4.2.2 Building Plan

(1) Facility Plan

The main points in the building plan of this facility are as follows:

① A high storage efficiency for the facility floor space.

Columns are set at suitable span to fix rack for providing a most efficient storage.

② Facility which provides easy quality control of drugs

Ventilation of warehouse and heat insulation of roofs and exterior are provided.

Ventilation utilizing outside night air was adopted instead of air conditioning equipment in view of difficulty in maintenance after completion of the facility. Also the following measures were taken to improve roof and exterior wall heat insulation.

1. Apply heat insulation material.
2. Construct double walls and roofs to provide a middle insulation layer.
3. Provide horizontal and vertical louvers and eaves to shut out direct sunlight.

① Warehouse

The floor area of the warehouse is estimated as described below.

Since a continuously connected rack of 2.4 m width is fixed in the warehouse together with a 1.5 m width passage for reach type fork-lift, the column spans are determined as shown in Fig. 4-2.

A block covered by one span is 8.3 x 7.0 m = 58.1 m² as shown in Fig. 4-2. The rack size within the block is 1.1 m(L) x 1.1 m(W) x 1.2 m(H), and when pallets are stored in three levels, 60 pallets would be stored within one span block.

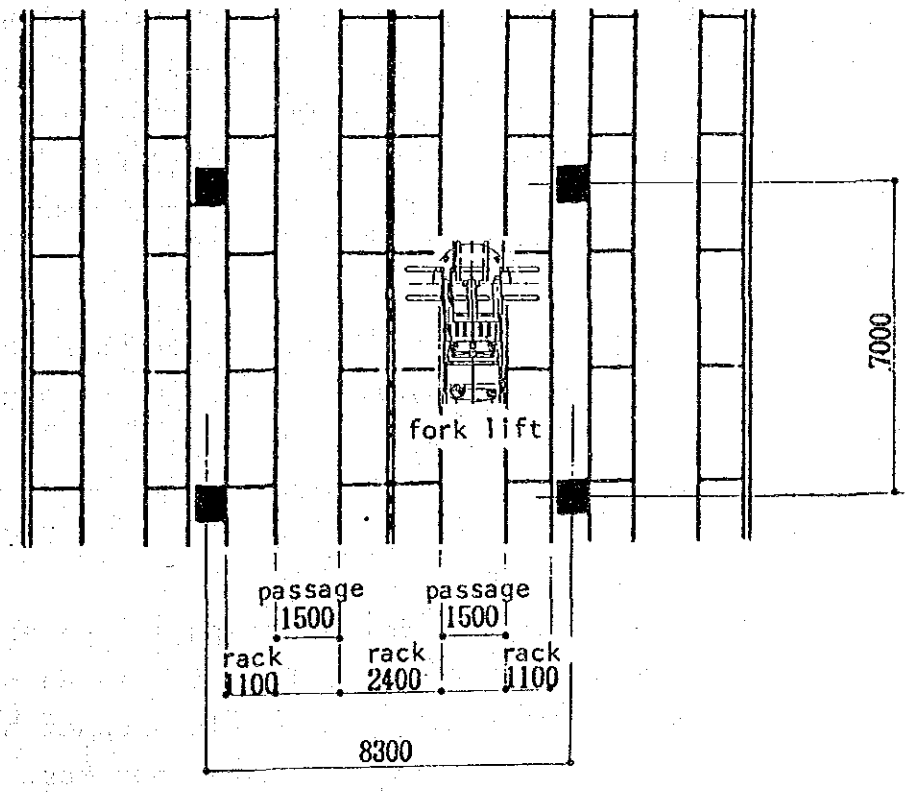


Fig. 4-2 Span Division in Warehouse

The floor area of the cool room kept at a temperature of 5°C - 10°C is determined for providing a storage space of 250 m^3. Since the temperature would be in the range of refrigerator specification, a prefabricated refrigerator which is durable, easy to install and maintain is considered. Also an anteroom is provided in front of the cool room to prevent filtration of outside air.

The floor area for restricted drugs store is determined for providing a storage space of 308 m^3.

② Incoming drugs and sorting area

The height of the platform for loading and unloading drugs is set at 1.0 m considering the height of the van type truck body. Although there is more incoming drug than outgoing drug owing to the function of EPTC, the same sorting area space is provided for incoming and outgoing drugs in view of its large variance.

③ Administration department

The content and size of facility for this department is based on the present Egyptian practice and organization described in 3.3.1.

④ Lifts: 2 sets

Although there are both oil pressure type and rope type lifts, the rope type is selected since the operation control of oil pressure type has problems under high temperature condition and lift machine room must be air conditioned, also the running cost is higher than that of the rope type.

Since lifts are indispensable for the operation of this facility, two sets are provided as measures against maintenance, repair and breakdown.

(2) Size of facility

① Warehouse

The floor area is estimated from the number of necessary pallets estimated in Section 3.2.3 and the number of pallets for one span block estimated in Section 4.2.2 (1). The entire floor area is decided after determining the best floor plan to cover the estimated necessary floor area.

Table 4-1 Warehouse Floor Area for Different Drugs

	Number of estimated pallets	Storage method	Estimated floor area
Imported drugs	3,300	Fixed rack three level stacking	3,300 ÷ 60 x 58.1 m² x 1.2 = 3,835
Licensed drugs	4,400		4,400 ÷ 60 x 58.1 m² x 1.2 = 5,113
Restricted drugs	220		220 ÷ 60 x 58.1 m² x 1.2 = 256
Cooled drugs	180	Fixed rack two level stacking	180 ÷ 60 x 58.1 m² x 1.3 = 226
Total	8,100		9,430 m²

② Other department

Table 4-2 Floor Area Other Department

Room		Area(m²)	Basis of estimate	Remark
Administration department	Storage & Distribution Director office	56.0	Includes guest corner & toilet	
	Secretary office	28.0	Presently 20 m²	
	Warehouse Manager office	35.0	Presently 20 m²	
	Chief Accountant office	35.0	Presently 20 m²	
	Warehouse Supervisor office x 6	126.0	21 m² x 6	
	Floor Supervisor office x 3	63.0	21 m² x 3	
	Worker room x 6	126.0	21 m² x 6	
	Conference room	84.0	35-40 persons & toilet	
	General office	87.5	20 persons x 4.5 m²	
	Printing room	15.0	Photo-copy machine work table	
	Computer room	52.5	Personal computer work table	
	Reference material room	20.0		
	Others	310.0	Stores, toilets & pathway	
	Sub total	1,038.0		
Sorting area		1,218.0		
Others		773.5	Elevator machine room, fan room, pathway, stair case, pump room, generator room, power room, air-condition room, hazardous goods store	
Grand total		3,029.5		

③ Total area of facilities

Warehouses	9,430	m²
Other departments	3,029.5	m²
Others: Open space (truck berth, platform)	616	m²

According to the above estimate, the floor area for the entire building is about 12,459.5 m² (9,430 m² + 3,029.5 m²) plus another approximately 600 m² for truck berth, etc.

④ Zoning

According to the layout arrangement, the area for the project, considering future extension, is limited to about 4,500 m², and when the area for truck berth is subtracted, the available floor area for one floor is about 3,900 m².

Therefore in order to secure a total floor area of about 12,459.5 m², the structure must be a three story building. The building is separated into warehouse and office departments, but since a smooth operation requires a close communication between both departments, it is also desirable to have them located in the same building.

The truck berth should be located in an open space with eaves for easy unloading and loading.

In view of the above considerations, the general office is located in the first floor above the truck berth and separated from the warehouse department. In order to utilize the site effectively and provide maximum operation efficiency, the building is zoned into a three-story warehouse department zone and a zone for administration, truck berth, and sorting area.

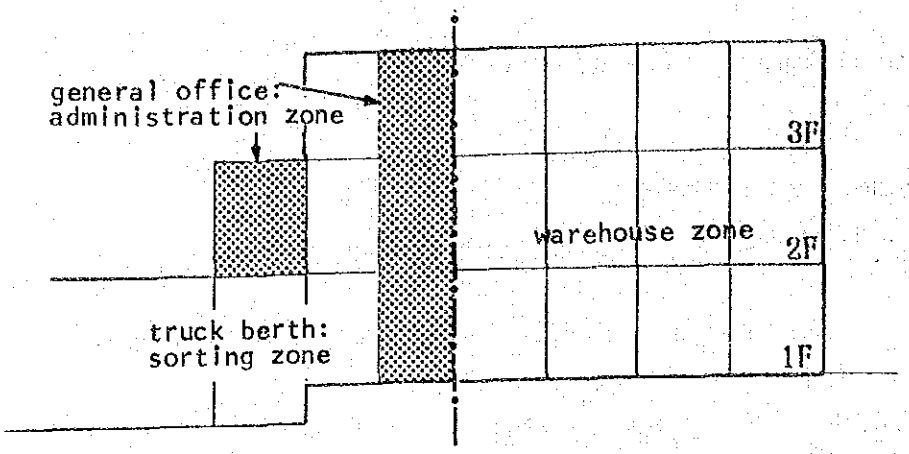


Fig. 4-3 Zoning Diagram

(3) Floor plan

(a) Warehouse and administration offices are separated. Offices and rooms such as; floor supervisor office (Floor manager room), warehouse supervisor office (Storekeeper room) and workers room which are closely related to warehouse operation are located between warehouse area and sorting area where incoming and outgoing drugs can easily be supervised.

(b) Administration office is separated from warehouse operation and is located on the second floor between the warehouse operation department and the top management, since walking distance is the same from both departments.

(c) Restricted drugs and drugs required to be cooled are stored next to the administration department for easy supervision.

(d) Ventilation fan rooms are located on the roof, one at the east side and the other at the west side.

Table 4-3 Details of Floor Area

	Floor area	Stored drugs	Administration and office	Others
PH	366.0 m²			Elevator machine room, fan room, stair case
Third floor	3,963.5 m²	Licensed drugs	Conference room, office	Warehouse, sorting area
Second floor	4,236.5 m²	Licensed drugs Imported drugs	Office, toilet	Warehouse, sorting area
First floor	3,893.5 m²	Imported drugs Cool room Restricted drugs		Warehouse, sorting area, platform, generator room, pump room, power room, air-condition room
Total	12,459.5 m²			

(4) Elevation plan

The ceiling height of ordinary room is set at 3.0 m, which is the normal height in Egypt, while the effective ceiling height in warehouse and sorting area is set at 5.4 m to secure sufficient height for three level racks and fork-lifts. The relation among floor height, fork-lift and racks are shown in Fig. 4-4.

In order to shut out direct sunlight and to improve heat insulation, the exterior walls are double insulated walls. The roof is also a double roof construction which is a combination of concrete slab with good waterproof finish and a steel frame corrugated slate roof.

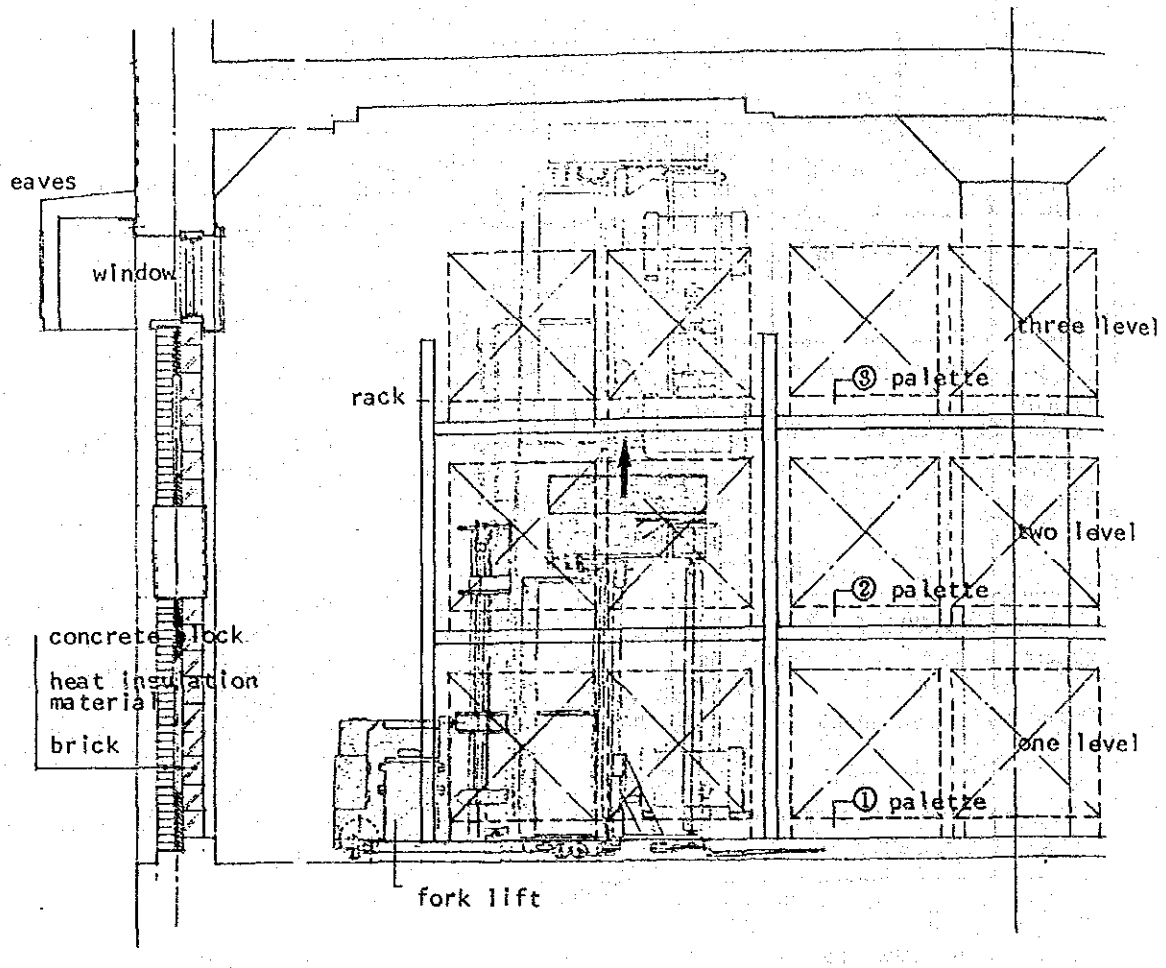


Fig. 4-4 Relation Among Floor Height, Fork-Lift and Rack

(5) Structure plan

① Basic plan

(a) The ordinary building construction in Egypt is to construct floor and frame with reinforced concrete and to build the wall within the frame with bricks or concrete blocks. In this project, this ordinary construction method is adopted. The structure system is a flat slab structure, but the warehouse roof eave above the truck base is a steel frame structure.

