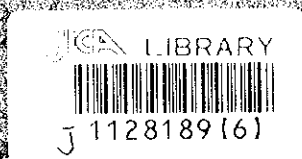


No.   

**BASIC DESIGN STUDY REPORT  
ON  
THE REHABILITATION PROJECT  
OF  
CAIRO UNIVERSITY PEDIATRIC HOSPITAL  
IN  
THE ARAB REPUBLIC OF EGYPT**

BASIC DESIGN STUDY REPORT ON THE REHABILITATION PROJECT OF  
CAIRO UNIVERSITY PEDIATRIC HOSPITAL IN THE ARAB REPUBLIC OF EGYPT



**AUGUST, 1995**

**JAPAN INTERNATIONAL COOPERATION AGENCY  
NIKKEN SEKKEI LTD**

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Letter of Transmittal

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## PREFACE

In response to a request from the Government of the Arab Republic of Egypt the Government of Japan decided to conduct a basic design study on The Rehabilitation Project of Cairo University Pediatric Hospital and entrusted the study to the Japan International Cooperation Agency (JICA).

JICA sent to Egypt a study team from March 23 to April 12, 1995.

The team held discussions with the officials concerned of the Government of Egypt, and conducted a field study at the study area. After the team returned to Japan, further studies were made. Then, a mission was sent to Egypt in order to discuss a draft basic design, and as this result, the present report was finalized.

I hope that this report will contribute to the promotion of the project and to the enhancement of friendly relations between our two countries.

I wish to express my sincere appreciation to the officials concerned of the Government of the Arab Republic of Egypt for their close cooperation extended to the teams.

August 21, 1995

A handwritten signature in black ink, appearing to read 'Kimio Fujita', written over a horizontal line.

Kimio Fujita  
President

Japan International Cooperation Agency

August 21, 1995

Letter of Transmittal

We are pleased to submit to you the basic design study report on The Rehabilitation of Cairo University Pediatric Hospital in The Arab Republic of Egypt.

This study was conducted by NIKKEN SEKKEI LTD, under a contract to JICA, during the period from March 17, 1995 to August 21, 1995. In conducting the study, we have examined the feasibility and rationale of the project with due consideration to the present situation of Egypt and formulated the most appropriate basic design for the project under Japan's grant aid scheme.

Finally, we hope that this report will contribute to further promotion of the project.

