ARAB REPUBLIC
OF EGYPT

INVESTMENT
AND
FREE ZONES
AUTHORITY

Sectoral Survey 3

# CONSTRUCTION MATERIALS, COMPONENTS, AND SYSTEMS IN EGYPT

1982

CONTENTS

TABLES

## PREFACE

This report is one of a series published by the General Authority for Investment and Free Zones and designed specifically to promote the participation of U.S. companies in investment projects in Egypt.

Funded by the U.S. Agency for International Development (U.S. AID) and prepared by the Chase World Advisory Group of Chase Trade Information Corporation, these reports focus on sectors of the Egyptian economy which offer the foreign investor specific investment opportunities in significant areas of the Egyptian economy ranging from pharmaceuticals; the processing and distribution of food crops; and the production and processing of livestock, poultry, and fish products; to construction materials, components, and systems; and electrical and electronic machinery.

There are ten reports in all. This third report, on construction materials, components, and systems in Egypt, was prepared under the direction of Dr. Iraj Ertefai, of Chase Trade Information Corporation, and edited by Vivien E. Fauerbach.

# INTRODUCTION

This report, which presents an in-depth review of the construction sector in Egypt, highlights emerging trends and identifies specific investment opportunities for American and Egyptian firms in the areas of construction materials, components, and systems.

The gathering of information for this report began with a search for primary and secondary sources of data on the construction industry in Egypt. These sources were contacted by the Chase Trade Information Corporation (CTIC) construction team, and a data bank of relevant information was set up. After the initial fact-finding and analysis were completed, a detailed in-country work program was drawn up for the purpose of filling the information gaps identified during the initial research and completing the study by conducting on-site interviews and surveys.

A structured interview guide was developed to assure consistency of topical coverage from one source of information to another. The CTIC construction team then carried out a series of extensive field interviews with over 70 private, public, and state organizations in Egypt. By this means, between April and August 1981, the construction market was studied and specific

potential investment opportunities were explored.

During the field investigations, substantial information was collected on the size and structure of the construction market, its major characteristics, and the competitive environment within which Egyptian construction firms operate. The following were among the sources contacted:

- All relevant government agencies involved in the construction industry
- Major manufacturers of construction materials, components, and systems in Egypt, including joint-venture operations
- Major import/export trading companies active in the construction field
- Local and foreign architectural and engineering firms involved in current construction projects
- Existing and potential end-users of construction materials, components, and systems, including commercial, industrial, institutional, and state agencies
- Existing and potential competitors, both Egyptian and foreign firms, in the construction market
- Major banks and financial institutions

specializing in construction finance and development

Finally, the information compiled through in-country field work was added to the initial research and again carefully analyzed by the CTIC construction team. The result is the following report, which, in addition to presenting the key market findings, identifies a selected number of projects for possible joint-venture investments between Egyptian and American construction firms.

# 1. EXECUTIVE SUMMARY

The construction industry in Egypt is struggling to meet the enormous demands placed upon it by the 1980-1984 Development Plan and subsequent plans now in preparation. A total of L.E. 10 billion, or nearly half of the total planned investment for all economic sectors, is to be spent on construction. The great economic pressures that this ambitious development program has placed upon Egypt's government-dominated construction industry have required major changes in the industry's overall structure, management, and production processes.

A major bottleneck in achieving the Plan's objectives is the way the industry itself is structured: Almost every aspect of Egypt's construction industry is characterized by government control and regulation. Under this system, most construction projects are commissioned, designed, and built by public contracting firms, with materials often purchased at subsidized prices from public producers. The government's current policy of gradually shifting construction activities to the private sector raises the question of how to coordinate private sector activities with those of some 47 existing public sector

companies which account for almost half the construction turnover in Egypt.

To alleviate this problem, the government plans to retain only a few strategic industries, such as the steel and cement industries, under public sector control and leave responsibility for other construction-related industries to the private sector. Public sector companies are to be encouraged to finance new investments internally by going into joint-venture partnerships with foreign companies, or at a later stage, by selling some of their shares to private investors, provided an appropriate formula can be structured for this purpose. The government is now encouraging the first option as a means of injecting both capital and technical know-how into the construction sector.

There is a growing awareness among public sector contracting companies of the need for specialization and structural change. To this end, an increasing number of public firms have begun to form joint-venture companies with foreign partners to carry out special construction projects.

Construction Materials

Egypt has extensive resources of the raw materials

required for construction. Natural stone, aggregates, clay, iron and aluminum ores, gypsum, glass sands, and other basic materials are all available in commercially exploitable deposits throughout the country. The only basic construction material without a domestic resource base is timber; timber for conventional construction is imported.

The Egyptian government, through public sector companies and other state agencies, maintains tight control over the supply and distribution of basic construction materials--cement, steel, bricks, and timber. The predominance of concrete-based technology in Egypt makes the construction industry highly dependent upon aggregates, cement, and timber.

Demand projections show that the consumption of cement in Egypt is to increase from the 1980 level of 5.5 million MT to over 7.0 million MT by 1984, an average annual growth of 6.2 percent during the Plan period. Total demand for reinforcing steel bars is to increase by almost 27 percent over the Plan period, reaching nearly 1 million MT per year by 1984. Demand for bricks is to reach 3.2 million units by 1984, an increase of 28 percent over the 1980 level of 2.5 million.

To meet the projected demand for various construction materials, the government has set certain guidelines and priorities for the upgrading and expansion of local production capacity. About 90 percent of total investment for the targeted production increase in construction materials under the 1980-1984 Plan is allocated to cement and cement blocks, reinforcing steel, and bricks. The overall investment share of the public sector is estimated at 77 percent, with the remaining 23 percent coming from the private sector.

Even with the completion of planned manufacturing facilities for the supply of construction materials, some key materials will remain in short supply during the Plan period. Reinforcing steel is a major example. The shortage of reinforcing steel in the construction market is expected to reach 669,000 MT by 1984, almost 34 percent over the current supply gap of 500,000 MT. Imports averaging about L.E. 170 million annually will therefore be required throughout the Plan period.

Cement, on the other hand, presents a far different picture. It is expected that, as the large cement plants currently under construction gradually come on stream, there will be an excess available for export.

By 1984, Egypt is expected to have a surplus of 2.5 million MT of cement per year after meeting domestic requirements. The current shortfall in the production of bricks is also to be eliminated over the 1980-1984 period.

Construction Equipment

Egypt's fleet of construction equipment today consists of over 30,000 machines, with an estimated value of L.E. 1 billion. However, a large percentage of this equipment is either obsolete or in need of major repair and maintenance.

The public companies active in general building and civil work own and operate about 50 percent of Egypt's equipment fleet, but their equipment utilization is unusually low--about 40 percent compared with the minimum international standard utilization rate of 60 percent. Private sector contractors in Egypt are known to attain fairly high rates of equipment utilization.

Underlying the low equipment utilization rate among large public sector companies is a shortage of spare parts. This is most evident in the operation of a giant construction company such as Arab Contractors, which owns about 400 different types of equipment

purchased from over 250 foreign equipment manufacturers. Another major problem is the shortage of equipment operators and maintenance personnel.

Although Egypt's supply of construction equipment may be physically sufficient to handle current and planned construction projects, its low productivity dictates large-scale replacement over the Plan period. To merely maintain current productivity levels, it is estimated that at least half of Egypt's construction equipment must be replaced by 1985. This will require an estimated L.E. 600 million for equipment and spare parts during the 1980-1984 period.

Under current market conditions, equipment rentals and/or leasing present a viable alternative to reducing the capital costs of implementing a replacement program. Recently introduced to the market on a very limited scale, further development of this service could result in substantial cost savings, particularly for small and medium-sized contractors. Such rental companies could be established either within existing large contracting firms, or preferably, as independent firms serving the entire construction market.

Prospects for local manufacturing of less sophisticated construction equipment, under license or

local assembly, look very good as they usually present further manufacturing opportunities for parts and components. Items included in both of these categories include concrete mixers, liquid pumps, cranes, hoists, improved builders' hardware, central air-conditioning equipment, scaffolding, forming and shoring, aluminum frames, and so on.

Most industry experts agree that the feeder industries already in existence in Egypt are now reasonably equipped to support the creation of such satellite manufacturing facilities in the construction sector.

Construction Systems

The nationalization of key production facilities in the construction sector, coupled with tight government control in the pricing, allocation, and distribution of basic construction materials, have led to the adoption of certain construction systems in Egypt that, for the most part, utilize state-controlled resources: namely, reinforced concrete technology and heavy steel-based structural systems.

Many construction methods currently in use in Egypt are relatively outdated or rely on equipment badly in need of repair. These conditions usually lead to

oversimplification in project design, wasted construction materials, and ultimately higher project costs. In addition, because there are few regulations concerning building material standards and testing procedures, Egyptian architectural firms often overdesign by as much as 30 percent to offset expected structural weaknesses. And, to offset the absence of product standards and avoid excessive material waste, more sophisticated labor is often required on job sites. All of this translates into protracted delays in project completion and excessive cost overruns.

CTIC analysis of the various construction systems and techniques now in use in Egypt has revealed a number of potential areas in which the application of modern techniques could result in substantial improvement in construction performance. Structural formwork is one of these potential areas. Until recently, all formwork in the construction sector consisted of timber boards and props. This technique, which is still common, has various applications, particularly in the housing sector. More sophisticated systems--including steel and plywood shutters, aluminum shutters, adjustable steel props, and moving shutter systems--are gradually finding their way to the market.

Prefabricated housing construction is yet another major opportunity area. Egypt's acute housing shortage has made the industrialization of the housing industry almost inevitable in recent years. The introduction and development of prefabricated, large-panel housing systems present good opportunities: Field interviews with experienced private sector contractors suggest that prefabricated housing can be built in Egypt within 10 percent of the cost of traditional housing. Given sufficient volume, and in light of the private sector's renewed interest in prefabricated housing in the last two years, this seems to be a valid claim.

In addition, there are a number of possibilities for using prefabricated modular units for buildings other than housing--school buildings and health clinics, for example--and these are being examined.

Because gypsum, a major input material, is readily available throughout Egypt, there are also good prospects for the introduction of the nonstructural, lightweight partitions. This type of partition not only reduces an unnecessary load on the structure and requires less skilled construction labor, but it also minimizes the use of mortar and plaster, thus reducing unnecessary costs.

## Potential Investment Opportunities for U.S. Firms

CTIC findings suggest that the most potentially lucrative areas for private U.S. investors in the Egyptian construction sector are in specialized processes, techniques, and materials. Such projects include precast concrete slab production and the manufacture of scaffolding and forming equipment.

Construction experts believe that, although American construction firms cannot easily compete on price in the Egyptian market, they can sell quality and efficient management. Projects in which U.S. firms could have a competitive advantage vis-a-vis Egyptian and European competitors, therefore, are limited to high-technology, joint-venture investments.

There are also a number of investment oppportunities for U.S. firms in industrial development. These range from factory buildings to pipe manufacturing as well as the manufacture of specialized materials, equipment, and components for building projects.

## 2. THE CONSTRUCTION INDUSTRY IN EGYPT

### Overview

The construction industry in Egypt is struggling to meet the enormous demands that have been placed upon it by the government's 1980-1984 Development Plan. Of the anticipated total investment of L.E. 22 billion, about L.E. 10 billion, or nearly half of the total planned investment, is to be spent on construction. The great pressures that this ambitious economic program has placed upon Egypt's government-dominated construction industry have required major changes in the industry's overall structure, management, and production process.

