

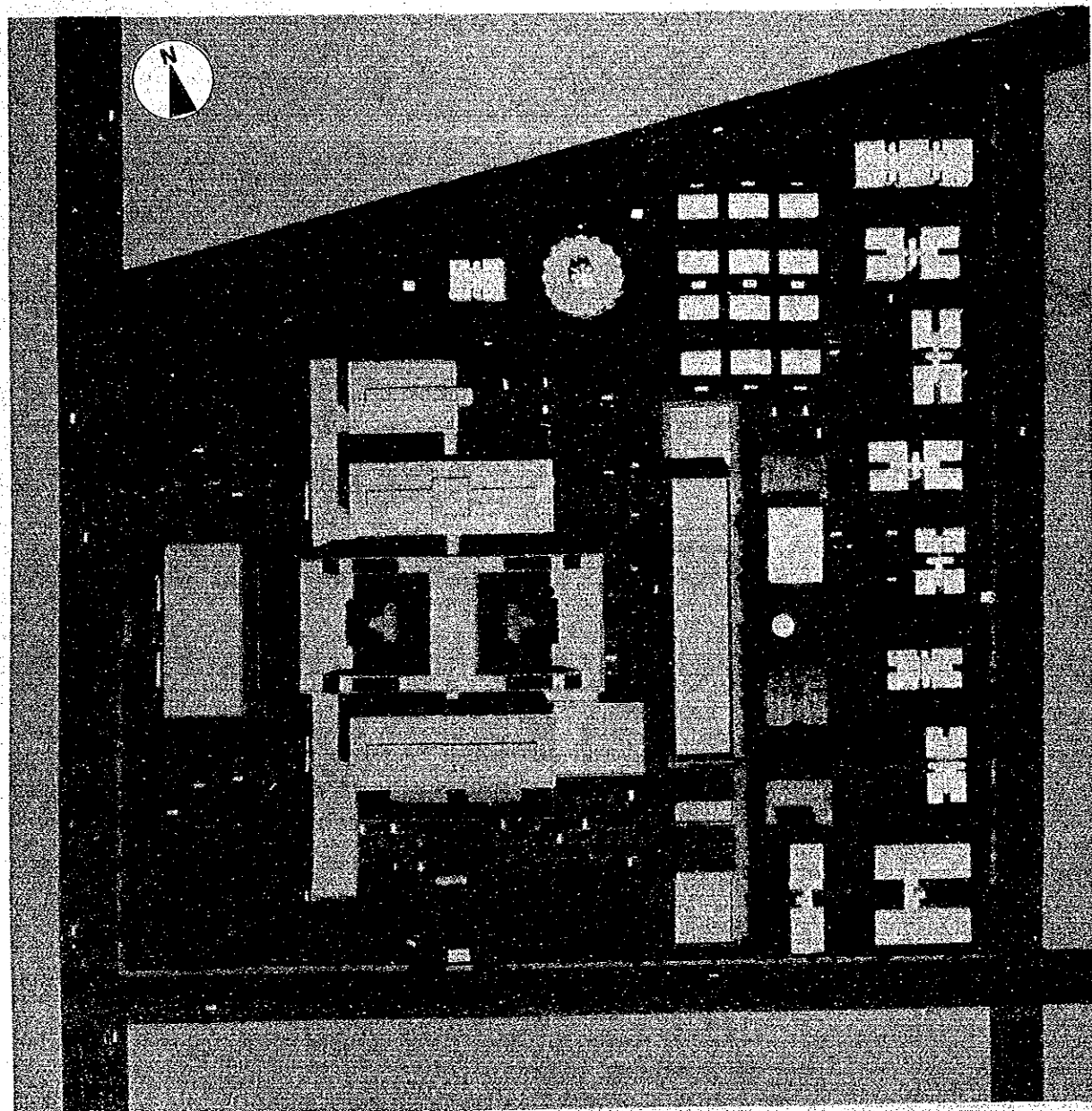
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PART 1 — OVERVIEW OF PROJECT

1. BACKGROUND

The Kingdom of Saudi Arabia was newly created in September, 1932 by proclamation of His Majesty King Abdul Aziz Bin Saud with the unification of the Kingdoms of Hajaz and Nejd.

The country is bordered on the east by the Persian Gulf and on the west by the Red Sea and occupies 4/5 of the Arabian peninsula. The area of the Kingdom is 2,149,000 km² and its population is 8.6 million people (1980 estimate).

The Kingdom is one of the driest areas, with one of the hottest climates, in the world. Therefore, most of the country is desert or arid land with little vegetation. The maximum temperature in summer exceeds 40°C while the annual precipitation is under 100 mm, excluding the southwest mountain region.

Recently, the social development within the Kingdom has progressed rapidly because of the strong economic foundation resulting from the discovery of oil in the 1930's and the subsequent rapid and large development of oil resources.

In 1980, the oil production of Saudi Arabia constituted 15.5% of the world production. The Kingdom's Gross National Product (GNP) grew rapidly from 109 billion dollars in 1965 to 1,454 billion dollars in 1979. Per capita income was one of the highest in the world — \$12,300.

Saudi Arabia is now implementing its third five-year development plan. The development of medical services is given a high priority within the five-year plan and the Ministry of Health is endeavoring to expand medical facilities and to train medical personnel.

In recent years, the progress made in establishing general hospitals and implementing free medical care has resulted in a decreasing mortality rate and an increasing life span.

Infectious diseases, such as cholera, dysentery and tuberculosis, are decreasing, but adult diseases, such as cancer and circulatory organ diseases, are becoming problems to be addressed. The medical field of cancer is still in its infancy and cancer statistics, which is the basis for cancer research and care, is still inadequate.

Although such progress as the opening of the Endoscope Center in Jeddah in 1978 has been made, the organization of information, the dissemination of knowledge and the creation of a diagnosis and therapy system remain as immediate and important concerns in the national efforts to counter cancer today.

The Saudi Arabian government set up a plan to establish a national cancer center in Jeddah and requested the technical cooperation of the Japanese government. In response to this request, the Japanese government sent missions to Saudi Arabia for discussions and exchange of views. As a result of these discussions, in August, 1982, both governments agreed on the Basic Concepts of the National Cancer Center and the Scope of the Work.

Based on this agreement, in October, 1982, work commenced on the Basic Design Study of the National Cancer Center Establishment Project in the Kingdom of Saudi Arabia.

2. DESCRIPTION OF THE PROJECT

2.1 General

The National Cancer Center will provide specialized medical care facilities to conduct diagnostic and therapeutic functions, to train staff to deal with cancer, to establish diagnostic and therapeutic systems, and to disseminate information and knowledge on these diseases.

The National Cancer Center will be located close to the east side of the former Jeddah International Airport. It will have a Cancer Center, a General Hospital, Joint-Use Facilities for the Cancer Center and the General Hospital, and a hospital community for staff and patients.

The Joint-Use Facilities are for the purpose of obtaining savings through the centralization of administration and maintenance and operations. The complex is expected to be staffed by approximately 2,000 persons.

2.2 The Composition of the National Cancer Center

The composition of the National Cancer Center will be as follows:

Cancer Center

- Medical Care Services

Outpatient Department: 20 clinical department

Wards: 200 beds (future extension 100 beds)
general wards, infectious disease
beds and germ-free beds

Diagnosis & Therapy Departments

Diagnosis: radioisotope department

Therapy: radiotherapy department, intensive
care unit, chemotherapy center and
radioisotope center

Clinical Research: research facilities

Administration: cancer registry information

Joint-Use Facilities

General Clinic: examination rooms, centralized
treatment rooms, X-ray, laboratory
and pharmacy

Diagnosis & Therapy Department

Diagnosis: radiodiagnosis department,
endoscopy department, physiology
department, clinical laboratory,
autopsy department

Therapy: surgical department, C.C.R.U.,
rehabilitation department, blood
bank, hyperbaric

Administration and Support Services:

general business department,
service department, energy and
maintenance department

2.3 Physical Facilities and Medical Equipment

This Center is a complex consisting of the Cancer Center, the General Hospital, the Joint-Use Facilities, the utility & service facilities, the housing and recreational facilities to provide the functions necessary to operate the National Cancer Center.

The complex is enclosed in an area of 138,703 m², and the floor space of buildings, excluding housing, totals 202,270 m² while the floor space of housing totals 53,520 m².

A. Physical facilities

- 1) The Hospital complex will be a reinforced concrete structure consisting of a four-story central building with two seven-story north-wings and a seven-story south-wing. An underground parking and an outdoor recreational area on the roof of the central building will also be provided.
- 2) The General Clinic will be a two-story building of reinforced concrete connected to the hospital building by two passage ways.
- 3) The Mosque will be a reinforced concrete building on the north side of the north-wing building.
- 4) The overnight accommodations will be a six-story building of reinforced concrete to house visitors staying overnight.
- 5) 760 housing units will consist of buildings of concrete structure to provide housing for 1,700 employees.
- 6) The utilities Center will be a two-story building of reinforced concrete to house utility facilities to service the hospital and housing area.
- 7) There will be a water tower to supply water to the hospital and housing area.
- 8) An ordinary waste water treatment facility and a special radioactive waste water treatment facility will be provided to treat all waste water generated in the complex. Part of the treated water will be recycled to be used for flush toilets and water plants.
- 9) A recreation center with facilities for outdoor recreation and a building to house a restaurant, a

library, shops, a supermarket and a bank will be provided.

B. Medical equipment

Medical equipment necessary for the National Cancer Center will be fully provided. Refer to section Part 2, Chapter 7 of the Basic Design Report for detailed descriptions.

2.4 Project Schedule and Costs

A. Project schedule

It is estimated that 36 months would be necessary to complete this project. The overall schedule is divided into (1) the present Basic Design phase being conducted by JICA, covering 11 months; (2) the Detailed Design phase requiring 10 months; and (3) the construction phase of about 36 months. However, since the site work can be performed during the detailed design period, it is possible to shorten the total detailed design period and construction period.

Note: The preparation periods between phases (1) & (2) and phases (2) & (3) have not been estimated since both preparation times involve the Saudi Arabian Government in negotiations and the bidding process.

B. Costs

The total cost of this project is estimated to be 1,675,583,000 SR. with the hospital zone estimated to be 1,413,663,000 SR. and the housing zone estimated to be 261,920,000 SR.