(b) As this facility is a drug warehouse, structure is heavy and floor slabs are thick to prevent vibration and cracks due to fork-lifts running on all floors. Thus a flat slab construction with no beams is expected to be most suitable and economical. Furthermore a pile foundation is planned since the construction site seems to be filled-in land according to boring results around the site. The result shows red bricks and chinaware pieces at about 12.0 m depth from GL and above this depth is filled-in soil. The pile length and type of foundation will be decided after further study.

(c) Egyptian materials are used as long as there are no problems in quality or strength.

(d) The soil in Egypt is reported to be high acid soil. In such case, the concrete contacting the soil must be treated. Therefore when studying ground condition, the acidity of soil will be analyzed, and the most suitable and economical measure will be taken.

② Structural design

(a) The structure is designed by allowable stress design method according to the stress obtained from dynamic analysis.

(b) Materials

. Steel: Deformed bars (Egyptian Standard ES 262, 1974) Grade 36/52
ft = 2,200 kg/cm²

. Concrete: Ordinary portland cement (BS specification) Fc = 210 kg/cm² (28 days strength on cylinder specimen)

. Steel frame: General construction rolled steel SS41 ft = 1,600 kg/cm²

. Bolt: Medium tension bolt SS41

(c) Dead load

The weight for unit volume of main materials are as follows:

. Reinforced concrete	2.4 t/m³
. Brick	1.9 t/m³
. Concrete block	250 kg/m²
. Steel frame	7.85 t/m³

(d) Live load

. Roof	180 kg/m²
. Office	300 kg/m²

The load of the warehouse floor was estimated as 1,000 kg/m² as follows:

A 35 kg weight pallet with 600 kg load is stocked to three levels. 24 three level pallet loads are stacked in a 7 m x 8 m grid. A rack weighs 175 kg, also a one ton fork-lift weighing 4.05 ton runs on the floor. From these conditions, the live load is estimated as follows:

$$P = \frac{3 \times (600 + 35) \times 24 + (4{,}050 + 1{,}000) \times 1.25^{*} + 175 \times 12}{7 \times 8}$$

$= 966 \text{ kg/m}^2$

Note: * 1.25 is the impact factor for moving load.

The live load is estimated as 1,000 kg/m² by considering safety factor.

(e) Other forces

Seismic force: Not considered

Wind force: Wind force was was considered for truck berth roof eave design based on the following formula of AIJ standards

$P = C \cdot Q \qquad q = 60\sqrt{h}$

P: Wind force kg/cm
C: Wind force coefficient
Q: Velocity force
h: Height from ground level

(6) Electrical installation

① Power receiving and transforming

During the site survey, it was observed that power is received from the power line running along Ahamed Shafic Street at 11 kV, 3-phase, 4 line which is transformed to 380 V, 3-phase and 220 V, single phase for use within the present centre. However, there is no surplus power in this line to supply the new storage centre (Fig. 4-5).

In order to assure a constant supply, 11 kV power will be newly received. Since power fluctuation exceeding 10% of rated voltage as well as blackouts frequently occur, power for computer is transmitted through a CVCF.

Received power:	11 kV, 3-phase, 4 lines, 50 Hz	
Transformer:	11 kV/380 V - 220 V, 3-phase, 4 lines 500 kVA	1 set
CVCF:	380 V/220 V ±10% Own capacity 1 kVA Circuit capacity 1.5 kVA	1 set

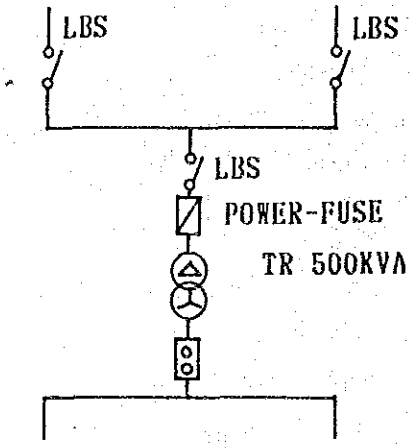


Fig. 4-5 Power Receiving and Transforming System

The connected load is estimated as listed below, while total capacity is estimated to be about 700 kVA.

(a)	Light outlet	152 kVA
(b)	Air condition and ventilation load	463 kVA
(c)	Water supply and drainage load	13 kVA
(d)	Elevator	52 kVA
(e)	Others	28 kVA

A generator is installed as a standby power supply source.

Since power blackouts occur often in Cairo, an indoor type, air cooled generator is installed as emergency power supply for refrigerator, computer, emergency lighting, fire water pump, and other necessary equipment. The generator load is estimated to be about 125 kVA and the fuel tank capacity shall be sufficient for at least 12 hour operation.

② Main line system

A main line system of 3-phase 380 V, and single phase 220 V is installed for transmitting power from substation panel to power panel and lighting panel.

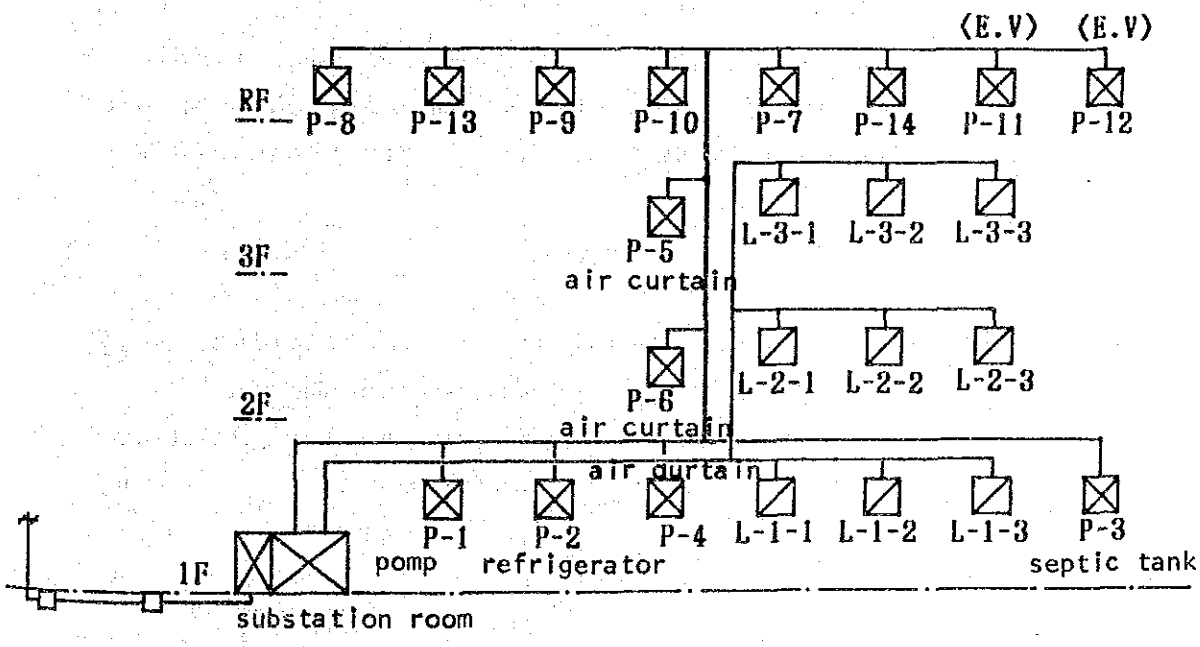


Fig. 4-6 Main Line System

③ Lighting

Illumination for each department is based on the following standards. Power for illumination is 220 V.

Warehouse	
Fluorescent lamp	50 lux (Warehouse passway, sorting area 150 lux)
Administration office	
Fluorescent lamp	300 lux (Computer room 500 lux)
Outside, parking lot	
Sodium lamp	10 lux

Lamp switch shall be separated for different zones to conserve energy.

Ordinary outlets, outlets for ventilation fan, outlets for cooler, and outlets for battery charger are installed. The outlets are mainly single phase 220 V.

④ Power

Power wiring to air conditioner, ventilation fan, fire fighting pump and water pump are encased in conduits, and the conduits from power panel to load are generally installed in exposed condition.

⑤ Telephone

Three telephone circuits are taken into the site. One is a direct line while two are for extension lines connected to phones in director office, secretary office, administration office and guard room (Fig. 4-7).

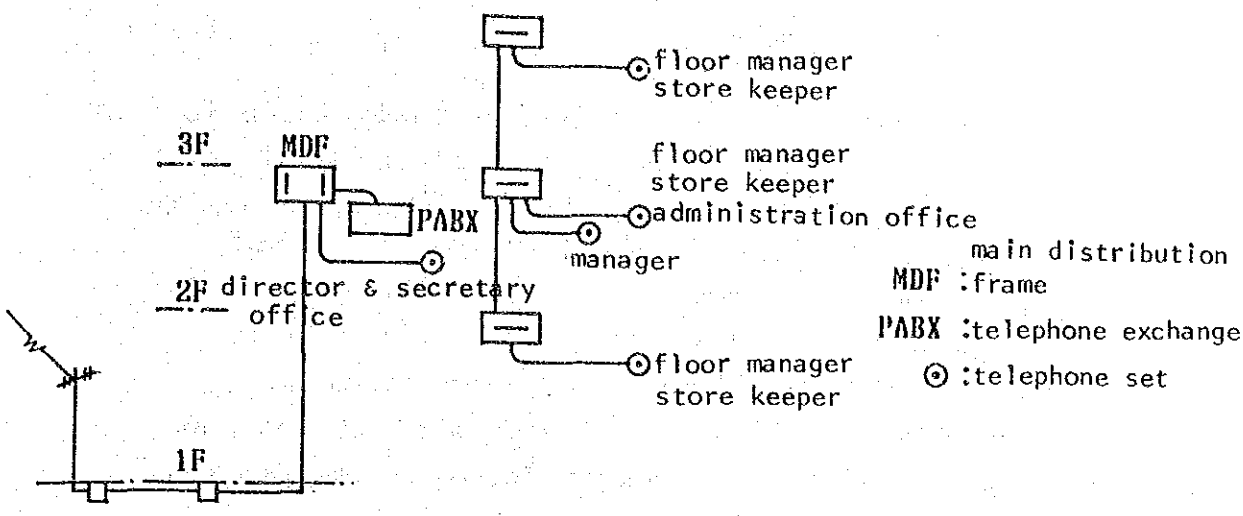


Fig. 4-7 Telephone Circuit System

⑥ Loudspeaker system

A loudspeaker system is provided for addressing the sorting area and the warehouse. This system shall also have function to address the entire facility in case of emergency such as fire (Fig. 4-8).