Almost every aspect of Egypt's construction industry is characterized by government control and regulation. In the early 1960s, the government nationalized major segments of the construction industry and severely limited the role of private sector in supplying construction materials. Simultaneously, the government nationalized many other key sectors of the economy, thus creating a market environment in which most end-users of the construction industry are still in the public sector. Under this system, most construction projects are commissioned, designed, and built by public contracting firms, with

materials often purchased at subsidized prices from public producers.

For a variety of reasons, but largely as a result of shortages of raw materials, outdated technology, and inadequate management, the production process in the construction industry is slow. A major bottleneck has been created by the loss of a good number of skilled workers to the construction boom in the oil-rich Arab countries. In addition to the shortage of skilled labor in the industry, limited contact with the industrialized nations for nearly a generation has adversely affected standards of design and utilization of building materials, and architects often overdesign by as much as 30 percent to offset possible structural weaknesses. These shortcomings and bottlenecks, which clearly affect the performance of the industry as a whole, appear to be mainly the result of the way in which the industry is structured.

Current and Planned Level of Construction Activity

As a result of large-scale economic development programs, the level of new construction activities in Egypt has increased substantially in recent years. Turnover in the construction industry has almost tripled in the last six years, increasing from

L.E. 542 million in 1975 to over L.E. 1,500 million in 1980 at current prices (see Table 2-1).

Table 2-1

CONSTRUCTION TURNOVER IN EGYPT, 1975-1980

| Year | Value of New Construction (L.E. millions) |
|---|---|
| 1975 | 542 |
| 1976 | 636 |
| 1977 | 715 |
| 1978 | 805 |
| 1979 | 1,350 |
| 1980 (estimate) | 1,543 |

Source: CTIC, based on data supplied by Ministry of Planning, August 1981.

Although official statistics are not always consistent, that they serve as a general indicator of overall construction activity is supported by most industry experts as well as by major public and private contractors who, over the past three years, have experienced an increase in the volume of business of as much as 100 percent.

Barring unforeseen shifts in government policy, the

construction sector is expected to remain one of the most active sectors of the Egyptian economy. The development of new cities, port expansion, tourist facilities, massive housing programs, and continued reconstruction in the Suez Canal area will result in increased construction activity in Egypt over the next five years.

As noted earlier, the 1980-1984 Five-Year Development Plan sets bold targets for the construction sector. A 27-percent increase in the value of new construction activity in real terms is called for, an increase from L.E. 1,543 million in 1980 to nearly L.E. 2,000 million by 1984 (see Table 2-2).

Table 2-2

PROJECTED CONSTRUCTION TURNOVER IN EGYPT, 1980-1984

(L.E. millions at 1979 prices)

| Year | Value of New Construction | Percentage Change over Previous Year |
|---|---|---|
| 1979 | 1,350 | - |
| 1980 | 1,543 | 14.3 |
| 1981 | 1,590 | 3.0 |
| 1982 | 1,689 | 6.2 |
| 1983 | 1,813 | 7.3 |
| 1984 | 1,955 | 7.8 |

Source: Ministry of Planning and Five-Year Development Plan, 1980-1984.

Inasmuch as they are based on an annual growth of 10 percent in Egypt's national output, the Plan's overall targets for the construction sector may well prove to be too ambitious. Taking into consideration current economic bottlenecks and constraints, most observers expect an annual growth rate of about 7 percent over the next four to five years.

Major Segments of the Construction Market

The Ministry of Planning subdivides the

construction sector into 14 groups, covering almost all economic sectors in Egypt. For analytical purposes, these classifications are regrouped here into six broader segments, organized according to the particular type of construction work involved in each market segment.

(1) Transportation and communications, including storage and Suez Canal construction

(2) Housing construction

(3) Public utilities, including electricity, water, and sewage plants

(4) Industrial construction, including industry and mining, petroleum, and contracting

(5) Agricultural construction, including land reclamation, irrigation, and drainage

(6) Other construction, including the building of schools, mosques, social and commercial buildings

The structure and relative importance of these market segments are significantly different from each other, and their major characteristics and role in the overall construction market are discussed below. The relative size of major market segments in terms of construction turnover is outlined in Table 2-3.

Table 2-3

MAJOR MARKET SEGMENTS AND THEIR
RELATIVE SHARE OF CONSTRUCTION OUTPUT, 1980

| | Value of New Work (L.E. millions) | Percentage Share |
|---|---|---|
| Transportation and communications | 355 | 23 |
| Housing construction | 339 | 22 |
| Public utilities | 293 | 19 |
| Industrial construction | 216 | 14 |
| Agricultural construction | 170 | 11 |
| Other construction | 170 | 11 |
| TOTAL | 1,543 | 100 |

Source: CTIC, based on Ministry of Planning data.

Transportation and Communications

Transportation and communications, which together accounted for 23 percent of the value of all new construction undertaken in 1980, represent the largest market segment in the construction market in Egypt. The 1980-1984 Development Plan has allocated a total fixed investment of L.E. 3,250 million to this sector,

of which about L.E. 2,000, or roughly 63 percent, is earmarked for the construction of various transportation and communication facilities.

The transportation sector covers the construction of various roads, communication facilities, docks, waterways, airports, and the Suez Canal works. The greatest amount of information available is on road construction. There are about 8,500 kilometers of paved urban roads in Egypt and a similar amount of unpaved roads. A conservative maintenance program for this network is estimated to cost around L.E. 844 per kilometer. For new urban roads, an annual maintenance expenditure of L.E. 1,000 per kilometer will be required. Upgrading a road from unpaved to paved is estimated to cost about L.E. 20,000 per kilometer. For inter-urban roads, similar calculations are made by the Ministry of Planning.

There are also 12,336 kilometers of paved highway and another 14,183 kilometers of unpaved inter-urban roads in Egypt. The maintenance of paved roads is estimated to cost L.E. 1,200 per kilometer; the upgrading of unpaved inter-urban roads will require an average of L.E. 35,000 per kilometer. For planned roads within new satellite cities, an average cost of

L.E. 225,000 per kilometer is assumed. The total investment for the required road network program in Egypt is estimated to amount to L.E. 180 million in 1983 and L.E. 305 million by 1994. Of the L.E. 180-million investment for 1983, about 55 percent, or L.E. 100 million, will be spent on the construction of new urban roads alone.

According to a study prepared for the Ministry of Transport by Netherlands Engineering Consultants, other planned construction schemes in the transportation sector include the Cairo Urban Transport Project, with an estimated cost of L.E. 36 million in 1983, and, also in 1983, the improvement of the railroad network at a cost of L.E. 12 million.

The construction of various communications facilities, docks, waterways, airports, and the Suez Canal works is estimated to require a total of L.E. 200 million per year during the 1980-1984 period.

Given the existing transportation infrastructure in Egypt, a transportation investment program growing at 4 percent per year in the 1980s is considered reasonable by most experts. This program should, however, allow for additional maintenance costs after a close examination of new development schemes is made on

a case-by-case basis.

Housing Construction

Egypt is experiencing an acute shortage of urban housing. The National Housing Policy, prepared by the Ministry of Housing in 1979, estimates the current housing backlog at 830,000 units, although it may be much more. At the same time, Egypt needs to build about 200,000 housing units a year simply to keep up with the 1.2 million annual increase in population.

According to the 1976 census, the number of dwelling units in the country's urban areas was 3,587,000. Of this number, 2,853,000 units were classified as flats and 734,000 units were classified as rooms. The National Census further shows that in the same year there was a crude housing deficit of 555,000 units, a shortage estimated to have reached the one million mark at the present time. In addition, it is estimated that some 900,000 units of the existing housing stock in Egypt were built before the beginning of the present century. Field observations reveal that most of these old urban dwellings are in very poor condition and require immediate renovation, if not total replacement.

The critical shortage of housing in Egypt is

attributed to a number of important economic/ demographic factors, including:

- The rapid growth of the urban population, estimated at 4 percent annually, coupled with the inability of the construction industry to produce sufficient housing units to meet the growing demand
- A loss of skilled manpower to oil-rich countries of the Middle East
- A shortage and/or misallocation of state-controlled basic construction materials
- The destruction of housing in the Canal Zone during the 1967-1973 war
- The need for substantial government subsidies to make standard housing affordable for nearly 80 percent of the population

Recognizing the critical nature of its housing problem, the Egyptian government has attempted to direct all available resources into the housing effort. The high priority given to the housing sector has been backed up by continued budget support, which has remained high despite cutbacks in other economic sectors.

Since the mid-1950s, the Ministry of Housing has

constructed nearly 10,000 housing units annually in various urban areas of the country. These units are usually 4-room, five-story, walk-up flats with full private utilities. Each unit has a floor area of 80 square meters and currently costs about L.E. 4,000. Present plans call for the construction of 45,000, 70 square meter units per year, at a cost of L.E. 3,500 per unit (see Table 2-4).

Table 2-4

CURRENT AND PLANNED LEVEL
OF HOUSING CONSTRUCTION IN EGYPT

| Housing Category | Unit Size | Unit Cost (L.E. 000s) | Annual Production (Units) | Annual Investment (L.E. 000s) |
|---|---|---|---|---|
| Current public housing | 80 $M^2$ * | 4,000 | 9,000 | 36 |
| Planned public housing | 70 $M^2$ | 3,500 | 45,000 | 155 |
| Private formal housing ** | 90 $M^2$ | 5,000 | 5,000 | 25 |
| Private formal housing ** | 150 $M^2$ | 10,000 | 5,000 | 50 |
| Private informal housing ** | 50 $M^2$ | 2,000 | 50,000 | 100 |

* $M^2$ = square meter.

** Private formal housing is constructed under government auspices; private informal housing is constructed without a permit.

Source: The Cairo University/MIT study, The Housing and Construction Industry in Egypt, 1979; Ministry of Housing data.

Currently, the public sector builds essentially a single type of housing unit, which it rents at heavily subsidized prices. There is obviously an enormous demand for such units, and waiting lines are long. The private sector operates in a quite different way, building and marketing three types of housing: luxury units, standard middle-class units, and low-cost or informal housing. Based on the present shortage of urban units and the projected 20-million increase in urban population by the year 2000, Egypt's housing needs are estimated at about 4 million units by the end of the century. Meeting this demand will require the construction of 200,000 units per year in addition to some 80,000 units annually to cover the present housing backlog.

Because of cost considerations, government attempts to attract foreign companies to invest in low-cost housing have, to date, produced few results. Some foreign construction companies, such as George Wimpey of U.K. and Dongsan of South Korea, have found such projects commercially unfeasible at prices asked by the government. Yet Ministry of Housing construction experts claim that local companies can build simple housing units at L.E. 50 per square meter. At present,

government negotiations are underway for a large multi-billion dollar project with international institutions for a financial package to support the building of 500,000 new homes in Egypt over a five-year period.