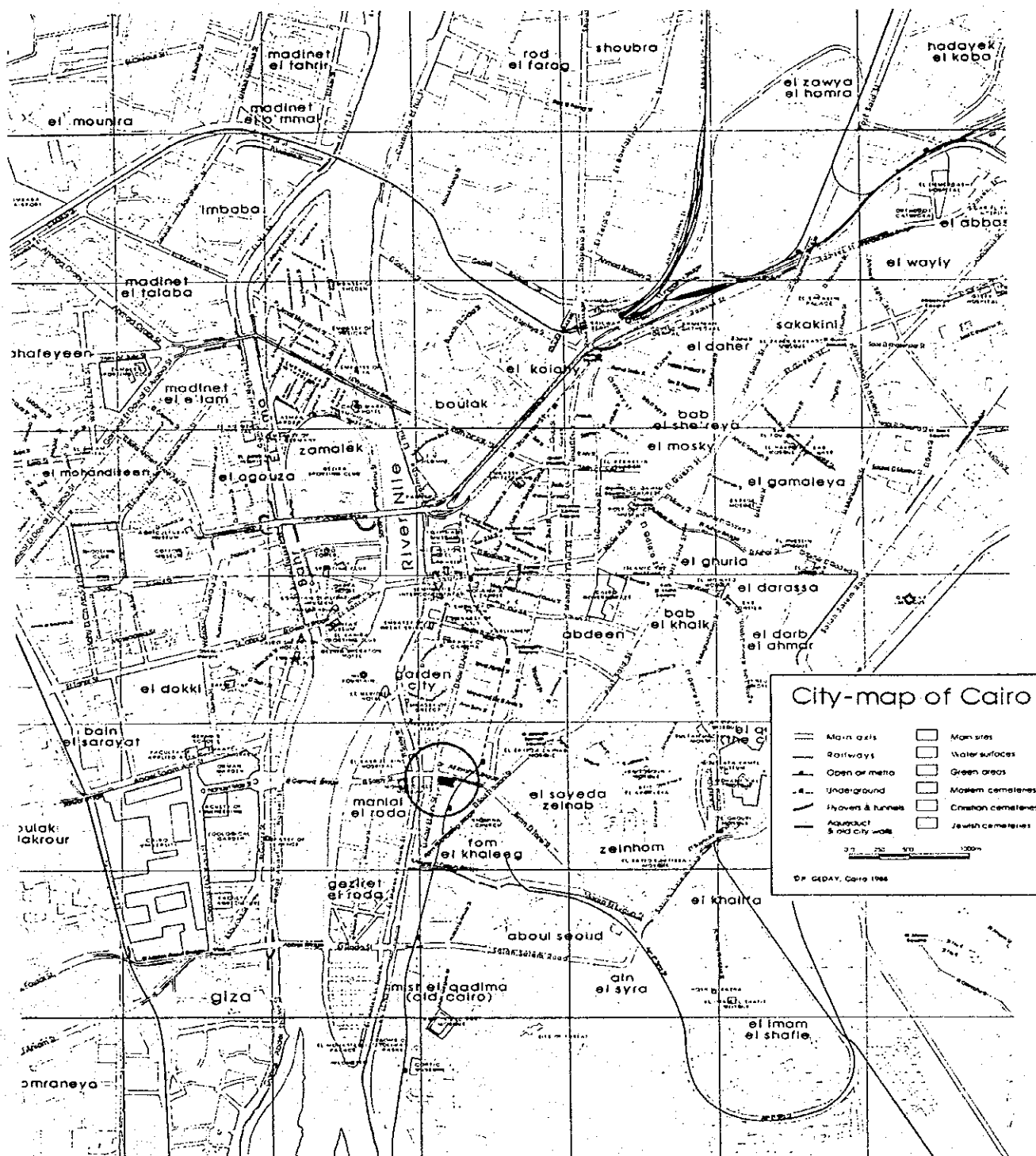
Very truly yours,

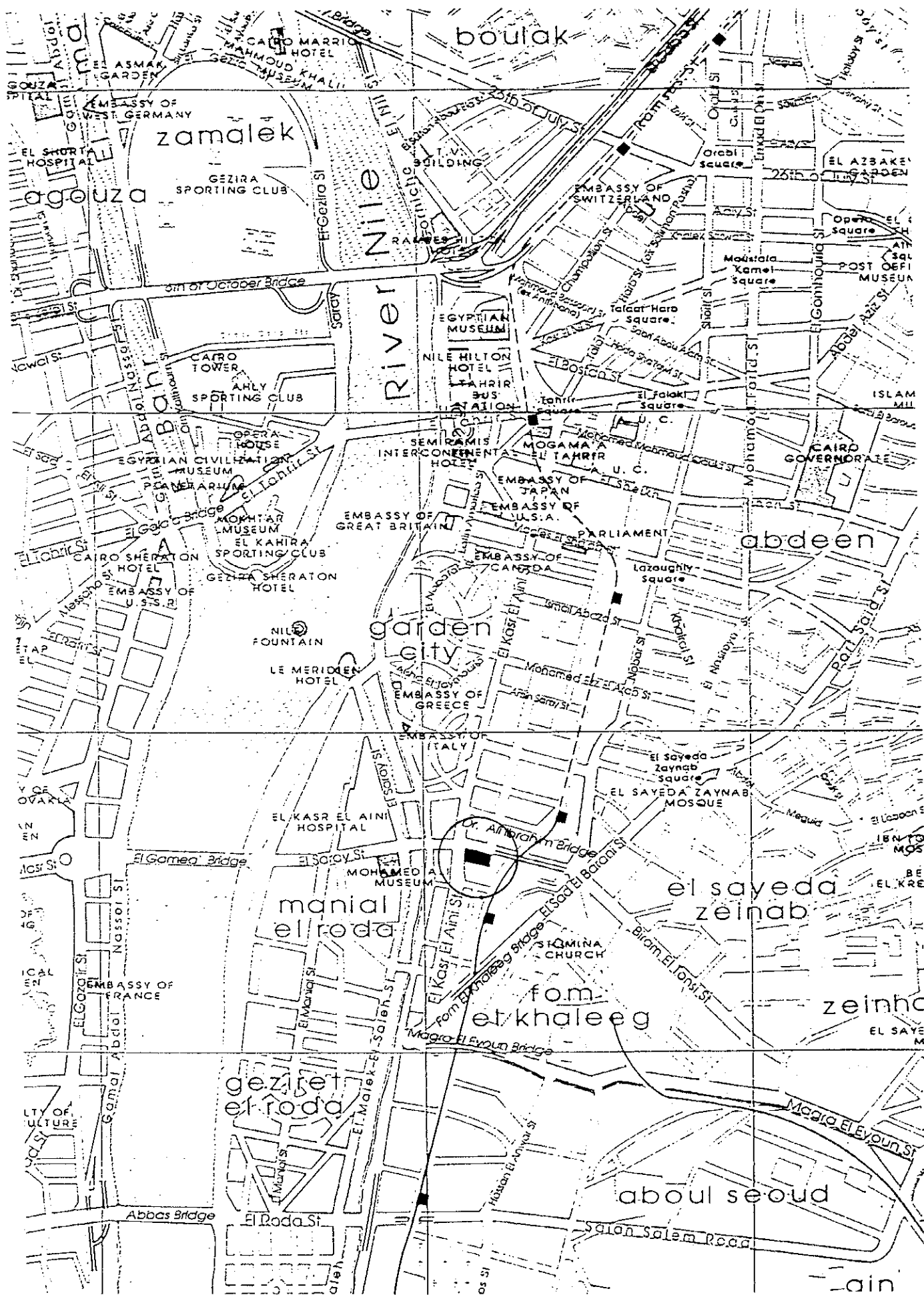


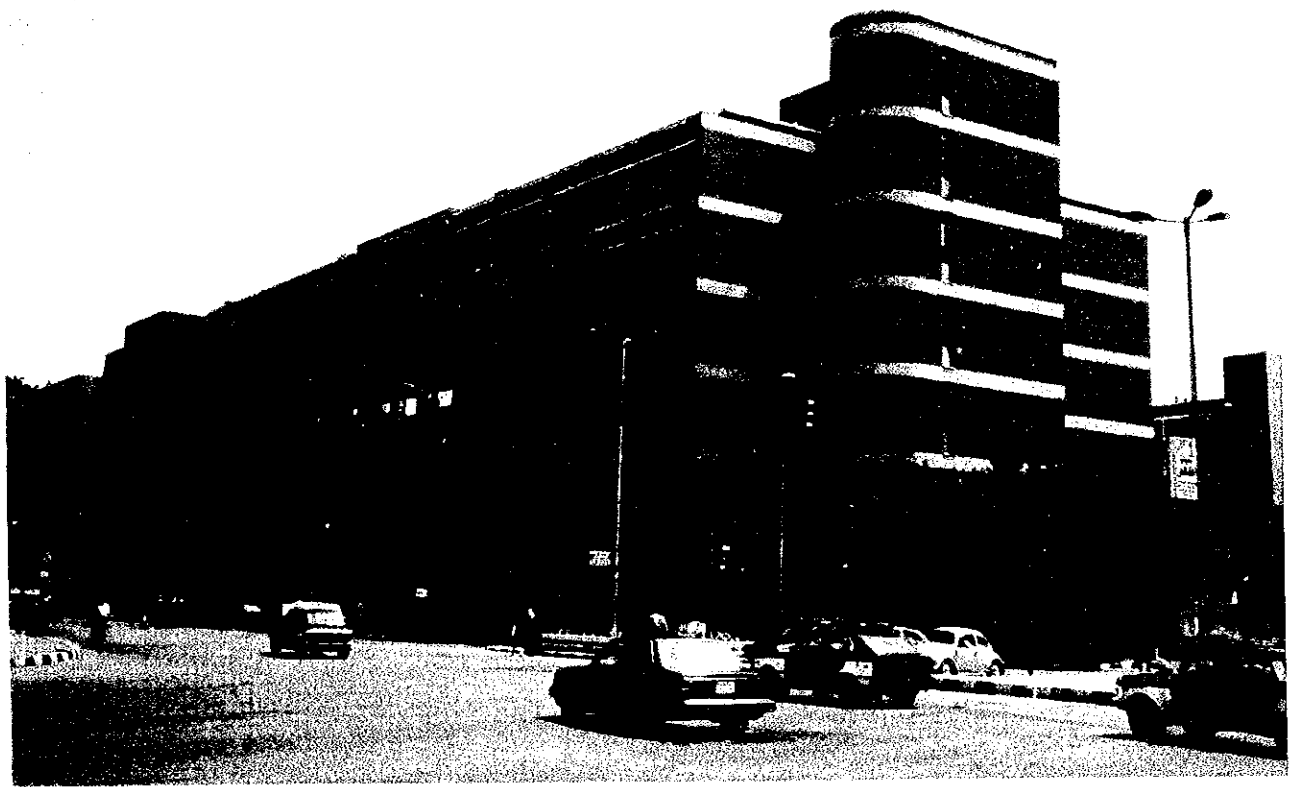
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Motoaki Murao  
Project Manager,  
Basic design study team on  
The Rehabilitation of Cairo University  
Pediatric Hospital  
NIKKEN SEKKEI











## CHAPTER 1 BACKGROUND OF THE PROJECT



## CHAPTER 1: BACKGROUND OF THE PROJECT

The Arab Republic of Egypt is situated in the North Eastern part of Africa, has the area of 1000 thousand square kilometers and the population of 59,586 thousand (1993). 96% of its land is desert, and the remaining 4% is the agricultural land along the Nile, where most population is centered on. The Egyptian economy is under continuous financial, trade deficit, and is also suffering international debt. The GNP per capita still rests on a low rate of \$640 (1992).

