

2.3 STORAGE AND DISTRIBUTION OF DRUGS

2.3.1 Characteristic of Pharmaceutical Distribution

(1) Characteristics of Drugs

Since drugs have influence on all living bodies, and have function of preventing and curing illness, they have a great effect on human lives. Because of such big influence on human lives, drugs are required to keep potency and safety. Also, maintenance of high quality is required throughout the distribution stage.

Furthermore, drugs are incorporated in the welfare or medical care system of the country, so their influence on the public and the society is very high. Therefore, because of its close relation with health and life, various regulations concerning drugs are set up in all countries.

Also, since drugs are required for all types of illness, there are many different kinds of drugs. Unlike other products, drugs are products which require production of many different kinds in small quantity.

Another feature affecting drugs is that outbreak of illness is unpredictable and demand is not constant either in time or location. Demand of drugs such as drugs for influenza is seasonal, but on the whole the demand of drugs is changing and is very unstable.

Thus, necessary drugs, at necessary time in necessary amount must be supplied through the distribution system.

(2) Distribution of Drugs

Drugs are distributed through a route of manufacturers — distributors — dispensary/pharmacy — patient.

The function of a distributor is to tie production to consumption by means of providing services through purchasing, collecting, storing, selling, sorting and shipping activities and management.

Aside from these basic function, the distributor of drugs are responsible for providing constant supply, strict quality control and accurate information, because drugs are a product which directly affect the health and the life of human beings.

(a) Stable, constant supply

Although drugs are of many different types subject to an unstable ever-changing demand, the distributor is responsible to keep necessary stock for providing reliable supply of necessary drugs, in necessary amount, at necessary time.

(b) Quality control

Keeping the quality of drugs to ensure potency and safety is most important. For this purpose, the "Good Manufacturing Practice, GMP" standard was adopted by the countries of the world at the General Meeting of WHO in 1976 to assure manufacture of good quality drugs.

Also in the field of drugs distribution, a "Good Supplying Practice, GSP" standard was adopted by Japan, USA and European countries to assure delivery of good quality drugs. In order to prevent drugs manufactured under GMP standard from deteriorating, the GSP standard requires drugs to be stored and tested under satisfactory facilities and condition.

(c) Information management

Collection and transmission of medical information for medical institutions is generally conducted by members of pharmaceutical manufacturers handling medical information through activities such as providing publication and reference materials.

The information collected through the broad network of the distributor regarding drugs consumption trend, quality control and inventory control is most important for providing a constant, stable supply of drugs.

2.3.2 Distribution of Drugs in Egypt

(1) Distribution system

The distribution system from production and import to the final user is shown in Fig. 2-2. The final users purchase drugs from the approximately 7,700 private pharmacies (approved by the General Organization for Pharmaceuticals, Chemicals and Medical Appliances which specifies the disposition of pharmacists is required) located throughout the country, or through the 26 EPTC pharmacies, health centres of the Ministry of Health and public or private hospitals (Table 2-14).

However, since medical practice and dispensary are strictly separated in Egypt, drugs including injections must be purchased by the user from pharmacies based on doctor's prescription. The hospital does not provide drugs directly to patients with the exception of anesthetics, special drugs and drugs for in-patients.

EPTC supplies most of these drugs used in pharmacies and hospitals. EPTC purchases drugs from local and foreign producers, then stores the drugs at its main warehouse and distributes to the 42 intermediate warehouses located throughout the country or through the hospital suppliers centres in Cairo and Alexandria for distribution throughout the country.

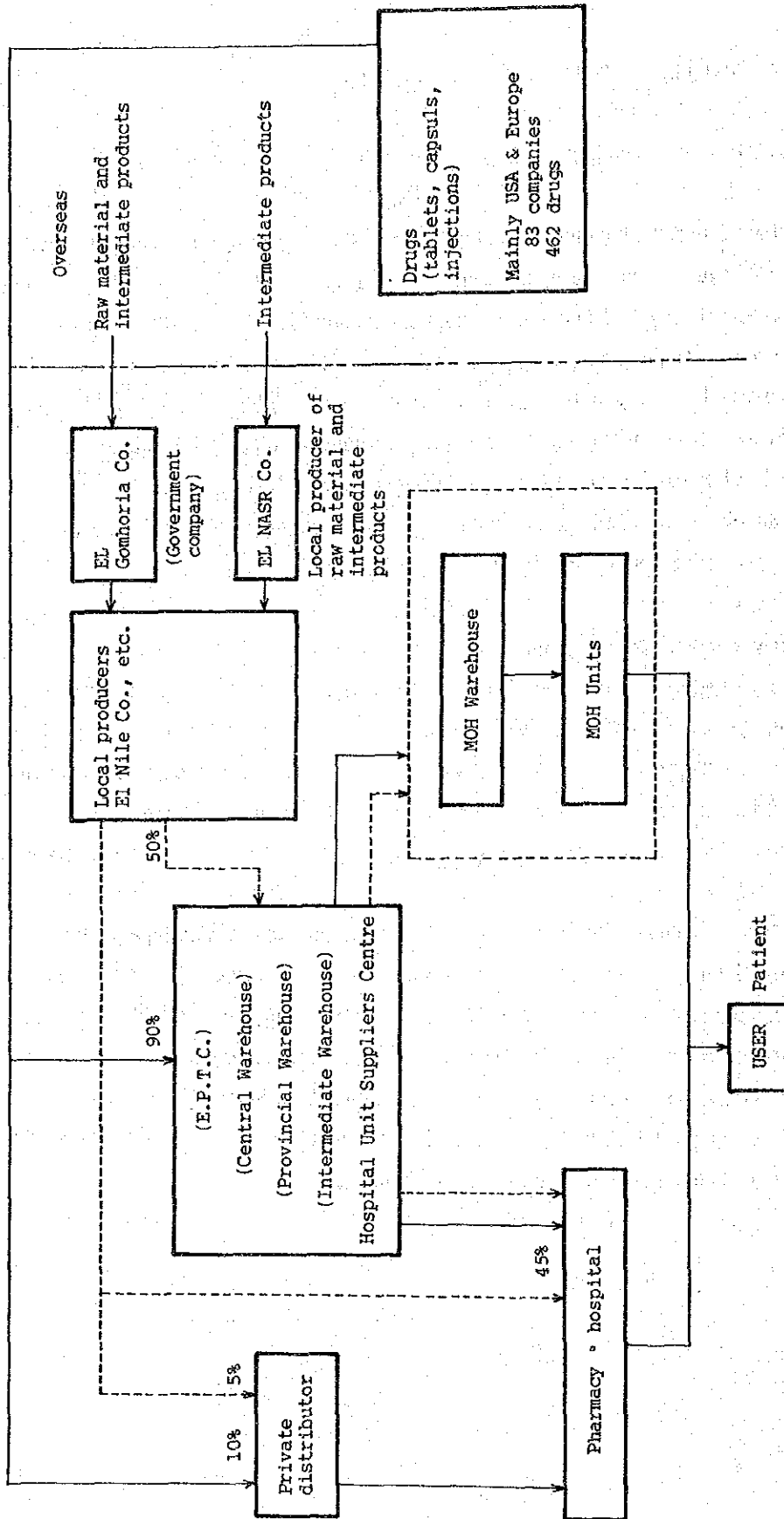


Fig. 2-2 Drugs Distribution System

2.3.3 Organization and Activity of EPTC

EPTC is the largest drug supplier in Egypt handling 90% of imported drugs and 50% of local drugs. The number of drugs total about 2,700 drugs (packages) consisting of 600 imported drugs, 900 drugs produced under license and 1,200 local drugs. These drugs are supplied to medical institutes and pharmacies throughout Egypt under the EPTC distribution network.

(Fig. 2-3)

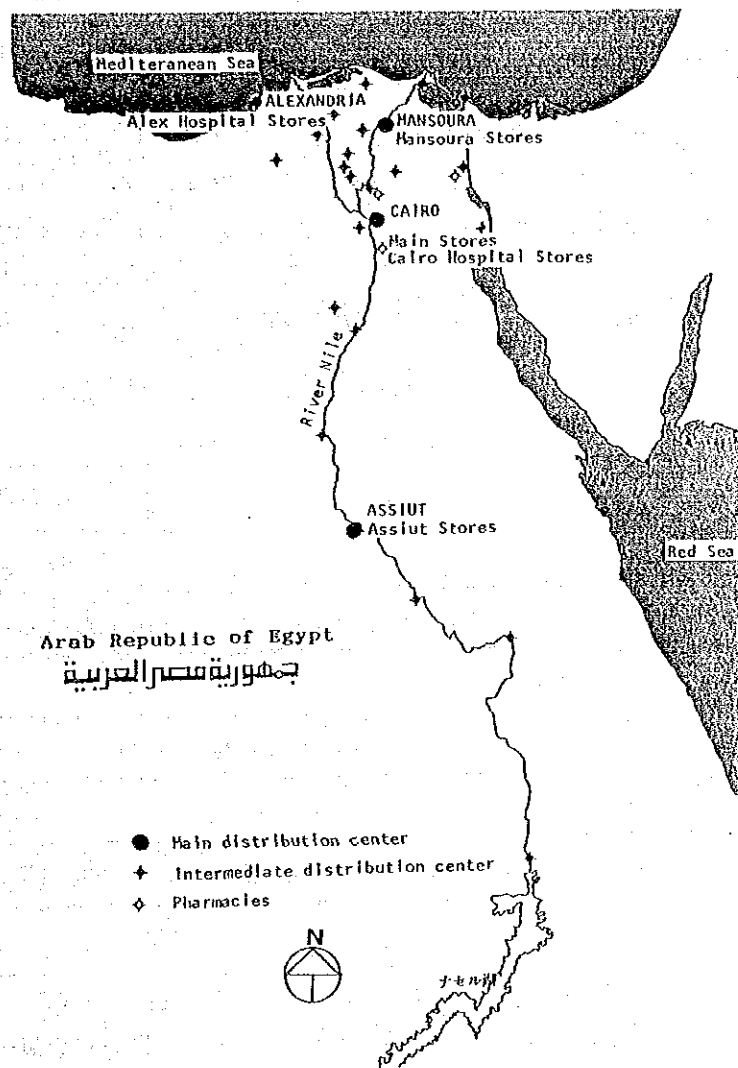
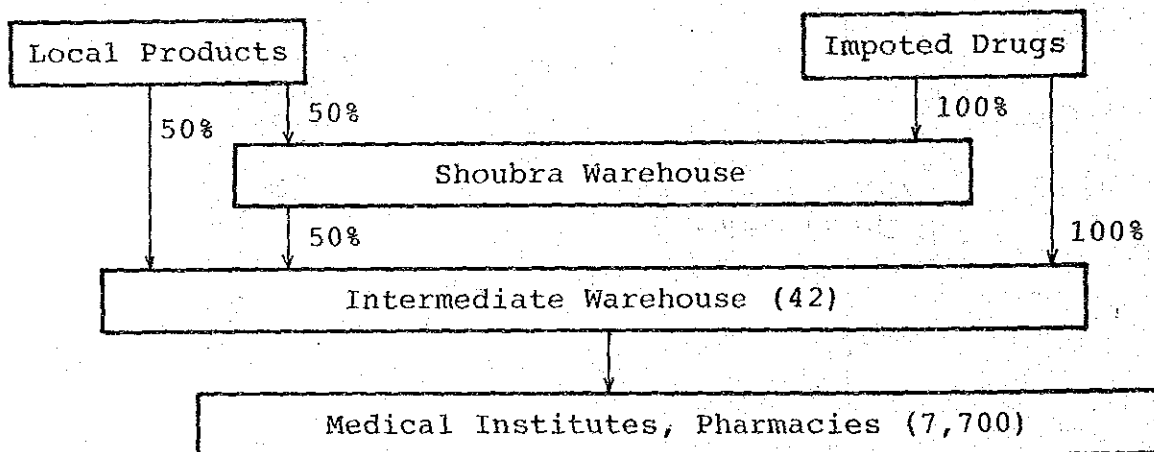