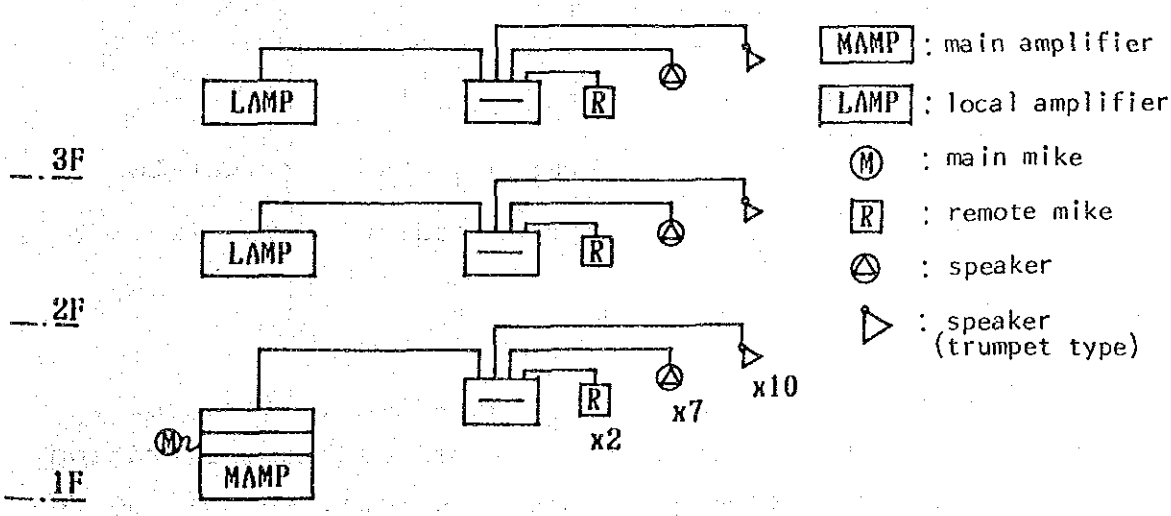


Fig. 4-8 Loudspeaker Circuit System

⑦ Automatic fire alarm

An automatic fire alarm system consisting mainly of smoke detectors is provided with an alarm panel in the watchman room. Bells are provided for sound alarm and placed at fire extinguisher boxes.

⑧ Alarm system

Breakdown alarms are provided on electrical and mechanical equipment, and alarm for each equipment is displayed on the panel in the watchman room.

⑨ Lightening arrester

A lightening arrester is provided on the building roof.

(7) Equipment plan

① Refrigerator equipment

A refrigerator equipment is provided for storing drugs which must be kept cool.

Refrigerator temperature:	5° - 10°C
Type:	Prefabricated refrigerator
Freezer:	Air cooled unit type freezer

② Cooling equipment

Separate type coolers are installed in director office, secretary office, manager office, administration office, computer room and conference room. A ceiling fan is installed in the floor manager room, storekeeper room and worker room.

③ Ventilation equipment

(a) Drug warehouse

Forced ventilation equipment with dust trap and filter is considered for preventing sand and dust filtration. In order to prevent temperature from exceeding 30°C in the warehouse in summer, cooling by storing cool night air is considered (Figs. 4-8 and 4-9). Through simulation, it was found that sufficient cool air can be stored by ventilating at a pace of 5 times/h starting from 5 hours before sunrise.

Condition of simulation (3 story drug warehouse)

. Outside temperature (August)

Average maximum temperature	35.4°C
Average minimum temperature	21.5°C
Temperature difference	13.9°C

. Illumination

Daytime	50 lux

. Date of calculation June 23 (summer solstice)

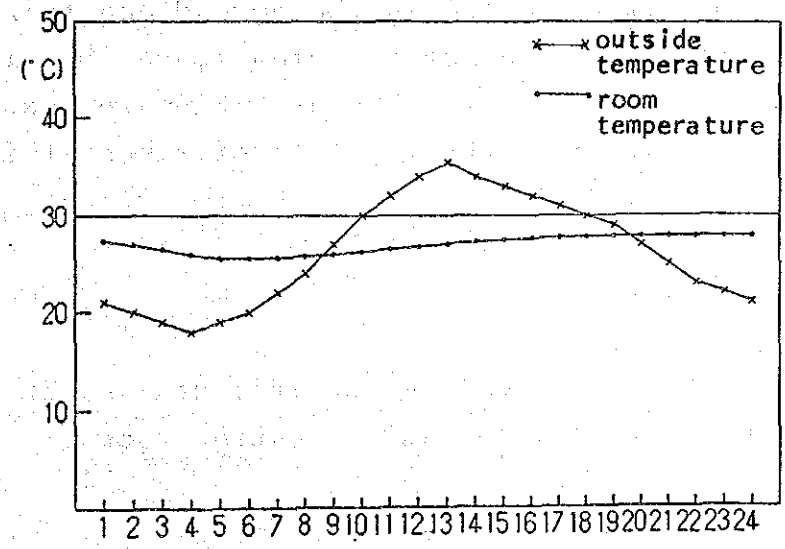


Fig. 4-8 Temperature Change in Warehouse by Outside Cool Air Ventilation

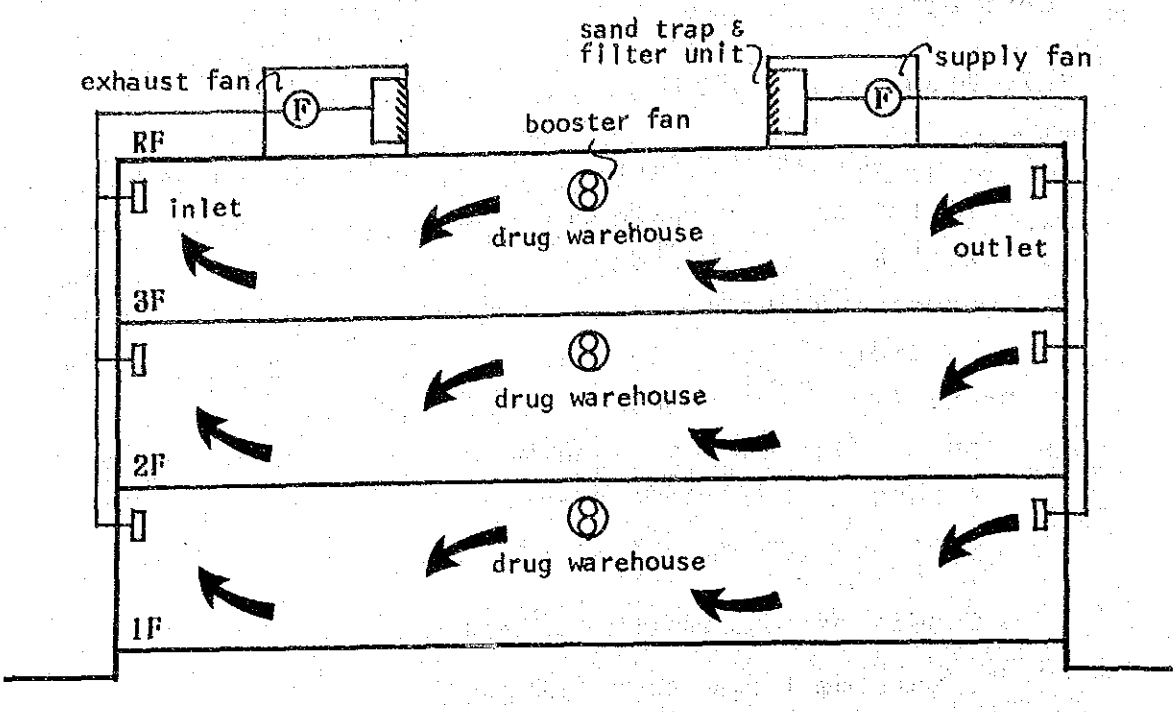


Fig. 4-9 Ventilation System of Drug Warehouse

(b) Sorting area

Forced ventilation equipment with sand trap and filter is installed in the second and third floor sorting area. Since the area space is large, ventilation is performed at 5 times/h. No equipment is installed in the first floor since it is open to outside air.

(c) General rooms

Ordinary ventilation is installed in ordinary rooms, toilets and water heating room.

④ Water supply, drainage and sanitation equipment

(a) Water supply equipment

Water is supplied to the water receiving tank through a branch pipeline which is connected to the 100 diameter city water main taken into the site. From this tank, water is pumped up to the elevated tank and then supplied to different locations by gravity force. (Fig. 4-10)

(i) Daily water requirement

Personal use

100 persons x 150 ℓ/man-day = 15 m^3/day

Cleaning use

1,000 ℓ/day x 3 floors = 3 m^3/day

Total 18 m^3/day

(ii) Capacity of water receiving tank

The daily water requirement plus fire fighting water is secured.

Q = 18 m^3/day x 0.5 + 15 m^3 (fire fighting water)
= 24 m^3

(iii) Elevated tank capacity is 3 m^3.

18 m^3 ÷ 6 hours = 3 m^3

(iv) Two sets of water pump including spare in case of breakdown are provided.

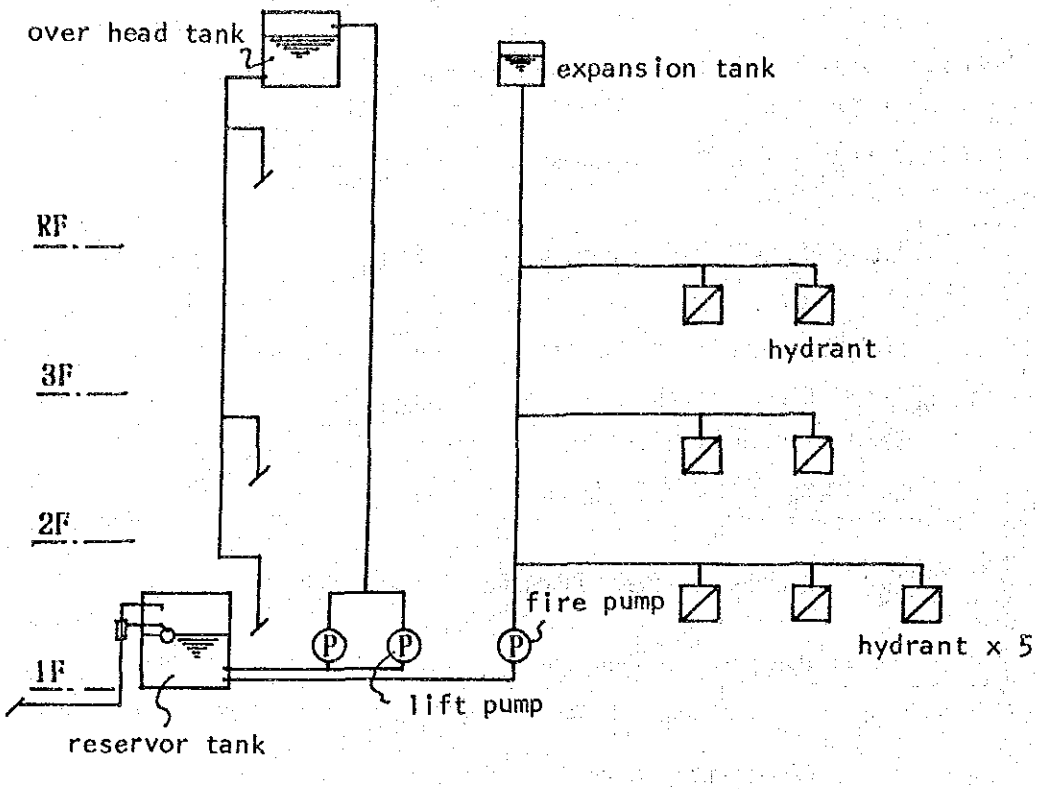


Fig. 4-10 Water Supply and Fire Fighting System

(b) Hot water supply

An electric water heater with reservoirs is installed in the Kettle room.

Hot storage	20 ℓ x 3 sets
Electric capacity	3 ø x 380 V x 3 kW

(c) Water drainage

Water drainage is planned to be separated for sewage and waste water in the building. Since there is no sewage treatment facility in the site, a septic tank is provided to treat the sewage before draining into the public sewage line outside the site. Ordinary waste water is drained directly into

the public sewage line. Since there is no drainage along the road for storm water, water permeable manholes are provided within the site.

Sewage treatment:	Septic tank 100 persons

(d) Fire fighting equipment

The following fire fighting equipment is provided for early fire fighting.

(i) Inside fire hydrant

Installed inside buildings.

(ii) Outside fire hydrant

Installed at suitable locations within the site.

(e) Sanitary equipment

Water conserving type sanitary equipment is adopted for conserving water resources. Stools, urinals, washing basins, washing stands, and faucets are installed where necessary.

(8) Building material plan

① Basic principle

Based on the site survey, building materials are determined by the following standards.

(a) Materials which can be maintained easily.

(b) Local materials will be used as long as quality, price, supply and delivery are sound and acceptable.

② Outside finishing material

(a) Outside wall

Decorative brick wall -- some portion is plain concrete finished with paint.

(b) Roof

Reinforced concrete -- waterproofed with urethane coating. Roof is covered with slate to shut out direct sunlight.

Steel frame structure (eave) -- long corrugated steel sheet.