The country focuses on the improvement of welfare and health of children in the national development and plans to expand the preventive injections, achieve the eradication of polio, and to improve the infant medical services in the '90's. The Cairo University Pediatric Hospital was constructed through Japan's grant aid as a foundation for expanding and improving the facilities in the area of children's health care. (20 hundred million yen was spent for the construction of the hospital and purchasing medical equipment 1980, 1981). The Hospital is the only Pediatric Hospital in Egypt and is giving great influences to medical studies in Africa and Middle East on its medication, researches, and educative areas.

Extension of the building and purchasing of additional medical equipment, and reinforcement of medical activities were realized as the second phase of Japanese grant in 1989 under its grant aids in 1986. It has also been giving a project type technical cooperation since the foundation; from 1983 to 1988, and from 1989 through 1994. Government of Japan has also carried out following technical cooperation in 1994 through 1996 and has been contributing to the development of medical care for children. However, due to the increase of patients, and insufficient maintenance brought in after 10 years since its completion of the major constructions, a serious problems are rising concerning the management of medical facilities, mainly around the boiler systems, air conditioning, and the water-sewage systems. Thus, the Egyptian government has planned on a total repair of the whole establishment and has requested the Government of Japan for he grant aid for the implementation of the plan.

However, since the foundation, the number of the outpatients and the surgical operations have been continuously increasing. In 1993, there were 123,272 outpatients, 5,703 inpatients, and 3,351 operations treated. In the past 3 years, the number of the inpatients have leveled off, and viewing the situation in which the medical treatment which was dealt in the former Pediatric Hospital, which was closed due to the superannuation, is being dealt in the temporary ward, constructed adjoining to the hospital building of the concern, it could be said that the usage of the facility is at the peak of congestion.

Also, by the nature of a pediatric hospital, there are attendant nurses present. Thus, the usage of the facilities of the day, and hospitalizing sections are twice or 3 times as much than the other. The increase of users and the fact it has been 13 years since founded, the facilities are superannuated.

Under such circumstances, the Egyptian government has set up a whole scale rehabilitation plan, including the improvement of plumbing, air conditioning, and boiler related facilities together with the establishment of the NICU as an educative hospital, and has requested Japan for the grant aid for the implementation of the project.





## **CHAPTER 2 CONTENTS OF THE PROJECT**



## CHAPTER 2: CONTENTS OF THE PROJECT

### 2-1 OBJECTIVES OF THE PROJECT

The objective of the Project is to rehabilitate the 13-year old Cairo University Pediatric Hospital, by achieving an enhanced environment that allows the Hospital to develop on its own, so that the Hospital may continue to play a healthy role as the sole pediatric hospital in Egypt as well as a hospital dedicated to education in Africa and Middle East. The 23 items for renovation compiled by the JICA experts and the Hospital (February 26, 1995) were reviewed through on-site studies (March 23 - April 12, 1995) and through consultations with the University. The results of the discussions are summarized below.

- (1) Items that are recognized as extremely damaged and superannuated, and which are considered indispensable to the retention of the Hospital's functions: Lavatories, Shower Rooms, plumbing in the Basement Pit, etc.

- (2) Items that require expansion of the facilities in order to accommodate the expanded base of the Hospital users (patients and their families, students, etc.):

Outpatient Waiting Lobby, circulation from Examination/Radiology Department Waiting Hall and Outpatient Department, renovation of the air conditioning system in Operation Rooms, relocation of Sterilization, medical gas equipment, expansion of Emergency Outpatient Department and NICU, etc.

- (3) Items that are regarded as crucial for preventing the cleanliness of the Hospital from deteriorating:

system for exhausting excess medical gas, relocation of Sterilization, isolation of NICU, etc.

- (4) Items that are approaching the end of their life span after 12 years of usage, and require renovation or overhauling:

boiler facilities, emergency generator system (1st Floor). Among the facilities listed above, the works for (1), (2) and (3), at least, should ideally be carried out by the Japanese side.

The facilities listed in (4) are not yet dysfunctional. Nevertheless, they should undergo sufficient inspections and maintenance and be renovated as necessary. The aim of this Project is to sufficiently renovate and upgrade the Hospital so that it will be able to develop on its own in the future. Consequently, the equipment used for renovation should be that which is easily available in Egypt, and for which maintenance agreements can be executed locally.

Based on these study results, the table of priority (in terms of emergency) has been drawn up on the works to be undertaken according to the request by the JICA experts and the Hospital.

Priority Order	No. in List of Requests	Items for Renovation	Floor	Area
1	1.1	Renovation of all Lavatories in the building (General Ward to be relocated)	1-6	
1*	1.3	Relocation/renovation of Lavatories and Showers in Patient Wards	1, 2, 3, 4	
1*	6.3	Relocation and expansion of Treatment Rooms	2, 3, 4	
	6.1	Furnishing of Nurses' Changing Room/Rest Rooms	2, 3, 4	
1*	9	Relocation and renovation of Laundry for inpatients	2, 3, 4	
1*	8	Relocation and renovation of Mothers' Rooms	2, 3, 4	
1*	23.1	Relocation of Social Workers' Rooms	2, 3, 4	
2	3	Renovation of ventilating system in the 1st Floor Laundry	1	
	4	Renovation of ventilating system in the 1st Floor Kitchen	1	
3	2.4	Renovation of plumbing system in Basement Pit	B1	
4	5.1	Expansion of outpatient Waiting Hall space	1, 2	
	5.2	Passage from Outpatient area to Examination/Radiology Department	2, 3	
		Expansion of Waiting Hall for Examination/Radiology Department	3	
5	10	Relocation and expansion of Sterilization • Autoclave, EOG sterilizer, etc.	4	
	11	Renovation of General Operation Rooms • Reconsideration of Clean Zone • Individual air conditioning system • Excess anesthetic gas exhaust system • Video system	4	
6	12	Renovation of ICU	4	
7	20	5th Floor Operation Room, excess anesthetic gas exhaust system	5	
		5th Floor Sterilization, sterilization steam exhaust system	5	

8	16	Emergency Outpatient Department <ul style="list-style-type: none"> <li>• Relocation of Lavatories for emergency outpatients</li> <li>• Relocation of Operation Rooms for emergency outpatients</li> <li>• X-rays for emergency outpatients</li> </ul> Medical gas (for both suction and compressed air)	1	
9	12.2	New installation of NICU	2, R	
10	19	Relocation of Pharmacy Expansion of the engineering-related rooms	1 2 or 6	
11	18	1st Floor Lecture Room	1	
12	22.2	Waiting Hall for Visitors	1	
13	15.3	Renovation of the generator system and electrical room	1, 6	
14	7	Renovation of the boiler system	1	
15	2.1 - 2.3	Renovation of the sanitary and ventilating systems	1-R	
16	13	Repair and painting of doors	1-R 1	(work to be done by the Egyptian side)
17	14	Renovation of elevators	ELV 1- ELV 4	(work to be done by the Egyptian side)

(Note) 1\*: Work arising from the renovation of Lavatories and Shower Rooms

## 2-2 BASIC CONCEPT OF THE PROJECT

Using the List of Requests submitted by the Egyptian side, and conforming to the basic policy of enabling the Egyptian side to achieve growth on its own, the two parties (Egypt and Japan) made an overall evaluation of the Project, from the financial as well as architectural aspects, and agreed on the following plans for expansion and renovation of the Hospital.