The hospital zone consists of the Cancer Center (21,470 m²), the Joint-Use Facilities (45,450 m²), the General Hospital (28,220 m²), the parking building (95,800 m²), the utilities center, the Mosque, the overnight facilities, the related other facilities (11,330 m²) and the external works.

The housing zone consists of the housing units, the recreation center (53,520 m²) and the external works.

3. OUTLINE OF MEETINGS AND SURVEY

3.1 Outline of Meetings

During November 1982 to August 1983, a series of meetings were conducted between the Japanese Study Team and the Saudi Arabian authorities at the respective phases to complete the basic design of this project.

The purpose of these meetings were to clarify and determine the concept of the basic design of the National Cancer Center, and to incorporate as far as feasible the desires expressed by the Saudi Arabian authorities.

In order to clarify problems in each phase before proceeding to the next stage, meetings were held for each phase of the design schedule: namely, the Conceptual Design (I) in November-December, 1982; the Conceptual Design (I-2) in February 1983; the Basic Design Draft (I) in May 1983; and the Final Draft Basic Design in August 1983.

The gist of the meetings may be summarized as follows:

A. Conceptual Design I

At the opening of the first meeting, the Saudi Arabian authorities expressed their plan to construct a general hospital of 350 beds with provisions for a future extension of 150 beds together with the National Cancer Center. It was requested that joint facilities consisting of hospital service functions, diagnosis and therapeutic facilities, parking facilities and housing be designed together with the Cancer Center.

The Study Team promised to report the Saudi Arabian request to the Japanese Government, but they verified the basic design criteria of the General Hospital and the scope of the Joint-Use Facilities.

The basic layout of the land-use plan was agreed upon.

B. Conceptual Design I-2

The Study Team submitted Conceptual Design I-2 which incorporated the construction of the General Hospital

together with the Cancer Center. The scope of Joint-Use Facilities, the outline and size of each department, the site plan and the floor plan was agreed upon from among a number of different plans.

The basic design condition for each diagnosis department and the design criteria for facilities such as housing and parking were agreed upon.

Furthermore, it was approved that the completion of the Basic Design would be extended if the designs of both hospitals were to be conducted by the Japanese side.

C. Basic Design I

Discussion was conducted on the Basic Design I which was prepared based on the Conceptual Design II submitted in advance and the subsequent comments forwarded by the Saudi Arabian authorities.

The Saudi Arabian authorities requested a number of changes on the site plan and floor plan. The Survey Team prepared and submitted revised plan for most of the changes to which the Saudi Arabian authorities gave their approval. It was agreed to incorporate the Saudi Arabian authorities request regarding medical equipment, structure and equipment plan in the next report.

It was also agreed to complete the Final Basic Design at end of September 1983.

D. Final Draft of Basic Design

Discussion was conducted on the Final Draft of the Basic Design prepared on the basis of the discussion on Basic Design Draft I.

Agreement was arrived at for all basic items such as site plan, floor plan, medical equipment, structure, and equipment plan. The Saudi Arabian authorities requested that the detailed design period and construction period estimated in the project schedule be shortened. It was agreed to re-study this schedule and also the project cost.

3.2 Medical Service in Saudi Arabia

3.2.1 General

The population of Saudi Arabia, which was 7 million (census) in 1974, increased to 8.6 million (estimate) in 1980. A birth rate of 4.95% (estimate) in 1975 was 4.9% (estimate) in 1980, showing no change; but the mortality rate, which was 2.02% (estimate) in 1975, fell to 1.2% (estimate) in 1980, showing a rapid decline. The rate of population increase, therefore, rose from 2.93% (estimate) in 1975 to 3.7% (estimate) in 1980; while the average life span increased highly from 44.2 years (estimate) for men and 46.5 years (estimate) for women during 1970-1975 to 60 years (estimate) for men and 65 years (estimate) for women in 1980.

This decrease in mortality rate and increase of average life span indicate that the health and medical conditions have improved rapidly in the Kingdom and that the health level and the disease conditions are approaching those of developed countries. The big differences are that the Kingdom's birth rate and the rate of population increase are still high.

Recently infectious diseases have greatly decreased. The decline in such primary diseases as malaria, dysentery, tuberculosis and virus type hepatitis has greatly reduced the mortality rate and increased the average life span.

Cancer and circulatory organ diseases, however, have been increasing although the actual numbers are not clear since reliable statistics of diseases and mortality rates throughout the country are not readily available. At any rate, the increase of these diseases indicates that measures to counter adult diseases will become an important problem in the near future for the Kingdom of Saudi Arabia, too.

3.2.2 Cancer in Saudi Arabia

Since adequate statistics on cancer do not now exist in Saudi Arabia, the actual number of deaths due to cancer, the number of cancer patients, the types of cancer and other such characteristics are not clearly known.

However, the number of deaths due to cancer is estimated at 8,000 and the number of cancer patients is estimated at 10,000. It is also suspected that the rate of cancer of the lymphatic gland is rather large.

The important problem at the present time is to install measures to counter cancer by implementing measures such as the registration of matters relating to cancer, the dissemination of knowledge, early detection, diagnosis, therapy, medical research and education.

3.2.3 Present conditions of medical facilities

As of 1979, the number of hospitals under the jurisdiction of the Ministry of Health was 65 with a total of 12,955 beds. These hospitals include 43 general hospitals, four hospitals for obstetrics and pediatrics, three hospitals for eye diseases, seven hospitals for chest diseases, two hospitals for psychiatry, five hospitals for fever and one hospital for leprosy. Besides these hospitals, there are 462 clinics, 230 inspection centers, and 35 blood banks.*1

During 1979, the following five hospitals were newly completed and began operations in 1980.

Jizan Hospital	.....	487 beds
Hofuf Hospital	.....	487 beds
Jeddah Hospital	.....	460 beds
Medina Hospital	.....	460 beds
Al-Khobar Hospital	....	381 beds
Total	.....	2,275 beds

With the addition of these new hospitals, the total number of hospital beds in Saudi Arabia was brought up to 14,930 beds.

The National Health Council, established in the first year of the third Five-Year Development Plan starting from March 15, 1980, will determine all health policies and guide the development and improvement of all health services in Saudi Arabia.

Priority will be placed upon completing the construction and initiating the operation of hospitals, health centers and training centers that were started during the Second Plan period.

These additional institutions will provide a total of 1,150 additional beds. During the Third Plan period 36 new hospitals with a total number of 7,550 beds will be constructed. Of this latter number, 2,388 beds will come into service during the Third Plan period. Furthermore, the present hospitals will be expanded and upgraded to provide an additional 2,000 beds so that by 1985 a total of 5,538 new hospital beds will be available.*2

As can be seen from this health service plan, the Saudi Arabian government is placing top priority upon expanding medical facilities such as hospitals and health centers to provide good health service to the people of the Kingdom.

3.2.4 Training and maintaining health personnel

The training and maintenance of health personnel to increase the proportion of Saudi national health personnel, together with the upgrading of health services, is an important program of the Saudi Arabian government.

As of 1979, the number of health personnel engaged in the 65 hospitals under the jurisdiction of the Ministry of Health was 3,312 doctors, 8,094 nurses and 212 pharmacists and para-medical personnel.*1

In Saudi Arabia there are over 5,000 doctors of whom about 10% are Saudi nationals, and over 10,000 health personnel of whom about 20% are Saudi nationals. The percentage of Saudi national nurses is especially low, being only 7% of the total.

To expand the health services in Saudi Arabia, at present it is necessary to recruit and replace health personnel from expatriates coming from the Arab countries, Europe, the U.S.A., the Indian sub-continent and the Far East.

However, other problems also exist due to the widely diverse cultures and differing levels of education among the expatriates. These problems arise mainly because of these newcomers' inadequate knowledge of the health and disease situation and the socio-economic and cultural background of Saudi Arabia.

From 1969 to 1980, four Medical Schools, a Faculty of Dentistry, a Faculty of Health Sciences, a Faculty of Veterinary Medicine and a Department of Hospital Administration were established. In addition, three new health institutes to train male medical personnel and seven nursing schools to train female nurses now exist.

In order to increase Saudi national health personnel, the Third Five-Year Development Plan places priority on the completion and expansion of university medical training centers at the Riyadh University, the King Abdul Aziz University, and the King Faisal University.*1

Furthermore, the establishment of two new health training institutes and five new nurse training institutes in Medina and Abha are being planned for; while 250 nationals will be sent abroad on scholarships to study medical sciences.

*1 Saudi Arabia Yearbook 1981 - The Research & Publishing House Sineh Fil-Lebanon

*2 Summary of Saudi Arabian Third Five Year Development Plan Second Edition 1982 - English Books Published by Tihama

3.3 Site Conditions

3.3.1 General

Jeddah, the location of the National Cancer Center, is a commercial center in the Kingdom of Saudi Arabia. It is a port city situated about halfway along the Red Sea's eastern coast (lat. 21°30'N, long. 39°12'E). It is the principal port of entry for pilgrims to Mecca.

A port city of great age, Jeddah is growing rapidly with an estimated population of 1.6 million. The city is expanding northward and southward. Although the environment is harsh with a mixture of desert and coastal weather, careful planning is being done to make it more tolerable by planting trees along roads and by building parks.

3.3.2 Project location

The project site is located near the former international airport, about six kilometers east of the center of Jeddah. The site has an area of approximately 140,000 m² and faces the Shara Al Matar Al Qadim Road in the west.

The site is presently a barren land covered with fine yellowish-brown sand with no plants or bushes. The differences of ground levels in the site area is small, being within 1.00 m. In general, the site conditions are favorable for the construction of this project.

3.3.3 Geological conditions

According to the soil investigation report (by a French Consultant) of the project site provided to us by the Saudi Arabian authorities, the geological conditions are as follows:

- 0.00 to -0.10 m: fine to very fine powdery sand
- 0.10 to -0.40 m: fine to very fine greyish sand slightly clayey
- 0.40 to -1.20 m: brown sand slightly clayey with gravel, pebbles and rocks, very compact and difficult to excavate by shovel and pickaxe.

The resistance to dynamic penetration is in the region of or greater than 200 bars below the depth of 0.50 to 0.70 m.

3.3.4 Climatic conditions

The climatic conditions are a mixture of desert and coastal weather with high temperature, high humidity but low precipitation.

The average temperature throughout the year is 28°C. The coldest month is January when the average temperature is 23°C, and the hottest month is June when the average temperature is 30°C.