Although the government has become increasingly involved in public housing, particularly low-income housing, the construction of standard residential buildings in Egypt has been, and continues to be, largely in the private sector. One of the first private housing projects to take advantage of Law 43 incentives is a 10,000-unit project in Cairo sponsored by Arab Contractors, a project of luxury and semi-luxury apartments with shopping center facilities, cinemas, and other commercial space. This project encourages foreign investors and non-resident Egyptians to purchase units as shareholders, with foreign currency. Down payment before construction ranges between 20-25 percent, and occupancy is anticipated within three to four years. For luxury units, full payment is required upon project completion; for semi-luxury units, a ten-year mortgage at 7 percent interest for half the unit cost has been arranged by the project sponsor.

Public Utilities

At present, Egypt relies heavily on the High Dam and the older Aswan Dam downstream on the Nile for its energy. In 1979, hydroelectric power accounted for 60 percent of the 16.5 billion kwh generated in the country. Hydroelectric installations currently account for over half of the nation's installed capacity of 4,600 megawatts; the remaining 2,250 megawatts is thermal.

To meet future demands for power, estimated to increase by 20 percent per year, the government is launching a massive program to build several large thermal power stations. The 1980-1984 Development Plan envisages more than doubling the current installed thermal capacity to 5,000 megawatts. All generating units will be convertible to gas in anticipation of the expansion of the local gas industry. A number of generating units, using natural gas from the Abu Kir field, already have been converted.

The Egyptian Electric Authority plans to increase electric generation capacity by a factor of 6.3 between 1980 and the year 2000. Costs have been calculated on the basis of L.E. 6 million per 100 kwh capacity. It is estimated that the cost of generating plants will

amount to L.E. 1,238 million, or 55 percent of total investment in this sector for the duration of the Plan.

The National Housing Policy estimates an average cost of L.E. 1,290 per dwelling for the supply, distribution, and maintenance of new water and sewage plants. The Ministry of Housing estimates satisfaction of current needs to require L.E. 1,034 million at 1979 prices.

Total investment in public utilities construction, which amounted to L.E. 153 million in 1979, is expected to increase substantially over the next few years, reaching L.E. 554 million by 1984.

Industrial Construction

Industry and mining, the largest component of the industrial construction sector, accounted for over 90 percent (L.E. 127 million) of the sector's total turnover in 1979. Petroleum and contracting accounted for the remaining L.E. 10 million in construction turnover. The World Bank has projected that, over the next four to five years, the value of new industrial construction in Egypt will grow at about 10 percent annually, should the GDP achieve an annual growth rate of 8 percent per year.

In the 1980-1984 Development Plan, investment in

the petroleum sector is combined with investment for tourism and the Suez Canal project. Although the Plan does not specify how much is intended for the petroleum sector alone, it indicates that the planned growth rate of petroleum output is set at 13.4 percent per year through 1984. Investment in this sector, however, will be determined by factors such as world prices and the supply of oil on the international market, Egypt's balance-of-payments status, and national and international policies. Though it is impossible to predict the effect of these variables, it is generally expected that, at least for the near future, the current pace of investment in Egypt's oil sector will continue.

The construction sector's own investment in buildings and related works is expected to be very low, averaging about L.E. 1-2 million annually over the next few years. The market for industrial buildings in Egypt is dominated by public sector companies responsible for the bulk of industrial production. Private sector demand, however, is growing rapidly as a result of the government's new emphasis on the role of the private sector in the construction industry.

Agricultural Construction

The value of new construction work in agriculture has increased significantly in recent years, from L.E. 50 million in 1975 to L.E. 160 million in 1980. The 1980-1984 Plan gives top priority to investment in agricultural and irrigation projects. The sector's overall construction turnover is projected to increase at an average rate of 8.8 percent per year to a total of 40 percent by 1984. Agricultural experts maintain that past investment in repair and maintenance has been insufficient to compensate for the losses due to deterioration. There is therefore considerable need in Egypt for the repair and maintenance of irrigation works, agricultural roads, and related buildings.

Development plans for existing agricultural lands in Egypt center around a vast $1-billion program to bring one million out of six million feddans of the old lands under tile drainage by 1987. At present, about 2 million feddans of land are under tile drainage. This program, organized by the World Bank, costs the Ministry of Irrigation about L.E. 170 million a year. The Ministry also hopes to start remodeling the Esna barrage within the next five years. This L.E. 100-million project involves installing

hydroelectric capacity during the Plan period. The Nag Hammadi and Asyut barrages are to be remodeled sometime after the completion of the projects covered by the current Development Plan.

Government investment in land reclamation schemes in Egypt is still relatively small. The investment budget in 1980, for example, was only L.E. 40 million, although a further L.E. 25 million was under negotiation for private sector schemes in this area. Attempts to reclaim one million feddans of land in Egypt over the past 20 years have had relatively limited results, principally because of the high cost of infrastructural facilities. The development costs to date of about L.E. 350 million have been very high compared with results: 400,000 feddans of land are now productive, of which one-fourth or 100,000 feddans, are classified as marginal land.

At present, some 1.5 million feddans of good quality, reclaimable land exists in Egypt. Government plans to cultivate 2-3 million feddans of land during the next 20 years are considered very ambitious. Some lands are easier to reclaim than others. For example, about 100,000 feddans of Nile islands, uncultivable since the construction of High Dam, could be reclaimed

with proper drainage. There are also large reclaimable tracts on both sides of the Suez Canal. The $93-million Al Salam Canal project, currently under construction, will provide water from the Damietta branch of the Nile for 400,000 feddans in Sinai, a major area for reclamation schemes.

In Tahrir Province, the French are rehabilitating land originally reclaimed in the 1960s, and in nearby West Nubareyah, the British consulting group ULG has recommended work on 66,000 feddans of land for processed food and sugar beet production. The estimated cost of these ten-year projects, including capital and infrastructure inputs, is about $440 million. This investment is projected to bring about 400,000 feddans under cultivation at an average development cost of $1,100 per feddan.

In Wadi El Natrun on the Cairo-Alexandria desert road, and at New Valley, west of Luxor, there are also good, reclaimable soils and groundwater resources. In 1979, Hawaiian Agronomics, a U.S. agribusiness firm, prepared a prefeasibility study for the Wadi El Natrun project. Modern drip irrigation techniques could be used to replenish a vast underwater lake, and in the long run, it may be even feasible to divert water from

Lake Nasser into the New Valley depression.

Despite these possibilities, reclaiming land in the New Valley is very expensive. It costs somewhere between L.E. 1,000-3,000 to rehabilitate one feddan of land. Price escalation and the fact that the reclamation of sand desert requires about five years to produce 20 percent of old land yields and another five years to reach a total of 80 percent make the cost of development almost prohibitive.

Institutional/Commercial Building

The private sector is the main end-user in this market segment, particularly for commercial and tourist facilities such as hotels, office complexes, shopping centers, private hospitals, and private schools. The public sector concentrates on the construction of administrative and institutional buildings: public schools, government offices, mosques, hospitals, and clinics.

With the growth of business in large cities, particularly in Cairo and Alexandria, and the opportunities offered by Public Law 43, the private sector in Egypt is starting to build large and modern facilities for tourism, offices, and commercial activities. Within the last four years, for example,

at least a dozen first-class hotels have been developed by private firms in Cairo alone. Hassan Allam, the second largest contractor in Egypt, has undertaken a joint venture with J. Jarvis of the United Kingdom to build a $6-million office block in downtown Cairo, which is now almost complete.

A number of other foreign contractors also are active in this field. Higgs and Hill, of the U.K., which is building a twin-tower tourist hotel complex on a river site in Bulaq, Cairo, known as Cairo Plaza, has formed a joint venture with private Egyptian businessmen whose main objective is to seek new contracts and develop commercial buildings throughout Egypt. The Egyptian/Kuwaiti Real Estate Investment Company plans to develop a commercial center in Nasr City, a project estimated to cost $40 million in its first phase.

Several public sector companies also have begun work on joint-venture projects in this field. El Shams Company for Housing and Development, for example, which was previously involved as prime developer in the construction of Jolie Ville Hotel in Cairo and Sheraton Hotel in Alexandria, is now working on the development of a new office complex in downtown Cairo. The

Egyptian General Hotels and Tourism Company also is active as a joint-venture partner in a number of luxury hotel projects such as the Intercontinental and Marriott hotels in Cairo. However, with the demand for five-star hotel accommodations largely satisfied in the greater Cairo area, both public and private sector interest in hotel building is gradually moving to other major cities such as Alexandria, Luxor, and Aswan.

The construction turnover in the institutional/commercial building market has registered a notable growth in recent years: in 1980, it reached a high level of L.E. 169 million, up from only L.E. 35 million five years earlier. According to the National Housing Policy, the value of new construction in public buildings in 1980 totaled L.E. 73 million. This implies that an estimated L.E. 96 million, or roughly 57 percent of the value of new works in the institutional/commercial building market, is attributable to the private sector.

Assessment of Planned Sectoral Objectives

The construction projects included in the 1980-1984 Development Plan are so large and, in large projects, the construction stage lasts so long that at least 75 percent of the work called for by the Development

Plan in any one year is expected to be on projects started in previous years. Recently, this figure has been even higher, reaching as high as 90 percent and in some cases even 100 percent.

A review of past trends in the construction industry, together with 1979 output figures provided by the Ministry of Planning, suggests that the industry was experiencing boom conditions in 1979. This was continued into 1980, according to most industry observers.

In the past few years, construction prices have been increasing at rates considerably higher than other prices, averaging about 20 percent annually, compared with 13 percent in general price levels. Given the existing structure and the limited capacity of the Egyptian construction industry, the continuing pressures on the industry are likely to result in further cost and price increases, thus preventing it from increasing its real output to levels projected by the government under the 1980-1984 Development Plan.

To avoid further cost increases and inflationary pressures, the planned output levels for the construction industry should be modified to bring them in line with the industry's expected capacity. On that

basis, the World Bank construction team has adjusted the output levels for various segments of the construction market over the 1980-1984 period (see Table 2-5).

Because the World Bank projections are based on the construction industry's current capacity constraints, Chase Trade Information Corporation believes that they represent a more realistic picture of achievable construction goals in Egypt over the next four to five years.

Table 2-5

PROJECTED LEVELS OF
CONSTRUCTION ACTIVITY IN EGYPT, 1980-1984

(L.E. millions at 1979 constant prices)

| Market Segment | 1980 | 1981 | 1982 | 1983 | 1984 |
|---|---|---|---|---|---|
| Transportation and communications | 336 | 369 | 383 | 399 | 415 |
| Housing construction | 318 | 445 | 465 | 496 | 536 |
| Public utilities | 274 | 311 | 328 | 350 | 404 |
| Industrial construction | 208 | 229 | 253 | 281 | 311 |
| Agricultural construction | 160 | 176 | 210 | 247 | 284 |
| Institutional/ commercial construction | 169 | 160 | 150 | 140 | 130 |
| TOTAL | 1,543 | 1,690 | 1,789 | 1,913 | 2,055 |

Source: CTIC analysis of Ministry of Planning data and World Bank study, The Construction/Contracting Industry in Egypt, July 1981.

# 3. THE ROLE OF GOVERNMENT IN THE CONSTRUCTION INDUSTRY

## Overview

The government plays a major role in the construction industry in Egypt: first, as a central regulating body that oversees all construction activities at industry level; and second, as a major participant in construction projects, entering into contracts with construction firms either as client, contractor, or supplier.