### \* Expansion Plan

The main goal of the expansion work is to cope with the fact that the Hospital in recent years has reached its capacity due to the increased number of patients (which, in turn, was caused by the closing down of the former Pediatric Hospital). The overall activities of the Hospital are taken into account in the expansion plan, so that the Hospital will be able to function more smoothly in the future.

The request from the Egyptian side was to increase the floor area for the 1st to 4th floors in the Large Courtyard, and to expand the floor area for the 2nd to 4th floors in the Small Courtyard. However, in-depth studies revealed that such alterations were not feasible, in terms of structure as well as in construction, specifically for the Large Courtyard. Hence, the more practical plan of expanding only the 1st and 2nd floors of the Large Courtyard is adopted. As to the Small Courtyard, expansion of the 2nd to 4th floors will be carried out, as per request from the Egyptian side, since examination of the condition of the existing piles confirm the feasibility of such an expansion.

In addition, a one-storey building for Lavatories is constructed on the southern part of the building that houses the Treatment and Operation Departments (inside the building), to serve these areas that have taken over the function of the former Pediatric Hospital.

### \* Renovation Plan

The renovation work aims to rehabilitate the parts of the building that have undergone particularly serious damage. Priority is given to selecting Egyptian materials and construction methods so that any problem that may arise in the future may be taken care of locally.

For water-related utilities (Lavatories, Shower Rooms) and ventilation system, (Kitchen, Laundry, etc.) which tend to be especially superannuated, renovation work should be carried out with due consideration on how these facilities are used in Egypt.

### <Outline of the Expansion/Renovation Works>



Consultations with the Egyptian side resulted in the mutual agreement on the scope of works to be undertaken by the expansion and renovation plans, the details of which are given below:

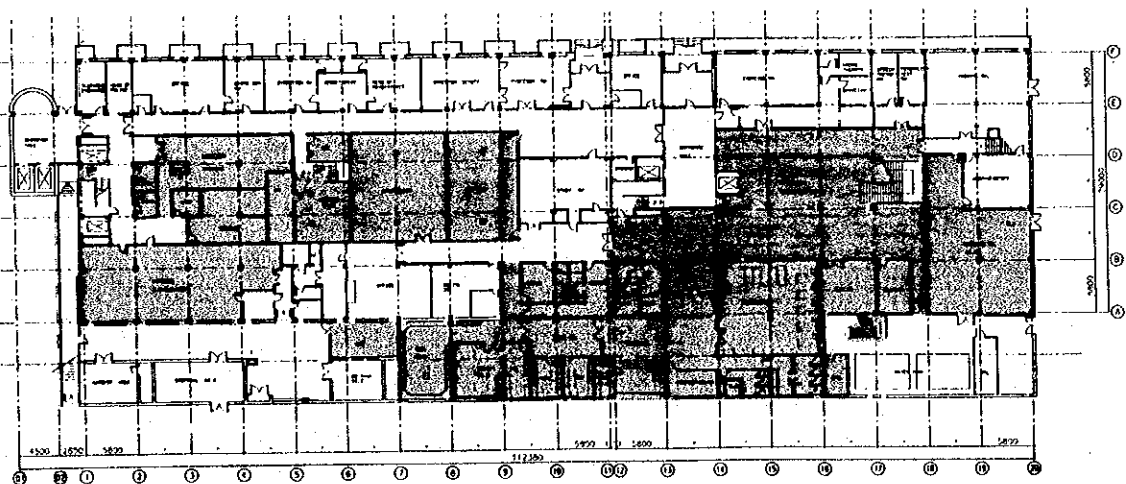
#### (1) Expansion Works

- |     |                          |                           |   |
|-----|--------------------------|---------------------------|---|
| (a) | (5) - (9) / (C) - (D)    | (Large Courtyard)         | : 1st Floor - Storage, Lecture Room<br>2nd Floor - NICU   |
| (b) | (8) - (16) / (AC) - (A)  | (Southern side, External) | : 1st Floor - Operation Room for Outpatients, Emergency Treatment Department<br>2nd Floor - Storage |
| (c) | (13) - (16) / (AC) - (A) | (Small Courtyard)         | : 2nd Floor - Waiting Hall<br>3rd Floor - Waiting Hall<br>4th Floor - Sterilization                 |

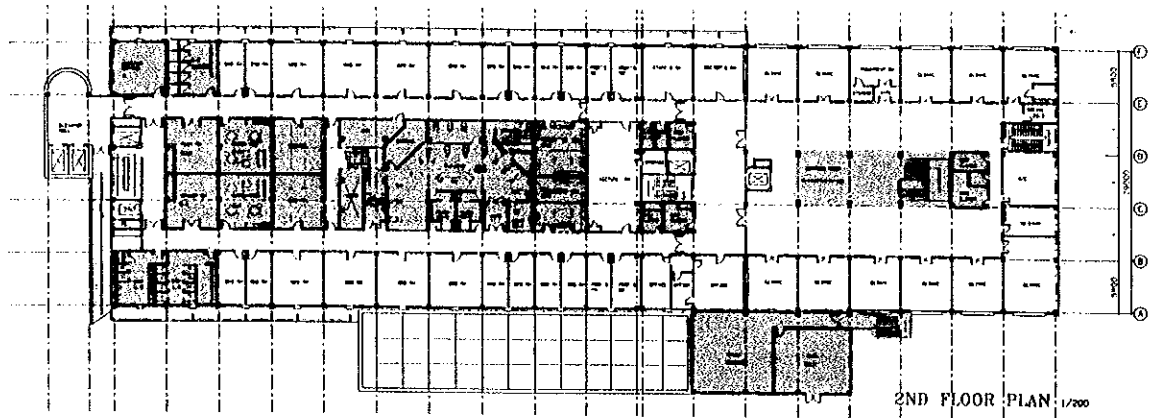
#### (2) Renovation Works

- |     |  |                    |  |
|-----|--|--------------------|--|
| (a) | (1) - (5) / (A) - (E)  | : 2nd - 4th Floors | - Lavatories, Shower Rooms, Play Rooms, Mothers' Rooms, Nurses' Rooms, Wards |
| (b) | (9) - (10) / (B) - (D)   | : 2nd - 4th Floors | - Treatment Rooms  |
| (c) | (12) - (20) / (A) - (D)  | : 2nd - 4th Floors | - Operation Rooms  |
| (d) | (9) - (13), (14) - (16)  | : 2nd - 4th Floors | - Outpatient Operation Department, Emergency Treatment Department            |
| (e) | Lavatories on each floor, Machine Room, Kitchen, Laundry, etc. |                    |  |