Fig. 2-3 EPTC Drugs Distribution Network

Drugs are distributed to the 7,700 pharmacies throughout Egypt through Shoubra main warehouse, hospital supply centres and 42 intermediate warehouses. Each intermediate warehouse supplies to an average of 180 pharmacies and medical institutes.

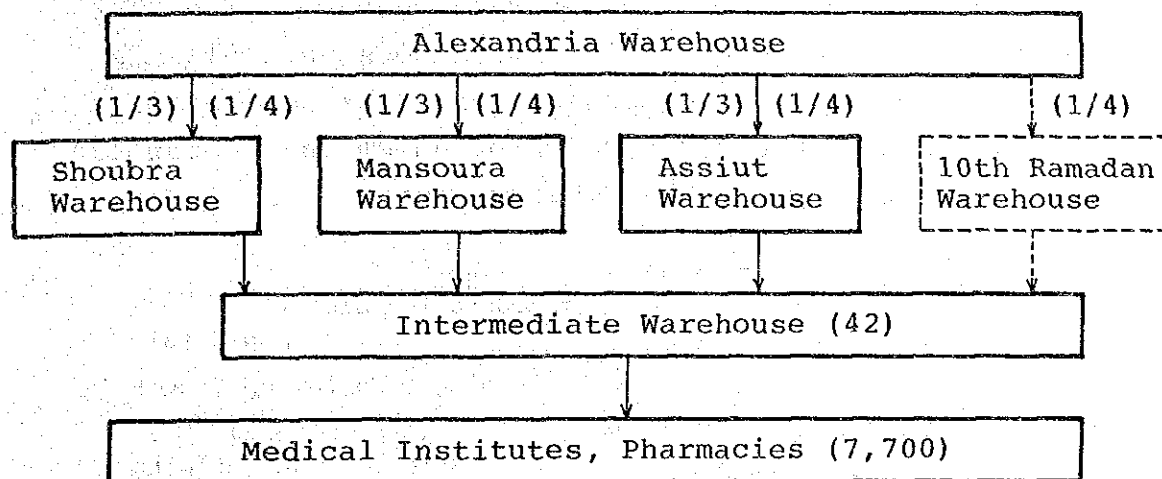
The Cairo hospital supply centre supplies drugs to public and private hospitals in Cairo and Ministry of Health warehouses throughout the country. The Alexandria hospital supply centre supplies drugs to hospitals in Alexandria and its vicinity.

Imported drugs are all supplied from the Shoubra main warehouse through intermediate warehouses, but owing to the lack of storage capacity at the Shoubra main warehouse, 50% of the EPTC sales of local drugs and drugs produced under license are supplied directly to intermediate warehouses and hospital supply centres from drug manufacturers.



The supply of drugs is the main duty of EPTC, but in line with the government's health policy, semi-pharmaceutical products such as baby milk (specified as semi-pharmaceutical product under the pharmaceutical law in 1987) is also handled by EPTC. Baby milk is stored and distributed from provincial

warehouses at Alexandria, Mansoura and Assiut through intermediate warehouses.



Pharmaceutical drugs supplied by EPTC during the past 3 years are shown in Table 2-15 and from the Table it can be seen that the growth for the last 3 year period was 19%, and the average annual growth rate was 9%.

Among the total EPTC sales of 318.69 million Egyptian pounds, 75.6% was sold through intermediate warehouses, 19.2% through hospital supply centres and 5.2% through pharmacies.

Table 2-15 Pharmaceutical Drugs Supplied by EPTC

| Year | Imported drugs | | Local drugs | | Total | |
|---------|----------------|----------------------|----------------|----------------------|----------------|----------------------|
| | Million pounds | Rate of increase (%) | Million pounds | Rate of increase (%) | Million pounds | Rate of increase (%) |
| 1984/85 | 104.59 | 100.0 | 161.58 | 100.0 | 266.17 | 100.0 |
| 1985/86 | 111.53 | 106.6 | 174.28 | 107.9 | 285.81 | 107.4 |
| 1986/87 | 123.58 | 118.2 | 195.11 | 120.8 | 318.69 | 119.7 |

Source: EPTC

(2) Organization and Operation

The organization of EPTC, as shown in Fig. 2-4 consists of 13 sectors headed by directors. The operation is decided by a Board of Directors which is the highest decision making organ. The total number of employees is roughly 3,600 employees of whom about 350 employees are employed in storage sector.

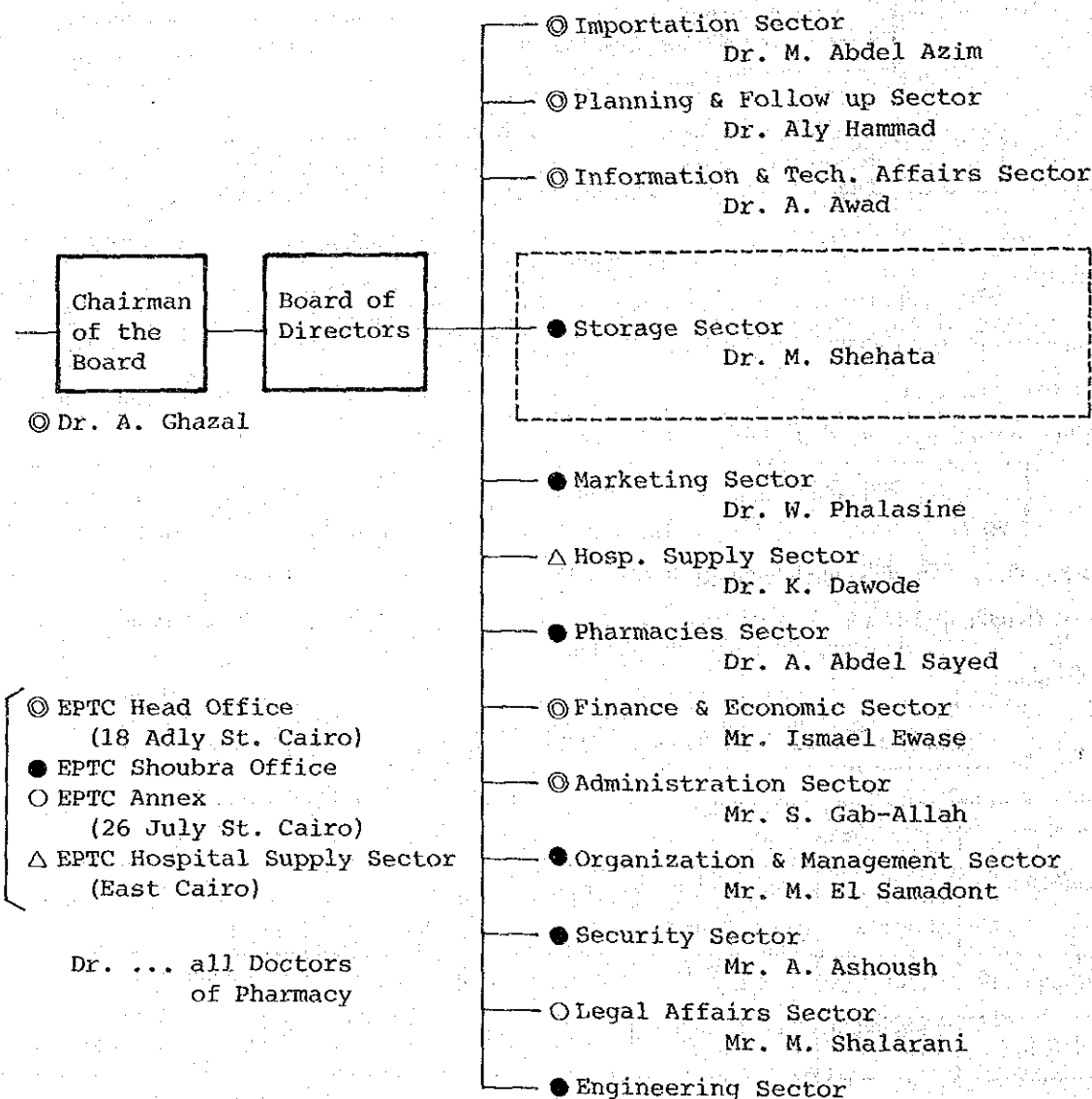


Fig. 2-4 Organization of EPTC

(3) Pharmaceutical product supply

Within the organization of EPTC, the sectors concerned with the supply of pharmaceutical products are the 6 sectors; importation sector, marketing sector, storage sector, hospital supply sector, pharmacies sector and engineering sector. The storage and distribution system is shown in Fig. 2-5.