In its role as regulator, the government enacts numerous laws, decrees, regulations, and codes that affect the operations of the construction industry either directly or indirectly. Not only do these regulations impose certain relationships between the construction industry and the government, but they determine the organizational structure of the government as it performs its various roles in the construction sector.

The government's role as a participant in the construction industry has increased markedly since the nationalization of industry in the early 1960s. The creation of a large public sector and the extension of its direct control over most of the large contractors

and production facilities has contributed substantially to the government's role in the construction sector. In the future, however, this situation is expected to change gradually as a result of the greater emphasis placed by the 1980-1984 Development Plan upon the development of private sector.

The Role of Government as Regulator

The Egyptian government directs construction activities through medium-term development plans as well as through laws, decrees, and regulations. Because construction activity represents a significant share of new investment in almost all economic sectors, the plans and regulations affecting those sectors also directly influence the level and direction of construction activities in Egypt.

Government Policy and Investment Plans

Since 1959, as a means of achieving the nation's development goals and priorities, the government has employed central planning in all its economic activities. The principal focus of this effort has been a series of medium-range plans, which highlight the targets and objectives of each economic sector and concentrate upon fulfillment of the policies and specific projects of the Development Plan. In addition

to five-year plans, detailed annual budget plans for the allocation of funds to ministries and government agencies are prepared jointly by the Ministries of Planning and Finance.

The 1980-1984 Development Plan calls for substantial public sector capital expenditures in various construction activities. The L.E. 3.8 billion allocated represents nearly 21 percent of the total public sector capital expenditures under the Plan, the largest single government investment compared with planned expenditures for other economic activities (Table 3-1).

Table 3-1

PLANNED FIXED INVESTMENT
IN THE 1980-1984 DEVELOPMENT PLAN

| Sector | Investment (L.E. millions) | | |
|---|---|---|---|
| | Public | Private | Total |
| Agriculture and food security | 3,600 | 775 | 4,375 |
| Housing, utilities, and building materials | 2,880 | 1,750 | 4,630 |
| Transportation and communications | 3,000 | 250 | 3,250 |

Table 3-1 (cont'd)

| Sector | Investment (L.E. millions) | | |
|---|---|---|---|
| | Public | Private | Total |
| Industry and military production | 2,000 | 500 | 2,500 |
| Export sector* | 1,800 | 300 | 2,100 |
| Social and soverign services** | 1,600 | - | 1,600 |
| Electricity | 1,500 | - | 1,500 |
| Reconstruction and new cities | 900 | 300 | 1,200 |
| Local government agencies | 1,000 | - | 1,000 |
| TOTAL | 18,280 | 3,875 | 22,155 |

* Includes planned investment in oil, tourism, and the Suez Canal (excluding investment by foreign oil companies) and an estimated investment of L.E. 300 million by the private sector.

** Includes investment in health, education, security, justice, and cultural and religious services.

Source: Ministry of Planning; 1980-1984 Development Plan.

Because construction represents a significant share of investment in almost all other economic sectors, however, the actual public sector investment in construction-related activities is expected to be much

higher than L.E. 3.8 billion. Recent estimates by the Construction and Building Division of the Ministry of Planning show that about 45 percent of planned investment across all economic sectors is generally allocated to construction. This ranges from a high of 90 percent in the housing sector to a more moderate share of 30-70 percent in utilities, services, agriculture and irrrigation, industry, and transportation and communications, and a lower share of less than 20 percent in electricity. All told, under the 1980-1984 Plan, about L.E. 8 billion will be invested in various construction activities during the Plan period--over double the amount allocated directly to the construction sector.

Despite the large government role implied by the size of this investment, government experience with development planning in the construction sector has been sporadic to date, largely because of over-ambitious targets and inadequate coordination among various government agencies in charge of project implementation. Given present planning efforts, the prospects for the future look somewhat more promising.

There is a general consensus among industry experts that the government will continue to serve as the

principal means of guiding and controlling investment and production in the construction sector, despite the current policy of gradually shifting construction activities to the private sector. This policy raises the question of how to coordinate private sector activities with those of some 47 existing public sector companies which account for almost half the construction turnover in Egypt.

Because they are a function of non-economic factors rather than economic needs and requirements, the existing government subsidies and price controls in the construction industry are viewed by most industry experts as the main barriers to reform. To alleviate this problem, the government plans to retain only a few strategic industries, such as steel and cement production, under public sector control and leave responsibility for other construction-related industries to the private sector. Public sector companies are to be encouraged to finance new investments internally, by selling shares or by going into joint-venture partnerships with foreign companies. The government is encouraging the second option as a means of injecting both capital and technical know-how into the construction sector.

Government Laws and Regulations

In addition to controlling the construction sector through central planning, the government also influences the operation of existing and new construction projects through a series of regulations such as land-use laws, physical planning guidelines, and building codes and standards. Law 52 of 1940, as amended by Law 2 of 1952, for example, regulates subdivisions of land for building projects. This law, however, is limited in scope in that it is confined to minimum specifications regarding road widths, lot sizes, public areas, and the like.

Building and construction activities are further regulated by Law 106 of 1976, which establishes a two-step procedure for the erection of new buildings and the alteration of existing buildings requiring the expenditure of more than L.E. 5,000. Any investment in private housing must be first approved by a committee at the governorate level to determine its compliance with the local housing budget for the private sector. Second, a local permit/license must be obtained for the construction, regardless of whether it is for a public, private, or government client.

In industrial construction, the Ministry of

Industry, through the General Organization for Industrialization (GOFI) must approve the project before any permit/license can be issued for actual construction. Regulated building materials--cement, steel, wood, and glass--are allocated to the governorate on the basis of planned investment, and permits for their purchase are distributed in conjunction with the building permits/licenses.

Building standards are controlled by ministerial decrees and have long concentrated on aspects specific to the construction of housing. Ministerial decree 169 of 1962, as replaced by ministerial decree 237 of 1977, has been the primary regulator of building standards. It controls details regarding building height, ceiling height, lighting, ventilation, stairways, sanitary services, and the like. It was not until 1973 that some general standards were established for specific construction activities--namely, Decree 93 of 1973 regarding the use of blocks in buildings, Decree 96 of 1974 for painting and finishing activities, Decree 94 of 1973 for steel and bridge construction, and Decree 95 of 1974 for building embankments.

All construction equipment and materials imported into Egypt for development efforts are exempt from

duties and taxes under Law 62 of 1974. Decree 47 of 1977 issued by the Ministry of Finance further extended this exemption to include most building materials and components.

The Role of Government as Participant

The construction industry in Egypt is characterized by government participation at almost every level. The government is involved in financing, designing, and managing construction and contracting activities as well as in supplying basic construction materials and equipment. It produces, allocates, and distributes key building materials; provides equipment; develops technology; trains construction manpower; and finances most construction activities.

The Role of Public Sector Firms

Public projects in Egypt are currently undertaken by 47 contracting companies which operate under direct ministerial control, although they subcontract about a third of their work to private sector contractors. The combined annual turnover of public contracting firms, including subcontracts, accounts for nearly two-thirds of all construction. In 1978, for example, the direct annual turnover of these companies amounted to L.E. 692 million. This amounts to about half of the

contracting work in Egypt (see Table 3-2).

Table 3-2

ANNUAL TURNOVER OF PUBLIC SECTOR CONTRACTING FIRMS IN EGYPT, 1978

| Company Size by Turnover (L.E. millions) | Number of Firms | Turnover (L.E. millions) | Percentage of Total |
|---|---|---|---|
| 200 | 1 | 200 | 29 |
| 50-199 | 1 | 50 | 7 |
| 25- 49 | 2 | 55 | 8 |
| 10- 24 | 15 | 232 | 34 |
| 5- 9 | 18 | 120 | 17 |
| 0- 4 | 10 | 35 | 5 |
| TOTAL | 47 | 692 | 100 |

Source: Ministry of Planning.

At present, 29 of these 47 public companies are under the Ministry of Housing. In 1977, the last year for which official statistics are available, these firms executed over L.E. 420 million worth of construction work in Egypt and another L.E. 100 million outside Egypt, mainly in the Middle East (Table 3-3).

Table 3-3

CONSTRUCTION WORK EXECUTED BY PUBLIC SECTOR COMPANIES UNDER THE MINISTRY OF HOUSING AND RECONSTRUCTION, 1977

| Company | Turnover (L.E. millions) | | |
|---|---|---|---|
| | Domestic | Foreign | Total* |
| Arab Contractors | 153 | 13 | 166 |
| Misr Concrete | 27 | 41 | 68 |
| Hassan Allam | 36 | 9 | 45 |
| Egyptian Contracting | 19 | 8 | 27 |
| Cairo General Contracting | 16 | 6 | 22 |
| Egyptian Shareholding Contracting | 15 | 6 | 21 |
| Atlas General Contracting | 15 | 4 | 19 |
| El Nile General for Reinforced Concrete | 10 | 5 | 15 |
| El Gomhuria General Contracting | 13 | - | 13 |
| El Arabia General Contracting | 12 | 1 | 13 |
| El Nasr for Building & Construction | 13 | - | 13 |
| General Construction (Rolan) | 8 | 4 | 12 |
| Giza General Contracting | 6 | 4 | 10 |
| Engineering and Industrial Projects | 10 | - | 10 |
| El Nile General for Contracting | 7 | - | 7 |

Table 3-3 (cont'd)

| Company | Turnover (L.E. millions) | | |
|---|---|---|---|
| | Domestic | Foreign | Total* |
| El Nile General for Bridges | 7 | - | 7 |
| El Mahmoudia General Contracting | 7 | - | 7 |
| El Nasr for Civil Construction | 6 | - | 6 |
| El Arabia for Foundations | 6 | - | 6 |
| El Said General for Contracting | 6 | - | 6 |
| El Delta General Contracting | 5 | - | 5 |
| New Valley for Contracting | 4 | - | 4 |
| Red Sea General Contracting | 3 | - | 3 |
| Alexandria General Contracting | 3 | - | 3 |
| Egyptian General for Building | 3 | - | 3 |
| El Nasr for Utilities and Erection | 3 | - | 3 |
| General Contracting for Sanitary Works | 3 | - | 3 |

Table 3-3 (cont'd)

| Company | Turnover (L.E. millions) | | |
|---|---|---|---|
| | Domestic | Foreign | Total* |
| Canal General Contracting | 3 | - | 3 |
| General Foundations | 1 | - | 1 |
| TOTAL | 421 | 101 | 522 |

* Figures may not add to totals because of rounding.

Source: Ministry of Housing, Report on Public Sector Contractor's Performance, September 1978.

Among the public sector contracting companies in Egypt, Arab Contractors (AC) is the largest, accounting for almost a third of all public construction works in the country. Although Arab Contractors has only about 20 percent of the total construction market in Egypt, its influence extends far beyond the limits these figures suggest. There are a number of reasons for this.

- o Direct or indirect interest by AC in other contracting companies including the 10th of Ramadan Contracting Company (60 percent) and Misr Iran Contracting Company (50 percent).

- AC interest in various organizations serving the construction industry: consulting engineering firms, banks, building material manufacturers, and investment companies.
- AC's market share of well over 70 percent in carrying out certain kinds of construction: construction of bridges and cement plants.