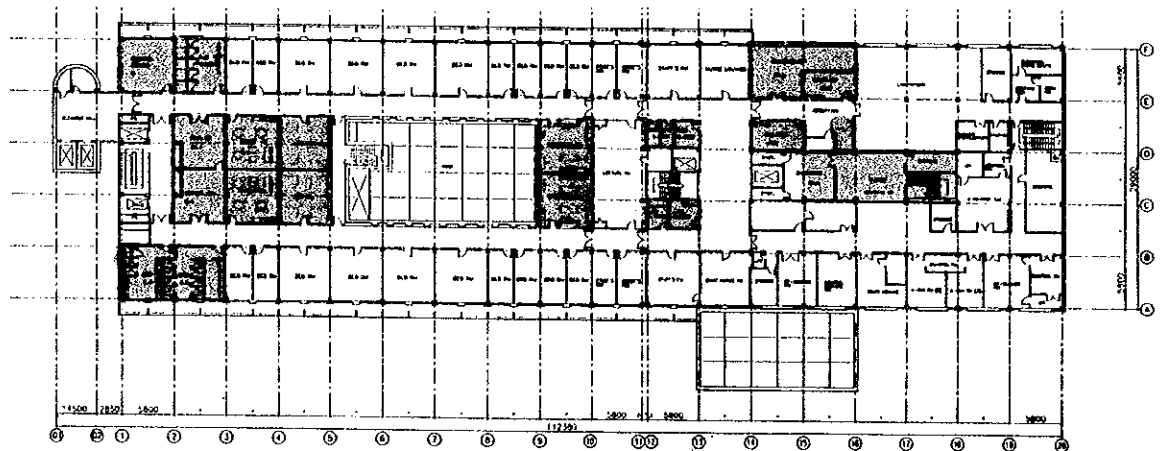
 : RENOVATION AREA  
 : EXPANSION AREA



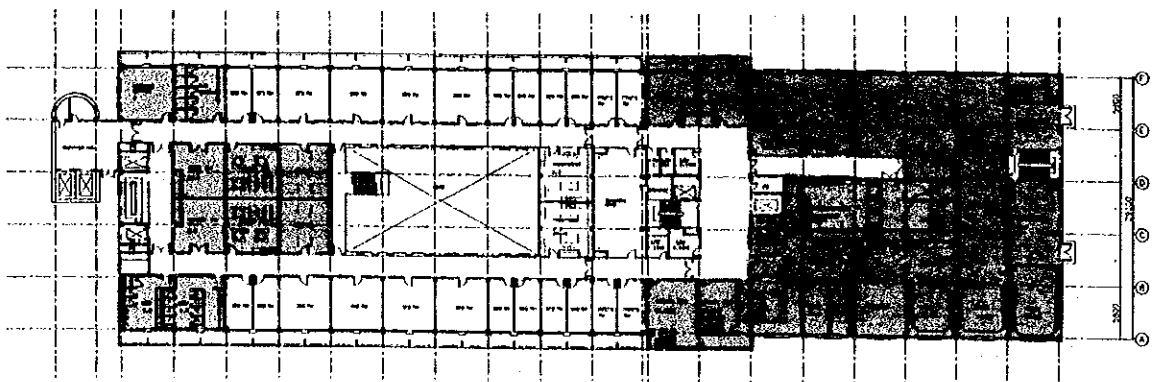
1ST FLOOR PLAN 1/800



2ND FLOOR PLAN 1/800

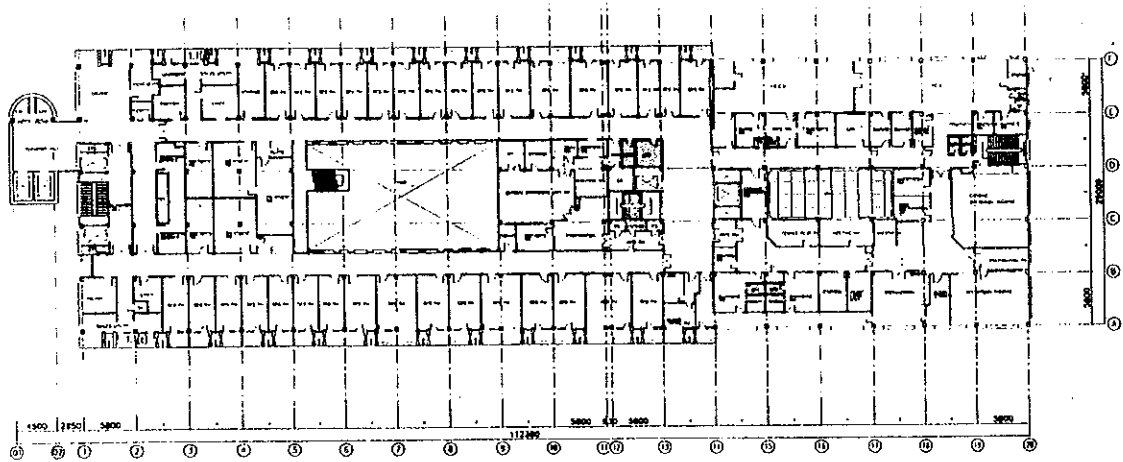


3RD FLOOR PLAN 1/800

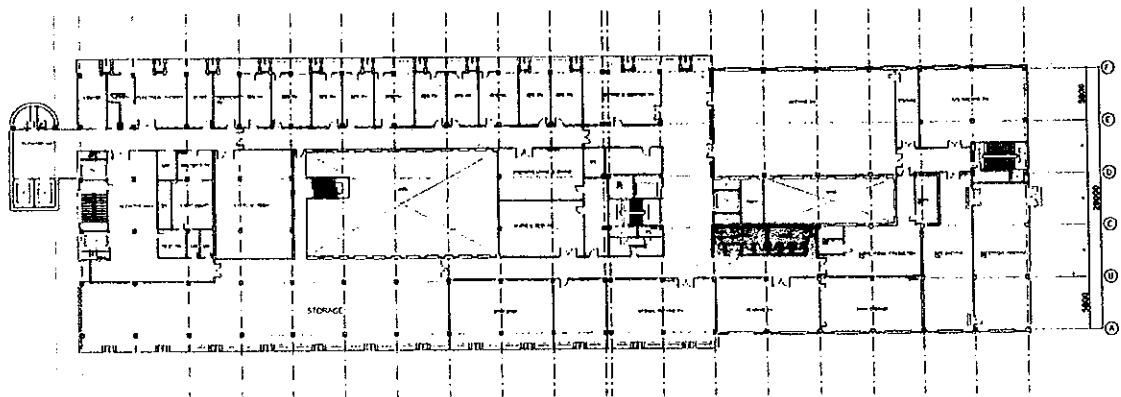


4TH FLOOR PLAN 1/800

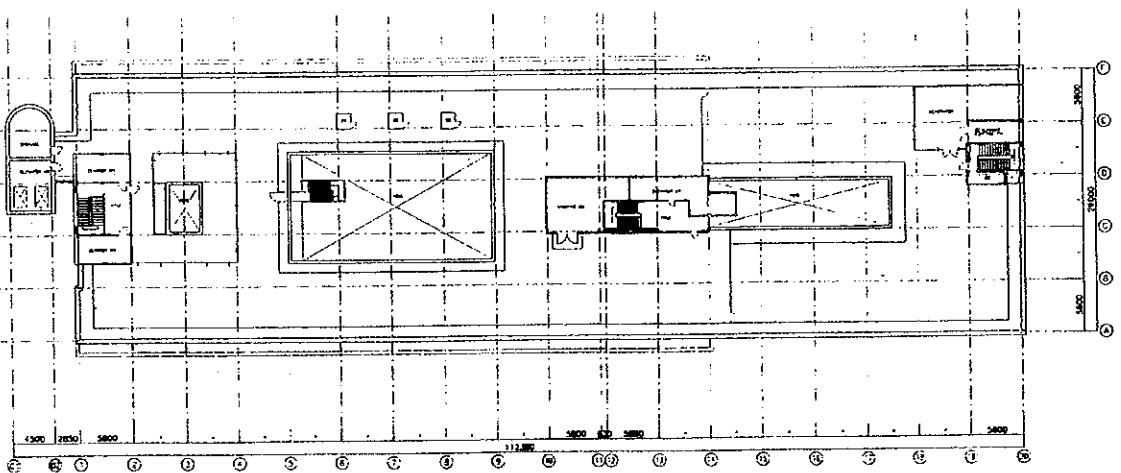




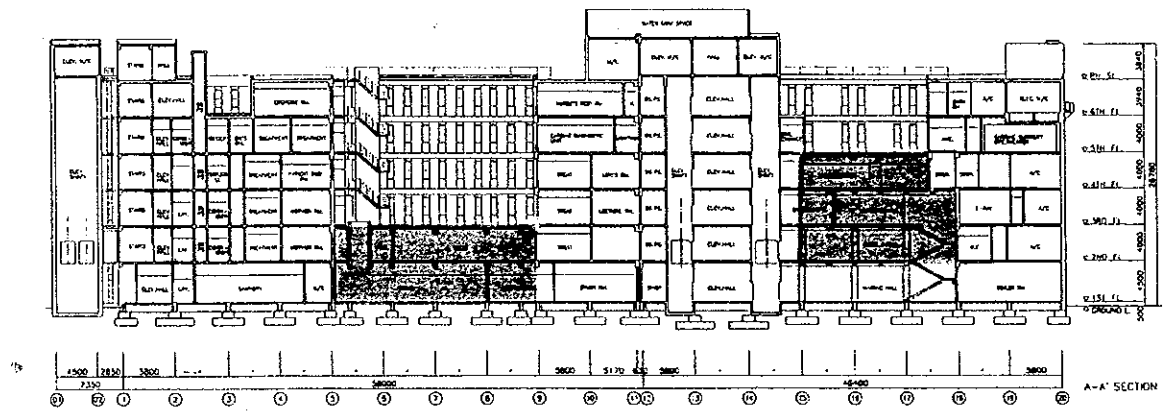
5TH FLOOR PLAN 1/800



6TH FLOOR PLAN 1/800



ROOF FLOOR PLAN 1/800



SECTION 1/800

## 2-3 BASIC DESIGN

### 2-3-1 Design Concept

#### (1) Basic Design Policies

- (a) To carry out renovation works that mainly aim at rehabilitation of the facilities but also help the Hospital achieve growth on its own in the future.
- (b) To give due consideration in the design of the renovation works so that the functions of the Hospital will not be significantly inconvenienced during the works.
- (c) To design facilities that satisfy the needs of the users and are also convenient to the local people.
- (d) To design facilities that are both safe and easy to use and maintain, based on experiences with the existing facilities.
- (e) To take into account local construction practices, methods and skills and adopt a design that uses locally procurable materials and equipment wherever possible.
- (f) To select systems for M/E design that can be sufficiently taken care of locally at times of breakdown (e.g. choose systems served by local agents or for which spare parts are available in Egypt).

#### (2) Establishing the Grade of Facilities

Since the Project consists of works necessary for rehabilitating the existing CUPH facilities, the newly provided areas shall conform to the grade of the existing facilities. Nevertheless, materials and equipment that are durable and easy to maintain, and locally procurable, shall be adopted wherever possible, to facilitate cleaning and maintenance works. Rooms such as Operation Rooms and NICU, mechanical shall be equipped with mechanical and electrical systems suitable for creating an environment where state-of-the art medical devices are used.

#### (3) Codes, Regulations and Specifications

The design for the expansion/renovations works shall adopt the same codes and regulations as those applied to the existing facilities. Specifically, they comply in principle with the relevant Egyptian codes and regulations to the utmost extent. However, where these are non-existent, the regulations and standards in Japan or internationally established regulations and practices are applied instead. The Codes, Regulations and Specifications applied are as follows:

##### (a) Architectural Design and Works:

- 1) A.R.E. Building Housing Laws
- 2) A.R.E. Building Code, Municipal Laws
- 3) A.R.E. New Laws for the Basics of Design and Execution of Building Works
- 4) Egyptian Standard Specifications (ESS)
- 5) Japanese Industrial Standard (JIS)

(b) Structural Design and Works:

- 1) Pile: A.R.E. Code of Practice (Pile)
- 2) Concrete: A.R.E. Code of Practice (Reinforced Concrete)  
American Concrete Institute (ACI)
- 3) Egyptian Standard Specifications (ESS)

(c) Electrical, Mechanical and Medical Equipment Design and Works:

- 1) A.R.E. Building Code (Service)
- 2) Japanese Industrial Standard (JIS)