Importation sector: Activity related to drug import (example, tendering, opening L/C)

Marketing sector: Inventory control of all EPTC drugs and management of 42 intermediate warehouses

Storage sector: Storage of drugs and management of main warehouse as well as provincial warehouses (3)

Hospital supply sector: Management of hospital supply centres in Cairo and Alexandria

Pharmacies sector: Management of EPTC pharmacies (26)

Engineering sector: Distribution of drugs (from main warehouse to intermediate warehouses)

Storage Sector

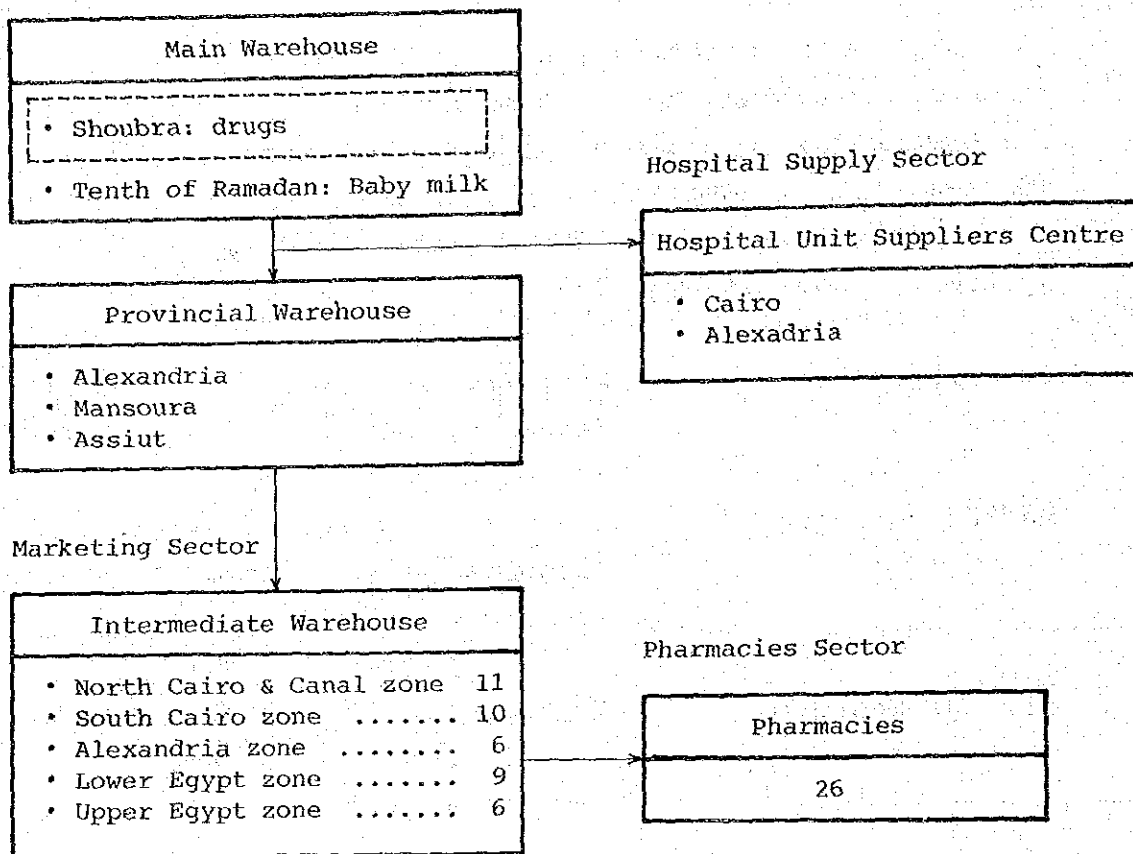


Fig. 2-5 Distribution System of EPTC

(4) Storage management organization

The General Managers of the each store are responsible for storage and management, and the General Manager of the inventory control section is responsible for quantity and quality inspection.

The Shoubra main warehouse is separated into eight stores, each managed by a storekeeper under the supervision of the General Manager of the main store.

The storekeeper is responsible for storing and issuing drugs and is assisted by assistants, pickers, writers, finance, card writer and workers.

| | | |
|-------------------|---------------------------------------|--------|
| Shoubra Warehouse | 1. Imported drugs store | |
| | 2. Local drugs store | |
| | 3. Restricted & essential drugs store | Note 1 |
| | 4. Underlicensed drugs store | |
| | 5. Vet. & tender drugs store | Note 2 |
| | 6. Infant milk store | |
| | 7. Chemical drugs store | |
| | 8. Family planning goods store | Note 3 |

- Notes:
1. Restricted and essential drugs include anesthetic drugs and neurosis drugs which are controlled by special regulations.
 2. Underlicensed drugs are locally produced drugs under license (technical transfer agreement).
 3. Family planning are mainly oral contraceptives (pills) and other contraceptives which destroy spermatozoon.

(5) Operation budget

The operation of EPTC is financed from sales of drugs and from government subsidies. The income for the year 1986/87 is shown in Table 2-16 and it is seen that the sales of drugs is 318,687,000 Egyptian pounds or 94.2 percent of the total income.

In the expenditure items, the purchase of drugs is the largest item amounting to 268,208,000 Egyptian

pounds, and next is the custom duty paid on imported drugs which amounts to 11,884,000 Egyptian pounds. These two items represents 82.7 percent of the total expenditure. Third is labour expense which amounts to 10,999,000 Egyptians pounds or 3.4 percent of the total expenditure. The annual maintenance expense is 653,000 Egyptian pounds or 0.1 percent of the total expense.

Table 2-16 Operation Budget (1986/1987)

Unit: 1000 Egyptian pounds

| Income | | Expenditure | |
|---------------------------------------|----------------|--------------------------|----------------|
| 1. Operation income | 321,282 | 1. Labour expense | 10,999 |
| (1) Sales income | 318,687 | 2. Social purchase | 1,389 |
| (2) Transfer of drugs | 4,975 | 3. Drug purchase | 268,208 |
| 2. Other income (sales service) | 41 | 4. Sample purchase | 412 |
| 3. Subsidies (import continuation) | 4,979 | 5. Necessary expense | 653 |
| 4. Exchange profit | 200 | (1) Oil lubrication | 116 |
| 5. Operation profit | 11,928 | (2) Parts | 125 |
| | | (3) Spare/case | 33 |
| | | (4) Printing machine | 281 |
| | | (5) Utilities | 98 |
| | | 6. Service expense | 2,147 |
| | | 7. Miscellaneous expense | 34,878 |
| | | (1) Custom duty | 11,884 |
| | | (2) Others | 22,994 |
| | | 8. Extraordinary expense | 10,560 |
| | | 9. Interest expense | 8,984 |
| Total | 338,230 | Total | 338,230 |

Source: EPTC Finance & Economic Sector

2.3.4 Condition and Problems of Existing Storage and Distribution Facilities

As described in the preceding sections, EPTC bears the important responsibility of supplying good quality drugs to the Egyptian people through its purchasing, storing, distributing and marketing system. In order to fulfill this responsibility, EPTC must purchase drugs in accordance with the demand trend, store and transport the drugs without deteriorating its quality, and promptly deliver the drugs ordered by pharmacies and hospitals.

Furthermore, when considering the unstable production and delivery of local drugs as well as the long lead time required for imported drugs (2 months for opening Letter of Credit & 6 months from Letter of Credit opening to receiving drugs), keeping a certain amount of safety stock to prevent stock out is also an important responsibility of EPTC.

EPTC must also deliver the limited amount of drugs most effectively and efficiently by reducing losses of drugs during distribution process.

However, the present condition is such that at the intermediate warehouses an uneven drug distribution exists where excessive stock exists at some places while shortages as well as stock out condition exists at other places which impedes smooth distribution to hospitals and pharmacies. Also EPTC estimates that 0.6% or roughly 1,910,000 Egyptian pounds (about 112 million yen) of drugs are lost annually. The breakdown is as follows:

- (1) Loss due to expiry of effective period is 0.3% (₱956,000). This is mainly because first-in/first-out procedure is not followed and long stored drugs exist. Drugs left over due to reduced demand is caused by insufficient monitoring of demand trend.
- (2) Loss due to physical damages is 0.2% (₱637,000). This is mainly because handling during storage and distribution is improper.
- (3) Loss due to chemical quality deterioration is 0.1% (₱319,000). This is mainly because storage is long under improper condition such as unsuitable temperature.

The inventory control and quality control conditions leading to uneven distribution and losses at EPTC today are described in the following paragraphs.

- (1) Inventory control

At first glance, all warehouse is observed to carry much stock. The primary responsibility of intermediate warehouses is to efficiently turn over a suitable amount of drugs by keeping hospitals and pharmacies supplied as needed. However, stock of some drugs far exceed the necessary amount and are piled on warehouse floor preventing effective first-in/first-out handling. Some drugs are piled so high that sunlight shines directly on the drugs which could lead to quality deterioration. It is assumed that such condition arises because of insufficient storage space at the main warehouse and drugs which should be stored at the main warehouse is pushed out to intermediate warehouses.

On the other hand, shortage and stock out condition for some drugs were observed at main warehouse and intermediate warehouses. The shortage and stock out at main warehouse are caused by late purchase order because inventory is taken only once a month and not on real time.

At intermediate warehouses, another reason is that delivery from main warehouse is only conducted once or twice a month and it is difficult to keep stock in line with consumption trend. In order to deliver drugs to intermediate warehouses in necessary amount, a proper inventory control must be instituted.

The main inventory control problems are as listed below.

- ① All drugs are recorded in a kardex for each drug and totalled manually once a month. Since the entire inventory is not totalled, an inventory control of the entire inventory is not performed.
- ② A rack card is provided for each drug, but since only outgoing drugs are recorded and incoming drugs are not recorded, the balance is not recorded.
- ③ Since inventory is difficult to take on piled drugs, an accurate inventory is difficult.
- ④ Since purchasing is conducted by the marketing sector and not the storage sector, purchase is not well planned owing to insufficient communication between the two sectors.

In order to solve the above problems, EPTC should implement the following improvements.

- ① Modify the present storage system to monitor accurate inventory.
- ② Extend and improve office management procedure to keep up-to-date record of drug consumption and inventory.
- ③ Improve inventory control to set up a purchase plan based on up-to-date inventory and consumption trend.
- ④ Extend and improve the storage capacity at the Shoubra main warehouse and improve intermediate warehouse facilities.

(2) Quality control

- ① Good Supplying Practice, GSP, in USA, Europe and Japan

GSP practiced in USA, Europe and Japan specifies the storage facility and handling of drugs as follows; "A satisfactory medical storage facility shall be constructed with due consideration on cleanness, temperature, humidity, light deflection and first-in/first-out storage and shall prevent drugs from being stored directly on the floor."

GSP provides quality control standards both for hardware such as the above-mentioned storage facility structure and for software such as storing and handling practices.

Temperature control

The standard Temperature shall be 30°C or lower and at no time shall it exceed 35°. Medical drugs which require temperature control shall be provided with a cool room (15°C or lower), a refrigerator (2°C - 5°C) and a freezer (0°C or lower).