The average humidity throughout the year is 60%. The humidity is lowest in July, with an average humidity of 55%, and the humidity is highest in September, with an average humidity of 68%.

The average annual precipitation is 62.0 mm. January has the highest precipitation with 20 mm and June, the lowest, with August having only a trace of precipitation.

The prevailing wind during December through March is from the north, and the prevailing wind is from the northwest during April through November. The average wind speed is 7 knots but an extreme wind speed of 48 knots has been recorded in February 1971.

A seismic zone exists in the center of the Red Sea and seismic records of 6.3 and 5.8 magnitudes 185 km from Jeddah have been recorded respectively on March 11 and May 17, 1967.

Meteorological data is provided in an attached Appendix.

3.3.5 Availability of utilities

A. Water supply (fresh water)

The data on water supply, confirmed by Project Director General Mohammed A. Al-Orinan, Water Works Department, Ministry of Agriculture & Water (M.A.W.), Jeddah, are as follows:

1) Capacity of water supply

Hospital	800 m ³ /day (approx.)
Housing	500 m ³ /day (approx.)
Total	1,300 m ³ /day (approx.)

2) Interface of construction

The M.A.W. will provide the construction up to and including the water meter with stop valve.

3) Connection charge

SR 150 lump sum charge

4) Analysis data of fresh water is shown in an attached Appendix.

B. Public drainage

Sewage and storm water lines are not available at the project site. This was confirmed by Mr. Mohd Abukwaik Director of Sewage Department, Water Supply and Sewage Treatment in Western Region.

Jeddah has a plan to start a public sewage work in the western region of the city after two years, but a sewage treatment facility will be required for this project before then.

C. Electric power supply for this project

The electric power supply conditions confirmed by Chief Engineer Mr. Subhan Ahmed of the Saudi Consolidated Electricity Company, Western Region, are as follows:

1) Capacity of electric power

Hospital	20 MVA (approx.)
Housing	30 MVA (approx.)
Total	50 MVA (approx.)

2) Voltage, phase and frequency

3 ϕ 3 W, 13.8 kV, 60 Hz

3) Electric power supply will be available three years from now.

4) Interface of the construction

The Saudi Consolidated Electricity Company will provide construction up to and including the receiving breaker and meter.

MOH will prepare the facility for breaker and meter.

5) Connection charge

SR 40/KVA

- 6) Capacity of the short-circuit current
500 MVA

D. Telephone lines

The conditions of the telephone line connection, confirmed by Technical Engineer Mr. Samir Matbouly, Saudi Telephone, Jeddah District, are as follows:

1) Number of telephone lines

Hospital	100 p (approx.)
Housing	1,000 p (approx.)
Total	1,100 p (approx.)

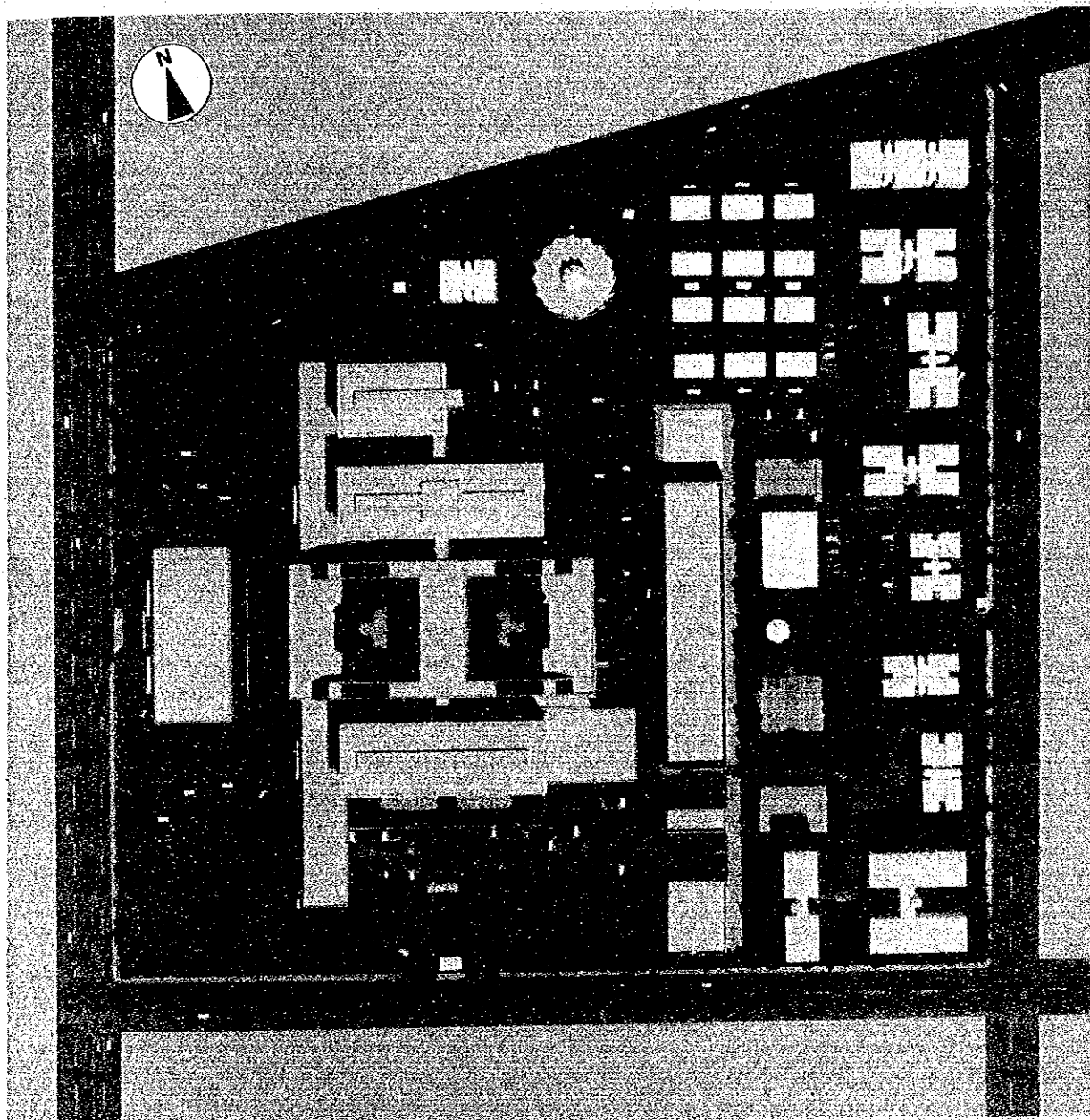
- 2) Telephone lines will be available three years from now.

3) Interface of construction

The Saudi Telephone will provide construction up to and including the main distributor fixture.

E. Gas

Jeddah has no public gas supply, so almost all buildings generally rely on butane-gas cylinders.



PART 2 – BASIC DESIGN

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PART 2 — BASIC DESIGN

1. DESIGN REQUIREMENTS

1.1 Basic Concepts for the Cancer Center and the Joint-Use Facilities with the General Hospital

A. Cancer Center

- 1) The Cancer Center must provide specialized diagnostic and therapeutic services.
- 2) The Cancer Center must also provide clinical research, staff training and information services.

B. Joint-Use Facilities

The savings through centralization and sharing are the basic concept for the joint-use of facilities as follows:

1) Administration

- 1-1 Staff Saving
- 1-2 Centralized Training
- 1-3 Centralized Information
- 1-4 Centralized Purchasing of Materials and Supplies
- 1-5 Centralized Management

2) Facilities Maintenance and Operation

- 2-1 Saving in Maintenance Costs
- 2-2 Saving in Operational Costs

3) Facilities and Equipment

- 3-1 Saving in Construction Costs
- 3-2 Saving in Equipment Costs

1.2 Methods of Implementing the Plan

A. Hospital community

- (a) The block plans for the buildings, the traffic plan, and the landscaping are designed to harmonize with the surrounding environment and to utilize the 138,703 m² site most effectively.
- b) The mosque, the hospital, the housing, the recreational facilities, the parking, the utilities center, the water supply, the drainage system, and the water treatment facilities are all provided for in the plans.

B. Comprehensive functions

- (a) Plans are for the diagnostic, clinical research, staff training, public health service, and cancer information services to be housed in one building.
- (b) While the Cancer Center and the General Hospital will maintain separate clinical functions, the Diagnostic, Therapeutic, and other departments lending themselves to common usage are planned for joint-use by both institutions.
- (c) Administration, Services, and Utilities are planned for joint-use; while separate housing for senior staff and separate parking for patients and staff are to be provided.

C. Future extensions

- (a) Plans for the future extensions of the Wards and the Research Center have been made to be consistent with their respective functions and to harmonize with the overall building designs.
- (b) Future extensions of the Radiotherapy, Radiodiagnosis, Endoscopy, and Rehabilitation Departments are planned for the east side of the hospital complex.
- (c) The increased capacity of the mechanical system to accommodate the future extensions of the various departments has been included in the plans for the Utilities Center. And plans have been made for the extension of conduits supplying energy to the various departmental additions.

D. Efficient facilities

- (a) The joint-use departments for the Cancer Center and the General Hospital will be located in the central part of the hospital complex, and the various other departments will be located on either side of the joint-use section, in their respective institutions.
- (b) An uncovered extension connected to the first floor, providing additional parking in the front of the hospital complex, will also allow for separate circulations for patients, staff, emergency patients, and materials.
- (c) Departments having related functions and located in close vicinity on the same floor, or located in the same area on different floors, will be connected by elevators or dumbwaiters.
- (e) The Utilities Center will be housed in a separate building. The placement of utilities space in the hospital buildings will be in the same area on each floor to provide for the most efficient mechanical system.

E. Comfortable environment

- (a) To minimize sun radiation, the hospital buildings will be placed on an east-west axis.
- (b) For protection from the severe weather conditions (sun radiation and sandstorms), trees will be planted in open spaces and on rooftops.
- (c) Courtyards and atriums will be located in various places to provide atmospheric variety in the hospital.
- (d) To provide protection from sun radiation, an Islamic style open corridor will form the facade of the hospital.

F. Religion and customs of Saudi Arabia

- (a) The mosque will be placed near the main entrance of the complex. A praying room for in-patients will be available in every ward floor.
- (b) Separate waiting rooms for men and women will be provided.
- (c) The Housing Zone will have clearly separated Villa, and Married, Male, and Female housing.
- (d) The outer design of the hospital will be based on a modernized Islamic style.