Altogether, public sector clients in Egypt account for over 70 percent of total construction demand, almost 80 percent of non-housing works, and more than 90 percent of civil engineering works. The striking aspect of this massive involvement in the construction sector is that the government's various functional responsibilities are not clearly separated. In many cases, for example, a single ministry acts as client, contractor, and material distributor. This leads to a blurring of functions which, in turn, results in inadequate project supervision and management and frequent nonpayment or delay of payment to the public contractor.

Payment delays, in their turns, have created a situation in which, as a safeguard against liquidity and cash flow problems, contractual requirements and obligations are largely ignored by most public

contractors. These problems are often overlooked by various government agencies on the grounds that all parties concerned are, indeed, one and the same.

The Allocation of Public Works

Until 1979, public sector contractors received almost all their construction work through direct orders: that is, on a negotiated basis under which each company was allotted work directly by a client ministry or public organization. Since January 1979, although it is still possible to extend an existing contract almost indefinitely, the government's policy has been that no new contracts should be given by direct order. Military works may still be awarded by direct order. Nevertheless, new large contracts for non-military works continue to be given by direct order. One of the country's largest contractors, for example, has negotiated 70 percent of its ongoing works on a direct order basis, and other public sector contractors are working under more or less similar arrangements.

Despite these arrangements, public sector contractors face growing difficulties under the new competitive bidding system, for all contractors, including private sector firms, can now bid on

government jobs below a certain project level and price. Technically, the sudden exposure of public companies to an open and competitive market environment implies that they no longer can rely on guaranteed government work and must improve their job performance and marketing techniques to win new contracts.

The methods now most commonly used for awarding new public contracts are open tender for smaller construction works, and a prequalification stage followed by a limited tender stage for larger works. On larger jobs, the number of bidders is normally 10 to 15; for smaller jobs it is much more.

One of the problems in the tendering process is non-adherence to conditions specified in the tender document by most participants. Despite clear instructions in the tender document, bidders usually put qualifications and conditions into their bid, and negotiations take place after the tenders are submitted.

### Prospects for Change in the Role of the Public Sector

Field investigations indicate that, despite recent government restrictions on public contractors, they still enjoy certain advantages over private sector contracting firms. First, they do not have to compete

for construction raw materials, inasmuch as they continue to receive allocations of basic materials for their project work. Second, they can still rely on government allocations for project finance. Third, they can continue doing business with government support and subsidies even if they show substantial operational losses. These favorable conditions not only tend to relax the efforts of public firms to raise their operating efficiency, but they also make it more difficult to achieve an objective and meaningful economic assessment of their productivity and efficiency.

There is, however, a growing awareness among public sector construction companies of the need for specialization and structural change. To this end, a number of public firms have begun to form joint-venture companies with foreign partners to carry out special contracts. Although this trend is expected to continue for the next five to six years, it is quite unlikely that the fundamental structure and relative market position of public sector contracting firms will change significantly in the near future.

## Government Policy toward the Private Sector

### The Open Door Policy

Since the early 1970s, under Law 43 of 1974, the Egyptian government has pursued an "Open Door" policy under which private sector involvement and foreign investment are to be encouraged in Egypt. This policy has to date created a substantial and growing demand for the services of private construction firms, particularly in areas where effective planning and management of projects are essential to the client.

By January 1980, a total of 75 private contracting companies was established under Law 43. Although few of these new firms are currently in full operation, their combined turnover is expected to grow substantially within the next few years.

Many expatriate architectural/contracting firms, not formed under Law 43, also conduct business in Egypt as branch operations. These include several British firms as well as Belgian, Finnish, French, and German companies.

### The Role of the Private Sector

The contractor segment of the Egyptian construction industry consists of a large number of small-to-medium-size private firms and a limited number of large public

contractors. The official registration figures for private contractors at the end of 1977 show some 12,000-15,000 general and specialty contractors and an additional 6,700 labor contractors. These figures also reveal a considerable growth in the number of private contractors in Egypt over the last decade (see Table 3-4).

The Ministry of Planning estimates the volume of construction work executed by these companies at about L.E. 300 million annually. This figure includes subcontracting work received from public companies. Several of the larger private contractors interviewed reported significantly higher volumes for their combined annual turnover.

Table 3-4

PRIVATE CONTRACTORS REGISTERED WITH THE MINISTRY OF HOUSING: SELECTED YEARS, 1966-1978

| Year | General Contractors | Specialty Contractors | Labor Contractors | Total |
|---|---|---|---|---|
| 1966 | 3,884 | 2,831 | 2,996 | 9,711 |
| 1971 | 6,013 | 4,226 | 4,621 | 14,860 |
| 1972 | 6,449 | 4,427 | 4,951 | 15,827 |
| 1973 | 6,913 | 4,630 | 5,216 | 16,759 |
| 1974 | 7,470 | 4,900 | 5,566 | 17,936 |
| 1975 | 8,070 | 5,130 | 5,866 | 19,066 |
| 1976 | 8,708 | 5,352 | 6,148 | 20,208 |
| 1977 | 9,381 | 5,566 | 6,715 | 21,662 |
| 1978 | 10,035 | 5,843 | 6,863 | 22,741 |

Source: Office of Private Sector Contractors, Ministry of Housing.

Types of Work Performed by Private Sector Firms

As prime contractor, most public sector firms do anywhere from half to all of the work assigned to them. This practice varies widely among public firms. Giza Company, for example, generally does anything except electrical work, painting, and door/window installation, while Misr Concrete, on the other hand,

usually performs the skeleton work and subcontracts the remainder to private sector firms. Overall, it is estimated that about a third of public sector work is subcontracted to private contractors, particularly in building construction, where the work is more divisible than in civil works. Aspects of construction typically subcontracted to private firms include:

- Foundation excavation and associated concrete work
- Concrete and masonry
- Plastering, carpentry, sanitary installations, and plumbing
- Electrical installations and fixtures
- Painting and finishing work
- Light metal roofing/wall installation
- Scaffolding

Over half of the private contractors in Egypt, by virtue of their small size, tend to work as specialty contractors, concentrating on activities such as concrete work, masonry, carpentry, plumbing, electrical and metal work, among others. The larger firms, which are more diversified, function as general building contractors, with much of their work in commercial, institutional, and residential building and a lesser

amount in industrial building. About 10-15 percent of private construction work is in nonbuilding--particularly in irrigation, water and sewage works, and, to a lesser extent, on roads and bridges.

The following examples reflect the typical range of contracting work currently undertaken by the private sector in Egypt. SCIB, a large general contracting and trading company, is working on a number of medium-to-large building projects including Nile Tower ($22 million), Amal Hospital ($80 million), Six Towers ($12 million), among others. The company, which is also affiliated with several foreign architectural/engineering firms such as Max-O-Urban (U.S.), Setec International (France), S.N.T.P. (France), and Sybetra (Belgium), employs about 42 engineers and technicians. About 70 percent of its business is with public sector companies.

Dorra Company, a large general building contractor, is active in concrete, masonry, and finishing works. The company also provides scaffolding and all major construction materials and equipment, and subcontracts electrical and sanitary works to other specialized firms. Like SCIB, about 70 percent of works undertaken by Dorra Company is for public sector clients. Dorra

Company has been increasingly involved in joint-venture projects with British firms in areas such as slip-form construction and long-span steel work for manufacturing plants in Egypt. Industrial construction works account for 50 percent of Dorra's annual volume.

As a specialty contractor, Volcan Company manufactures and installs cement tiles in buildings and sidewalks. The tiles are produced in a small factory owned by Volcan, which sells some 40 percent of its production on a retail basis. Another private sector specialty contractor, Egyptian Company for Engineering Works, is involved in electrical installation works in both Egypt and Saudi Arabia. Because of problems with materials supply in recent years, the company is investigating the possibility of entering a joint venture for manufacturing electrical fixtures in Egypt.

Among the emerging trends in the private sector are the diversification and expansion of current contracting activities into design and material/ equipment supply. Although such new activities might begin as a department or division within an existing company, as private contracting firms capture a larger share of the construction market in Egypt, they may eventually function as completely separate entities.

## 4. CONSTRUCTION MATERIALS

### Overview

Construction materials, which obviously play a vital role in the development of any construction industry, represent the largest single cost component of construction projects undertaken in Egypt. It is estimated that construction materials account for L.E. 750 million, or some 50 percent of the value of all construction work in the country.

Egypt has extensive resources of raw materials for construction purposes. Natural stone, aggregates, clay, iron and aluminum ores, gypsum, glass sands, and other basic minerals are all available in commercially exploitable deposits throughout the country. The only basic construction material without a domestic resource base is timber; all timber for conventional construction is imported.

Construction materials in Egypt can be classified into two broad categories: basic materials and secondary materials. Basic materials such as cement, steel, bricks, and timber are generally used in the structural and partitions components of construction projects. Secondary materials, such as sanitary and electrical fittings, tiles, doors and windows, pipes,

and paints, are used chiefly in the finishing and completion stage of projects.

Basic Materials

The Egyptian government, through public sector companies and other state agencies, maintains tight control over the production and distribution of basic construction materials--cement, steel, bricks, and timber. These materials, which, as noted above, comprise more than half the value of total construction materials used, are used chiefly for structural components.

The predominance of concrete-based technology in Egypt makes the construction industry highly dependent upon aggregates, cement, and timber.

Cement

The production of cement, which is handled by four large public sector companies, has declined since the mid-1970s. This is attributable in part to obsolescent equipment and a lack of spare parts. Between 1975 and 1979, for example, cement production decreased by almost 600,000 tons*--from 3.6 million in 1975 to 3 million in 1979 (see Table 4-1).

---

* Unless otherwise specified, the term "ton" refers throughout this report to a metric ton (MT). A metric ton is 1,000 kilograms, or about 2,205 pounds.

Table 4-1

THE PRODUCTION OF BASIC
CONSTRUCTION MATERIALS IN EGYPT, 1974-1979

| | 1974 | 1975 | 1976 | 1977 | 1978 | 1979 |
|---|---|---|---|---|---|---|
| Cement (000 MT) | 3,264 | 3,579 | 3,362 | 3,233 | 2,722 | 2,987 |
| Reinforcing bars (000 MT) | 262 | 212 | 228 | 248 | 261 | 302 |
| Bricks (millions) | 665 | 738 | 1,628 | 1,703 | 1,786 | 1,910 |

Source: Central Agency for Public Mobilization and Statistics (CAPMAS), Federation of Egyptian Industries, and Ministry of Housing and Reconstruction.

The continued rapid growth in demand has increased imports of cement to well over 1.5 million MT per year in recent years. Exports of cement have almost ceased.

In order to meet the increased demand, the government has launched a program to substantially increase the local production of cement. Among its projects are two large AID-financed cement plants at Suez and Qattameya, south of Cairo, each with a production capacity of 1 million tons per year or more. It is expected that two more cement plants capable of producing 2 million MT per annum will come on stream within the next two years, thus making the country

self-sufficient in cement production by the mid-1980s.

Reinforcing Steel

The steel industry, which has been active in Egypt for many years, is dominated by the Soviet-built Helwan Iron and Steel complex. Plant utilization at Helwan ranges between 50-60 percent of capacity and, despite high price subsidies that enable it to undercut the price of imported steel, the company barely breaks even.

