. | Laryngoscope |
| 12. | Tracheal instrument set |
| 13. | Small operation instrument set |
| 14. | Tourniquet |
| 15. | Tajima's hand operating set |
| 16. | Universal operating table |
| 1st Floor (for laboratory) | |
| 1 | Desk top centrifuge |
| 2 | Urine analyzer |
| 3 | Binocular microscope |
| 4 | Automatic chemistry analyzer |
| 5 | Blood cell counter |
| 6 | Coagulator |
| 7 | Blood gas analyzer |
| 8 | Electrolyte analyzer |
| 9 | UV-VIS spectrophotometer |
| 10 | Distillation apparatus |
| 11 | Hemoglobin meter |
| 12 | Osmometer |
| 13 | Hematocrit centrifuge |
| 14 | Blood bank refrigerator |
| 15 | Medical refrigerator |
| 1st Floor (for emergency ophthalmology) | |
| 1 | Refractometer |
| 2 | Ophthalmic unit |
| 3 | Fundus camera |
| 4 | Ophthalmoscope |
| 5 | Slit lamp microscope |
| 6 | Treatment instrument set |

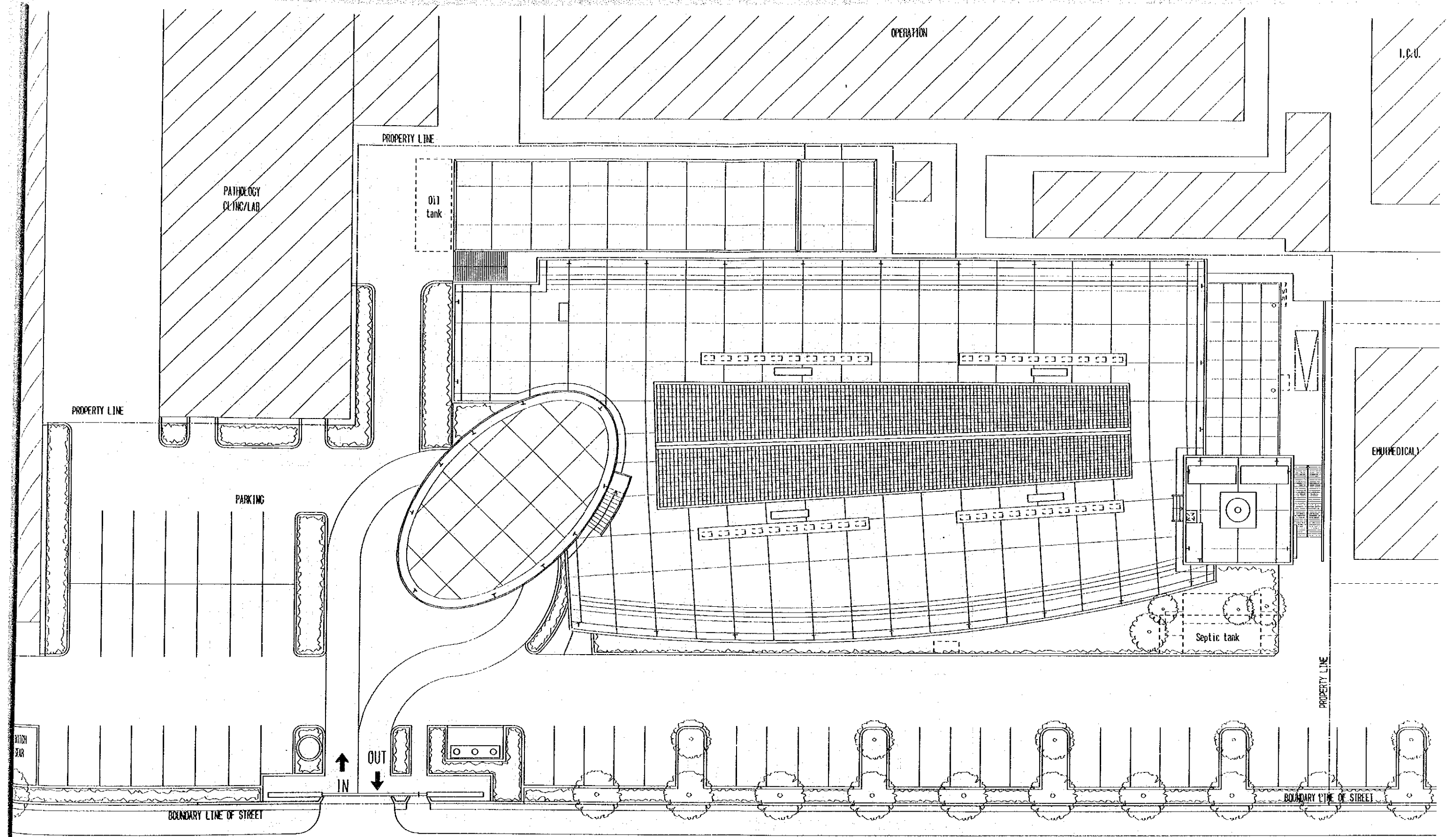
| No. | Instruments |
|---|---------------------------------|
| 1st Floor (for emergency E.N.T.) | |
| 1 | Treatment unit |
| 2 | Instrument cabinet |
| 3 | Examination instrument set |
| 4 | Tracheal set |
| 5 | Examination instrument set |
| 6 | Nebulyzer |
| 1st Floor (for radiography) | |
| 1 | Fluoroscopic X-ray TV unit |
| 2 | Whole body X-ray CT scanner |
| 3 | General X-ray unit |
| 4 | Portable X-ray unit |
| 5 | C-Arm surgical X-ray |
| 6 | Automatic X-ray film processor |
| 7 | Ultrasound diagnostic equipment |
| 2nd Floor (for obstetrics and gynecology) | |
| 1 | Ultrasound diagnostic equipment |
| 2 | Examination bed |
| 3 | Helus detector |
| 4 | Treatment unit |
| 5 | Stand type sphygmomanometer |
| 6 | Treatment instrument set |
| 7 | Film illuminator |
| 8 | Vacuum unit |
| 2nd Floor (for labor room) | |
| 1 | Labour bed |
| 2 | Fetal monitor |
| 3 | Irrigator stand |
| 4 | Infusion pump |
| 2nd Floor (Delivery room) | |
| 1 | Delivery bed |
| 2 | Vacuum extractor |
| 3 | Anesthesia machine |
| 4 | Fetal monitor |
| 5 | Instrument table |
| 6 | Infant warmer |
| 7 | Delivery instrument set |