Cleanness control

The structure shall be designed and constructed to prevent pollution from micro-organism, dust and others as much as possible. The structure shall be easy to clean and shall prevent entry of rodents, birds, insects, and other small animals. The drainage outlet shall be provided with a trap and equipment to prevent odor and backflow of sewage.

Light deflection

A suitable light deflection shall be provided to prevent direct sunlight on drugs.

First-in/first-out

An important point for keeping the effectiveness of medical drugs is to practice first-in/first-out storage. The facility should be designed for easy first-in/first-out operation, but also a good inventory control system must be established.

② EPTC storage condition from GSP viewpoint

Comments on EPTC storage condition for hardware and software from GSP viewpoint are given as follows.

(a) Structure of warehouse

Temperature control

Even though temperature exceeds 40°C in summer, there is no air conditioning and the structure is not designed to shut-out outside heat. Furthermore, since drugs required to be kept cool is transported in van type trucks in insulated boxes with cooling agent, temperature control is difficult.

Since the effectiveness of drugs are reported to be reduced in half when temperature rises by 10°C above normal storage temperature of 20°C, the deterioration of quality is expected to be very large.

Cleanness control

Even though the environment is a location of many rodents and much sand dust due to hamsheen, the warehouse is not structured to prevent rodents and dust entrance.

Light deflection

Since windows of the warehouse are not provided with any light deflection, sunlight shines directly on drugs, and it is one reason for decomposition and quality deterioration of drugs.

(b) Storage and handling

There are few racks and most of the drugs are piled on the floor. Since some drug packages were seen broken, breakage during storage must be quite high. Such breakages during storage can and should be prevented.

A piled storage obstructs easy first-in/first-out operation and is often a cause of mis-operation. This is a major cause for expiry of effective date of drug.

③ Loss of drugs

The loss of drugs at EPTC is shown in Table 2-17. The reasons for loss of drugs are as follows:

| | | |
|---|----------------------------|-----|
| ① | Expiry of effective period | 50% |
| ② | Damages | 32% |
| ③ | Quality deterioration | 17% |

Ninety-two percent of these losses seem to be caused by unsuitable inventory control and storage. According to EPTC data, the loss of drugs amount to 0.6% of annual handled drug value or about 1.92 million Egyptian pounds. For your reference, the loss of drugs during distribution in a Japanese manufacturer amounts to only 0.02%, so the loss of drugs at EPTC is 30 times as high as that of Japan.

The loss at Shoubra main warehouse is about 956 thousand Egyptian pounds or 50% of the entire loss, while loss at intermediate warehouse is about 803 thousand pounds or 42% of the entire loss, and the loss during transportation is about 153 thousand pounds or 8% of the entire loss.

Loss of drugs due to damages is mostly caused by unsuitable handling, but damages are also caused by packages of insufficient strength used by local drug producers. The local producers should be required to improve these practices.

- ① Some local drugs produced under license are delivered in small retail package units and are not even packed in carton boxes.
- ② The strength of retail packages is of acceptable level, but carton boxes are not strong enough.
- ③ Some drugs are only wrapped with paper in 10-20 pieces unit and syrup drugs are packed in shrink-pack for food wrapping.

Table 2-17 Brakdown of Loss of Drugs

| Causes | Percentage against total annual loss | Value of loss (thousand) | Location of loss | | |
|---|--------------------------------------|--------------------------|------------------------|-------------------------|-----------------------|
| | | | Shoubra main warehouse | Inter-mediate warehouse | During transportation |
| Expiry of effective period | | | | | |
| ① Drugs remaining due to excessive inventory | 0.3% | 956 (50%) | 0.15% (25%) | 0.15% (25%) | — |
| ② First-in/first-out is not observed | | | | | |
| Damage | | | | | |
| ① Unsuitable storage high stock, direct floor storage | 0.2% | 637 (33%) | 0.1% (17%) | 0.05% (9%) | 0.05% (8%) |
| Quality deterioration | | | | | |
| ① Long storage | 0.1% | 319 (17%) | 0.05% (8%) | 0.05% (8%) | — |
| ② Poor storage environment . direct sunlight . high temperature | | | | | |
| Total | 0.6% | 1,912 (100%) | 0.3% (50%) | 0.25% (42%) | 0.05% (8%) |

(3) Shipment and delivery system

Drugs are delivered to intermediate warehouses at the beginning of the month based on purchase order received by the end of the previous month. Deliveries to intermediate warehouses are made once or twice a month depending on the storage capacity and drug movement.

(Table 2-18)

The intermediate warehouses desire to have the number of deliveries increased in order to satisfy the consumers and to prevent excessive storage of drugs. However, owing to problems in delivery system and insufficient processing capacity, the Shoubra main warehouse is not able to satisfy the desires of intermediate warehouses.

Trucks, van type trucks and trailers are used for delivery, but there is no refrigerator trucks for drugs required to be kept cool. (Table 2-19) The present number of trucks is sufficient to meet increased number of deliveries. At present, small amount of drugs required to be kept cool is delivered in insulated boxes containing cooling agent, but large amount is shipped in ordinary manner.

Breakdown of packing for drugs delivered from Shoubra main warehouse to intermediate warehouses are shown in Table 2-20. The shipment by retail package unit not only hinder efficient drug distribution, but also cause losses with small number of drugs being left for a long period. Local drugs should be delivered in carton units, but it may be difficult for imported drugs.

Table 2-18 Number of Deliveries

| Destination | Number of deliveries number/month | Number of deliveries to one location number/month |
|---------------------------|-----------------------------------|---|
| Provincial warehouse | 10 | 2.5 |
| Intermediate warehouse | 102 | 2.4 |
| Hospital suppliers centre | 40 | 20.0 |
| Total | 152 | - |

Table 2-19 Number of Delivery Trucks

| Trucks | Number | Remarks |
|------------------------|---------|--|
| 5 ton truck | 36 | |
| 2.5 ton van type truck | 84 (64) | 64 trucks are located at intermediate warehouses |
| 30 ton trailer | 8 | For long distance delivery and for milk |

Table 2-20 Packing Units

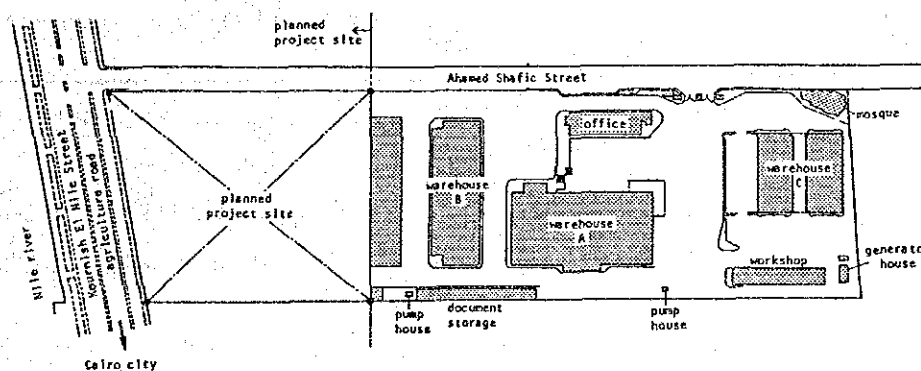
| Drugs | Packing |
|-----------------|---------------------------|
| Imported drugs | Retail packages |
| Domestic | Retail packages + cartons |
| Milk and syrups | Carton |

(4) Condition of Shoubra main warehouse

① Storage facilities

At the present Shoubra main warehouse, there are three warehouses, an office building, a mosque, a workshop and a few other small structures. (Fig. 2-6)

Warehouse "A" stores only imported drugs, warehouse "B" stores local drugs, restricted drugs and family planning goods, while warehouse "C" stores licensed drugs. (Table 2-21)



② Size and storage condition of present warehouse

Table 2-21 Size and Storage Condition of Present Warehouse

| Warehouse | Structure | Floor area (effective, storage area) | Usage |
|---------------------------------------|--|---|--|
| Warehouse A | <ul style="list-style-type: none"> . 3 story reinforced concrete building . The oldest building originally built as tobacco warehouse about 50 years ago. . Height of room is 7.5 m for 1st and 2nd stories and 6.0 m for 3rd story | <p>7,986 m² (5,743)</p> <p>72%</p> | Warehouse for imported drugs only, also has 4 cool rooms |
| Warehouse B | <ul style="list-style-type: none"> . 4 story reinforced concrete building built about 7 years ago . Height of room is 5.0 m for 1st story and 4.0 m for 2nd - 4th stories | <p>7,040 m² (4,988)</p> <p>71%</p> | Local drugs and restricted products for family plan Marketing sector |
| Warehouse C | <ul style="list-style-type: none"> . 5 story reinforced concrete building built about 15 years ago . Height of room is 6.0 m for 1st story and 4.5 m for 2nd - 5th stories | <p>9,712 m² (5,740)</p> <p>59%</p> | Licensed drugs, infant milk EIPICO Finance sector |
| Total floor area (A + B + C) | | 24,738 m ² | |
| Effective storage area (A + B + C) | | 16,471 m ² (66%) | |

General comments on storage facilities are as listed below:

- (a) Warehouse A was constructed 50 years ago, warehouse B 7 years ago, and warehouse C 15 years ago, so they are observed to be quite aged.
- (b) Even though warehouse B is quite new, all warehouses are not suitable both from drug distribution and quality control according to GSP standards.
- (c) Since structures and fixtures are not properly built and maintained, dust easily enters and builds up.
- (d) Only warehouse C is provided with a truck berth for loading and unloading. But the depth of this berth is not sufficient.
- (e) Since suitable louvers are not provided, sunlight enters directly into the warehouse.
- (f) An emergency generator is provided for power black-out, but its capacity is insufficient.
- (g) With the exception of the cool room, no consideration is made for heat insulation which creates temperature control problem when outside temperature is high.

③ Storage condition

Drugs are classified into imported drugs, local drugs, restricted drugs (narcotics), licensed drugs, veterinary drugs, baby milk and family planning products, also they are broken down into different effective

periods. This storage classification is also applied to provincial warehouse, intermediate warehouse and pharmacy. Drugs required to be cooled are mostly imported drugs, and are stored in the refrigerated room in imported drug warehouse. EPTC handles about 20 kinds of drugs to be cooled; insulin, vaccine, ether, halothane, suppository, ovules and cancer drugs. The incoming/outgoing flow of drugs and storage information are shown in Fig. 2-7.