G. Maintenance and operations

- (a) For clarity in the duties and responsibilities of the hospital, as distinguished from the medical, operations, a dual administrative organization is being proposed.
- (b) Various kinds of equipment of high quality and efficiency will be provided.
- (c) Mechanical and electrical systems are planned to result in savings in resources, energy and manpower.
- (d) A computerized informational system will be utilized for administrative and medical efficiency.

H. Safety facilities

- (a) Plans have been made for fire-resistant materials and facilities, fire-fighting, and safe evacuation in case of fire.
- (b) Clean and septic zones are separated to prevent contamination.

(c) The site area will be fenced in and gatehouses will be installed to provide for security checks.

(d) Special waste treatment facilities are planned for to protect the hospital and the surrounding environment from medical, human waste, and radioactive pollution.

(e) In the structural design of the buildings appropriate safety features (for example, earthquake resistant) will be utilized.

1.3 Conditions for the Design

1.3.1 Scope of the basic design

The scope of our work is the Cancer Center, the Joint-Use Facilities, the Mosque, the Housing and other related facilities. To be sure, a study of the General Hospital plans has also been necessary to complete our plans for the Cancer Center and Joint-Use Facilities.

A. Design conditions

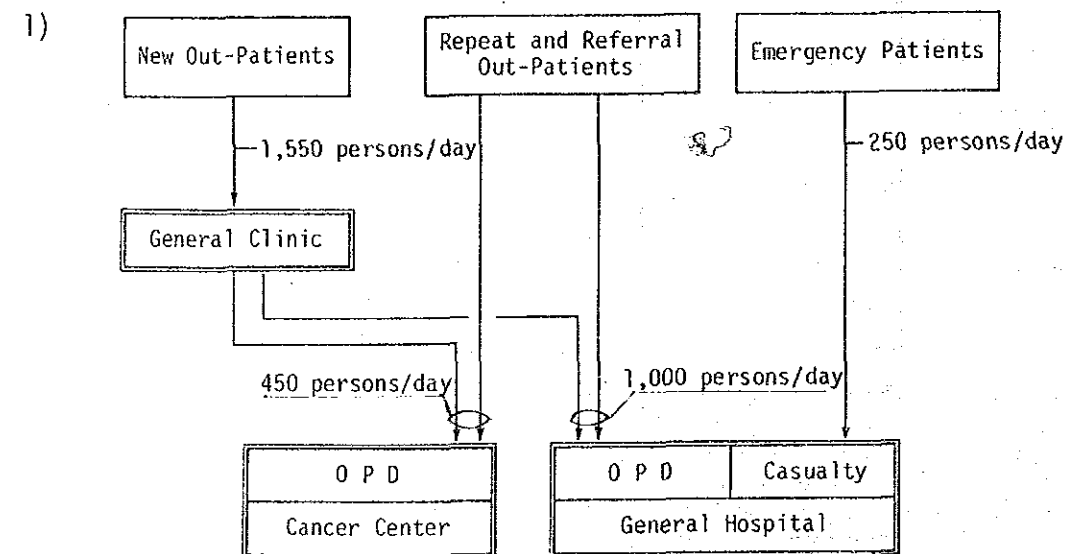
- 1) Project site location: Close to the east side of the former Jeddah International Airport (see maps.)
- 2) Site area: 138,703 m²
- 3) Number of beds:

Cancer Center	200 beds (future extension - 100 beds)
General Hospital	350 beds (future extension - 150 beds)
- 4) Accommodation capacity (Cancer Center + General Hospital):

In-patients	550 persons (final 800)
Out-patients ¹⁾	3,000
Emergency patients	250
Hospital personnel ²⁾	2,000
Visitors	2,000 estimated

B. Scope

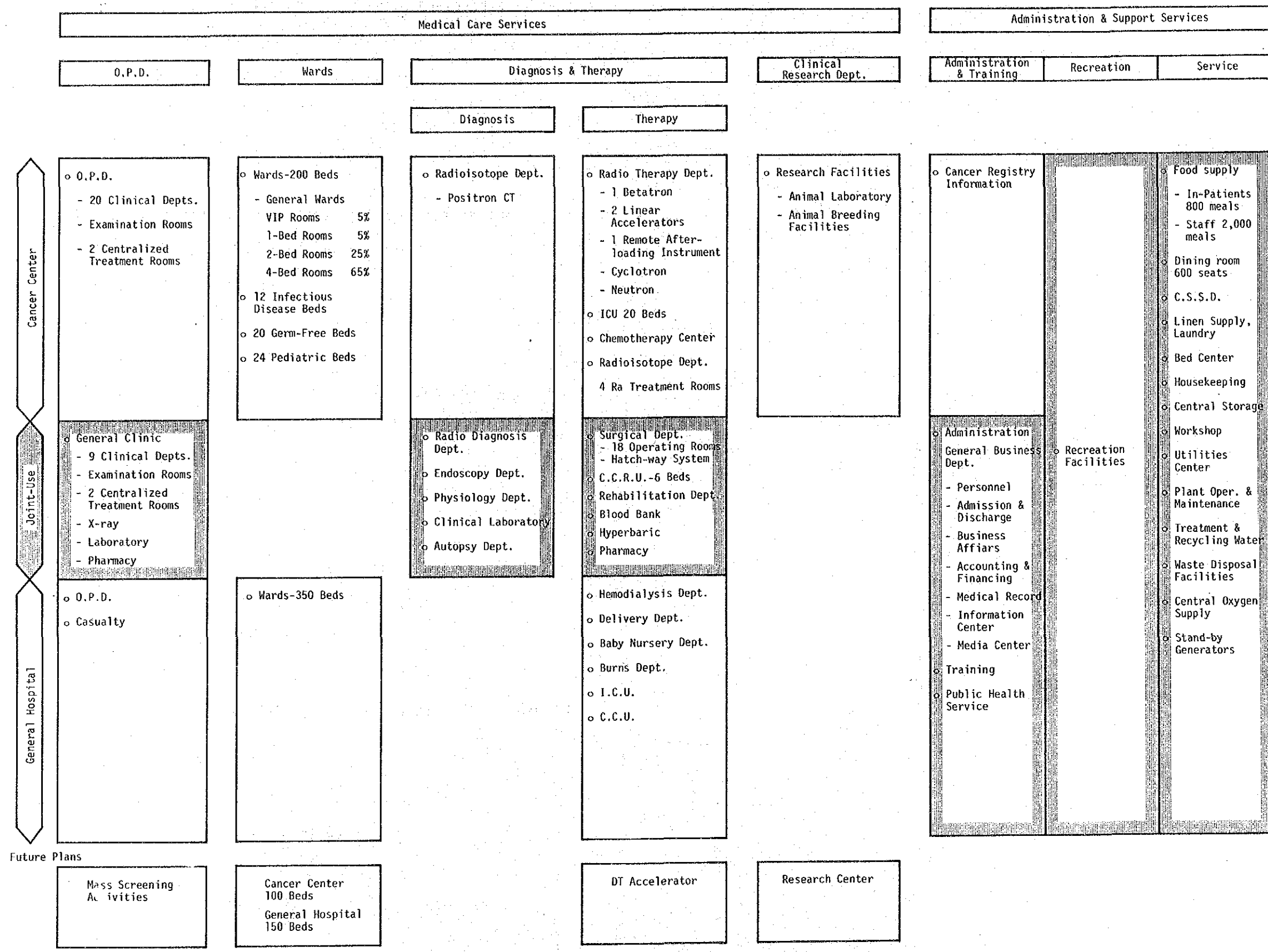
- 1) Facilities
 - (a) Cancer Center
 - (b) Joint-Use Facilities
 - i) Service facilities
 - ii) Parts of medical facilities
 - iii) Administration facilities
 - (c) Mosque
 - (d) Housing
 - (e) Parking: Number of stalls - approx. 2,500
 - (f) Other related facilities
- 2) Medical equipment
- 3) Management and operating system
- 4) Project schedule
- 5) Project costs



2)

Medical staff	1,000 persons
Doctors	130
Nurses	620
Para-medical staff	250
Administration	300
Energy & maintenance	130
Service	640
Total	2,070 persons

1.3.2 General requirements



Note: This diagram is based on the "Basic Concept for the National Cancer Center in the Kingdom of Saudi Arabia," the "Confirmation Items," and on the discussions of the Conceptual Design I, I-2, Draft Basic Design I and Final Draft Basic Design meetings held in Saudi Arabia.

1.3.3 Applicable codes and standards

The following codes and standards listed or referred to in this report have been used as references; the latest edition of these standards and codes will be applied to the design:

Japanese Architectural Standard Specifications (JASS)

Japanese Industrial Standards (JIS)

Japanese Fire Regulations (JFR)

Japan Welder Regulations (JWR)

Standards of the Japan Electrical Manufacturers' Association (JEM)

Standards of Japanese Electrotechnical Committee (JEC)

Broadcasting Technical Standards (BTS)

Japan National Fire Boards (JNFB)

Japanese Cable Maker's Association Standards (JCS)

Heating Air Conditioning and Sanitary Standards in Japan (HASS)

L.P. Gas Law and High Pressure Gas Regulations in Japan

National Electric Code (NEC)

National Fire Protection Association Codes (NFPA)

Uniform Building Code (UBC)

American Concrete Institute Standards for Reinforced Concrete (ACIS)

American Institute of Steel Construction Standards (AISC)

American National Standards Institute (ANSI)

American Society for Testing Materials Standards (ASTM)

American Society of Heating Refrigerating and Air Conditioning (ASHRAE)
Engineers Handbook

American Welding Society (AWS)

Saudi Arabian Standards

International Organization for Standard (ISO)

British Standards (BS)

Deutscher Normenausschuss, GERMANY (DIN)

Norme Française (NF)

2. ARCHITECTURAL PLANNING

2.1 Site Planning

2.1.1 Environmental planning

A. Landscape design (Figure 2-1)

1) Design policies

Major policies for landscaping are as follows:

- (a) The landscape in the hospital premises will be designed to ameliorate the harsh desert environment: e.g., greenery along the periphery for environmental modification.
- (b) The space design will aim at comfortable and restful effects befitting the hospital functions: e.g., creation of a verdant and tranquil milieu; lounging footpaths and areas surrounded by lawns and flower plots; and visual effects of cheerfulness and cleanliness.
- (c) Landscaping will be done to reduce maintenance and operation costs as far as possible: e.g., simpler planting designs and composition, and extensive use of planter boxes for easier irrigation and replanting.