③ Inside finish

	Room	Floor	Skirt	Wall	Ceiling
	(First floor)				
1	Drug warehouse	Concrete finished with surface hardener	Concrete joint	Concrete block E.P.	Plain concrete E.P.
2	Restricted drug warehouse	ditto	ditto	ditto	ditto
3	Cooled warehouse	Concrete placed on insulation and finished with surface hardener	Heat insulation panel	Heat insulation panel	Heat insulation panel
4	Anteroom	Concrete finished with surface hardener	Concrete joint	Concrete block E.P.	Heat insulation material E.P.
5	Sorting room	ditto	ditto	ditto	Plain concrete E.P.
6	Pallet storage	ditto	ditto	ditto	ditto
7	Warehouse supervisor office	ditto	ditto	ditto	Acoustic board
8	Floor manager office	ditto	ditto	ditto	ditto
9	Worker room	ditto	ditto	ditto	Plain concrete E.P.
10	Pump room	Concrete trowelled finish (dust prevention paint)	ditto	Plain concrete concrete block	Heat insulation material E.P.
11	Generator room	ditto	ditto	ditto	Acoustic material
12	Power room	ditto	ditto	ditto	Plain concrete E.P.
13	Machine room	ditto	ditto	ditto	ditto
15	Toilet, water heating room	Terrazzo	Terrazzo	Ceramic tile	Hardboard E.P.
16	Hazardous material warehouse	Concrete trowelled finish (dust prevention paint)	Concrete joint	Concrete block	Slate cover

	Room	Floor	Skirt	Wall	Ceiling
	(Second floor)				
1 9		Same as first floor			
10	Director office	Terrazzo	Terrazzo	Mortar E.P.	Acoustic board
11	Warehouse manager office	ditto	ditto	ditto	ditto
12	Chief accountant office	ditto	ditto	ditto	ditto
13	Computer room	ditto	ditto	ditto	ditto
14	Reference material room	ditto	ditto	ditto	ditto
15	Printing room	ditto	ditto	ditto	ditto
16	Administration office	ditto	ditto	ditto	ditto
17	Toilet, water heating room	Same as first floor			
	(Third floor)				
1 9		Same as first floor			
10	Conference room	Terrazzo	Terrazzo	Mortar E.P.	Acoustic board

4.2.3 Equipment Plan

The following sets of equipment are planned for this project. Equipment easy to inspect, maintain, repair and with readily available spare parts is selected.

(1) Equipment

① Pallet:

Wooden, 1.1 m x 1.1 m x 0.15 m	8,500 pieces

② Forklift:

Load, 1 ton electric, reach type Lift, 3.5 m	6 sets
Load, 1 ton electric, common type Lift, 1.0 m	4 sets

③ Roller conveyor:

Width 4.5 cm, length 3.0 m	6 sets

④ Refrigerator truck:

3 ton diesel	2 sets

⑤ Personal computer:

Main equipment,	CUP 16 bits	3 sets
Display,	14 inch	
Printer,	24 bits 50 letters/s	

⑥ Copy machine:

Size, B4 max. A5 min.	1 set

⑦ Overhead projector with screen:

Lens, ff 290 mm, halogen lamp type	1 set
Screen, 1.5 m x 1.0 m	

⑧ Wood working tools:

Electric saw, electric plane	2 sets

(2) Selection of equipment

① Pallet

The number of pallets that can be stored in the new storage and distribution centre is 8,100 pallets in accordance with the description in section 3.2.3. Adding a spare of 5 percent, the number of 8,500 pallets was selected.

② Forklift

There are two types of forklift, the reach type and the common type which have their respective features.

Reach type: Since this type can pass through narrow passway and lift cargo up high, it is especially suited for handling drugs in a rack type warehouse.

A forklift with one ton lifting capacity was selected because the drug load on one pallet is about one ton.

Common type: Since cargo handling from truck berth and sorting do not require much lifting, but require speed, a common type was selected for this operation.

a) Determination of reach type forklift number

① One forklift operating time cycle in drug warehouse

i. Average moving distance in warehouse (m) ÷ speed (m/s) = 84 m ÷ 1.5 m/s = 56 s

ii. Storing and retrieving drugs

(a) Lifting and lowering pallet

Rack medium height (mm) ÷ pallet lifting/lowering speed (mm/s) x 2 (1 cycle) = 1,750 ÷ 130 x 2 = 27 s

(b) Rack positioning 15 s

(c) Drug storing and retrieving operation (average) 90 s

iii. Job instruction transmission 30 s

i + ii + iii = 218 s

② Number of forklift operation in one hour

3,600 s ÷ 218 s/operation x 0.8 (operation efficiency) = 13.2 operation/hr/forklift

③ Number of pallets received and delivered in one day

The average storage period at EPTC warehouse is about 3 months, but in this program the average storage period is planned to be reduced to 2 months. The turnover in a year will be 6 which would require 2 storage movements (in/out).

i. Daily average in/out movement of pallets

8,100 pallets x 12 (movements/year) ÷ 300 days = 324 pallets/day

ii. Maximum pallet movement a day

The maximum is estimated as two times of the average number

324 pallets x 2 = 648 pallets/day

④ Necessary number of forklifts

The number of forklifts necessary to handle the average number of daily pallet movement is 4 sets (4.09 sets) while for maximum movement is 8 sets (8.18 sets). Although it is desirable to have enough forklifts to handle the maximum pallet movement a day, the mean number between average and maximum number or 6 sets (6.13 sets) were adopted in this case. Two forklifts will be located in each floor, and for large number of pallet movement, overtime work will be applied.

i. Average daily storage movement (in/out)

324 pallets ÷ 6 h (working hours) ÷ 13.2 movements/hr/set = 4.09 sets

ii. Maximum daily storage movement (in/out)

648 pallets ÷ 6 h (working hours) ÷ 13.2 movements/hr/set = 8.18 sets

iii. Mean number

(324 + 648) ÷ 2 ÷ 6 h (working hours) ÷ 13.2 movements/hr/set = 6.13 sets

b) Determination of common type forklift number

① One forklift operating time cycle in sorting room

i. Average moving distance in warehouse (m) ÷ average speed (m/s) = 40 m ÷ 1.9 m/s = 21 s

ii. Elevator loading and unloading 80 s

iii. Job instruction transmission 10 s

i + ii + iii = 111 s

② Number of forklift operation in one hour

3,600 s ÷ 111 s/operation x 0.8 (operation efficiency) = 25.9 operation/hr/forklift

③ Number of pallets received and delivered in one day (324 + 648) ÷ 2 = 486 pallets

④ Necessary number of forklifts

The number of forklifts necessary within the sorting area is 3 sets. These forklifts will handle pallet movement between storage area and elevator, and in sorting room. One set will be located on each floor.

486 pallets/day ÷ 6 h (working hours) ÷ 25.9 (movement/hr/set) = 3.13 = 3 sets

Another forklift is necessary for loading and unloading at the truck berth. So the total number of forklifts will be 4 sets.

(3) Roller conveyor

At the platform, 13 trucks can berth and assuming that half of them will use roller conveyors, the necessary number is 6.

(4) Refrigerator trucks

Most drugs which must be kept cool are expensive drugs. At present for small amount of drugs required to be cooled are transported in insulated cool box, but large amount of drugs are shipped with no temperature control. In a high temperature area like Egypt, it is desirable to ship all drugs in trucks with temperature control equipment.

For this time, refrigerator trucks are provided for shipping drugs which must be kept cool.

① Delivery to intermediate warehouses

52 intermediate warehouses* x 3 deliveries/day ÷ 20 days/month ≒ 8 deliveries/day

* Includes warehouses planned in the Second 5 Year Plan.

If delivery points are within Cairo, 1 truck will suffice, but to cover all Egypt at least 2 trucks are necessary.

② Receiving drugs required to be cooled at Cairo Airport

(a) Maximum cargo at one time:

15 ton, 30 m^3

(b) Refrigerator truck:

3 ton type refrigerated storage volume
10 m^3 (effective 6 m^3)

(c) Number of days to take delivery:

15 tons ÷ 3 ton = 5 times
30 m^3 ÷ 5 times = 6 m^3 (effective 6 m^3)

If the 3 ton type truck can make 2 trips a day, 3 days are necessary, but for 2 trucks, delivery can be taken in 2 days.

③ Number of refrigerator trucks

From the above ① and ②, the necessary number of trucks was determined as two 3 ton trucks.

(5) Personal computer

At present, there is no information processing equipment at Shoubra main warehouse, and the records of approximately 2,700 items are all processed manually. A large number of person are used to control delivery, issue and inventory. In order to process quickly, efficiently and accurately, a personal computer is introduced to perform the following operation:

① Delivery, issue and inventory control at Shoubra main warehouse

② Inventory control of the entire EPTC storage

③ Accounting and office calculation

For the above operation, 3 sets of computers should be sufficient.

(6) (7) Copy machine and overhead projector

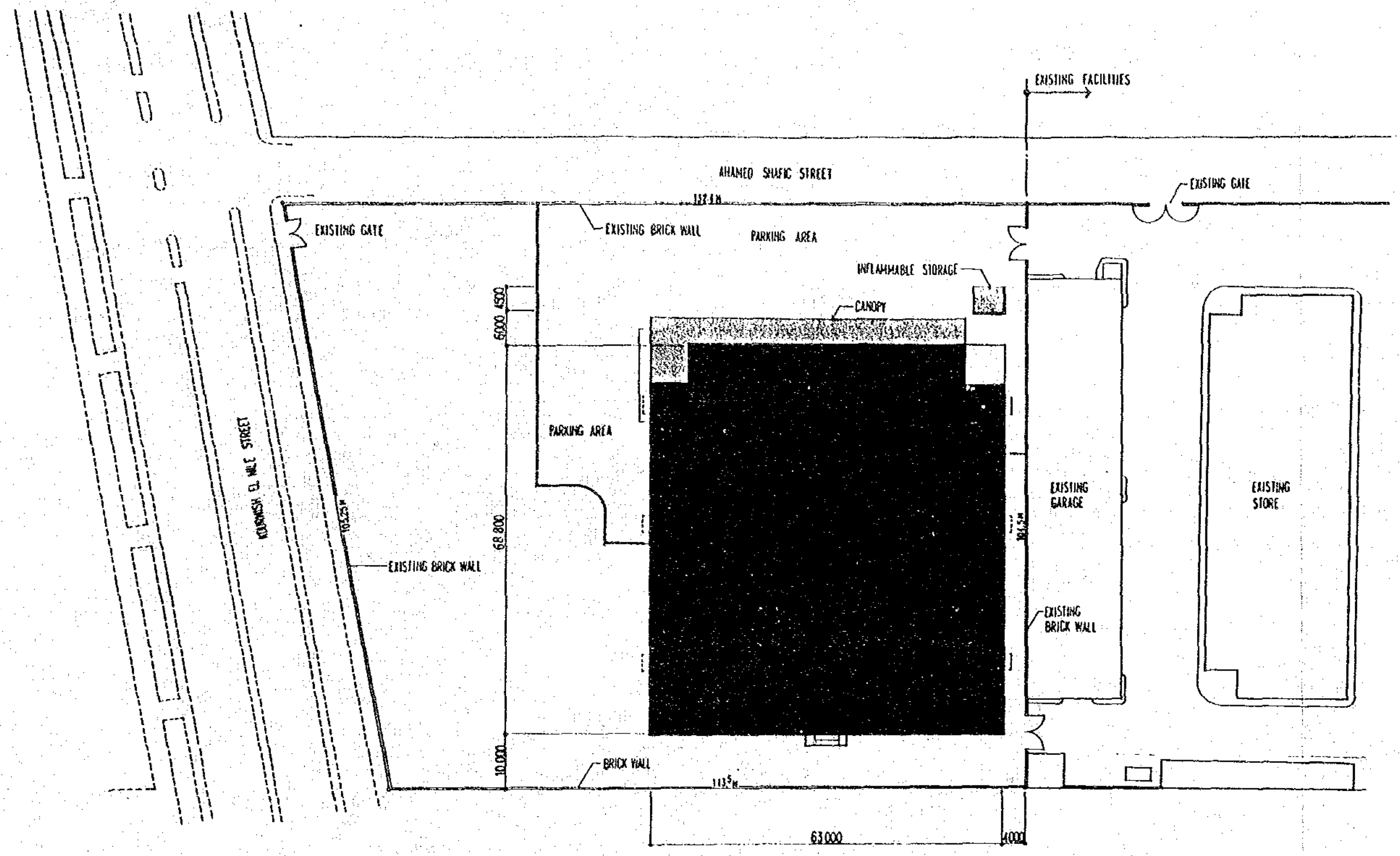
At the Shoubra main warehouse lectures on drug storage are given to staff employees once a week. In order to facilitate the lectures an overhead projector and copy machine is introduced.