Three types of steel products are used in the construction industry: reinforcing bars (rebars), steel sections, and steel sheets. Like other steel products, the production of rebars, the largest steel component used in most Egyptian buildings, is dominated by the public sector. About 90 percent of current annual production, or some 300,000 MT, is estimated to come from four large public sector companies, with the balance produced by some 20 small private firms (Table 4-2).

Table 4-2

MAJOR MANUFACTURERS
OF REINFORCING BARS IN EGYPT

| | Production Capacity (metric tons) |
|---|---|
| National Company for Metallic Industries, at Abou Zaabal | 85,000 |
| Egyptian Copper Company | 70,000 |
| Delta Steel Company | 60,000 |
| Helwan Iron and Steel Complex | 40,000 |
| Total Production by Public Sector | 255,000 |

Source: General Organization for Industrialization.

Particularly in recent years, Egypt's facilities for the production of reinforcing bars have been unable to meet the construction industry's growing demand. As a result, imports have been substantial and steadily increasing. In 1979, for example, some 444,000 MT of rebars were imported, an increase from 221,000 MT in the previous year.

Two types of rebars are currently manufactured in

Egypt: steel 37 and steel 52 ASTM specifications*, with steel 37 accounting for about 65-75 percent of total production. Because the production of small diameter rebars reduces plant capacity, these are rarely produced by public sector companies. Most of the 8 mm and 10 mm rebars are manufactured by private sector firms.

The Helwan Iron and Steel Complex, the first integrated steel plant in Egypt, uses iron ore as raw material for rebars; the other three plants, which use scrap and pig iron as raw material, are scrap-based.

Current plans call for increasing the production capacity of the Helwan complex to 1.75 million MT of pig iron per year. This will result in the production of 1.55 million tons per year of liquid steel, from which 1 million tons of rolled stock and 340,000 tons of billets will be produced annually. Plans are also underway to build a new $750-million integrated steel complex at Dekheila for the production, by the mid-1980s, of 700,000 tons per year of steel bars. A steel rolling mill project is proposed for Sadat City.

---

* Specifications made by the American Society of Testing Materials.

With the completion of these projects, it is expected that dependence upon imports can be substantially reduced. However, because current production capacity is sharply limited, reinforcing steel bars will continue to remain in short supply for the next five to six years. Consequently, significant imports of rebars, averaging about L.E. 170 million per year, will be required throughout the 1980-1984 Plan.

Bricks

Unlike cement and steel, the production of bricks in Egypt is handled largely by the private sector. Until recently, the most widely used brick material in Egypt was agricultural soil. Although the use of clay is now officially banned by the government because of its damaging effect on the land, red bricks are still produced in some 400 small factories scattered along the Nile River.

Current brick production in Egypt is estimated to run around 2.2 billion units annually. Of this amount, red bricks account for some 85-90 percent of total production. Cement bricks and sand-lime bricks account for the remaining 10-15 percent.

The government has recently started a program to encourage factories producing red bricks to convert to

the use of materials such as desert shale. In addition, the government is reviewing a number of projects for the establishment of additional brick and block factories, projects geared to utilize gypsum and sand and lime as well as desert shale as basic raw material.

It will obviously be several years before new projects for the production of bricks can be implemented--before new factories are built and modern technology is absorbed and accepted by the existing small-scale factories. In the meantime, until alternative production methods are fully developed, production costs for red bricks are expected to increase.

Timber

Because Egypt has no timber resources of its own, all wood used in construction is imported. About L.E. 80 million is spent annually on the import of wood and wood products for various construction applications--scaffolding, formwork, doors, windows, and so on (see Table 4-3). Industry experts believe that the use of timber in construction, particularly in non-housing projects, eventually will be phased out in Egypt, and that government subsidies are the main

reason for its continued use. The import, distribution, allocation, and pricing of timber in Egypt are controlled by the government.

Table 4-3

EGYPTIAN IMPORTS OF BASIC CONSTRUCTION MATERIALS: 1978, 1979

| | 1978 | | 1979 | |
|---|---|---|---|---|
| | Volume* | Value** | Volume* | Value** |
| Cement | 1,416 | 44.5 | 2,569 | 99.3 |
| Reinforcing steel | 221 | 30.0 | 444 | 100.0 |
| Wood | 561 | 87.8 | 393 | 80.0 |

* In thousands of metric tons.
** In L.E. millions.

Source: CTIC, based on CAPMAS foreign trade statistics, 1978 and 1979.

The only alternative to importing wood is to employ substitute materials--tiles for wood floors, and aluminum for windows and doors. A number of such projects are under study. Two projects for manufacturing hardboard from gypsum are already underway, and the production of aluminum is slated for further expansion. The Soviet-built smelter at Nag

Hammadi, which now produces 100,000 tons per annum of raw aluminum, is to be expanded to produce 66,000 MT of aluminum alloy annually. The cost of this expansion is to exceed L.E. 80 million, increasing the total cost of the smelter to L.E. 180 million. The equipment for the new facility will be purchased from the Soviet Union, and bauxite is to be imported from Australia and Guinea.

Finishing and Completion Materials

Finishing and completion materials include doors, windows, partitions, pipes, and sanitary and electrical fittings as well as tiles, ceramics, and paints. Because this group of building materials is extremely diverse, there are a number of potential opportunities for substitution of materials. Glass and gypsum, for example, are important substitute materials, and plans are underway for their increased use in construction projects in Egypt.

Gypsum can be used extensively in walling applications. Large supplies of this material are available in Egypt both in natural form and as a by-product of various industrial processes. Egypt has produced an average of about 330,000 MT of gypsum annually for the last five to six years (Table 4-4).

Very small amounts are imported (Table 4-5).

Glass is another important secondary construction material with diverse applications. The production of glass sheets has increased significantly in recent years. In 1979, some 27,000 MT of glass sheets were produced in Egypt, an increase from 16,000 MT five years earlier. Imports of glass products for construction purposes reached 26,000 MT in 1979, an increase from only 15,000 MT in 1978. Although glass is an expensive import, raw materials for its domestic production are believed to be available in Egypt.

Lime is available from large limestone deposits located throughout the country. Production of limestone, which reached 6 million cubic meters in 1979 (see Table 4-4), is slated for further expansion. The main construction application for lime is on mortars and renders, where it can substitute for cement. This is particularly important inasmuch as plastering and rendering are generally quite expensive, representing up to 10 percent of total building costs in Egypt. The increased use of lime in construction will effectively reduce cement consumption, thus reducing the production costs of finishing materials.

Table 4-4

PRODUCTION OF MAJOR FINISHING
AND COMPLETION MATERIALS, 1975-1979

| | 1974 | 1975 | 1976 | 1977 | 1978 | 1979 |
|---|---|---|---|---|---|---|
| Gypsum (000 MT) | 363 | 425 | 251 | 264 | 325 | 364 |
| Glass sheets (000 MT) | 16 | 20 | 23 | 21 | 19 | 27 |
| Limestone (mill. cubic meters) | 2 | 5 | 5 | 5 | 6 | 6 |
| Ceramics (000 MT) | 1.9 | 1.9 | 1.4 | 3.6 | 3.5 | 3.9 |
| Tiles (mill. square meters) | N.A. | 2 | 3 | 4 | 4 | 5 |
| Asbestos sheets and pipes (000 MT) | 56 | 66 | 69 | 79 | 77 | 80 |
| Clay pipes (000 MT) | 20 | 18 | 18 | 13 | 15 | 14 |
| Concrete pipes (000 MT) | 39 | 38 | 37 | 41 | 38 | 32 |
| Sanitary fittings (000 MT) | 6.9 | 6.8 | 3.9 | 4.0 | 4.5 | 4.9 |

Source: CAPMAS, Ministry of Housing and Reconstruction, Federation of Egyptian Industries.

The manufacture of pipes, sanitary fittings, paints, and related materials is undertaken by a large number of private firms and a few public companies. The major items produced by the private sector include wooden doors, windows, and partitions. This sector,

which currently produces an estimated 230,000 MT of wooden doors and windows annually, accounts for almost all domestic production.

The local aluminum industry is now fabricating sections suitable for construction use. It is expected that aluminum products will eventually be substituted for timber in a number of construction-related uses, particularly doors, windows, and special shapes and angles.

The quantity and value of selected finishing and completion materials imported into Egypt are shown in Table 4-5. At present, plywood and blockboard represent the largest single imported item, with total imports valued at L.E. 13 million annually. Plumbing and sanitary ware, with L.E. 8 million a year in imports, rank second. Imports of glass construction products reached 26,000 MT (L.E. 7.1 million) in 1979, almost double the amount imported in the previous year. Total imports of various paints and varnishes stand at L.E. 6.6 million annually, while imports of wall and floor-covering items amount to L.E. 2.8 million a year.

Table 4-5

IMPORTS OF SELECTED FINISHING AND COMPLETION MATERIALS: 1978, 1979

| | 1978 | | 1979 | |
|---|---|---|---|---|
| | Volume* | Value** | Volume* | Value** |
| Asbestos | 11,334 | 4.3 | 476 | *** |
| Gypsum | 509 | *** | 668 | *** |
| Glass construction products | 14,789 | 3.8 | 26,000 | 7.1 |
| Plywood and blockboard | 53,520 | 14.8 | 39,437 | 12.8 |
| Wall and floor covering | 1,171 | 2.1 | 2,025 | 2.8 |
| Plumbing and sanitary ware | 10,809 | 7.7 | 9,225 | 7.8 |
| Paints and varnishes | 7,673 | 7.1 | 5,896 | 6.6 |

* In thousands of metric tons.
** In L.E. millions.
*** Insignificant (under L.E. 1 million).

Source: CTIC, based on CAPMAS foreign trade statistics, 1978 and 1979.

## The Distribution and Pricing System

The Egyptian government maintains tight control over the basic construction materials--steel, timber,

cement, and glass. It controls not only production and imports, but the allocation, distribution, and pricing of construction materials. Complicated and time-consuming procedures for the supply of these materials often lead to long delays in delivery, yet advance payments in full are required by public sector suppliers. The resulting strain on the financial resources of most contractors has contributed directly to the creation of a large and established free market in state-controlled construction materials.

Distribution problems also stem from the lack of regional distribution facilities. Not only must construction materials be secured from many locations scattered throughout the country, but because of the economically inefficient locations of the plants that use these materials, there is substantial waste, and transportation and handling costs must be borne by the end-users.

The Rationing System

The rationing system for basic construction materials in Egypt is not as efficient as it might be. Upon presenting his plans, any contractor/developer with an approved building permit is eligible for a quota of materials at official, subsidized prices.

However, there are usually delays of several months in delivery from the government distribution centers. To eliminate these delays, smaller contractors, who build much of the housing in Egypt, often build without an official permit and obtain their requirements from the free market at much higher prices.

Under the present rationing system, a contractor may finally receive his materials allotment after his building project has been completed. He then sells his allotment on the free market--in effect creating a very expensive distribution system. Field investigations reveal that contractors often apply for more materials than they require, the excess supply ultimately finding its way to the free market.

Market investigations also indicate that, because of the existing quota system, most private housing in Egypt--particularly informal, low-cost housing--is built entirely with free market materials. For industrial construction projects and major civil works, the required materials are secured from government sources. For the construction of formal housing, both sources are used.

In practice, these controls have resulted in the subsidizing of non-housing construction and, to some

extent, middle-income housing, at the expense of low-cost housing. The system has also helped large contractors at the expense of small ones. Neither of these results seem consistent with the government's announced policy to fully support and encourage low-cost housing for the masses of Egyptian people.