2) Design specifications for greens

- (a) Periphery of premise
Tall trees of 5 to 6 m will be densely line-planted and the walls will be covered by climbing creepers.
- (b) Residential zone
Lawns and small flower gardens will be provided around residential houses and a line of palms will be planted as a landmark axis across the center of the zone.
- (c) Periphery of parking areas
Shade trees will be planted around the areas and paving will be done with precast concrete blocks with lawn patches.
- (d) Peripheries of the rooftop of the parking building will be provided with shrubs in planter boxes.
- (e) Roof garden
A lawned court with flower plots will be provided for lounging.
- (f) Wall face
Walls in the residential zones will be covered by climbing creepers.
- (g) Others
The entire ground surface will be, in principle, provided with green covers.

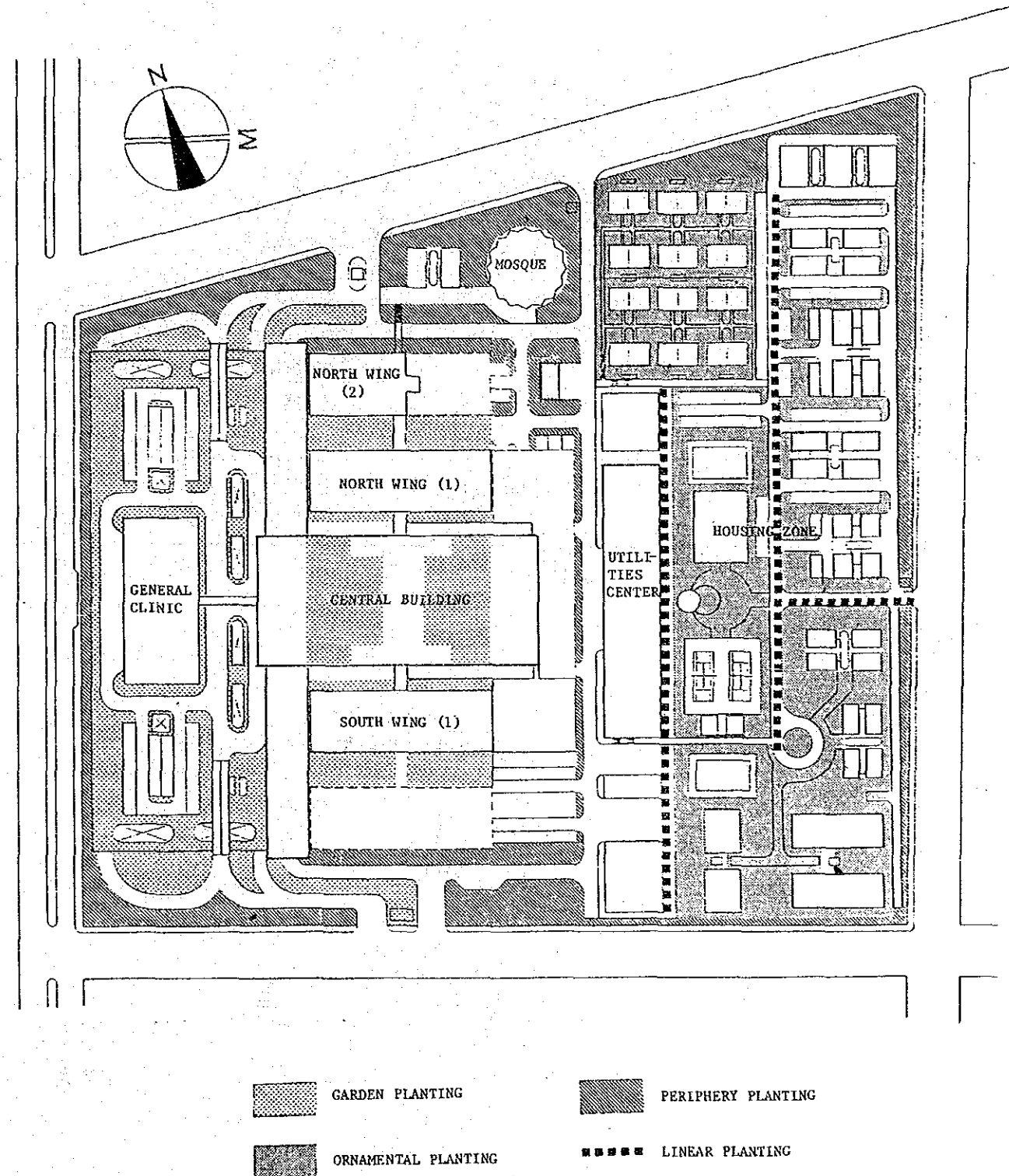


Figure 2-1. Landscape Plan

B. Sun control

- (a) The basic axis for the buildings will be east-west.
- (b) Shades cast by the buildings are utilized for sun control (see Figures 2-2 and 2-3).
- (c) Sun control by trees and plants
 - As many as possible shade trees will be planted to increase green covers.
 - Ground-cover plants will be provided in roof gardens.
 - Precast concrete blocks with lawn patches will be used for the pavement to avoid solar heat reflection

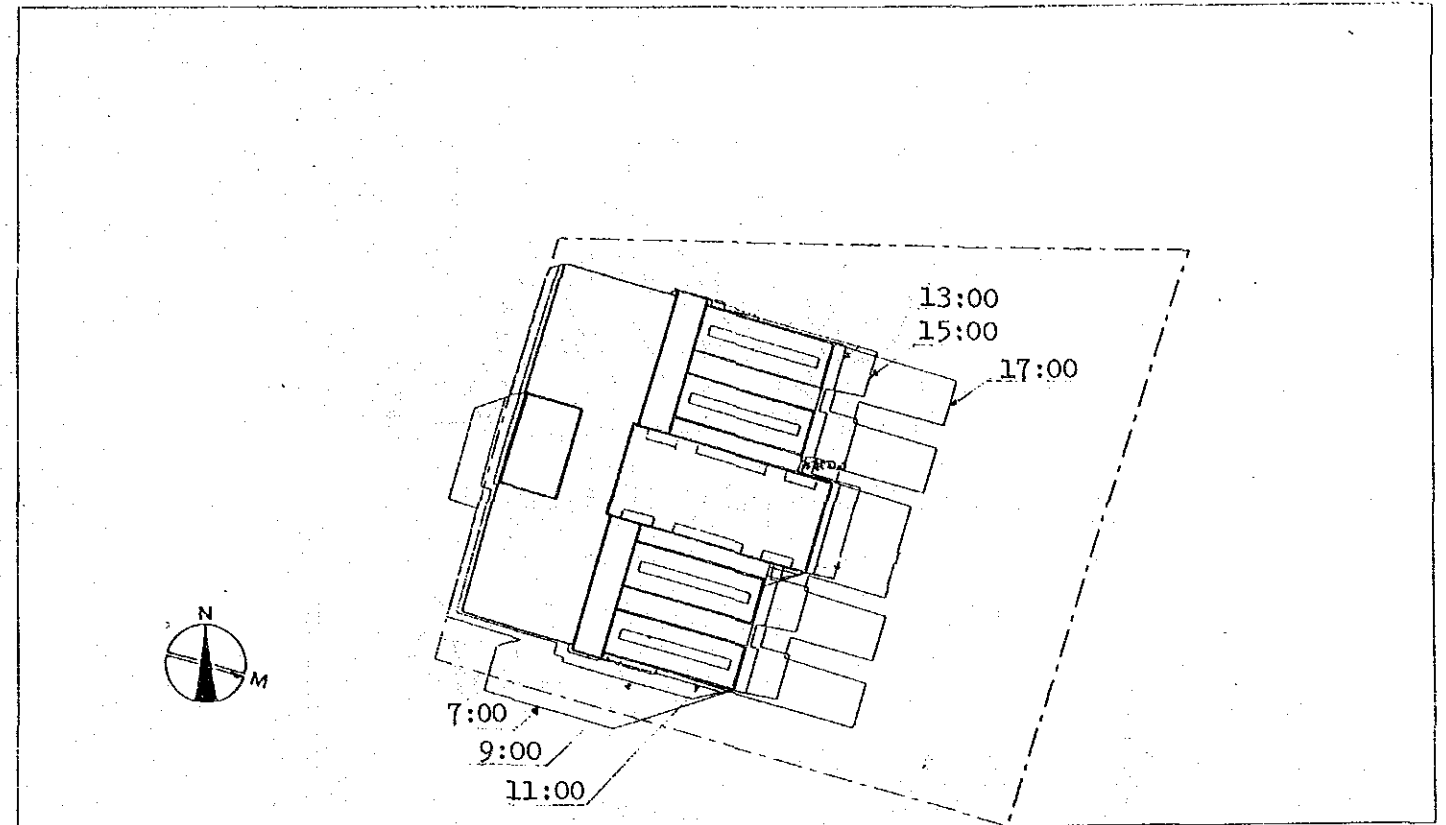


Figure 2-2 Building Shadows (Summer Solstice)