(8) Wood working tools

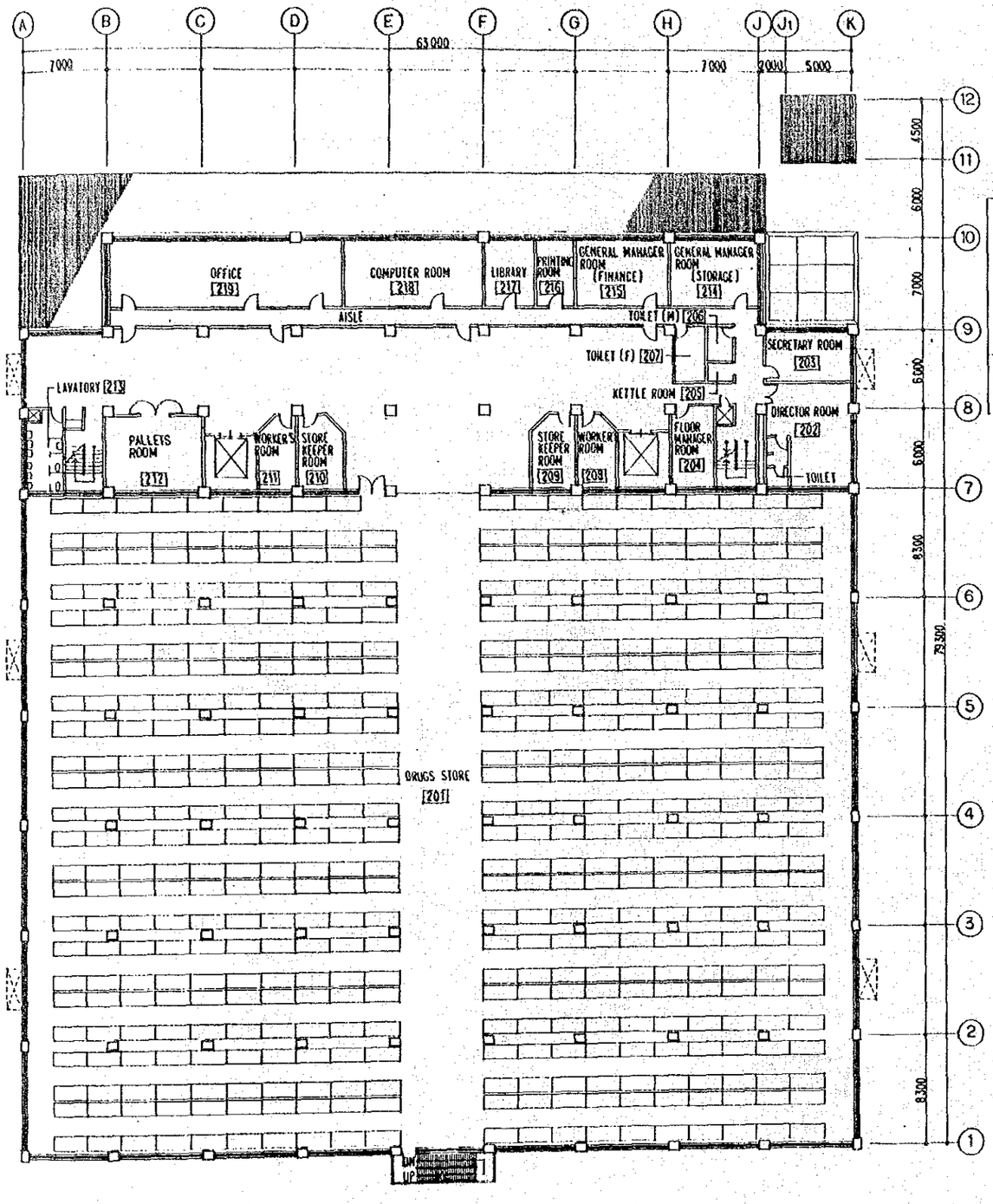
Wood working tools are introduced for repairing and making wooden pallets. The tools are electric saw and electric plane.

4.2.4 Basic Design Drawing

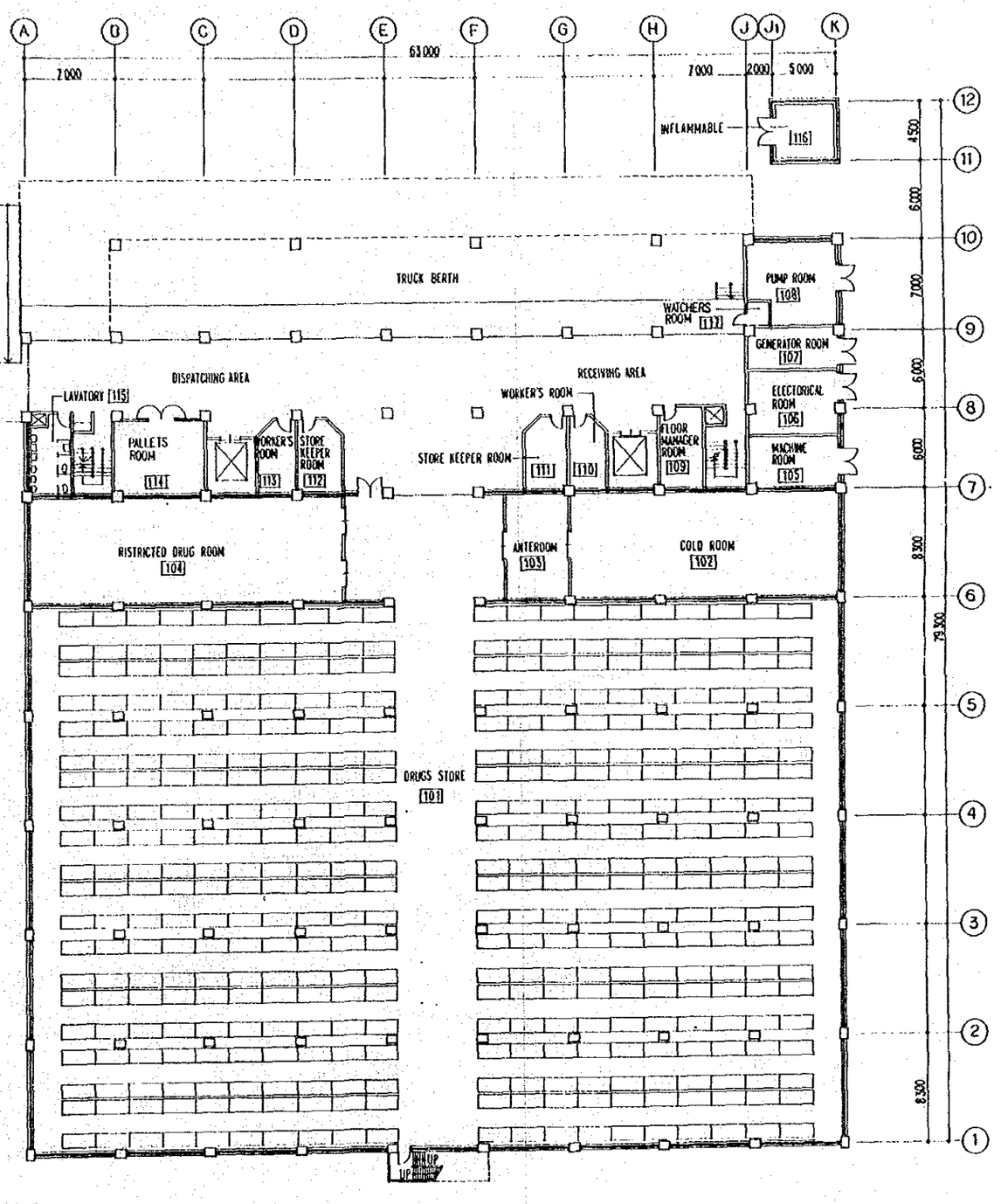
①	Layout	scale 1/1000
②	First floor plan, second floor plan	scale 1/400
③	Third floor plan, roof plan	scale 1/400
④	North elevation, east elevation	scale 1/400
⑤	South elevation, west elevation	scale 1/400
⑥	Cross section	scale 1/400


EXISTING FACILITIES
AHAMED SHAFIC STREET
EXISTING GATE
EXISTING GATE
EXISTING BRICK WALL
PARKING AREA
INFLAMMABLE STORAGE
CANOPY
PARKING AREA
KORNISH EL NILE STREET
EXISTING BRICK WALL
EXISTING GARAGE
EXISTING STORE
EXISTING BRICK WALL
BRICK WALL
6000
4500
68 800
10 000
63000
4000