Price Controls

Through subsidies, the prices of government-controlled construction materials are kept lower than the prices of imported materials. The cost of locally produced cement, for example, was fixed at about L.E. 28 per ton in 1979; free market prices in the same year reached L.E. 80 per ton (Table 4-6). Because of the government restrictions that have been imposed on imports until recently, cement imports have not been able to close the supply gap in the past few years. To alleviate prevailing shortages, the government is now beginning to deregulate trade in cement.

Table 4-6

ALTERNATIVE PRICES OF SELECTED CONTROLLED CONSTRUCTION MATERIALS, 1976-1979, 1979

(L.E. per MT)

| | Cement | | Steel | |
|---|---|---|---|---|
| | 1976-1978 | 1979 | 1976-1978 | 1979 |
| Official price | 18 | 28 | 150 | 180 |
| Free market price | 45 | 80 | 190 | 225 |
| Price of imports | 34 | 48 | 180 | 200 |

Source: Cairo University/MIT study, The Housing and Construction Industry in Egypt, 1979; CTIC data.

The free market prices for reinforcing steel bars have been much more moderate than those for cement. Unofficial prices of rebar averaged around L.E. 225 per MT in 1979, only 20-30 percent more than the official prices in the same year. Government price controls are also extended to other major construction materials, such as wood and glass. Free market prices for wood are about L.E. 180 per cubic meter, some 50 percent higher than the official price of L.E. 120 per cubic meter. The official price of glass

is set at an unrealistically low level of L.E. 0.80-0.85 per square meter, nearly a third of the free market price.

The International Monetary Fund and the World Bank have encouraged the Egyptian government to relax the existing system so that a better pricing mechanism, based on actual market forces, can be established. These institutions have maintained that the current system of government pricing, by not giving the necessary signals to the market for the efficient allocation of materials, fails to respond adequately to market needs.

Transportation and Delivery

The availability of basic construction materials is further complicated by distribution and delivery patterns. The shortage of proper storage facilities, inefficient handling and transportation, and the absence of ready-mix concrete technology have contributed to a market situation in which almost all cement is distributed in 50 kilogram bags. This practice incurs increased truck transportation costs as well as excessive losses due to breakage. Under the present distribution system, the waste of cement materials is estimated at over 20 percent of total

supply.

Many building materials are supplied by plants in uneconomic locations. Iron ore, for example, must be transported some 900 kilometers from Aswan to the Iron and Steel Complex at Helwan, south of Cairo--a contributing factor in recent years to the substantial increases in the ex-factory price of reinforcing steel bars.

Although brick factories are located near major market areas, because their product is both fragile and heavy, they can service areas only a short distance away by truck. At the same time, because of the high costs of truck transportation and alternative transport, the concentration of brick factories around the banks of the Nile makes the cost of using bricks in remote areas almost prohibitive.

Given the existing transportation infrastructure, it is essential that the location of new industrial projects in the construction sector be carefully analyzed to avoid the added cost and waste caused by inefficient transportation and handling of construction materials. The deficiencies in the stocking, distribution, and transportation of these materials underscore the need for a national program to develop

an effective distribution network. According to most industry participants interviewed, piecemeal solutions to these problems will have little, if any, effect. A large builders merchant system must be established as the framework for the development of an effective storage and transport system.

The Projected Demand for Construction Materials

Basing its figures on the material input required for each L.E. 1 million of the planned construction output over the period of the 1980-1984 Five-Year Plan, the Ministry of Planning has prepared estimates of demand for certain construction materials. A recent World Bank study, however, suggests that these estimates do not clearly reflect the size and direction of future demand in that they are apparently based on an analysis of the housing sector that was made some years ago.

The CTIC research team has carefully reviewed both sets of projections in light of past developments and the current structure of the Egyptian market for construction materials. The CTIC findings indicate that the World Bank projections present a more probable picture of the demand for materials over the next four to five years. Accordingly, it is this data that has

been incorporated in Table 4-7.

Table 4-7

THE PROJECTED DEMAND FOR
SELECTED CONSTRUCTION MATERIALS, 1980-1984

| | 1980 | 1981 | 1982 | 1983 | 1984 |
|---|---|---|---|---|---|
| Cement (000 MT) | 5,560 | 5,730 | 6,085 | 6,532 | 7,044 |
| Reinforcing steel bars (000 MT) | 764 | 787 | 836 | 897 | 968 |
| Bricks (million units) | 2,502 | 2,654 | 2,816 | 2,987 | 3,170 |

Source: Ministry of Planning; World Bank study, The Construction/Contracting Industry in Egypt, July 1981; National Housing Plan of the Ministry of Housing.

Demand projections show that the consumption of cement in Egypt is to increase from the 1980 level of 5.5 million MT to over 7.0 million MT by 1984, an average annual growth of 6.2 percent during the Plan period. Total demand for reinforcing steel bars is to increase by almost 27 percent over the Plan period, reaching nearly 1 million MT per year by 1984. Demand for bricks in the construction sector is estimated to reach 3.2 million units by 1984, an increase from the 1980 level of 2.5 million bricks.

Planned Production Levels

To meet the projected demand for various construction materials, the 1980-1984 Five-Year Plan has set certain guidelines and priorities for the upgrading and expansion of production capacity. The performance of past development plans in Egypt suggests a mixed record of adherence to such programs. This can be attributed, in part, to highly ambitious planning, financial constraints, and inadequate coordination among the various government agencies charged with project implementation. The formulation of realistic objectives is essential to the sound future development of the construction materials industry.

In Table 4-8, the Ministry of Planning target production levels for various construction materials are adjusted for existing financial constraints and production bottlenecks. Because the timing and completion dates of many projects under the 1980-1984 Plan cannot be accurately foreseen, the figures shown are estimates only.

Table 4-8

PLANNED LEVELS FOR THE
PRODUCTION OF CONSTRUCTION MATERIALS, 1980-1984

| | 1980 | 1981 | 1982 | 1983 | 1984 |
|---|---|---|---|---|---|
| Cement (000 MT) | 3,675 | 4,500 | 7,200 | 9,100 | 10,030 |
| Reinforcing steel (000 MT) | 317 | 325 | 333 | 347 | 345 |
| Bricks and blocks (million units) | 2,292 | 2,588 | 3,162 | 3,338 | 3,487 |
| Lime (000 MT) | 354 | 367 | 367 | 367 | 367 |
| Gypsum (000 MT) | 400 | 560 | 720 | 720 | 720 |
| Glass (000 MT) | 23 | 23 | 23 | 23 | 53 |
| Ceramic pipes (000 MT) | 64 | 80 | 96 | 96 | 97 |
| Cast iron pipes (000 MT) | 15 | 21 | 24 | 27 | 28 |
| Galvanized steel pipes (000 MT) | 100 | 100 | 100 | 100 | 100 |

Source: Ministry of Planning; World Bank study, The Construction/Contracting Industry in Egypt, July 1981; CTIC field interviews, March-August, 1981.

About 90 percent of total investment for the targeted production increase in construction materials under the 1980-1984 Plan is allocated to cement and cement blocks, reinforcing steel, and bricks. The

overall investment share of the public sector is estimated at about 77 percent, the remaining 23 percent coming from the private sector. Investment for reinforcing steel is to come entirely from the public sector.

Projected Supply Gaps and Surpluses

A review of the demand and supply estimates discussed earlier reveals that, even with the completion of planned manufacturing facilities for the supply of construction materials, some key construction materials will remain in short supply during the Plan period (Table 4-9). Reinforcing steel is a major example. The shortage of reinforcing steel in the construction market is expected to reach 669,000 MT by 1984, almost 34 percent over the current supply gap of 500,000 MT. Imports averaging about L.E. 170 million annually will therefore be required throughout the Plan period.

Table 4-9

PROJECTED SUPPLY GAP/SURPLUS
IN KEY CONSTRUCTION MATERIALS, 1980-1984

| | 1980 | 1981 | 1982 | 1983 | 1984 |
|---|---|---|---|---|---|
| Cement (000 MT) | (2,319) | (1,637) | 772 | 2,202 | 2,628 |
| Reinforcing steel (000 MT) | (488) | (506) | (539) | (595) | (669) |
| Bricks (million units) | (210) | (66) | 346 | 351 | 317 |

N.B. The figures in parenthesis represent the anticipated excess demand of a construction material over its planned production capacity. All other figures represent the anticipated excess supply of construction materials that may be available for exports.

Source: CTIC analysis.

Cement, on the other hand, presents a far different picture. It is expected that, as the large cement plants currently under construction gradually come on stream, there will be an excess available for export. By 1984, Egypt is expected to have a surplus of 2.5 million MT of cement per year after meeting domestic requirements.

Should current projects be completed as scheduled, the projected supply and demand for bricks also show

that the current shortfall in production will be removed over the 1980-1984 period.

A final point concerning the material waste factor in supply projections is worth mentioning here. Because the waste of materials--both on site and prior to site delivery--is now at unreasonably high levels, most construction operators in Egypt believe that any improvement in this situation could easily reduce the projected material requirements by as much as 10 percent or more, and thus dramatically decrease the expected shortages over the 1980-1984 period.

## 5. CONSTRUCTION MACHINERY AND EQUIPMENT

### Overview

Construction machinery and equipment, like building materials, play a key role in the current performance and future development of the construction industry in Egypt. Egypt's fleet of construction equipment today consists of over 30,000 machines, with an estimated value of L.E. 1 billion. However, a large percentage of this equipment is either obsolete or in need of major repair and maintenance.

The Egyptian companies which handle construction equipment can be grouped into three major categories:

(1) Public sector companies involved mainly in agriculture, irrigation, land reclamation, and drainage works

(2) Public sector companies active in general building and civil work, such as roads, bridges, fly-overs, and so on

(3) Private contractors involved mainly in building construction

In order to understand the construction equipment market in Egypt, it is necessary to be aware of basic characteristics of these companies and the complicated roles they play in the market. This, therefore, will

be the focus of this chapter, together with a survey of current market conditions and areas of potential opportunity for further development.

The Ownership and Utilization of Equipment

The public sector construction firms involved in agriculture, irrigation, and land reclamation projects in Egypt are highly mechanized, and achieve up to 80 percent utilization on the equipment they own and operate.

The public companies active in general building and civil work, the second group identified above, owns and operates about 50 percent of Egypt's equipment fleet, but its equipment utilization is unusually low. In building works, for example, equipment utilization ranges between 20-30 percent, and in bridge and other civil works it is only slightly higher than this. The combined equipment utilization rate in general building and civil work construction is estimated to average about 40 percent. A comparison of this rate with the minimum international standard utilization rate of 60 percent suggests that construction equipment in Egypt is underutilized.

The private sector contractors of the third group are known to attain fairly high rates of equipment

utilization. In addition to this group, there is a large number of smaller private contractors who have generally little or no access to construction equipment and limited experience in operating it.

Although Egypt's supply of construction equipment may be physically sufficient to handle current and planned construction projects, its substandard productivity dictates large-scale replacement over the next few years. A recent World Bank survey on Egypt's construction fleet has found that, if current equipment productivity levels are to be maintained, at least half of the existing machines will have to be replaced during 1980-1984 Plan.