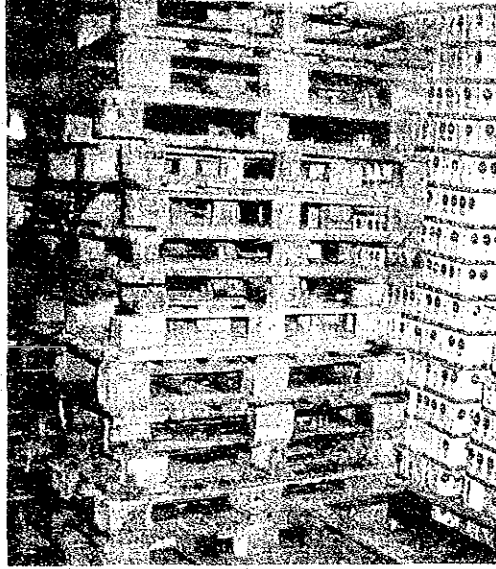
(a) Storage method

- (i) Drugs are stored either directly on wooden pallets or on racks. Drugs in large quantity are stored on pallets while drugs in small quantity are stored on racks.
- (ii) Drugs stored directly on pallets are piled up to a height of 3.5 m and packages at the bottom are mostly broken. This is due to the height of the pile together with insufficient strength of the cartons and workers standing on the cartons during loading and unloading.
(Photograph 1)
- (iii) Many drugs stored for long period were observed to be covered with dust. Dust enters the warehouse since structure and fixtures are not air-tight.
- (iv) Wooden pallets in three different size are being used and the size of pallets are not standardized. (Photograph 2)

- (v) The cool rooms (5° - 10°) have no racks and drugs, mainly insulin, are piled up high almost reaching the ceiling.



Photograph 1



Photograph 2

(b) Handling

- (i) Since there are no suitable truck berths nor fork lifts, heavy packages, especially imported drugs, are dropped directly on wooden pallets placed on the floor from trucks.
(Photograph 3)
- (ii) Handling within the warehouse is performed with manual by operated hand lifts carrying drugs placed on pallets. Vertical movement is by lifts. (Photograph 4)
- (iii) All handling is performed manually except the vertical movement between different stories.



Photograph 3



Photograph 4

④ Necessity of modifying main warehouse

The present EPTC facility has a number of serious problems such as, excessive stock, inventory problem including shortage and stock out of necessary drugs, insufficient quality control, and insufficient storage and distribution facilities.

Especially the central facility, Shoubra main warehouse, has many points which must be improved and the need for expansion and improvement of the Shoubra main warehouse is urgent to cope with the annually increasing demand for drugs in Egypt.

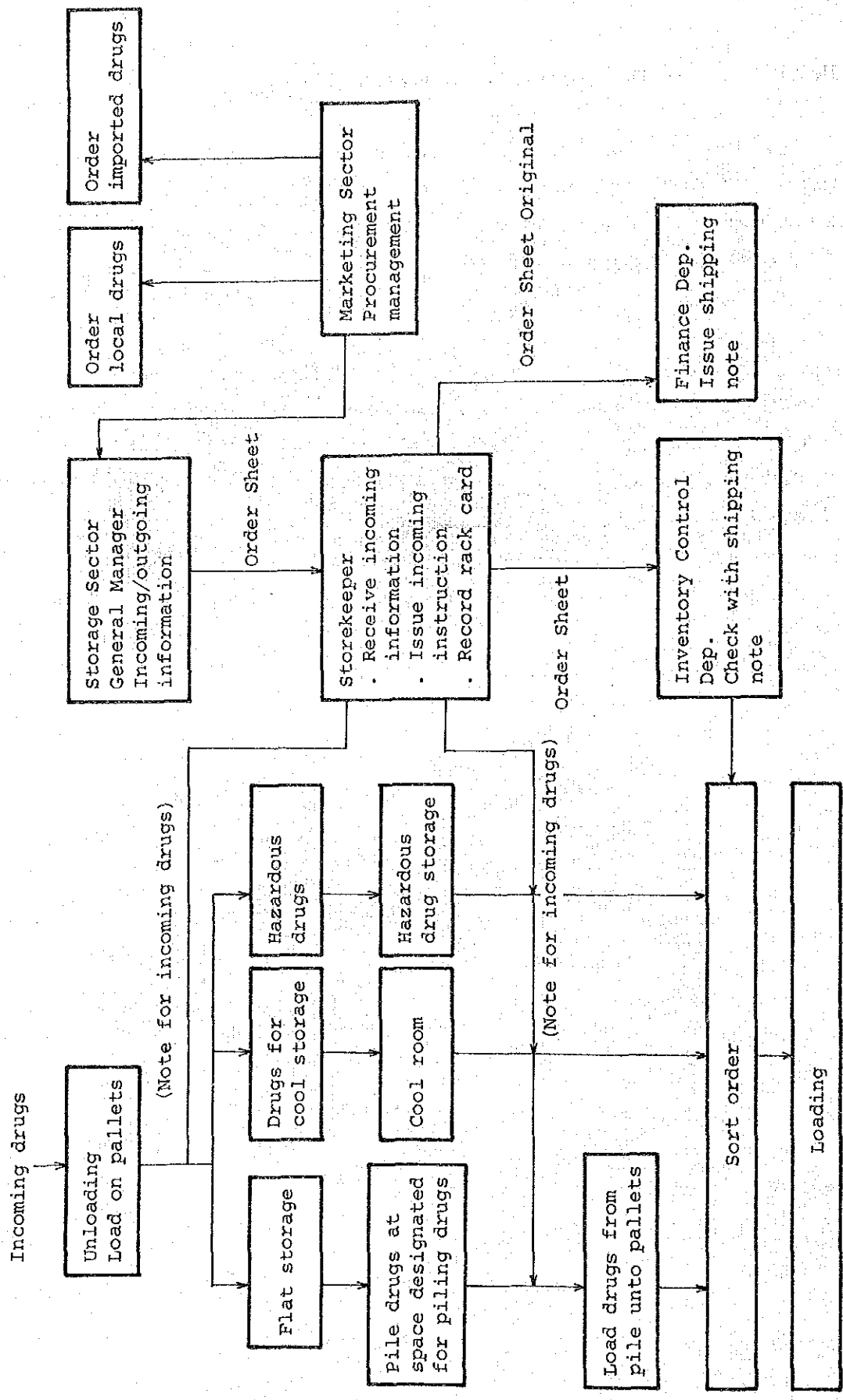


Fig. 2-7 Flow of Incoming/Outgoing Drugs and Storage Information

2.4 BACKGROUND AND CONTENTS OF REQUEST

2.4.1 Background of Request

EPTC operates main warehouse at Shoubra in Cairo and 3 provincial warehouses at Alexandria, Mansoura and Assiut, Also intermediate warehouses at 42 locations throughout the country. However, these warehouses are insufficient in both quality and quantity to satisfy the ever-increasing drug demand, and the following items must be addressed.

- ① Present warehouse facilities including provincial and intermediate warehouses must be expanded and improved.
- ② Management information system and function must be improved so that inventory and consumption can be monitored on real time.
- ③ Inventory control must be improved to plan procurement schedule accurately reflecting inventory and consumption trend.
- ④ Quality control based on GSP standards.

Furthermore, the present insufficient storage and distribution method are responsible for the increasing loss of drugs due to deterioration, damages and expiry of effective period.

EPTC is aware of such situation, but owing to limited budget which is first directed towards purchase and supply of drugs, it is not in a position to improve present warehouses nor newly construct a warehouse.

In order to enable EPTC to fulfill its responsibility of supplying high quality drugs inexpensively, improvement and rationalization of present storage, distribution method and inventory control system are of utmost importance.

Especially, since the extension and rehabilitation of the main warehouse and strengthening its function is of urgent importance, the construction of a drug storage and distribution centre incorporating the most suitable facilities within the Shoubra main warehouse site together with the establishment of modern storage, distribution and inventory control system was planned by the Ministry of Health.

In order to implement this project, the Government of Egypt requested a grant aid for this project to the Government of Japan, and in response to this request, the Government of Japan dispatched a basic design survey team to study the content, background and effect of this project to evaluate whether the content of the project qualifies as a Project for Grant Aid.

2.4.2 Contents of Request

The request of the Government of Egypt is to construct a warehouse and to provide materials and equipment for storage and distribution of drugs. The contents are as listed below.

① Facilities (about 10,000 m²)

- . High rise automatic rack storage system
- . Two story horizontal rack storage system capable of extending to 5 stories
- . Office rooms

- ② Refrigerating equipment
- ③ Air conditioning equipment
- ④ Electrical equipment
- ⑤ Truck berth
- ⑥ Fork-lift 5 sets
- ⑦ Rack storage system

CHAPTER 3 CONTENT OF PROJECT

CHAPTER 3 CONTENT OF PROJECT

3.1 OBJECTIVE

The objective of this project is to contribute to the constant supply of high quality, reliable drugs to meet the demand, which is increasing yearly, by constructing a storage and distribution centre. This will expand and strengthen the function of the Shoubra main warehouse of EPTC as well as provide the following systems.

- (1) A quality control system in accordance with GSP
- (2) An efficient delivery system
- (3) A modern inventory control system
- (4) An improved drug distribution network

3.2 STUDY OF PROJECT CONTENT

3.2.1 Objectives of the New Drugs Storage and Distribution Centre

- (1) Establishment of a quality control system for drugs

To provide suitable storage facilities, storage equipment and delivery system for performing quality control to maintain quality of drugs in accordance with the present condition and regulations in Egypt.

(2) Establishment of an efficient delivery system for drugs

To rationalize drugs distribution, improve warehouse operation and permit easy first-in/first-out operation by consolidating and modifying drug distribution at the main warehouse and providing transporting and handling equipment.

(3) Improvement of inventory control

In order to eliminate excessive inventory and maldistributed inventory, to improve the inventory control at EPTC, so that up-to-date consumption and storage of drugs is known at all times by improving and consolidating information processing. To update the record daily at main warehouse weekly for the entire EPTC.

(4) Strengthening of the main warehouse function

By extending the storage capacity of Shoubra main warehouse to keep sufficient inventory and strengthen the storage and distribution functions, so that intermediate warehouses may serve as temporary storage and distribution. This should solve the problems of excessive storage and maldistributed storage.

(5) Improvement of drug distribution network

By providing a suitable storage capacity at the new storage and distribution facility, to supply through the main warehouse the drugs (50%) presently directly supplied to intermediate warehouses from drug manufacturing companies. This will greatly simplify and improve distribution network.