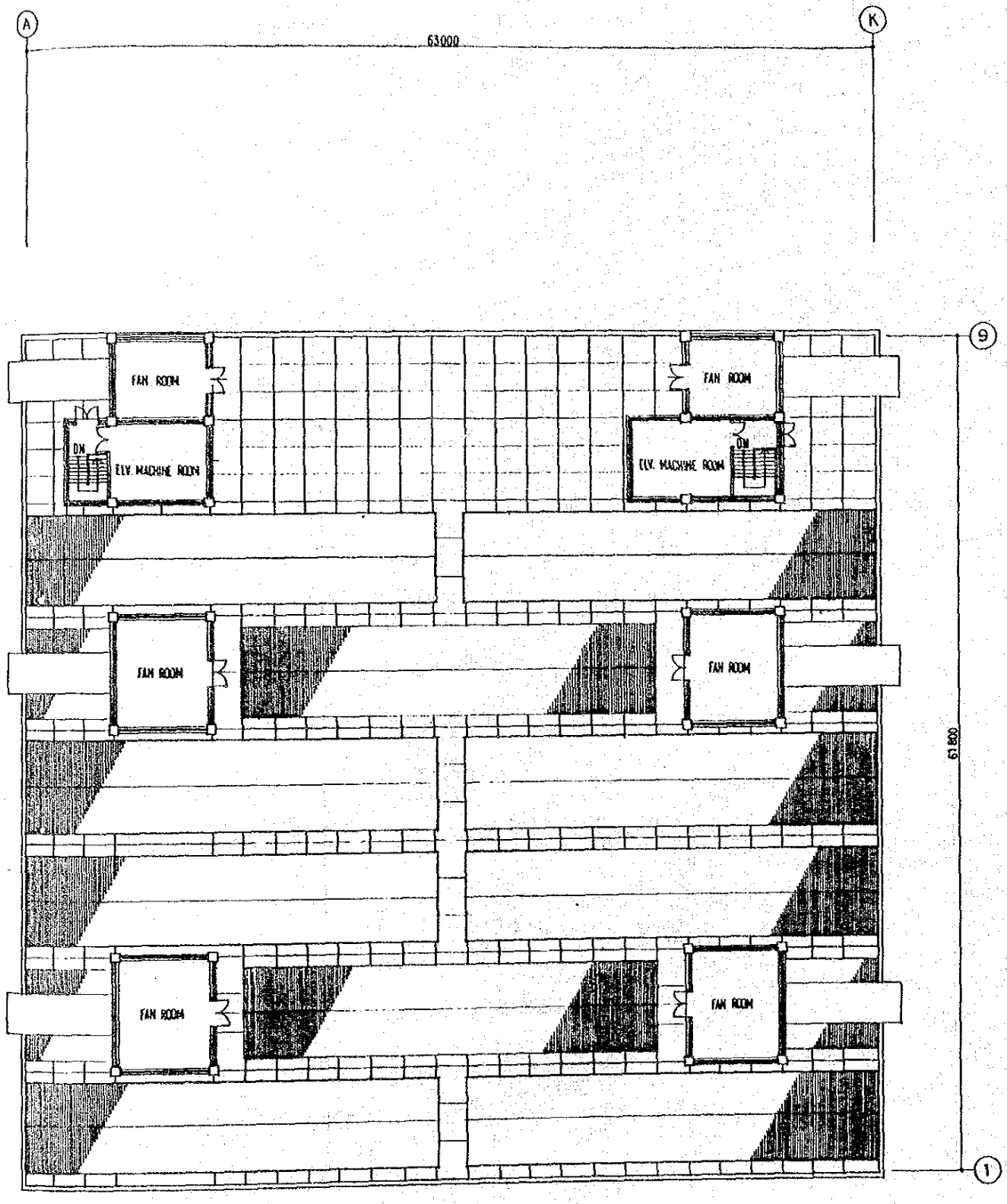
SITE PLAN



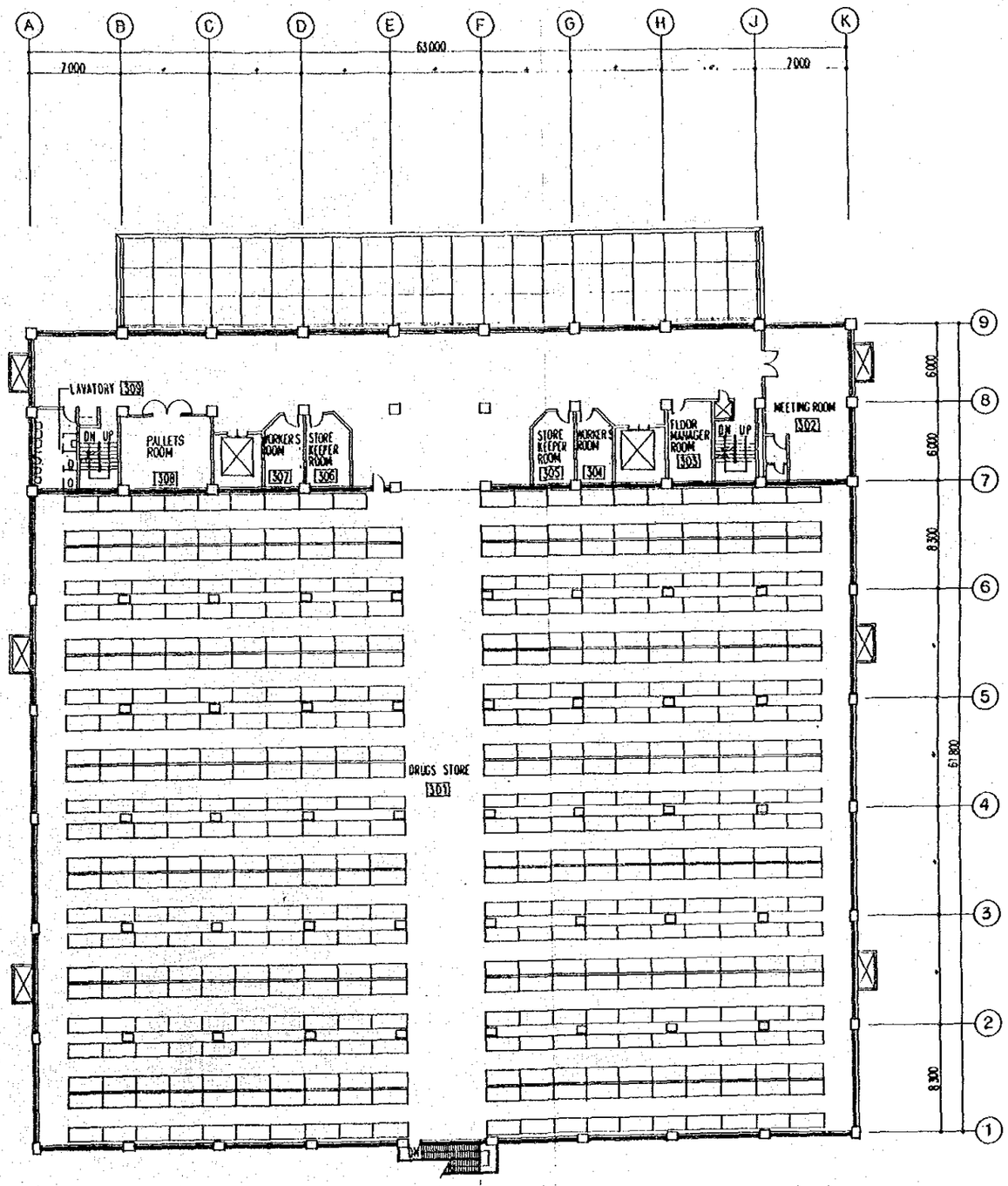
SECOND FLOOR PLAN



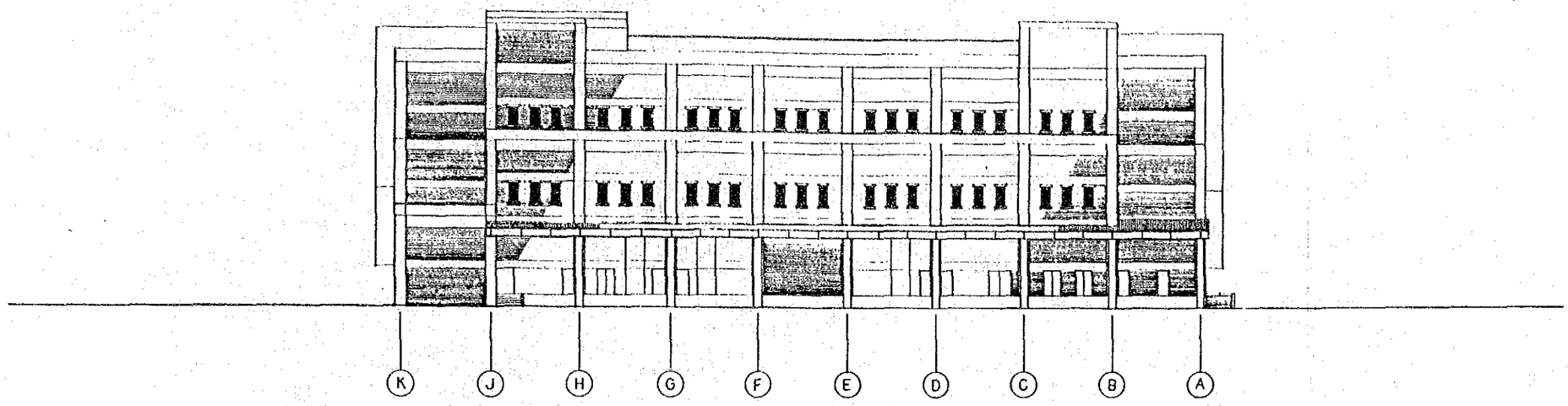
FIRST FLOOR PLAN



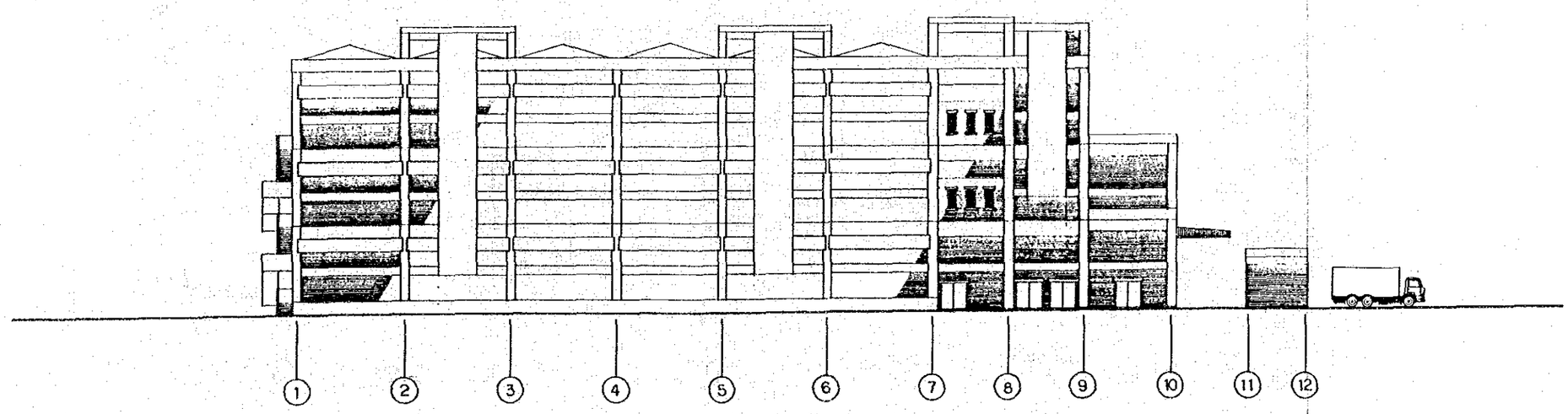
ROOF FLOOR PLAN



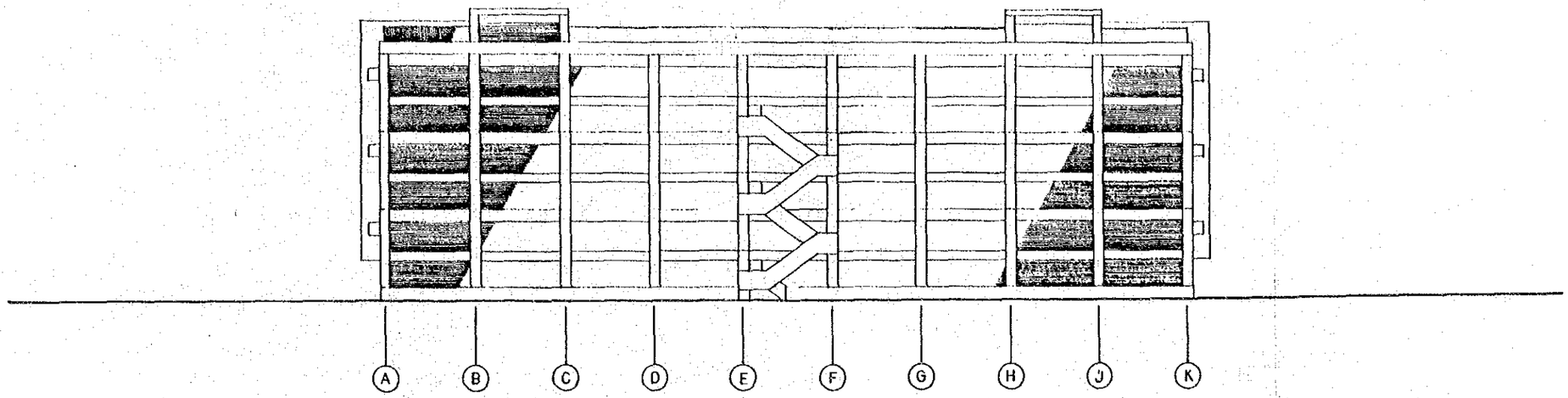
THIRD FLOOR PLAN



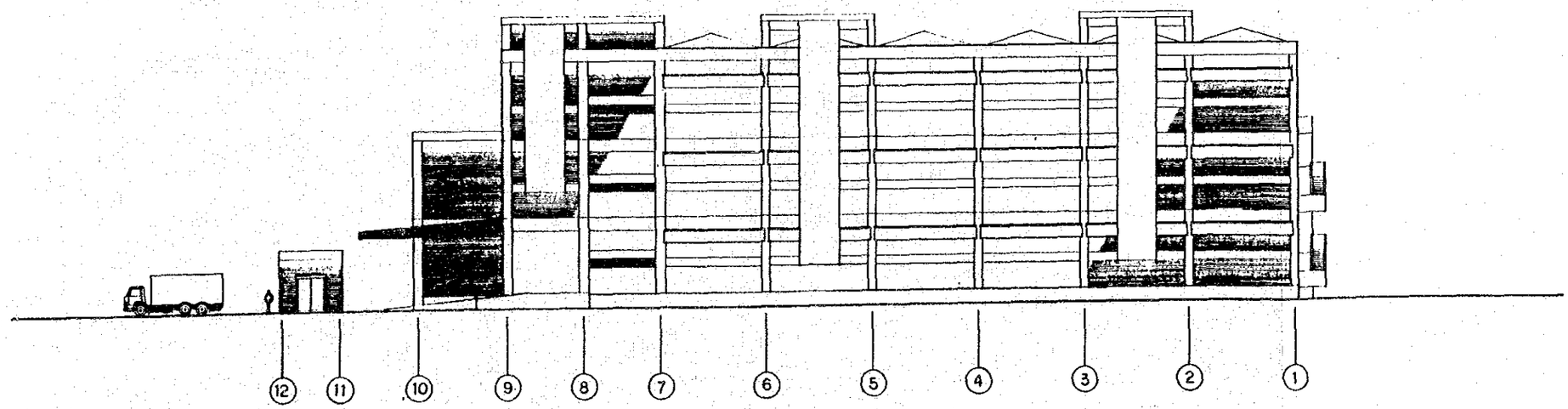
NORTH ELEVATION



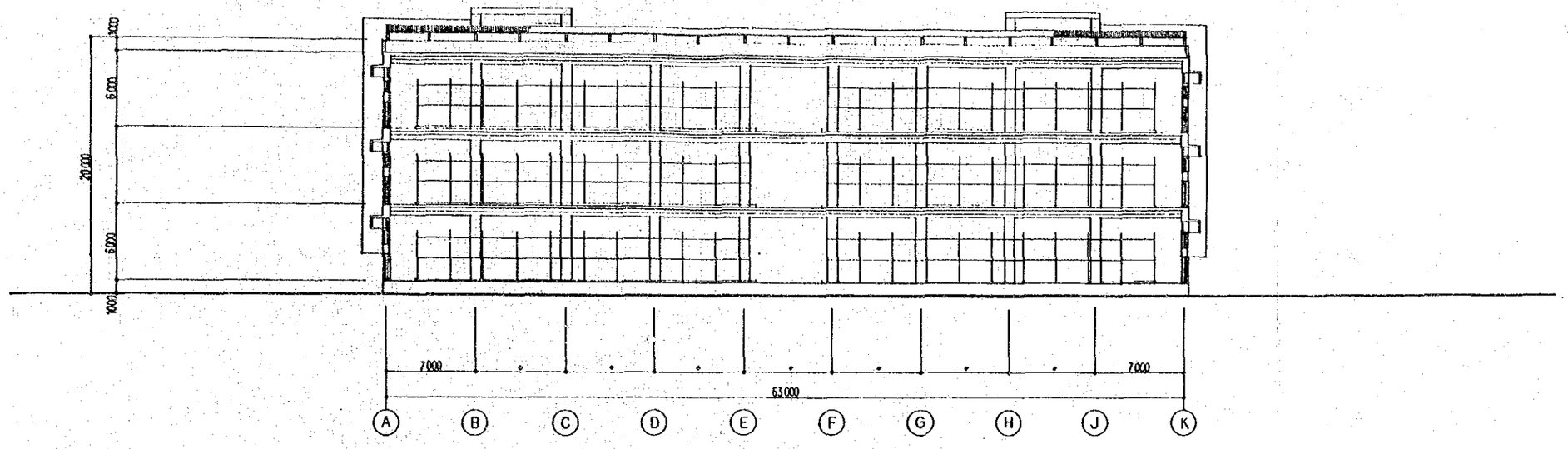
EAST ELEVATION



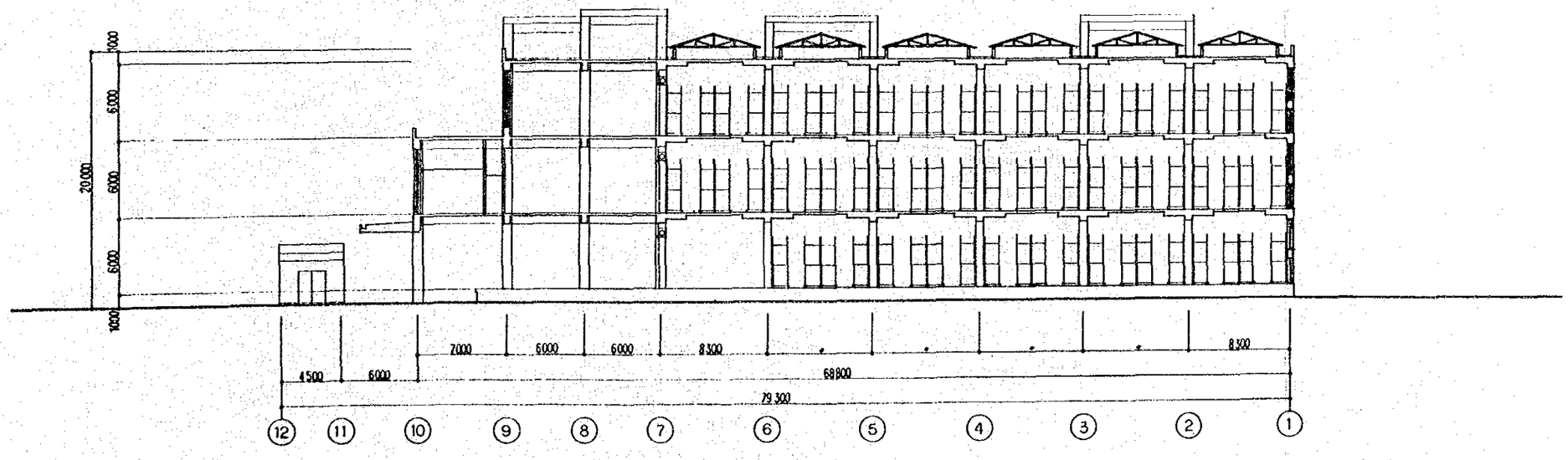
SOUTH ELEVATION



WEST ELEVATION



A-A SECTION



B-B SECTION

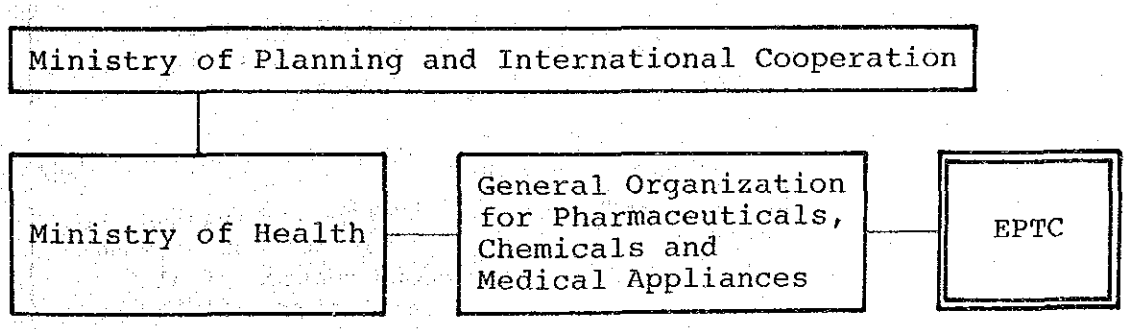
CHAPTER 5 PROJECT EXECUTION PLAN

CHAPTER 5 PROJECT EXECUTION PLAN

5.1 PROJECT EXECUTION ORGANIZATION

The government agency responsible for this Project is the Ministry of Health, but EPTC, a government corporation under the General Organization for Pharmaceuticals, Chemicals and Medical Appliances will undertake the implementation.

In order to promote the project implementation smoothly such as receiving the ratification of the People's Assembly and approval of the contract by the State Council, a close coordination and cooperation among Ministry of Planning and International Cooperation, agency in charge of economic cooperation, Ministry of Health, General Organization for Pharmaceuticals, Chemicals and Medical Appliances and EPTC are necessary.



For construction and installation of this project, a Japanese consultant will be designated in accordance with the regulation of the Grant Aid Program of Japan to design and supervise the project. After completion of detailed design, a Japanese contractor selected by tender will construct the project.

5.2 DIVISION OF UNDERTAKINGS

The division of construction work to be undertaken of both governments is shown below.

	Government of Japan	Government of Egypt
(1) Main construction		
① Site preparation		. Ground leveling within project site
② Water supply	. Piping within project site	. Piping from city water branch line to receiving tank
③ Drainage	. Sewage treatment facility construction . Piping within project site	
④ Power	. All wiring after power receiving transformers	. Wiring from public line to power receiving transformer and all related expense
⑤ Telephone	. All wiring after main terminal including installation of main terminal	. Wiring from public telephone line to main terminal
(2) Buildings	. Construction of project main facility and related facilities	. All expense related to permission and licenses . Construction of all facilities outside the Japanese scope
(3) Outside work	. Roads within project site and truck parking lot	
(4) Equipment	. Procurement of equipment	. Procurement of equipment outside the Japanese scope

	Government of Japan	Government of Egypt
(5) Furniture & fixtures		. Carpet, curtain, desk, chair and other fixtures
(6) Construction material & equipment	. Sea freight, insurance and inland transportation to site	. Custom clearance and exemption of custom duty
(7) Other work related to this project		. Bank arrangement and related expenses . Exemption of duty, Egyptian taxes and all assistance to members of consultant and contractor entering, residing and leaving Egypt

5.3 CONSTRUCTION SUPERVISION PLAN

Construction supervision consists of the following services.

① Instruction and assistance on construction contract

Evaluate qualification of tenderers, prepare and conduct tender, evaluate the contents of tender, select contractor and attend the signing of the construction contract.

② Inspect and approve shop drawings, etc.

Inspect shop drawings, material samples and equipment and issue approval.

③ Instruction and inspection of construction

Review and provide instruction on construction plan and schedule, also monitor, inspect and provide instruction on construction as necessary.