| No. | Instruments |
|---|--|
| 2nd Floor (for new-born/immature) | |
| 1 | Incubator |
| 2 | Infant ventilator |
| 3 | Photo therapy unit |
| 4 | Infusion pump |
| 5 | syringe pump |
| 6 | Resusci bag |
| 7 | Neonatal monitor |
| 8 | Laryngoscope |
| 9 | Weight scale |
| 10 | Infant treatment table |
| 11 | Infant care center |
| 12 | Electrocardiograph |
| 13 | Ultrasonic nebulizer |
| 14 | Bassinet |
| 15 | Examination lamp |
| 16 | Transhepatic O ₂ /CO ₂ gas monitor |
| 2nd Floor (for nurse station and patient room for obstetrics and gynecology) | |
| 1 | Diagnostic instrument set |
| 2 | Sphygmomanometer |
| 3 | Film illuminator |
| 4 | Boiling sterilizer |
| 5 | Oxygen mask |
| 6 | Instrument table |
| 7 | Irrigator stand |
| 8 | Treatment instrument set |
| 9 | Suction unit |
| 10 | Drug cabinet |
| 11 | Infusion pump |
| 12 | Standard bed with mattress |
| 13 | Oxygen inhaler |
| 14 | Portable resuscitator |
| 15 | Ultrasonic nebulizer |
| 16 | Instrument cabinet |
| 17 | Ice maker |
| 18 | Refrigerator |