- (6) Clarification of the function between new and old facilities

To clearly separate the function of the Shoubra main warehouse and the new storage and distribution centre. The new centre shall store and control all drugs requiring a high degree of quality control. By transferring drugs from existing warehouse to new warehouse, extra space will be created in the existing warehouses which will improve storage condition and quality control.

- (7) Reduction of loss of drugs

To reduce drugs loss by about 1,912,000 Egyptian pounds by establishing a quality control system, an efficient distribution system and a modern inventory control system.

- (8) Construction of a model drugs storage facility for EPTC

The new drugs storage and distribution system will be a model drugs storage facility for EPTC incorporating suitable drugs storage and management facilities.

3.2.2 Drugs to be Stored and Existing Warehouse

(1) Drugs to be stored

The drugs stored in the Shoubra main warehouse is classified into seven groups; namely, imported drugs, local drugs, licensed drugs, restricted drugs, family planning goods and veterinarianian drugs. They are presently stored in three warehouses (Table 3-1).

Under GSP standard, all of the 2,700 drugs handled by EPTC would be subject to control by this standard. If all drugs are to be stored in the new centre, a very large facility will be necessary. The warehouse storage area of the Shoubra main warehouse is 16,471 m², and 15,000 m² is estimated for storing imported drugs, local drugs, licensed drugs and restricted drugs. The present warehouse shall be utilized together with the new warehouse by separating their respective functions.

The drugs to be stored in the new warehouse shall be selected after considering the characteristics given in Table 3-2 and the following conditions.

- ① Drugs not produced in Egypt
- ② Drugs requiring temperature control
- ③ Drugs requiring strict control
- ④ Drugs requiring clean environment

The priority of drugs storage in the new warehouse is in the order of imported drugs, licensed drugs, restricted drugs and local drugs. The new storage and distribution centre shall store imported drugs, licensed drugs, and restricted drugs excluding narcotics.

Table 3-1 Storage Condition in Existing Warehouses

| Warehouse | Drugs | Store department responsible for control | Items to be transferred to new storage and distribution centre |
|-------------|---|---|--|
| A warehouse | Imported drugs | ① Imported drugs store | Imported drugs |
| B warehouse | Local drugs | ② Local drugs store | Restricted drugs Licensed drugs (Narcotics are excluded from restricted drugs) |
| | Restricted drugs | ③ Restricted drugs store | |
| | Veterinary drugs Family planning goods | ④ Veterinary drugs store ⑤ Family planning goods store | |
| C warehouse | Licensed drugs | ⑥ Licensed drugs store | |
| | Baby milk | ⑦ Milk store | |

Table 3-2 Characteristics of Medical Drugs

| Drugs | Characteristics |
|------------------|--|
| Imported drugs | Expensive drugs and drugs required to be kept cool |
| Licensed drugs | Drugs produced under license of foreign companies, which are mostly critical drugs and raw materials are mostly imported |
| Restricted drugs | Drugs restricted by regulations and require strict control such as narcotics |
| Local drugs | Drugs produced by local technology and are generic drugs such as aspirin |

(2) Utilization of present warehouse

With the construction of the new storage and distribution centre, storage space totalling 11,490 m² which consist of 7,470 m² A warehouse (imported drugs), 280 m² B warehouse (restricted drugs), and 3,740 m² C warehouse (licensed drugs) will be freed. This freed space may be utilized as space for increased drugs storage, and reducing excessive storage at intermediary and provincial warehouses.

When storing drugs at these existing warehouses, the storage condition should be improved by implementing the following.

- ① Implement suitable stacking method such as utilizing pallets for easy first-in/first-out operation instead of pile storage.
- ② Provide light deflection to prevent direct sunlight on drugs.
- ③ Seal opening to prevent infiltration of sand and dust.

The following utilization of the existing three warehouses are recommended to the Egyptian side for their consideration when determining their utilization. (Table 3-3)

- ① A warehouse shall store only local drugs.
- ② B warehouse shall be temporary storage for imported drugs and licensed drugs in crate arriving in large volume.

- ③ C warehouse shall store baby milk, family planning goods and veterinary drugs.
- ④ Drugs required to be separated owing to quality problems such as returned drugs, rejected drugs and drugs to be disposed shall be collected and stored in a specified part of the existing warehouse.

Table 3-3 Utilization of Existing Warehouses

| | Present use | Use after completion of new centre |
|-------------|--|--|
| A warehouse | Imported drugs | Local drugs |
| B warehouse | Local drugs Restricted drugs Veterinary drugs Family planning goods | Imported drugs & licensed drugs in crate |
| C warehouse | Licensed drugs Baby milk | Baby milk Family planning goods Veterinary drugs |

3.2.3 Size of Facilities

Table 3-4 Number of Pallets Based on Observed Figure

| | Number of drugs handled by EPTC | Average Number of pallets | Margin | Number of pallets |
|--------------------------------------|---|---------------------------|--------|-------------------|
| Imported drugs | 600 | 5.0 | | 3,300 |
| Licensed drugs | 900 | 4.5 | x 1.1 | 4,455 |
| Restricted drugs (exclude narcotics) | 50 | 4.1 | | 226 |
| Cooled drugs | 230 m ³ ÷ 1.4 m ³ /pallet x 1.1 | | | 180 |
| Total | | | | 8,161 |

From these figures, the size of the new storage and distribution centre is determined to store roughly 8,100 pallets.

3.2.4 Content of Project

The new storage and distribution centre is designed to satisfy the GSP standards, and drugs storage and handling is based on a first-in/first-out system. Furthermore, a rationally coordinated storage method is proposed for the combined use of the existing warehouse and the new storage and distribution centre.

(1) Flow of drugs and information management at new storage and distribution centre

The new storage and distribution centre is provided with a management information system which traces drugs flow systematically to provide accurate information for controlling drug flow and storage (Fig. 3-1).

- ① Since the new distribution system emphasizes first-in/first-out operation, storage location is managed to easily implement such operation.
- ② Since present inventory control department is not practicing satisfactory inventory control, this function is strengthened.
- ③ Close communication between storage and marketing sector is planned, so that purchasing will be conducted on actual inventory.

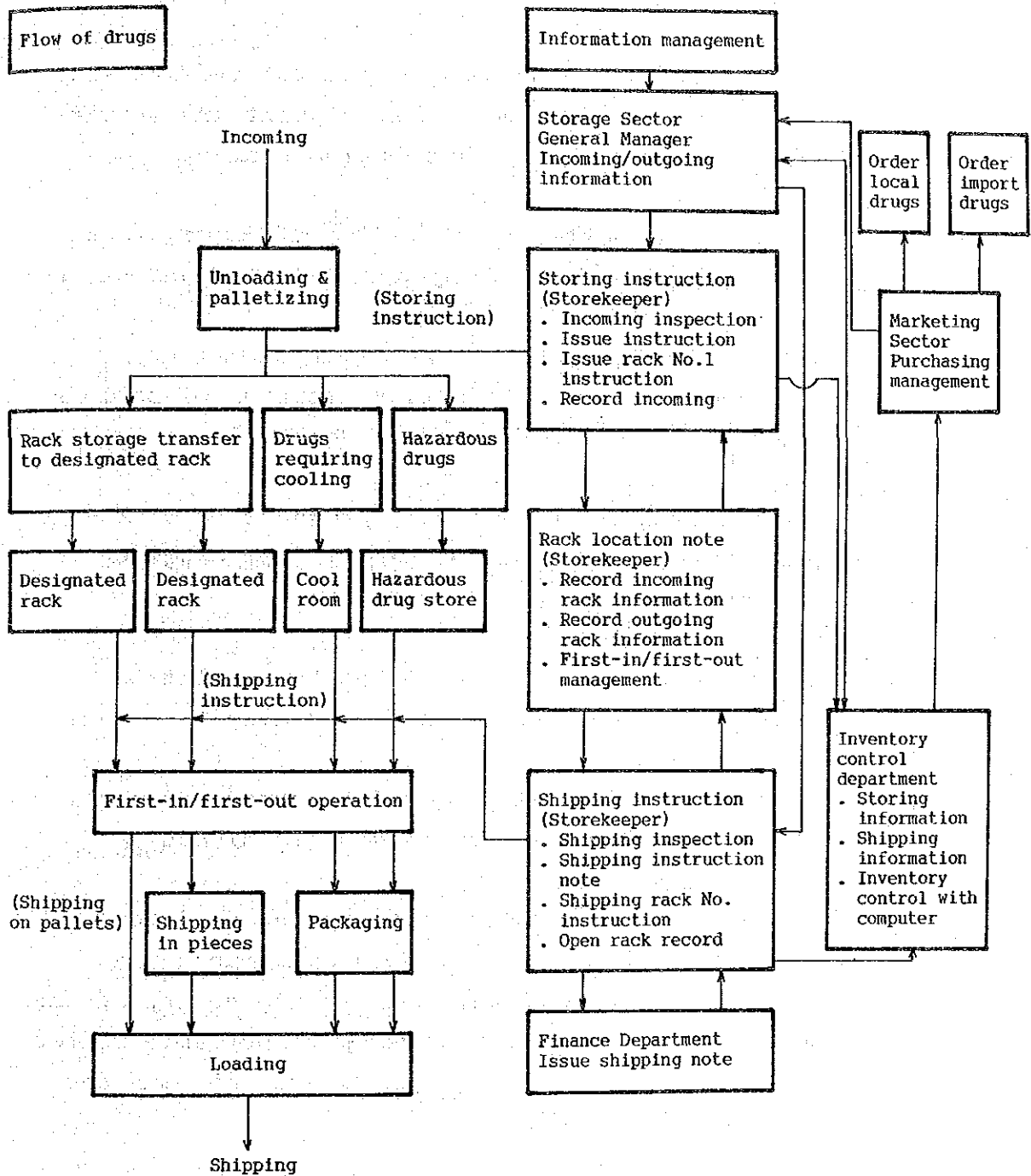


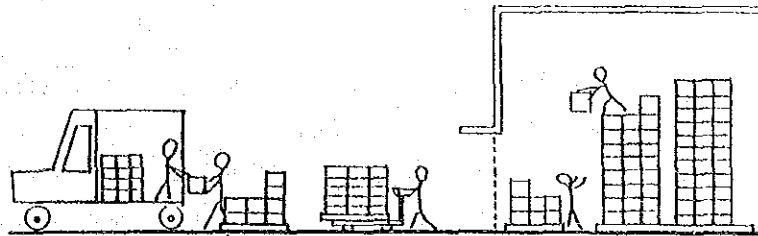
Fig. 3-1 Drug Flow and Information Management

(2) Storage management

- ① Drugs which must be handled on a first-in/first-out basis from a quality control standpoint are stored in the new storage and distribution centre.
- ② In order to eliminate stock piling of drugs, racks are introduced and all drugs are palletted and stored on racks.
- ③ Rules are established to assign location of pallets according to items and validity dates.
- ④ Racks are numbered to identify products by rack number for facilitating the handling of drugs by its location.
- ⑤ A board showing location of drugs to facilitate first-in/first-out operation is installed.
- ⑥ Rack type fork-lift is provided to store and remove drugs from rack either in cases or in pieces.
- ⑦ A fork-lift is provided in the sorting yard for transporting drugs between racks and trucks. A truck berth with platform equal to the height of the truck body is provided together with portable roller conveyor and fork-lift for quick, easy loading and unloading (Fig. 3-2).