④ Issue certificate of approval

Inspect and determine the amount of work completed during the course of construction and completion of work and then issue a certificate certifying the amount of work completed and approving payment.

⑤ Construction report

Regularly submit a construction report to the execution agency and to the concerned agencies of the Government of Japan in order to assure smooth execution of works undertaken by the respective governments.

⑥ Acceptance of facility and equipment

When the construction is completed, the supervisor will inspect and verify the construction is completed according to the contract. After verification, the facility and equipment will be handed over to the execution agency for acceptance. The supervisor will attend the acceptance and issuance of the certificate of acceptance. This completes the supervisor's work.

5.4 PROCUREMENT PLAN

Equipment and Materials

The main materials such as cement, steel bars, gravels, and sand are expected to be procured in Egypt (refer Table 5-1). However, in order to avoid dust in this drug storage, it may be necessary to procure finishing materials from Japan or other foreign countries. Since materials procured in Japan must be shipped by sea, about 2.5 months must be estimated for delivery, including custom clearance.

Table 5-1 Procurement of Equipment and Materials

Items	Egypt	Japan	Other countries
Aggregates	o		
Cement	o		
Steel bars	o		Europe
Steel frames		o	
Brick	o		
Concrete blocks	o		
Lumber	Δ	o (fittings)	Europe
Tile	o		
Corrugated slate	o		
Aluminum frame		o (dust-tight)	
Steel door		o (dust-tight)	
Shutter		o (dust-tight)	
Terrazzo	o		
Glass		o (quality)	
Waterproof material		o (quality)	
Main equipment	Δ	o (quality, delivery)	
Prefabricated refrigerator		o (quality, delivery)	

Since all equipment for storing and distributing drugs are not manufactured in Egypt, they will be procured in Japan. Equipment which is easy to maintain and repair in Egypt will be a principal factor in the selection.

5.5 EXECUTION SCHEDULE

After the Exchange of Notes (EN) between the Government of Japan and the Government of Egypt in accordance with the Grant Aid Programme becomes effective, a consultant contract shall be concluded, and the detailed design shall be started. The work after EN becomes effective shall be implemented in 3 stages as described below and as shown in the implementation schedule diagram. The execution of this project is estimated as 17 months after effective date of the Exchange of Notes.

(1) Detailed design

Detailed design will be started after EN becomes effective and conclusion of consultant contract. Discussion concerning detailed design, based on the Basic Design Study Report will be conducted first with the Egyptian agency, then tender documents will be prepared. This should take about two months which would be three months after the effective date of EN.

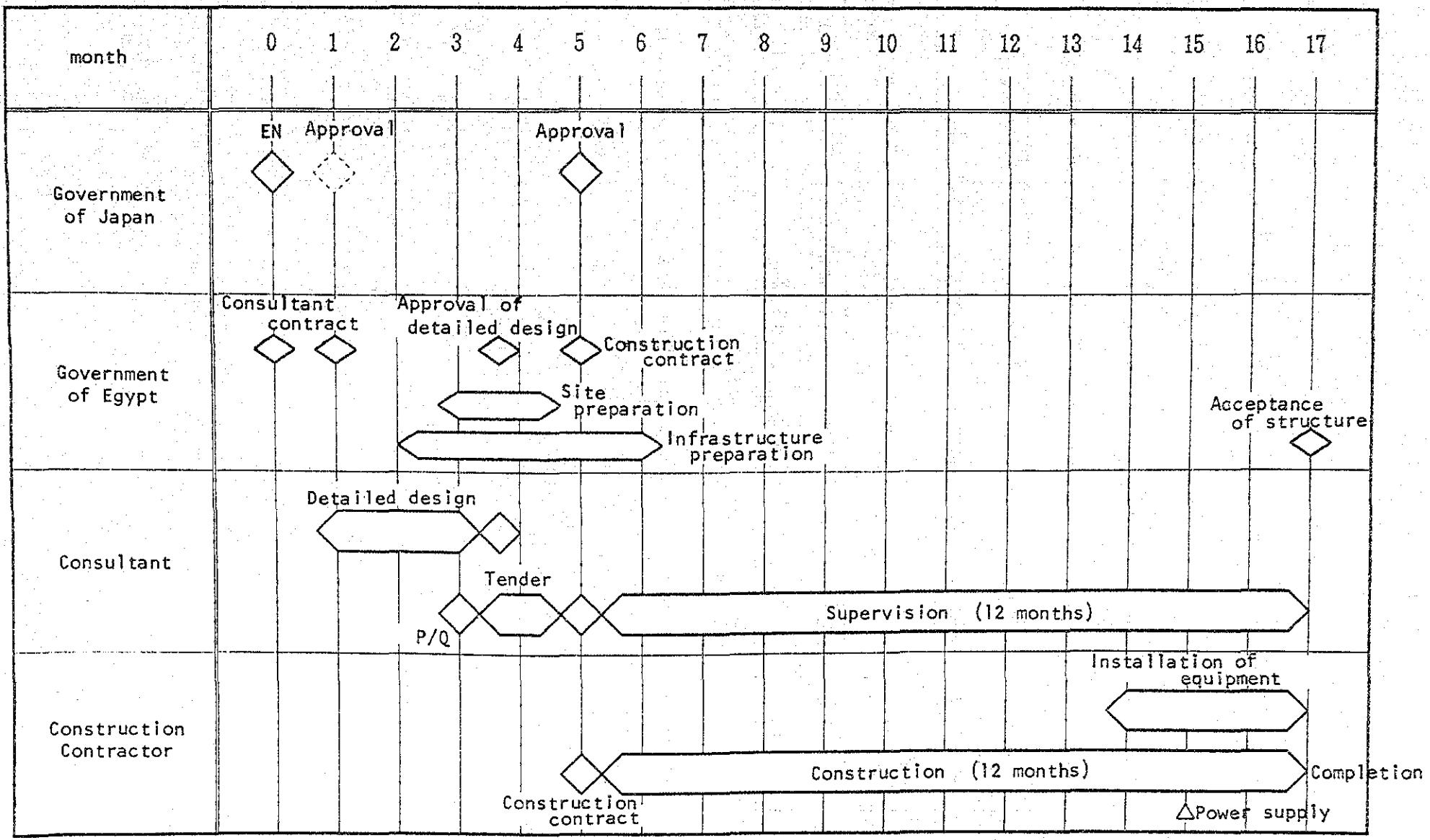
(2) Tender document

Two months is estimated for preparing tender documents, conducting tender, evaluating tender, determining successful tenderer, signing construction contract and starting construction. The period for preparation of tender such as issuing notice of tender and evaluation of qualification of tenderer is not included within the two months period.

(3) Construction

After the successful tenderer concludes a contract with the Government of Egypt, and the contract is approved by the Government of Japan, the construction will be started. The construction period is estimated as twelve months after handover of construction site.

Implementation schedule



5.6 PROJECT COST

The expense to be borne by the Egyptian side is estimated as 113,250 Egyptian pounds (about 6,640,000 yen), and its breakdown is shown in the following table.