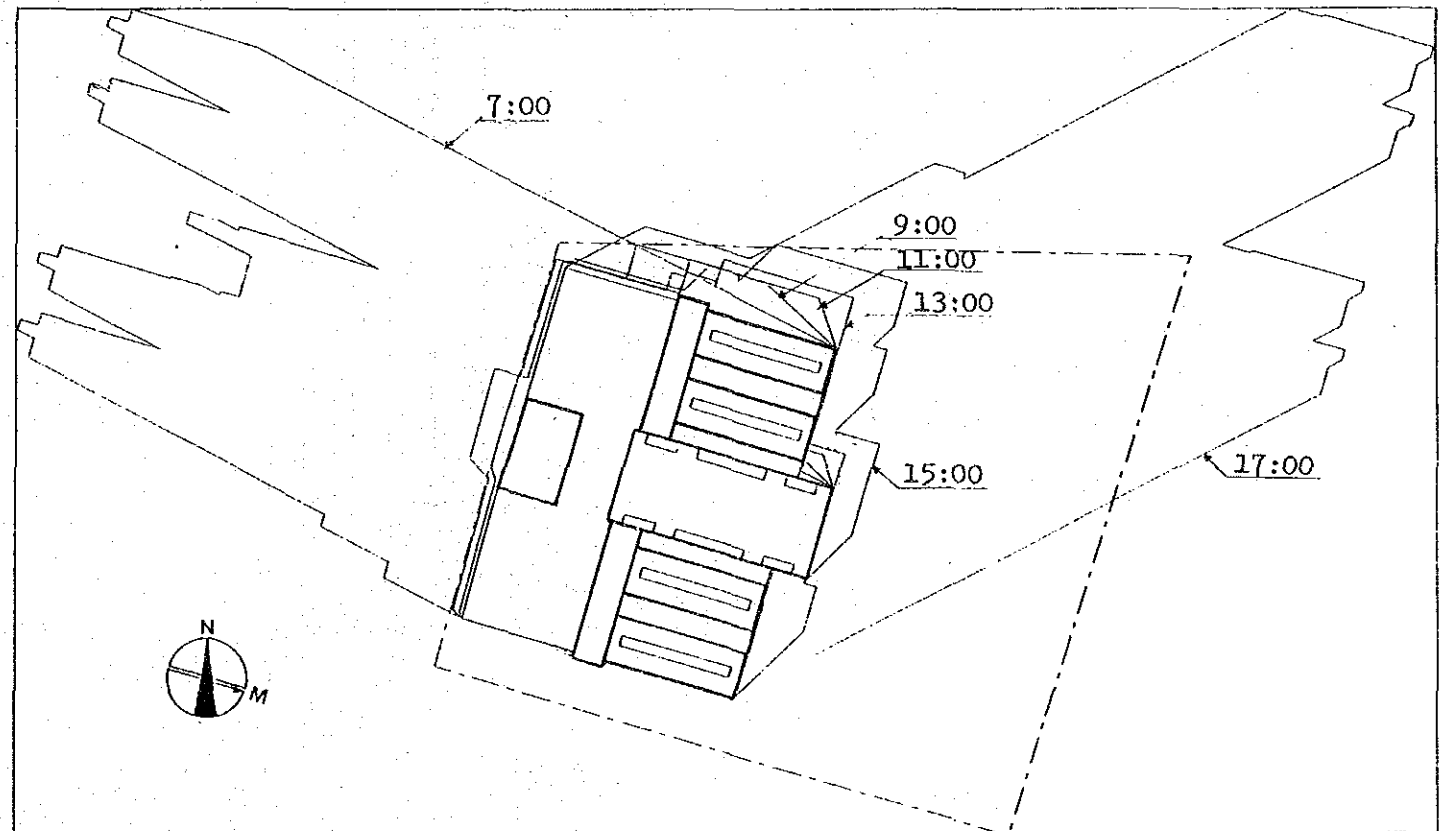


Figure 2-3 Building Shadows (Winter Solstice)

C. Sand control (Figure 2-5)

- (a) Every entrance to the buildings will be provided with a wind-screen room.
- (b) Air-tight fittings will be employed.
- (c) The periphery of the premise will be provided with concrete walls.
- (d) Outside air inlets will be provided with sand trap filters.
- (e) Parking areas and paths within the premise will be paved with asphalt.
- (f) A green belt will be provided just inside the outer walls.
- (g) Sprinklers will be provided for dust control.

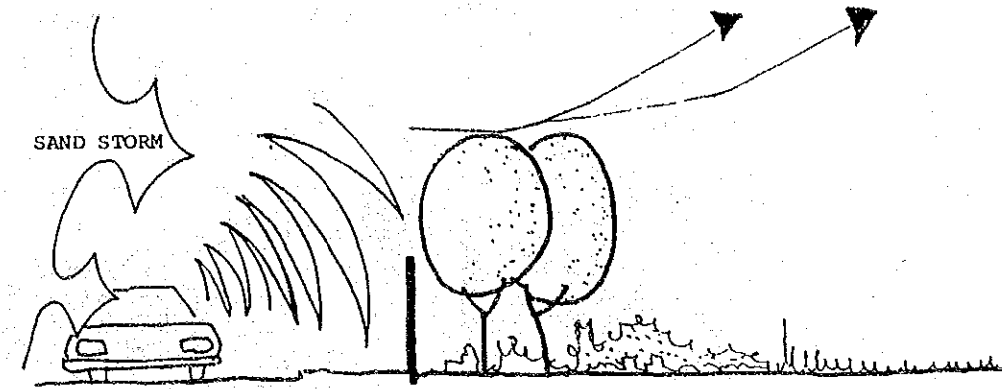


Figure 2-5 Walls and Plants for Sand Control

D. Water control (Figure 2-4)

The drainage system will control storm waters in several ways.

The ground level of the periphery of the premise will be elevated to prevent the inflow of storm waters collected on the encircling public road during heavy rains (assumed maximum rainfall of 50 mm/h).

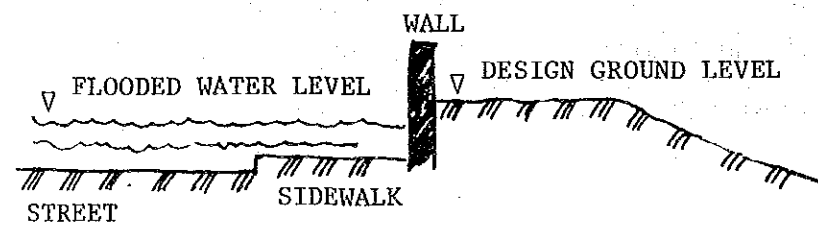


Figure 2-4 Storm Water Control

The storm waters of the residential zone will be led to the conduit under the main passageway and let out to the drainage culvert of the public road. The storm waters of the hospital zone will be led to the seepage pits beside the parking building, and the east side of the parking area. In case of an overflow, the storm waters will be force-drained to the drainage culvert of the public road.

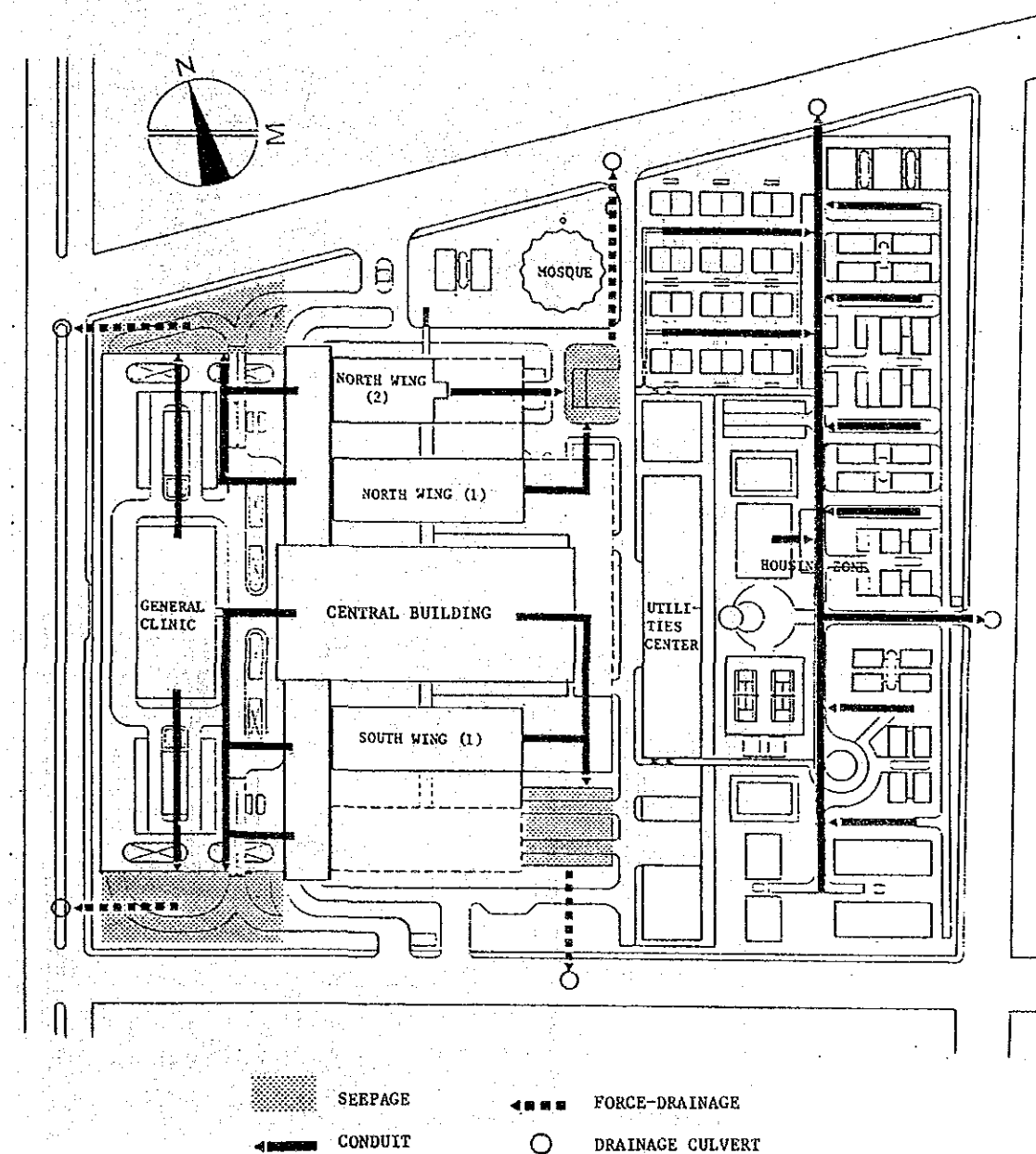


Figure 2-6 Site Drainage Plan

2.1.2 Site planning and circulation (Figure 2-7)

- (a) The main entrance gate will face the north-side public road, approximately 150 m from the crossroads. The main exit gate will face the south-side public road.
- (b) Driveways within the hospital complex will be planned for one-way traffic.
- (c) Service driveways will provide access to all the entrances of the buildings.
- (d) The front-plaza to the hospital entrance will be five-storied, with the top level (first floor) for out-patients and the lower level serving as an underground parking area.
- (e) The entrances to the Cancer Center and the General Hospital will be located on the side facing the north-south road. The entrance to the General Clinic will be located on the west side, facing the road branching off from the road, above.
- (f) The mosque will be located near the main entrance gate to provide access from both the hospital and housing zones.
- (g) The housing zone will be in the eastern part of the site with the main gate facing the east side public road.
- (h) The utilities center will be located between the hospital and the housing zones, with the elevated water tower (60 m) as its landmark.
- (i) A sculpted sign post will be placed in front of the out-patients' entrance.
- (j) Parking spaces will be provided as shown in Table 2-1.
- (k) A pedestrian entrance facing the public road to the west, where a bus terminal will probably be located, will provide a passageway to the General Clinic, the Cancer Center, and the General Hospital.