Storing drugs

(Present)



(New storage and distribution centre)

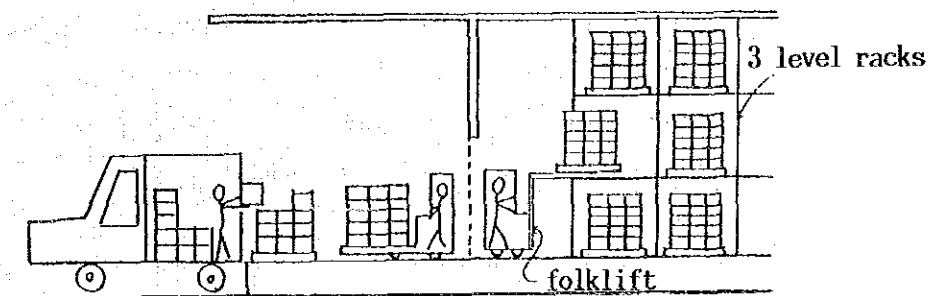


Fig. 3-2 Storing and Shipping of Drugs

(3) Inventory control

An inventory control system which coordinates all information such as storing instruction, and shipping instruction is installed to provide up-to-date accurate inventory information. A computer is introduced to process this information.

- ① Since this is the first stage of computer introduction, personal computers with capacity to calculate Shoubra main warehouse drug delivery/issue and inventory control, EPTC inventory and also to perform simple accounting and office calculation are selected.

- ② Most of these functions may be performed with commercially available computer software, but some modification may be necessary to satisfy the needs of EPTC.

(4) Structure of facility

- ① The new warehouses are designed to satisfy the standards of GSP, taking into consideration the conditions in Egypt and EPTC.
- ② Drugs that must be kept cool are stored in a temperature controlled cool room, while anesthesia drugs and inflammable drugs are stored in special storage area or store room.
- ③ In order to reduce operating expense, the general rack store rooms are not air-conditioned with a refrigerator, but is cooled with cool night air to prevent warehouse temperature from rising above 30°C in summer, also double exterior walls are adopted for improving heat insulation.
- ④ Suitable shades and eaves are provided to keep away direct sun light on drugs.
- ⑤ An emergency generator is considered in the cool room as a countermeasure for blackout.

3.3 OUTLINE OF PROJECT

3.3.1 Organization for Operation

Shoubra main warehouse, the organization of which is shown in Fig. 3-3, will be operating the new storage and distribution centre. As shown in Fig. 3-3, EPTC main warehouse is organized of 8 departments and a general manager under the Head of the Storage Sector, and it employs about 350 persons.

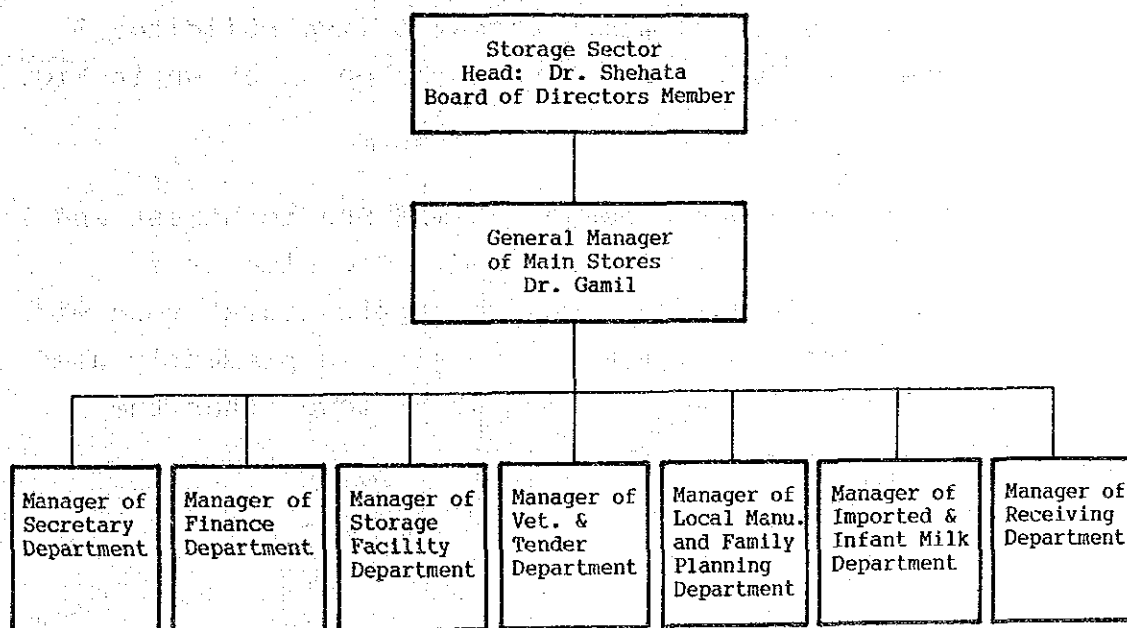


Fig. 3-3 Organization of Main Warehouse Centre

3.3.2 Outline of Project Site

(1) Construction site

The construction site, Shoubra district (1353 Kournish El Nile Street), is located in north Cairo along the Nile river bank. Since the site is on the agricultural road which is the main road between Cairo and Alexandria, it is a most suitable location for drug distribution, but one problem is that the agricultural road is heavily congested.

Within the site, there are an office building, 3 warehouses, mosque, garage and workshop as shown in Fig. 3-4.

There are 2 entrances on Ahamed Shafic Street and 1 entrance on the agricultural road. The site is a trapezium configuration along the agricultural road with an area of about 39,000 m². The site is presently used as a parking lot, and is about 60 cm lower than the agricultural road.

(2) Ground condition

Since the site is said to be where the Nile river flowed about 1,000 years ago, the ground condition is believed to be soft. Water came out at a depth of about 1.5 m below ground level when trial boring was conducted during this survey. This condition is expected to affect the drainage plan during construction earthwork.

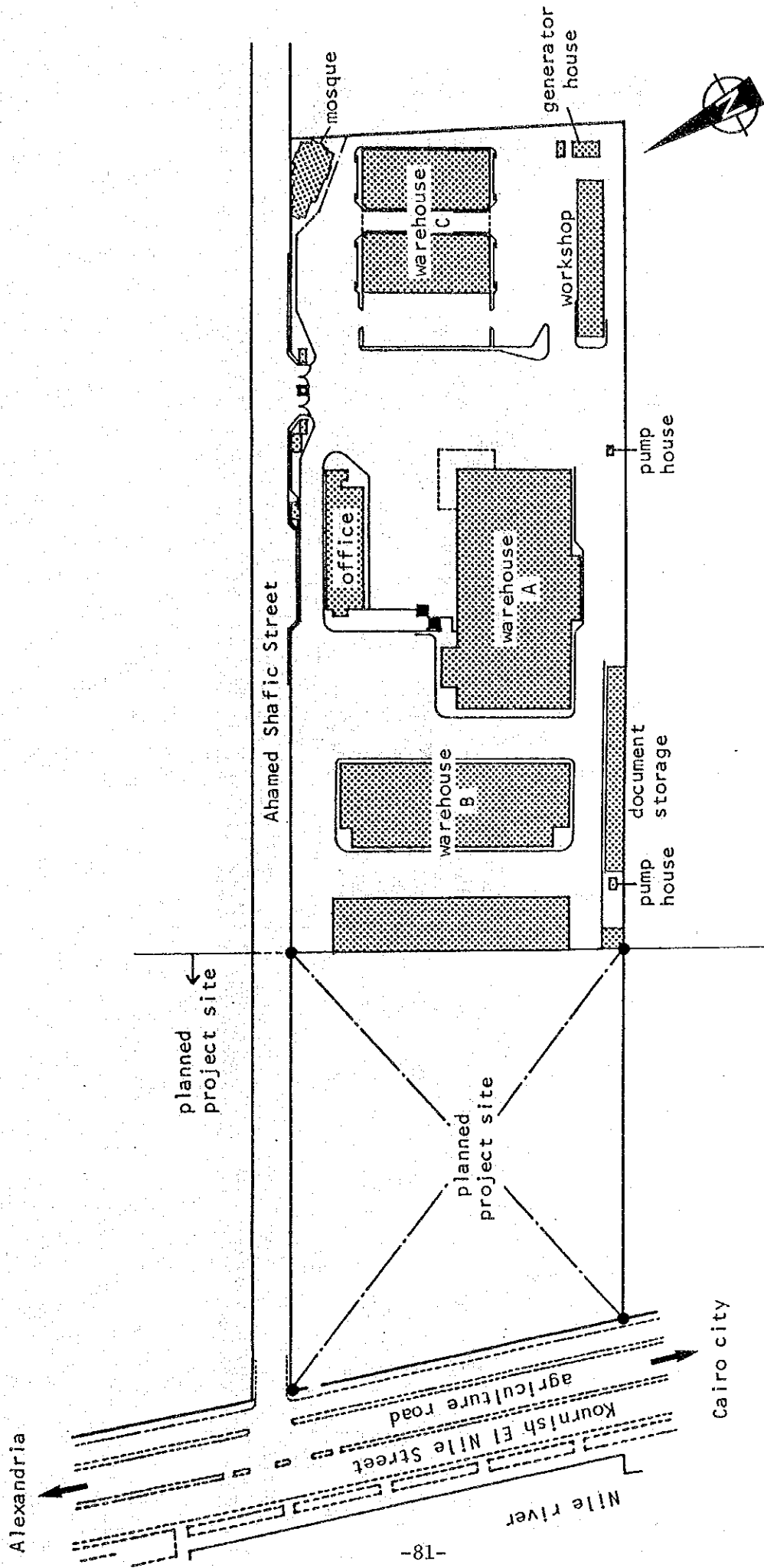
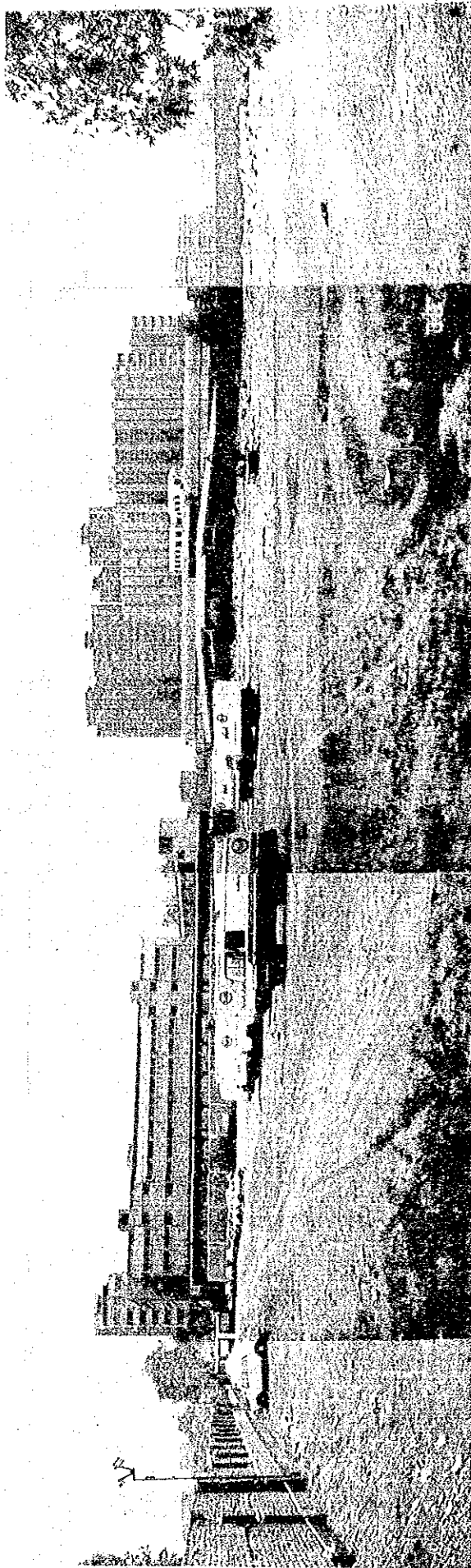