	Egyptian pounds	Yen
Outside work	57,750	3,384,150
Water intake work	0	0
Power intake work	10,000	586,000
Telephone intake work	8,000	468,800
Fixture installation work	37,500	2,197,500
Total	113,250	6,636,450

This does not include the cost of the project site which is already a property of EPTC.

CHAPTER 6 MAINTENANCE AND MANAGEMENT PLAN

CHAPTER 6 MAINTENANCE AND MANAGEMENT PLAN

6.1 MANAGEMENT PLAN

Although personal computer and mechanical equipment are introduced for the improved storage system of medical drugs, the present manpower is expected to be fully utilized.

Some personnels may be transferred to different departments, but the new storage and distribution centre will be operated by the present employees under the present organization.

Now there are approximately 350 persons employed in the storage sector of the Shoubra main warehouse. The persons necessary for operating the new storage and distribution centre is estimated as about 100. (Table 6-1)

With the completion of the new facilities, imported drug storage, licensed drugs storage, restricted drugs storage, and part of the administration department will be transferred to the new storage and distribution centre.

It is expected that, 10 fork-lift operators for the warehouse, 1 programmer and 3 operators for the computer and 3 workers for the maintenance and management department, a total of 17 persons must be newly employed.

The strengthening and improvement of inventory control function of EPTC depends on whether suitable programmer to develop computer software and operators can be secured. Especially, a person familiar with simple computer language such as BASIC and has experience in preparing computer software is desirable as programmer.

Suitable personnel must be employed and trained before the completion of the project, and EPTC must take necessary measures.

It is believed that some fork-lift operators can be secured by training present EPTC employees who hold driving licenses.

Table 6-1 Manpower Table of New Storage and Distribution Centre

Warehouse	66 persons
Warehouse Manager	2
Storekeeper	6
Assistant	6
Writer	6
Picker (incl. fork-lift operator)	10
Finance	6
Card Writer	6
Folk Operator	6
Worker	18
Administration	26 persons
Director	1
Secretary	3
Warehouse Manager	1
Chief Accountant	1
Office Workers	20
Computer	5 persons
Manager	1
Programmer	1
Operator	3
Maintenance & Management	3 persons
Mechanical maintenance & operation	1
Guards	2

6.2 MAINTENANCE PLAN

In order to operate this project efficiency, EPTC must secure necessary budget and set up a suitable maintenance programme.

6.2.1 Maintenance of Facility

(1) Maintenance organization and manpower

The facility will be maintained by the engineers of EPTC.

In order to maintain the facility in good condition, it necessary to perform daily and scheduled inspection and maintenance of the facility in accordance with the equipment maintenance and operation manual, also to inspect, correct and repair the equipment at time of abnormal by engineers familiar with the equipment. Therefore, it is necessary to secure and train engineers and technicians so that they will be fully familiar with the facility when it is completed.

Since it is important to be familiar with the design concept and construction process for maintaining the facility in good condition, it is desirable to transfer such technical knowledge to the maintenance engineer during construction. Therefore its is desired that maintenance engineers be selected before construction of the new storage and distribution centre starts so they can receive technical training from the very beginning.

(2) Consumables and spare parts

This project is designed to mainly use local material and equipment, but some are procured from Japan or Europe. In order to be able to procure consumables and spare parts whenever necessary, it is necessary to clarify the model and type purchased for the facility and to verify the manufacturer and its agent in Egypt so that necessary materials and parts can be immediately procured. It is also necessary to include estimate for such materials and parts when preparing operation budget.

6.2.2 Maintenance of Equipment

(1) Maintenance organization and manpower

Equipment which can be maintained by employees of EPTC is mainly selected, but for maintenance of lifts, fork-lifts and computers a maintenance and management contract should be concluded with the agent of the manufacturer.

In order to assure that the facility will be maintained in good condition, operators and maintenance workers should be selected and secured before completion of the facility.

Since operators of the equipment will be responsible for daily maintenance, it is necessary to have them receive technical training from Japanese instructors so that they may be able to perform daily maintenance as written in the operation manual and to prevent misoperation.

In order to assure that maintenance will be performed as required, the following measures should be taken by Japanese instructors.

① Provide instructions on maintenance and management of consumables, spare parts and train workers on maintenance and management method.

② Prepare a maintenance manual for equipment also instruct and train EPTC personnels how to use the manual.

③ Provide explanation and instruction on equipment operation and repair by a Japanese engineer, who has sufficient linguistic capability and who is familiar with the equipment.

(2) Consumables and spare parts

Equipment parts may be classified into consumable parts which must be regularly replaced and emergency spare parts which must be replaced at breakdown. However, emergency spare parts for one or three years operation may not necessarily include parts for all repairs. Such parts must be procured by EPTC. Since good maintenance cannot be performed without spare parts even if maintenance workers are sufficient, EPTC must secure budget for procurement of spare parts.

6.3 OPERATION AND MAINTENANCE EXPENSES

Operation and maintenance expenses consist of equipment operation expense, maintenance expense and labour expense. An estimate of annual expense after completion of the facility is given in the following table.

The total operation and maintenance expense of the new storage and distribution centre is 408,180 Egyptian pounds, while that for the increased persons excluding persons transferred from other sections is 178,104 Egyptian pounds.

Since the Egyptian side has promised that budget will be secured for the new storage and distribution centre, also since this expense is only 3.5% (total employees) and 1.5% (increased employees) of the operation budget of EPTC (labour + necessary expense) which is 11,562,000 Egyptian pounds, it is expected that budget for the new storage and distribution centre can be secured.

Table 6-2 Annual Operation and Maintenance Expense

(estimate for 1990)

Item		Egyptian pound
Operation expense	Power	52,200
	Water	180
Maintenance expense		78,600
Labour expense	Total labour	277,200
	(increased labour)	(47,124)
Total		408,180 (178,104)

(1) Power

(a) Estimated average monthly consumption 30,000 kW

(b) Annual power expense

£E4,350 x 12 months = £E52,200/year

(2) Water

(a) Estimated average monthly consumption 300 m^3

(b) Water cost 5.0 p/m^3

(c) Annual water expense

£E15.0 x 12 months = £E180/year

(3) Maintenance expense

Monthly maintenance expense of 6,550 Egyptian pounds is estimated for lift, fork-lift, computer and other equipment.

Lift:	£E1,350 x 12 months = £E16,200
Fork-lift:	£E1,500 x 12 months = £E18,000
Electrical equipment:	£E2,000 x 12 months = £E24,000
Others:	£E1,700 x 12 months = £E20,400
Total	£E78,600

(4) Labour expense

The annual labour expense is estimated as 2,100 Egyptian pounds (£E175/man.month x 12 months), and an yearly increase of 15% is estimated for the first 2 years.

Annual labour expeses

£E2,100 x 100 employees x (1.32%) = £E277,200

Increased employees

£E2,100 x 17 employees x (1.32%) = £E47,124

The annual labour expense for total employees is estimated as 277,200 Egyptian pounds while that for increased employees is estimated as 47,124 Egyptian pounds.

CHAPTER 7 PROJECT EVALUATION

CHAPTER 7 PROJECT EVALUATION

The objective of this project, the construction of a new storage and distribution centre in Shoubra main warehouse which is the principal installation for EPTC drug storage and distribution, is to extend and strengthen the function of EPTC drug storage and distribution activities. This project is evaluated from its overall social and economical impact.

(1) Maintain drug quality during distribution

By construction of the new storage and distribution centre, the drugs presently stored separated in 3 different warehouses, especially drugs requiring good quality control such as the 600 imported drugs, 900 underlicense drugs, restricted drugs and drugs required to be kept cool will all be stored and controlled under GSP standard at the new centre.

Furthermore, by cleaning and utilizing the space created by transferring the above drugs and also improving storage method, the 4,000 local drugs can also be stored in better condition.

The expanded storage capacity at the main warehouse will ease the storage burden of provincial and intermediate warehouses, and permit them to function as a temporary storage and distribution facility. This will reduce the risk of drug quality deterioration at provincial and intermediate warehouses and will make it possible to distribute high quality drugs to hospitals and pharmacies.

By providing a refrigerator transportation trucks, the effectiveness of drugs which require strict temperature control such as insulin will not drop during transportation from main warehouse.

Therefore, by implementing this project, the reliability of drug quality will be improved by better storage and distribution. The avilability of high quality drug from improved storage and medical service will surely contribute greatly toward improvement of the health of the Egyptian people.

(2) Stable supply of drugs in accordance with consumption trends.

By construction of the new storage and distribution centre, the storage capacity of Shoubra main warehouse will be enlarged, making it possible to perform a much more efficient storage and distribution function.

The present irregular drug distribution route, caused by insufficient storage capacity at the main warehouse, can be in principle standardized to a route of manufacturer — main warehouse — intermediate warehouse — hospital or pharmacy. This will reduce long period storage at main warehouse, as well as excessive inventory, drug shortage and stock out at intermediate warehouses, and will create a system for providing necessary drug in necessary quantity at necessary time.

Furthermore, with the introduction of a computer for inventory control, the amount of drug inventory, amount of drug movement, and drug consumption trend will be known quickly and accurately. This will permit order of drugs in accordance with market trend, provide inventory

control such as inventory adjustment and prevent stockout or excessive stock. To know inventory and consumption trend quickly is especially important for imported drugs which require long lead time from order to delivery.

The improvement of inventory control at EPTC will provide a stable supply of drugs to hospital and pharmacy, which is expected to improve health and medical service for the Egyptian people.

(3) Reduction of drug loss

A drug loss amounting to 0.06% (approximately 1,912 thousand Egyptian pounds) of annual turnover of EPTC is recorded. The causes of loss are damage during storage and transportation, expiry of effectiveness due to long storage and quality deterioration due to unsuitable storage condition.

By implementation of this project, modern storage control at main warehouse (rack storage of palletized drugs), improvement of inventory control (storage period control) and improvement of distribution method (standardized stacking, refrigerator truck transportation) are established which greatly reduce drug loss.

The reduction of drug loss will not only raise the economic efficiency of EPTC acitivity, but will improve efficiency use of drugs which is an important though limited health and medical resource. This will result in improved health and medical services.

(4) Reduction of storage control cost

The construction of the new storage and distribution centre will expand the storage space by 60 percent, but the operating and managing personnel will mostly be secured by transferring personnel from present warehouse and only about 20 persons will be newly employed. The increase of operation and maintenance cost including increase of labour cost and utilities is small compared with the large increase of drug handling. This will result in a reduction of unit storage cost.

As described in the above paragraphs, the implementation of this project is expected to contribute to the improvement of health and medical service in the Arab Republic of Egypt.

CHAPTER 8 CONCLUSION AND RECOMMENDATION

CHAPTER 8 CONCLUSION AND RECOMMENDATION

This project is expected to play an important role in the extension of the national health and medical care service in Egypt and to contribute toward its improvement and development. Therefore, this project qualifies as a Grant Aid Project of the Government of Japan.

In order to achieve the expected results of this project after its implementation, it is desired that the following items be conscientiously implemented together with the smooth operation of the storage and distribution centre.

(1) Taking this opportunity of the construction of the new storage and distribution centre, the EPTC drug distribution network should be rationalized by rehabilitating and modifying the existing facility at Shoubra main warehouse so that it may perform its original function as a main warehouse, and by limiting the function of provincial and intermediate warehouses to that of a temporary storage and distribution facility.

(2) With the construction of the new storage and distribution centre, the storage management system and operation organiization of Shoubra main warehouse should be reviewed. In order to conduct a smooth storage operation after completion of the new facility, a committee for operation of the new storage and distribution centre should be established as soon as construction is started so that a satisfactory operation system is organized when the project is completed.

(3) Since new pieces of equipment such as computer and forklifts are introduced, it is necessary to secure and train personnels who will be familiar with EPTC storage activities as well as computer operation knowledge and also personnel who can operate forklifts for storage operation.

(4) A drug handling manual based on EPTC drug handling standard (first-in/first-out operation, pallet stacking method, etc.) should be prepared, and storage workers should be trained to fully apprehend the content of the manual.

(5) In order to improve the drug supply system in Egypt, the production sector should also be rationalized to manufacture and ship drugs in accordance with consumption trend and to provide strong packing for units required in shipping as well as package units for marketing. It is desired that EPTC will contribute to these efforts by provide all necessary market information collected through EPTC network.

(6) The ministry in charge of this project is the Ministry of Health, but the actual implementation will be carried out by EPTC, a corporation under the General Organization for Pharmaceuticals, Chemicals and Medical Appliances.

In order to promote this project smoothly including the ratification by the Peoples Assembly and contract approval by the State Council, a close cooperation among the Ministry of Planning and International Cooperation, the ministry in charge of economic cooperation, Ministry of Health, General Organization for Pharmaceuticals, Chemicals and Medical Appliances and EPTC is desired, together with the establishment of an office responsible for implementation of this project.

Furthermore, in the implementation of this project, an Egyptian counterpart at the field level will be necessary. It is recommended that a competent person be appointed along with the progress of this project.