Table 2-1 Distribution of Parking Lots

	Hospital Zone		Housing Zone	Total
	Parking Bldg.	Ground Level	Ground Level	
Out-patients & visitors	1,200	—	—	1,200
Hospital Personnel	1,058	—	—	1,058
Service	—	213	—	213
Casualty	—	52	—	52
Resident Personnel	—	—	262	262
Total	2,258	265	262	2,785

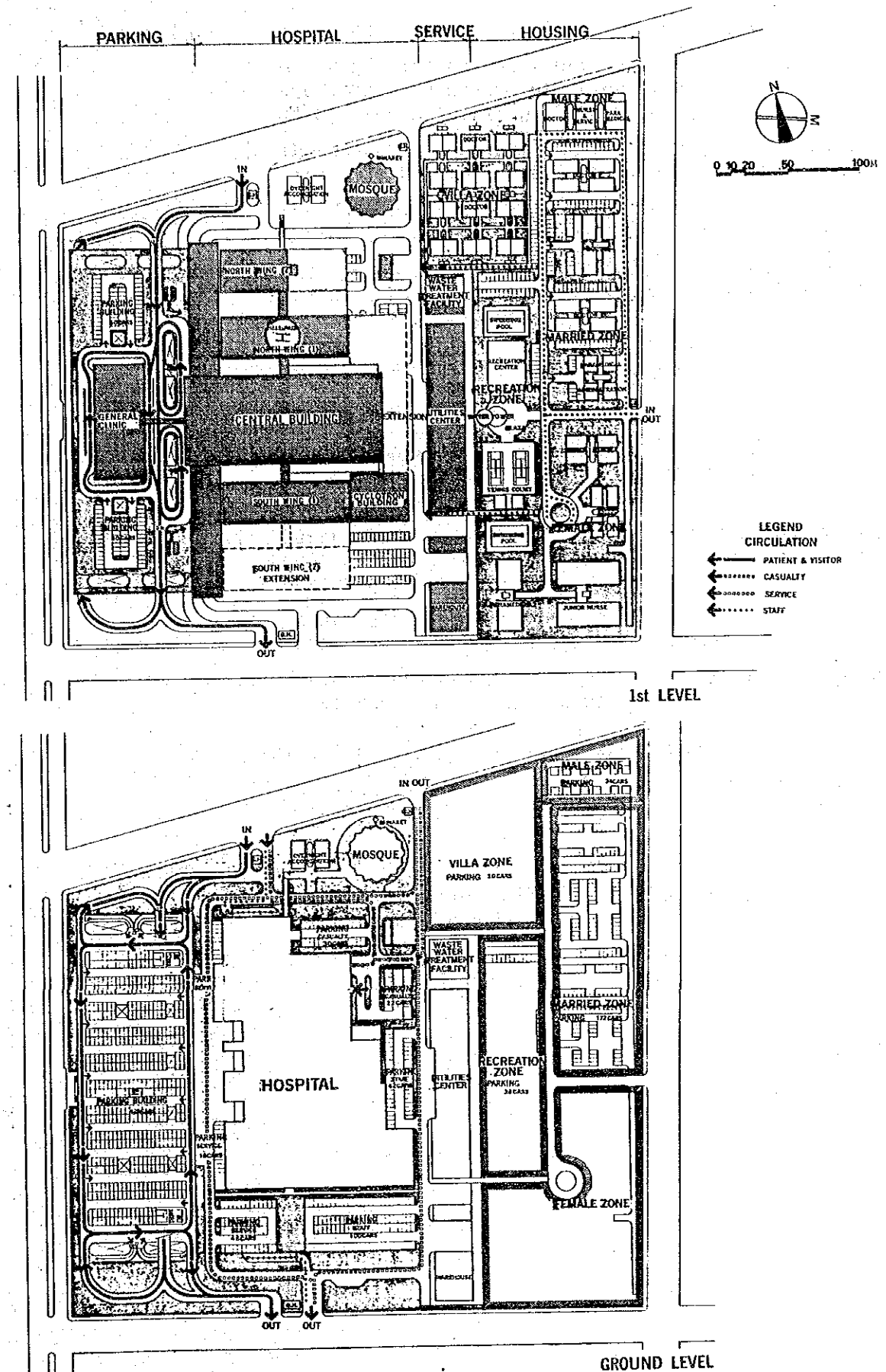


Figure 2-7 Exterior Circulation

2.2 Safety and Security

A. Design Policy

- (a) Measures to prevent disaster will be established.
- (b) Effective measures will be developed for disaster evacuation and rescue.
- (c) Adequate measures will be taken to prevent infection within the hospital and pollution of the environment.
- (d) The hospital complex will be planned for easy implementation of safety and security measures.

B. Safety and security design

1) Security Center

- i) A security center will be provided to observe the operation of machinery and equipment, supervise disaster activities, watch the entrances for trespassers, etc.

2) Security measures

(a) Security measures for fire

- i) A number of fireproof sectors will be provided in the buildings.
- ii) Different types of fire extinguishing systems to meet various purposes and situations will be provided. Sufficient water supply will also be arranged for fire fighting.
- iii) Fire resistant materials will be used for interior and exterior finishes.

(b) Security measures for earthquakes

- i) The structural system of all buildings and facilities will be planned to withstand earthquakes.
- ii) The buildings will be provided with expansion joints to keep each section within planned sizes.

3) Measures for evacuation and rescue

- i) Evacuation routes in two directions and escape stairways where necessary will be provided.
- ii) Emergency lamps will be provided at every exit and along escape routes to enable speedy and safe evacuation. A fire alarm and a smoke exhausting system will also be installed.

4) Infection prevention measures within the hospital

- i) Air-conditioning and ventilation system divided into sections to prevent infection by air circulation within the hospital will be planned.
- ii) The operating department, ICU, CCRU, CSSD, bed center, etc. will be separated into clean zone and used zones.
- iii) Separate elevators and dumbwaiters will be provided for clean and soiled items.
- iv) The system will be planned to control research animals, bacteria, etc. to prevent infection in the hospital from stray animals.

5) Measures to prevent environmental pollution

(a) Protection against radiation

- i) Protection will be provided to limit radiation leakage from rooms using radiation to below safety levels.
- ii) Departments using radiation will be provided with control zones to restrict unauthorized persons from entering the area.
- iii) Water, air, and materials polluted by RI will be treated separately to prevent environmental pollution.
- iv) Various monitors will be provided to constantly watch RI storage and leakage condition.

(b) Treatment of wastes, drainage and sewage

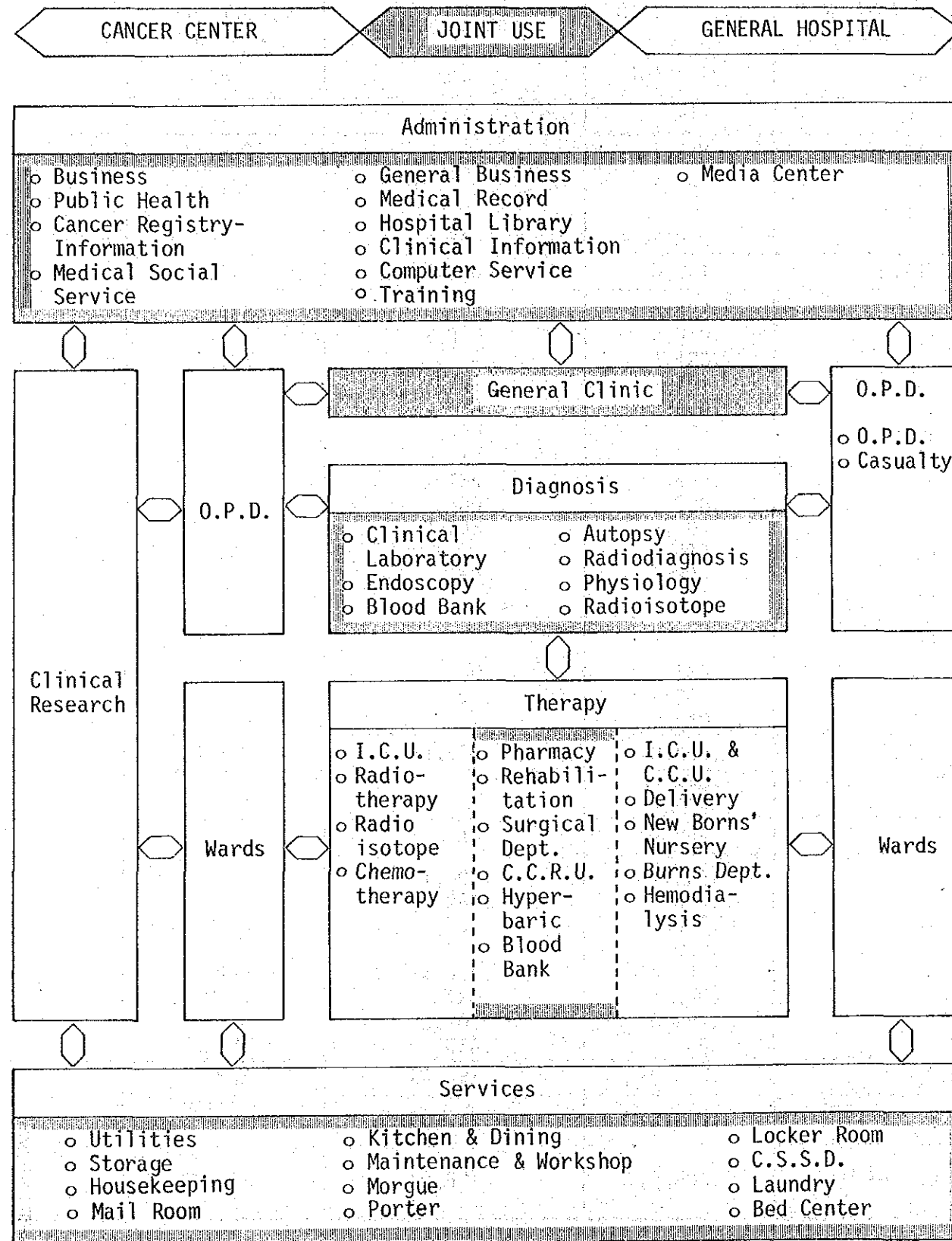
- i) Facilities to treat wastes, drainage and sewage originating within the complex will be provided.