- 3) Japanese Heating, Airconditioning and Sanitary Standard (HASS)
- 4) Japanese Electrotechnical Committee's Standard (JEC)
- 5) National Electrical Code (NEC, NFPA)
- 6) Hospital Engineering Association Standards (HEAS)

(4) Architectural Design

In designing the expansion/renovation works, the actual situation and frequency of usage of each facility is taken into account, with special considerations given to the following areas:

- (a) To adopt locally procurable materials and equipment and select construction methods practiced in Egypt so that problems arising in future can be solved locally. To study the actual situation of usage and select more durable devices wherever possible.
- (b) To provide sufficient pipe space and duct space to facilitate maintenance.
- (c) To adopt a layout of the rooms that takes advantage of natural ventilation and lighting.

(5) Structural Design

(a) Geological Conditions of the Site

The site of the Hospital was presumably amidst the stream of the Nile and in the 13th or 14th century it probably was found about 300 meters away from the bank. Boring tests at the site were conducted prior to the construction of the existing facilities, and boring data from the tests are available. The data reveal the soil of the site to have the following layer composition:

- \* 2 - 4 meters from the ground surface is a filling layer.
- \* 2 - 5 meters under this layer is a silty sand layer.
- \* The deeper, the higher N-value is obtained for standard penetration tests, and the increasingly dominant sand layer sometimes contains lens-shaped silt layers.
- \* The sand particles are not uniform in size.

(b) Basic Concept for Structural Design

Rigid frame structure composed of reinforced concrete columns and beams is adopted for the main frame of the building, in light of the usage of the facilities and also taking into account the local circumstances of construction works. Stretcher bond brick work is mainly used for partition walls etc. inside the building so that compatibility with the existing facilities can be achieved. In principle, the structure to be newly constructed is separated from the existing building structure with an

expansion joint. The weight of the expanded part is to be supported by a newly provided foundation. Nevertheless, apart of the expanded area is to be supported by the existing building structure, and the safety of the existing structure must therefore be examined. With the exception of special materials, locally procurable materials are used wherever possible for the structure, as long as there are no problems in terms of technology or quality.

(c) Design Standard

In principle, the structural design shall conform to Egyptian standards. The standard used for calculation of the reinforced concrete structure is Code of Practice for the Use of Reinforced Concrete in Buildings. However, the ACI-318 of the American Concrete Institute will be referred to or adopted for the parts in the expansions areas, particularly where they are connected to the existing areas, where the adoption of the Egyptian Code contradicts the concept of structural design of the existing building which was made basically in accordance with ACI-318.