Fig. 3-4 Construction Site



(3) Natural condition

Climate

Excluding the northern seacoast which is a Mediterranean type climate, the land is a desert type climate with hardly no rain and very dry. However, recently rain is observed in winter.

The temperature around Cairo is a maximum of 40°C and a minimum of 7° to 8°C throughout the year. The summer season lasts from May to October and after a brief autumn in November, it is winter.

(4) Infrastructures of Cairo

(a) Electric power

Power is presently received from the high tension power line, 11 kV, 3-phase, 4 W, running along the Ahamed Shafic Street, and the power is dropped to 380 V, 3-phase and 220 V, 1-phase in the power room. Since the capacity of the present power room is insufficient to cover even the present demand, power must be newly received from the high tension power line for the new storage and distribution centre.

Two emergency generators (230 kVA x 1, 140 kVA x 1) are now provided for supplying the cool room and lighting, but capacity is insufficient.

(b) Telephone

Telephone circuit is received from the line along Ahamed Shafic Street. Although senior staffs have direct outside circuits ordinary employees must use the interplant extension line.

(c) Water

Water is received from the water main running along the Ahamed Shafic Street through a 100-diameter pipe, and a 75-diameter branch runs up near the construction site. Water can be taken from this branch since quantity is sufficient.

(d) Drainage

A 250-diameter sewage pipe runs along the south fence of the site above ground level, because the agricultural road is higher than the site and public sewage main is laid at a shallow depth. Sewage from the site is pumped up into the public sewage main from 3 pump stations. The drainage of the site was observed at the last manhole but it was not good probably due to clogging.

3.3.3 Outline of Facilities and Equipment

After studying the request, background, necessity, effect, and suitability of this project as well as the function and content of the new storage and distribution centre, the following facilities and equipment are considered necessary and suitable for providing under the grant aid of the Government of Japan.

(1) Facilities (including equipment)

① Storage department

General drug warehouse, restricted drug warehouse, cool room warehouse, hazardous supply warehouse, (inflammable drugs), sorting room, pallet storage, site office, worker's room, racks, elevators

② Office department

Director's office of storage sector, general manager's office, chief accountant's office, administration office, computer room, conference room, printing room, reference material room

③ Common facilities

Refrigerator room, power room, emergency generator room, water storage pump room, toilet, water heating room and other necessary facilities

④ Outside facilities

Truck berth, truck parking lot

(2) Equipment

① Transportation equipment

Fork-lift, pallet, refrigerator truck, conveyor

② Office equipment

Personal computer, overhead projector, copy machine

③ Others

Wood working tools

CHAPTER 4 BASIC DESIGN

CHAPTER 4 BASIC DESIGN

4.1 BASIC POLICY

The facility and equipment plan is based on the consideration that the new storage and distribution centre is the main facility for drugs supply at EPTC and that the following items will be satisfied.

- ① Quality control of drugs
- ② Efficient distribution of drugs
- ③ Improved inventory control
- ④ Strengthen function of main warehouse
- ⑤ Improve drug distribution network
- ⑥ Coordinated function with existing warehouses
- ⑦ Reduced drugs loses
- ⑧ Model drugs storage facility of EPTC

The basic design is conducted in accordance with the objective of the grant aid of the Government of Japan while giving full consideration to the weather, environment, custom, construction practice and other local conditions in Egypt.

- (1) The design was made giving full consideration to economy, local construction skill and capability. Local construction practice was adopted and local materials were incorporated to provide a low cost construction without sacrificing necessary function and environmental condition.
- (2) An air ventilation system utilizing cool outside night air was adopted to maintain required room temperature and refrigerator cooling was provided only for the minimum necessary area. Measures to shut out direct sunlight and heat insulation was improved to provide energy saving and low running cost.

- (3) Facilities and equipment which are easy to maintain were designed and selected. Also, those with parts which are easily procured locally were selected.

4.2 BASIC PLAN

4.2.1 Site Utilization Plan

(1) Facility layout

EPTC officers expressed their desire to have the following points incorporated in the layout for the Drugs Storage and Distribution Centre Plan.

- . The new warehouse should be established to coordinate and supplement the function of the existing warehouse.
- . In order to provide better security, the entrance/exit should be limited to the present one entrance/exit.
- . An open space should be reserved along the agricultural road for future expansion.

In view of these requests, the facilities for this project were arranged to assure smooth circulation of vehicles.

- (a) The facilities of this project are arranged to secure sufficient width for vehicle movement on the north side and leave just enough space to permit vehicle movement on the south side, also space between the garage on the east side is minimized to provide as much open space as possible for future expansion on the west side.

- (i) Space for two way traffic and a truck berth is provided on north side.
 - (ii) Space for maintenance is provided on east side.
 - (iii) Space for one way traffic is provided on south side.
 - (iv) Space for parking trucks and for one way traffic is provided on west side.
- (b) One way traffic is adopted to avoid traffic confusion and congestion.
 - (c) Entrance/exit is the present main gate.
- (2) Outside work

Roads with heavy traffic are paved with concrete to prevent erosion caused by oil leakage of vehicles.

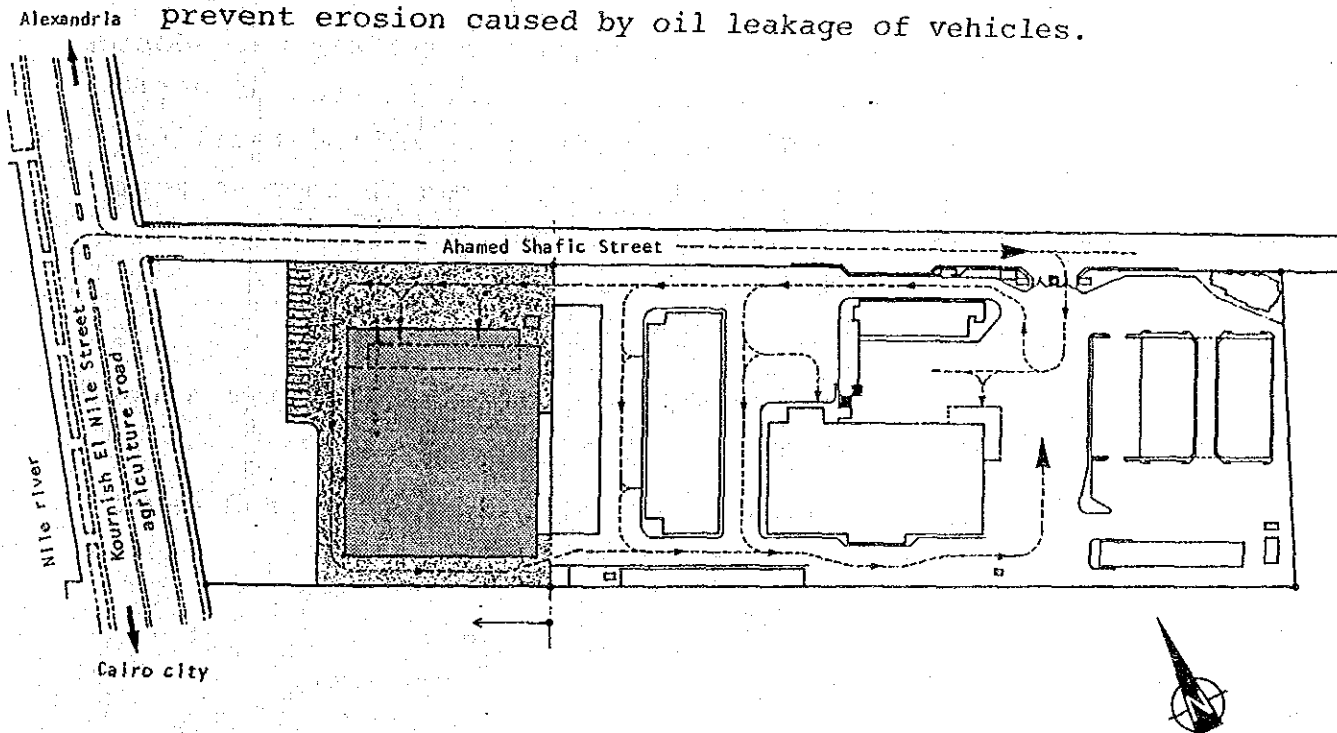


Fig. 4-1 Layout of Facilities and Traffic Circulation Plan