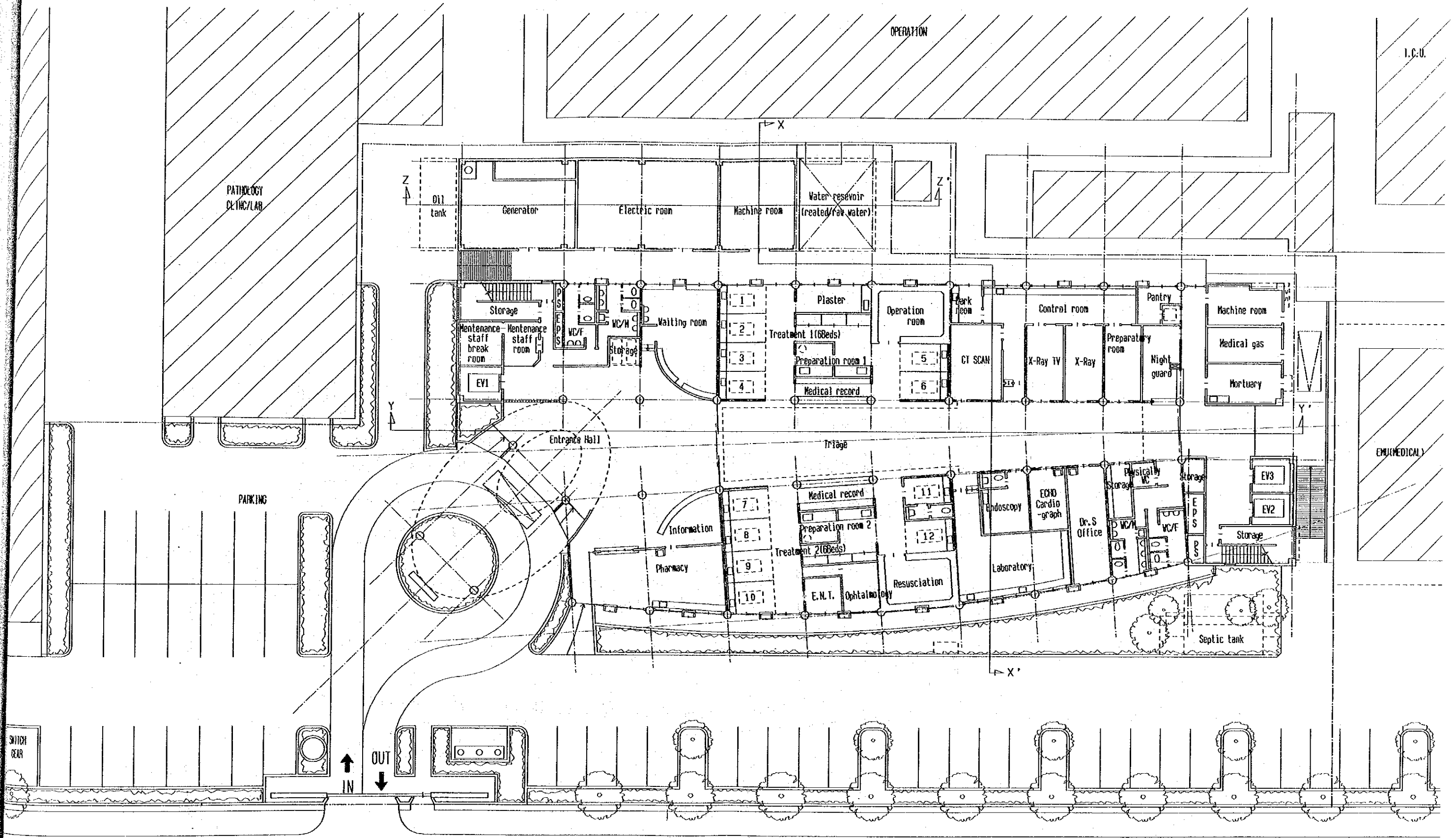
| No. | Instruments |
|--|--------------------------------------|
| 3rd Floor (for intensive observation unit (IOU)/nurse station) | |
| 1 | ICU bed |
| 2 | Bed side monitor |
| 3 | Ventilator |
| 4 | Infant ventilator |
| 5 | Portable ventilator |
| 6 | Defibrillator |
| 7 | Cardiac output computer |
| 8 | Infusion pump |
| 9 | Syringe pump |
| 10 | Ultrasonic nebulizer |
| 11 | CO ₂ -monitor |
| 12 | Low pressure continuous suction unit |
| 13 | Instrument table |
| 14 | Electroencephalograph |
| 15 | Film illuminator |
| 16 | External pacemaker |
| 17 | 3-ch electrocardiograph |
| 18 | Irrigator stand |
| 19 | Stand type sphygmomanometer |
| 20 | Boiling sterilizer |
| 21 | Desk top type autoclave |
| 22 | Bedpan washer |
| 23 | Dressing table |
| 24 | Ice maker |
| 25 | Refrigerator |
| 26 | Standard bed |
| 27 | Dialysis equipment |
| 5th Floor (for operation) | |
| 1 | Universal operation table |
| 2 | Orthopedic operation table |
| 3 | Anesthesia machine with ventilator |
| 4 | Patient monitoring unit |
| 5 | Anesthesia table |
| 6 | Suction unit |
| 7 | Irrigator stand |
| 8 | Resusci bag |
| 9 | Electric surgical unit |
| 10 | Pulse oximeter |
| 11 | CO ₂ monitor |
| 12 | Infusion pump |
| 13 | Syringe pump |
| 14 | Heating-cooling mattress |

| Instruments | | |
|--|--|------------------------|
| 5th Floor (for surgical operation) | | |
| 15 | Blood warmer | |
| 16 | Defibrillator | |
| 17 | Laryngoscope | |
| 18 | Operation instrument set | |
| 19 | Instrument table | |
| 5th Floor (for central supply) | | |
| 1 | High pressure steam sterilizer | |
| 2 | Ultrasonic cleaner | |
| 3 | Ethylene oxide gas sterilizer | |
| 4 | Bag sealer | |
| 5 | Drying oven | |
| 6 | Grove conditioner | |
| 7 | Tube dryer | |
| 5th Floor (for tools and instruments for maintenance) | | |
| 1 | Electronic instrument tool set | |
| 2 | General tool set | |
| 3 | Working table | |
| 4 | Oscilloscope | |
| 5 | Digital multimeter | |
| 6 | Multitester | |
| 7 | MAS-meter | |
| 8 | KVA-meter | |
| 4th Floor (for tools and instrument) | | |
| 1 | Over head projector and screen | |
| 2 | Slide projector | |
| 3 | Video camera set | |
| Ambulance | | |
| 1 | Ambulance with emergency medical instruments | |
| 2 | Ambulance | |
| Telecommunication | | |
| 1 | Telecommunication System (short distance) | VHF. 25W 12ch |
| 2 | ditto (long distance) | HF 100W |
| 3 | Transmitter for VHF | 50W solar cell and UPS |
| 4 | Telecommunication System (Ambulance) | VHF 40W 12ch |
| 5 | ditto (Portable type) | VHF 5W 15 ch |

4-3-4 Basic Design Drawing



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JL. DWIPRANANUSA