(d) Materials Used

As a rule, the main structural material to be used shall conform to the Egyptian Standard Specification. However, it is also possible to use where necessary the materials regarded as equivalent to them and conforming to such international standards as JIS, ASTM, BS, and DIN. The main materials used for reinforced concrete structure are as follows:

- \* Reinforcement : Round bar (Steel 37)  
Standard yield point:  $f_y = 1,400 \text{ kg/cm}^2$   
(used as shear reinforcing bar, etc.)  
  
Deformed bar (Steel 52)  
Standard yield point:  $f_y = 2,000 \text{ kg/cm}^2$   
(used as main bar for columns and beams)
- \* Concrete : Normal concrete, 28 days compressive strength (cylinder test)  
(cylindrical specimen)  
Compressive strength:  $F_c = 240 \text{ kg/cm}^2$
- \* Cement : Normal Portland Cement

Individual footing pile drive foundation is adopted as foundation. The local construction method of micro piling (allowable bearing capacity 30 t/pile) is used, due to the limited construction space of the Court etc.

(e) Establishment of External Forces and Loads

Dead loads and live loads which directly relate to the structural design are established as follows:

1) Dead Loads

Dead loads are calculated on the basis of the unit weight per cubic meter specified below:

- \* Reinforced concrete :  $2.50 \text{ t/m}^3$
- \* Brick (lightweight) :  $0.75 \text{ t/m}^3$
- (normal) :  $2.00 \text{ t/m}^3$

## 2) Live Loads

The following live loads are established referring to the building standards of U.K., U.S.A., Egypt and Japan. Separate standards are applied to extraordinarily heavy loads such as machines.

* Roof	150 kg/m <sup>2</sup>
* Court	200 kg/m <sup>2</sup>
* Treatment Room, Sterilization, ICU, Lecture Room, Corridors, Stairs	350 kg/m <sup>2</sup>
* Waiting Halls	400 kg/m <sup>2</sup>
* Storage	500 kg/m <sup>2</sup>
* Machine Room	600 kg/m <sup>2</sup>

## 3) Earthquake Loads

Earthquake load in Cairo has generally been regarded as negligible in designing buildings. However, the area has recently been subjected to several earthquakes, and standards for earthquake loads have been incorporated in the building standards. Hence, the earthquake load stipulated by the Egyptian standard is taken into account for the Project.

## 4) Wind Loads

The winds loads are established as follows, in consideration of the stipulation in the Egyptian standards.

$$p_w = e_q \quad P_x = C_q$$

$P_w$	:	normal wind pressure (kg/m <sup>2</sup> )
$c$	:	coefficient of wind
$q$	:	basic wind pressure (kg/m <sup>2</sup> )

Basic wind pressure depends on the height of the buildings as assumed below:

Height of Building (m)	Basic Wind Pressure (kg/m <sup>2</sup> )
0 - 8	50
8 - 20	75
20 - 100	100

Coefficient of wind is to be determined as follows:

* Windward Walls	0.8 (positive pressure)
* Horizontal roof	- 0.4 (suction)
* Leeward walls	-0.4 (suction)

## (6) Electrical System Design

### (a) Basic Policies

- \* In principle, to adopt for the renovation area the electrical system design that conforms to that of the existing facilities.
- \* To adopt equipment and materials that are both safe and easy to maintain.
- \* To select locally procurable devices and equipment.

(b) Power Supply and Distribution System

1) Normal Power Supply

- \* Power for the electrical system is supplied from the existing Electrical Rooms: from the 1st floor Electrical Room for the 1st to 4th floors, and from the 6th floor Electrical Room for the 5th floor to the Rooftop. The panelboard in the Electrical Room is renovated so that it can be used to supply power to the panels newly installed to cope with the increased loads.
- \* Power capacitor for power factor correction are installed in the Electrical Rooms on the 1st and 6th floors so that the power factor can be automatically optimized (power factor of approximately 90 - 95% is maintained). A total of 8 sets of power capacitor are provided: 200 kVA x 2 sets for each transformer bank.

2) Power Generator System

- \* The generator on the 1st floor is already 12 years old. It currently operates without failure to supply power for the required loads. However, once it breaks down it can be a problem, since the manufacturer does not provide maintenance services locally and spare parts are hard to procure in Egypt. Hence, it is desirable to replace the generator with a new one that has a local agent in Egypt who can provide such services. This makes it possible to supply sufficient power to serve the loads in the newly established NICU and Operation Theatres. In case of renovation, the plan is to remove the existing generator on the 1st floor and install an outdoor cubicle type generator in some open space in the site (e.g. next to the CSPM on the southeastern part of the site). A diesel engine type 300 KVA generator is selected for this purpose.
- \* The generator on the rooftop can continue to be used, as long as it is adequately maintained through regular trial operations. However, the automatic starter mode at times of power breakdown is not adequately established in this generator. Hence, improvement is made so that the generator will automatically supply power, assuming that, out of the transformers on the 6th floor, the one on the security system power side has broken down.

(c) Power Load System

1) Power System

- \* Power panels are newly installed to cope with the newly required power loads. The necessary plumbing and wiring is provided to each device.

2) Lighting and Receptacle System

- \* Mainly fluorescent fixtures are used to conform to the existing lighting system, both in terms of luminous intensity and type of fixture.
- \* The "2 circle pin" type of receptacles, the same as those used on the 5th and 6th floors, are adopted.

(d) Information and Communication System

1) Telephone System

Adopt a system that conforms to that of the existing facilities.

2) Public Address System

- \* For the ceiling area to be refurbished, the speakers are removed and cleaned, and subsequently reinstalled. For the expansion area, the public address system is

provided in the existing part of the building.

3) Interphone System

- \* For existing devices on the walls that are to be refurnished (existing Operation Theatre, ICU, etc.), the devices are removed and cleaned, and subsequently reinstalled.

4) Consuits for CCTV for Operation Rooms

- \* Vacant conduit is provided from the cameras on the 4th floor Operation Theatre (OT No. 3 room) up to the video Production Room on the 6th floor. TV camera (to be provided by the Egyptian side) is installed onto astral lamps.

(e) Fire Alarm and Power Trouble Alarm System

1) Fire Alarm System

Install detectors that conform to the Egyptian codes and regulations.

2) Power Trouble Alarm System

- \* Newly install a power trouble alarm panel for the additional power panel. The alarm panel is installed in the 1st floor Security Room.

(f) Elevator System

Elv. No. 3 and No. 4 were damaged by water leaking from Lavatories and Shower Rooms. No. 4 has been repaired and is ready for use, but No. 3 is still out of order. The Hospital has already discussed the repair work with Otis, the manufacturer of the elevators. The fee for the repair work has been approved, and the work will be carried out soon. Hence, the plan to renovate the elevators is deleted from the scope of the Project.

(7) Heating, Ventilating and Airconditioning System

(a) Basic Policies

- \* Heat sources are decentralized to conform to those of the expanded areas of the existing facilities, and the maintenance system is also established accordingly.
- \* A system that is both safe and easy to maintain is adopted.
- \* Equipment and devices that are easy to procure locally are adopted wherever possible.