(c) Ventilation of parking building

- i) Dry area and well will be provided inside the parking building to introduce outside air.
- ii) The supply of fresh air and exhaust air will be performed mechanically.

2.3 Hospital Building Design

2.3.1 Functional diagram



Legend: Departments for joint use

2.2.2 Distribution of floor space for each department

Department		Cancer Center 200 Beds	Joint-Use Dept.	C.C. + J.U.	General Hospital 350 Beds	Total	Remarks
		(A)	(B)	(A) + (B)	(C)	(A) + (B) + (C)	
		m ²	m ²	m ²	m ²	m ²	
Wards		11,542.	-	11,542.	18,845.	30,387.	
O.P.D.	O.P.D.	2,131.	-	2,131.	3,183.	5,314.	
	Casualty	-	-	-	2,569.	2,569.	
	General Clinic	-	3,240.	3,240.	-	3,240.	
	Sub Total	2,131.	3,240.	5,371.	5,752.	11,123.	
Diagnosis & Therapy	Radiotherapy	3,428.	-	3,428.	-	3,428.	
	Radiodiagnosis	-	2,079.	2,079.	-	2,079.	
	Radioisotope	1,123.	-	1,123.	-	1,123.	
	Clinical Laboratory	-	2,751.	2,751.	-	2,751.	
	Physiology	-	674.	674.	-	674.	
	Endoscopy	-	943.	943.	-	943.	
	Blood Bank	-	322.	322.	-	322.	
	Pharmacy	-	1,484.	1,484.	-	1,484.	
	Rehabilitation	-	1,386.	1,386.	-	1,386.	
	Surgical Dept.	-	3,703.	3,703.	-	3,703.	
	I.C.U., C.C.U.	1,512.	-	1,512.	1,164.	2,676.	
	C.C.R.U.	-	348.	348.	-	348.	
	Hemodialysis	-	-	-	217.	217.	
	Delivery	-	-	-	1,466.	1,466.	
	Baby Nursery	-	-	-	-	-	
Autopsy	-	560.	560.	-	560.		
Hyperbaric	-	284.	284.	-	284.		
Chemotherapy	49.	-	49.	-	49.		
	Sub Total	6,112.	14,534.	20,646.	2,847.	23,493.	
Clinical Research		1,151.	-	1,151.	-	1,151.	
Administration		-	7,946.	7,946.	-	7,946.	
Services	C.S.S.D. & Laundry	-	1,869.	1,869.	-	1,869.	
	Kitchen	-	1,884.	1,884.	-	1,884.	
	Dining	-	1,092.	1,092.	-	1,092.	
	Locker Room	-	940.	940.	-	940.	
	Utilities	532.	*1 14,015.	14,547.	886.	15,432.	
	Maintenance & Workshop	-	420.	420.	-	420.	
	Storage	-	3,901.	3,901.	-	3,901.	
	Morgue	-	476.	476.	-	476.	
	Sub Total	532.	24,597.	25,129.	886.	26,015.	
Recreation Facilities		-	2,214.	2,214.	-	2,214.	
Total		21,468.	52,531.	73,999.	28,330.	102,329.	(186.1 m ² /bed)

*1 The space for the Utilities Center includes future extension.

2.3.3 Departmental block planning

A. Block planning (Figure 2-8 and 2-9)

1) Zoning

- (a) The Diagnostic and Therapeutic Departments will be located in the central part of the Cancer Center and the General Hospital.
- (b) The Clinical Department for out-patients will be placed on the first floor.
- (c) The Wards of the Cancer Center and the General Hospital will be located on both sides of the Diagnostic and the Therapeutic Departments.
- (d) The Administration Department will be located on both sides of the Diagnostic and Therapeutic Departments.
- (e) The Service Department will be located on the ground floor.
- (f) The Utilities Center and the General Clinic will be separately located.

Utilities Center: designed to enable centralized control of various equipment and devices

General Clinic: separate access routes for new out-patients.

2) Interior circulation

- (a) In order to separate access routes, the entrances for out-patients and in-patients will be provided on the first floor, while separate entrances will be provided for emergency casualties, hospital supplies, and hospital personnel on the basement and ground floors.
- (b) A central north-south corridor will be provided to integrally connect the various departments, each with its own sub-corridors. The central north-south corridors on all floors will be connected by elevators.
- (c) Two emergency escape routes within the hospital complex will be arranged.

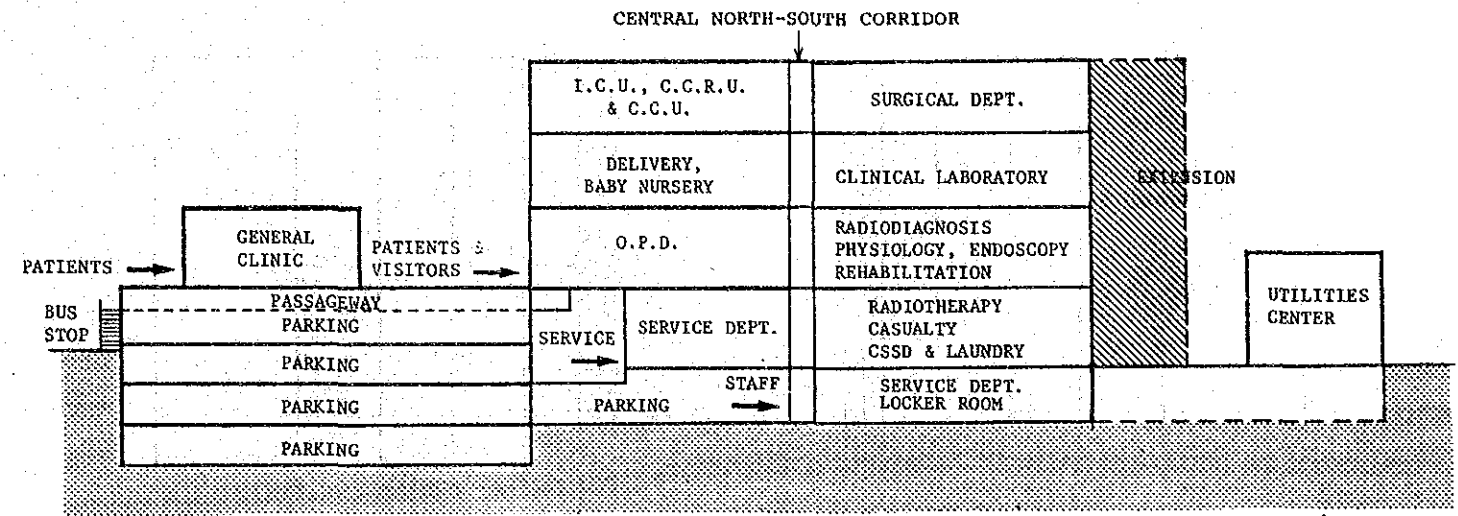


Figure 2-8 Locations of Various Departments

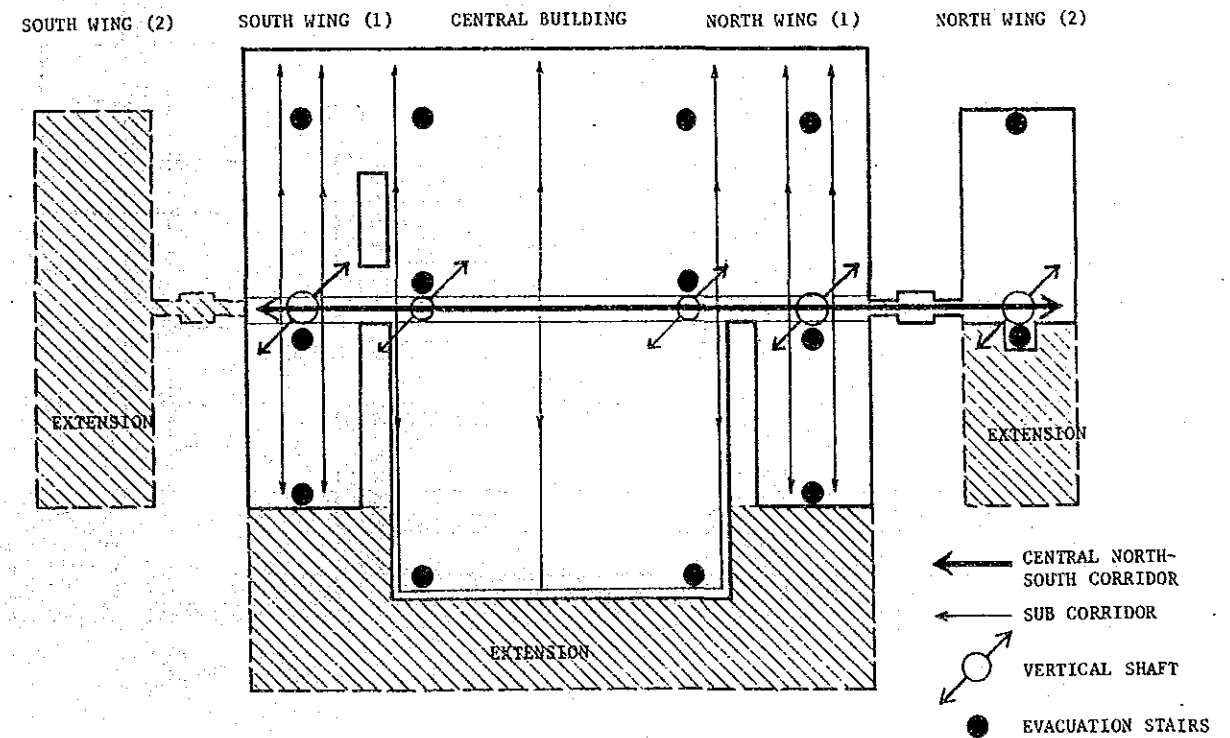


Figure 2-9 Interior Circulation