(b) Heat Source System

For the renovation area, a heat source which is separated from the existing central heat source is provided. An air-cooled package unit (incorporating an electric heater) or an air-cooled heat pump package unit (for both cooling and heating) is selected. These decentralized systems are easy to maintain and are capable of performing individual airconditioning for energy conservation.



(c) Airconditioning System

1) Conditions

\* Temperature inside the room

	Summer	Winter
Operation Theatres, ICU, NICU	24°C - 26°C	24°C - 26°C
Other rooms	26°C - 28°C	22°C - 24°C

\* Humidity inside the room

	Summer	Winter
Operation Theatres, ICU, NICU	50% - 60%	45% - 60%
Other rooms	Humidity level not controlled	Humidity level not controlled

\* Conditions outside the room

	Summer	Winter
Temperature	39°C*	7°C*
Humidity	54%	58%

\* ASHRAE STANDARDS (1%)

2) Airconditioning System

- \* Operation Theatre, NICU and ICU are provided with single-duct type package unit incorporating an electric heater.
- \* Other rooms are provided with a single-duct type heat pump package unit, or direct flow package unit (floor type).

3) The cleanliness of Air

- \* Operation Theatre NICU                      equivalent to class 10,000 (NASA)
- \* ICU, Sterilization                              equivalent to class 200,000 (NASA)

4) Frequency of Ventilation

- \* Operation Theatre                              about 30 times/hour
- \* ICU, NICU, Sterilization                      about 20 times/hour

5) Intake of Fresh Air

- \* Operation Theatre, ICU, NICU              about 5 times/hour

6) Airconditioning Zone

- \* Table 1-3-1 indicates the zoning of the rooms that are to be ventilated/air-conditioned.

(d) Ventilating System

Exhaust fans are used for ventilating Storages and Lavatories.

(e) Sand Control System

Highly efficient filters are operated for as many hours as possible. Dust guard devices are attached to all systems using these filters in order to keep down the maintenance cost.

(f) Removal of Existing Equipment System

The existing equipment (devices, plumbing, ducts, etc.) are removed and replaced with new ones for the areas that are to have additional airconditioning systems, or areas where the ceiling is to be removed, to conform to usage changes, relocation or expansion of rooms.

(8) Plumbing System

To facilitate maintenance work, as well as to be flexible to future changes, the newly installed pipes are exposed outdoors as a rule, instead of being concealed within the ceiling space.

(a) Basic Policies

- \* To ensure easy maintenance and flexibility to future renovations, vertical pipes for water supply and drainage systems are exposed outdoors as a rule, thereby minimizing the use of pipes concealed in the ceiling space.
- \* A system that is both safe and easy to maintain is adopted.
- \* Devices and equipment that are easy to procure locally are adopted wherever possible.

(b) Water Supply System

Water supply system is provided where necessary. For rooms that are newly constructed or renovated, the sanitary equipment for Lavatories, Shower Rooms, sinks and hand-wash sinks are newly provided. Equipment that are considered too damaged or superannuated for continued use are renovated.

(c) Hot Water Supply System

Hot water supply system is provided where necessary, in line with the addition, relocation or renovation of rooms.

(d) Drainage System

Drainage system is provided where necessary, in line with the addition, relocation or renovation of rooms. These systems are either connected to the existing outdoor catch basin on the first floor level, or connected through the existing drain pipes embedded within the site to a newly installed outdoor catch basin.

(e) Medical Gas Supply System

Supply systems for O<sub>2</sub>, V, Air and N<sub>2</sub>O are installed in ICU (4th floor), the newly provided NICU (2nd floor), the newly provided Emergency Outpatient Department (1st floor), and Treatment Room (1st floor).

Systems for exhausting excess medical gas are installed in the existing Operation Theatre on the 5th floor, and Operation Theatre on the 4th floor. Vacuum pumps and compressors are renovated to cope with increased capacity demands. Additional outlets for medical gas are installed in ICU, NICU and Operation Theatres.

Table 2-3-1: Zoning for Airconditioning

		Air-conditioning	Cooling	Heating
1st Floor	[Emergency Outpatient Department]			
	Emergency Operation Theatre	○	—	—
	Rehabilitation Unit	○	—	—
	Doctor's Room	○	—	—
	Nurse's Rest Room	○	—	—
	Ante Room	○	—	—
	Reception	○	—	—
	Emergency Diagnostic Unit	○	—	—
	[Outpatient Waiting Space]			
	Waiting Hall	○	—	—
	[Others]			
	Lecture Room	—	○	○
	Pharmacy	○		
2nd Floor	[NICU]			
	NICU	○	—	—
	Doctor's Changing/Rest Room	○	—	—
	Nurse's Changing/Rest Room	○	—	—
	Storage	○	—	—
	[Outpatient Waiting Space]			
	Waiting Hall	○	—	—
3rd Floor	[Examination Department]			
	Bacterial Examination Room	○	—	—
	Ante Room	○	—	—
	ECG Room	○	—	—
	Endoscope Room	○	—	—
	Reception	○	—	—
	[Outpatient Waiting Space]			
	Waiting Hall	○	—	—

		Air-conditioning	Cooling	Heating
4th Floor	[ICU]			
	ICU	○	—	—
	Soiled Utility	○	—	—
	Dark Room	○	—	—
	Storage 1	○	—	—
	Doctor's Changing/Rest Room	○	—	—
	Nurse's Changing/Rest Room	○	—	—
	Laboratory	○	—	—
	[Sterilization]			
	Sterilization	○	—	—
	Storage 2, 3	○	—	—
	[Operation Department]			
	Operation Theatre 1, 2, 3	○	—	—
	Rehabilitation Unit	○	—	—
	General Zone	○	—	—
	Storage 4, 5	○	—	—
	Corridor 1, 2	○	—	—
	Changing Room 1, 2, 3	○	—	—
	Doctor's Room	○	—	—
	Nurse's Rest Room	○	—	—
6th Floor	Workshop	—	○	○

Note: Cooling & Heating mean without humidifying

Table 2-3-2: Zoning for Water Supply Drainage and Hot Water Supply (expansion area)

		Water Supply	Hot Water Supply	Drainage
1st Floor	[Emergency Outpatient Department]			
	Corridor in front of Operation Theatre	○	○	○
	Rehabilitation Unit	○	○	○
	Doctor's Room	○	○	○
	Nurse's Rest Room	○	○	○
	Treatment Room	○	○	○
	Reception	○	○	○
	Emergency Diagnostic Unit	○	○	○
	Lavatory	○	—	○
2nd Floor	[NICU]			
	NICU	○	○	○
	Doctor's Room	○	○	○
	Nurse's Rest Room	○	○	○
4th Floor	[Sterilization]			
	Sterilization	○	○	○
	Sink for Cleaning	○	—	○
	[Operation Department]			
	Rehabilitation Unit	○	○	○
	General Zone	○	—	○
	Doctor's Room	○	○	○
	Nurse's Rest Room	○	○	○
Common to 2nd, 3rd and 4th Floors	Lavatory	○	—	○
	Shower Room	○	○	○
	Laundry	○	—	○
	Nurse's Rest Room	○	—	○
	Treatment Room	○	○	○