Equipment Cost-Management

The stock of construction equipment held by Egyptian contractors varies considerably, depending upon the ownership of the firm and the type of work it performs. Public sector companies currently maintain an average equipment/turnover ratio of 16 percent. This ratio ranges widely between 1 percent and 24 percent from one contractor to another.

The equipment/turnover ratio in private firms is much lower, averaging about 6-7 percent. Comparing these ratios with those held by similar contracting

firms in Europe (about 10-14 percent on the average) suggests that, as a result of inefficient management and poor maintenance practices, public sector companies in Egypt may have been forced to buy too much equipment.

Spare Parts and Maintenance

Underlying the low equipment utilization rate among large public sector companies is a shortage of spare parts. This is most evident in the operation of a giant construction company such as Arab Contractors, which owns about 400 different types of equipment purchased from over 250 foreign equipment manufacturers. Some efforts are underway by Arab Contractors and other major public sector companies to unify and standardize their equipment so as to reduce the need for maintaining numerous and diverse spare parts for various non-compatible items of equipment.

Another major problem is the shortage of equipment operators and maintenance personnel. To avoid the operational problems associated with the shortage of skilled labor in the construction market, large public sector contracting companies often train their own equipment operators and technicians at high cost. This practice, however, has its own drawbacks inasmuch as

company-trained technicians often leave a public firm for more lucrative jobs in the private sector. Arab Contractors, for example, is reportedly losing about 20 percent of its trainees to other contractors.

Imports of Equipment

Table 5-1 presents a general idea of the type of construction equipment imported into Egypt. In fact, most of the construction equipment used in Egypt is imported. Egyptian contractors often purchase their equipment directly from foreign manufacturers and suppliers, thus bypassing local agents. This practice, however, presents problems for contractors since obtaining government permission to import and to receive allocations of hard currency is a complex and time-consuming process.

Table 5-1

IMPORTS OF SELECTED CONSTRUCTION EQUIPMENT AND BUILDING COMPONENTS INTO EGYPT: 1978, 1979

| | 1978 | | 1979 | |
|---|---|---|---|---|
| | Volume* | Value** | Volume* | Value** |
| Lifting and handling equipment | 9,562 | 19,629 | 8,429 | 24,660 |
| Excavating, boring, and extracting machines | - | 27,351 | - | 37,318 |
| Parts for excavating, boring, and extracting machines | - | 34,107 | - | 30,228 |
| Liquid pumps | 5,560 | 16,019 | 4,748 | 14,837 |
| Iron and steel structures | 89,129 | 63,030 | 47,378 | 55,037 |
| Seamless tubes and pipes | 26,667 | 9,356 | 70,749 | 29,050 |
| Aluminum structures | 580 | 1,700 | 1,013 | 3,190 |
| Air-conditioning machines | 1,425 | 4,589 | 664 | 3,024 |
| Electric hand tools | 275 | 1,389 | 299 | 2,119 |

Table 5-1 (cont'd)

| | 1978 | | 1979 | |
|---|---|---|---|---|
| | Volume* | Value** | Volume* | Value** |
| Lock frames of base metal | 767 | 1,123 | 962 | 1,657 |
| Angles and shapes of iron or steel | 37,683 | 7,140 | 70,261 | 15,386 |

* In metric tons.
** In L.E. thousands.

Source: CTIC analysis of CAPMAS trade statistics, 1978 and 1979.

The major disadvantages of purchasing directly are that the responsibility for operator training and equipment maintenance is placed entirely on the contractor, and unnecessary and costly amounts of spare parts are stockpiled to cope with frequent equipment breakdowns.

At the time of purchase, many Egyptian contractors spend as much as 20 percent of the cost of the new equipment on spare parts, compared with 5-8 percent in the United States. One reason for the massive stockpiling of spare parts is the lower customs duty levied on spare parts when they are ordered in

conjunction with the original equipment. Another reason is the failure of local agents of foreign equipment manufacturers to stock sufficient spares to meet contractors' needs.

Given the existing market conditions in the construction sector, industry experts believe that purchasing reconditioned, secondhand equipment could result in significant cost savings to Egyptian contractors, particularly in the private sector. This practice, however, is not common in Egypt for obvious reason: secondhand equipment can be leased or purchased only where a local agent exists and a guarantee can be provided. When equipment distributors and agents are available, few of them seem to possess the financial resources required to provide the necessary guarantees. Another factor that works against the leasing of secondhand equipment is specific legislation that prevents construction firms and joint-venture companies from importing reconditioned equipment as equity in kind.

Equipment Requirements

Because the existing stock of construction equipment in Egypt is largely underutilized, market needs over the next few years can be met by increasing

equipment productivity and utilization. This can be achieved by undertaking a number of appropriate measures at the industry level:

- o Replacing and modernizing old equipment as required by operating conditions
- o Increasing equipment utilization through improved management techniques and training as well as through efficient repair and maintenance programs

To merely maintain current productivity levels, it is estimated that at least half of Egypt's construction equipment must be replaced by 1985. This will require an estimated L.E. 480 million during the 1980-1984 period. Spare parts for both old and new equipment will cost another L.E. 120 million, bringing the total for equipment and spare parts to L.E. 600 million over the Plan period (see Table 5-2).

Table 5-2

CONSTRUCTION EQUIPMENT REQUIREMENTS, 1980-1984

| Type of Equipment | 1979 Stock of Equipment | Required Replacement (1980-1984) | Replacement Cost (L.E. millions) |
|---|---|---|---|
| Earth-moving machinery | 4,500 | 2,250 | 165 |
| Excavation machinery | 1,700 | 900 | 80 |
| Piling machinery | 200 | 125 | 2 |
| Concrete plant | 8,900 | 4,500 | 70 |
| Lifting machinery | 1,000 | 400 | 25 |
| Road-making machinery | 1,650 | 700 | 20 |
| Pumping machinery | 4,450 | 3,300 | 6 |
| Compressed air plant | 1,150 | 650 | 20 |
| Transport* | 3,500 | 1,700 | 80 |
| Miscellaneous | 2,600 | 1,200 | 12 |
| TOTAL | 29,650 | 15,725 | 480 |

* Comprised chiefly of a wide variety of trucks.

Source: World Bank study, The Construction/Contracting Industry in Egypt, July 1981.

Although purchasing reconditioned, secondhand equipment might substantially reduce the capital costs of implementing this replacement program, it is unlikely that this option will be exercised. Under current market conditions, equipment rentals and/or leasing present a more viable alternative. Recently introduced to the market on a very limited scale, further development of this service could result in substantial cost savings, particularly for small and medium-sized contractors.

Lease/Rental of Equipment

Field investigations indicate that the high cost and specialized nature of construction equipment make it almost impossible for many small contracting firms in Egypt to purchase such equipment and utilize it in the most cost-effective manner.

As noted earlier, the development of large equipment rental companies will allow these contractors to expand their activities substantially without large capital expenditures. Such rental companies could be established either within existing large contracting firms or, preferably, as independent firms serving the entire construction market.

Most private sector contractors interviewed

indicated a pressing need for the establishment of equipment rental companies, which, in addition to their primary function, could undertake or facilitate the tasks of repairing, servicing, maintaining, and even operating construction equipment. In addition, they could act as regional clearing houses for surplus stocks of equipment, components, and spare parts. In short, these firms could reduce the peripheral activities of contractors, thereby providing them with the opportunity to concentrate on principal contracting activities.

Prospects for Local Manufacturing

The local manufacture of large items of construction equipment and machinery, such as bulldozers or scrapers, does not seem appropriate at the present stage of industrial development in Egypt. Because of the limited size of the market, it is unlikely that local production would be cost effective. However, the manufacture of less sophisticated construction machinery under license or local assembly has good potential. The less sophisticated machinery usually presents manufacturing opportunities as well for parts and components. Items included in both of these categories include concrete mixers,

liquid pumps, cranes, hoists, improved builders' hardware, central air-conditioning equipment, scaffolding and shoring, aluminum frames, and so on.

Not only would the manufacture of such equipment reduce foreign exchange requirements, but it also would create local employment opportunities and possibly avoid the long delays now experienced when obtaining imported equipment. Most industry experts agree that the feeder industries already in existence in Egypt are now reasonably equipped to support the creation of such satellite manufacturing facilities.

# 6. CONSTRUCTION SYSTEMS

## Overview

The nationalization of key production facilities in the construction sector, coupled with tight government control in the pricing, allocation, and distribution of basic construction materials, have led to the adoption of certain construction systems. For the most part, these systems utilize state-controlled resources: namely, reinforced concrete technology and heavy steel-based structural systems. Although the use of reinforced concrete as a structural medium was required in the 1960s for many of the large turnkey projects, such as the High Dam and military installations, this technology is not necessarily the most suitable for current projects.

CTIC field investigations in Egypt indicate that many construction methods currently in use are relatively outdated or rely on equipment badly in need of repair. The ineffective use of construction materials further adds to these inefficiencies, often resulting in substandard end-products. This is particularly evident in the production of cement and bricks. Aggregates are poorly graded and concrete reinforcements are poorly formed, positioned, and tied.

These conditions lead to overspecification in project design, wasted construction materials, and ultimately, higher project costs. Because there are few regulations concerning building material standards and testing procedures, Egyptian architectural firms often overdesign to offset expected structural weaknesses by as much as 30 percent. And, to offset the absence of product standards and avoid excessive material waste, more sophisticated labor is often required on job sites. All of this translates into protracted delays in project completion and excessive cost overruns.

This chapter presents an analysis of the various construction systems and techniques now in use in Egypt. The objective is twofold: (1) to determine the overall direction and pace of technological development in the Egyptian construction industry, and (2) to identify potential areas in which the application of modern techniques could result in substantial improvements in performance.

The construction systems under discussion, and related topics, are grouped into six categories, as follows:

- Infrastructural systems

- Structural systems
- Scaffolding systems
- Completion and finishing techniques
- Installation techniques
- Building standards

Because they present good market opportunities for the introduction of new techniques and systems, particular emphasis is placed on prefabricated housing, scaffolding techniques, and steel structures.

Infrastructural Systems

Infrastructural works generally comprise bulk earthmoving, excavation, filling work, piling, roadwork, and the like. Bulk earthmoving in Egypt is highly mechanized, and motorized scraper and grader teams, together with large pusher dozers and angle dozers, are used quite effectively. Traditionally, dredging, irrigation, and land drainage have been efficiently handled, with much higher equipment utilization than in building works.

Foundation piling, which is common in Egypt because of soil conditions, is generally handled by specialized subcontractors under an agreement separate from the contract for the building itself. Much of the country's piling equipment is out of date: most piling

is done with old self-contained steam-hammer rigs. Although some of this equipment has been converted to an air control system, there are frequent breakdowns and equipment utilization is rather low. In the past several years, additional modern "terr-drill" systems have been introduced as far more effective for bored piling. The lifting capacity of the crawler crane for handling the rigs, however, is too low, and this results in an output that is perhaps 40 percent lower per average rig, based on the rig's nominal capacity.

Several patented piling methods for bored piling and casement pile systems also have been introduced to the market, though because some of these systems are not quite suitable for Egyptian soil conditions, the results have been mixed.

Building earthwork is another traditional construction activity in Egypt. Most groundworks for building are carried out manually, and a large part of this work consists of carrying construction materials in woven baskets. Wheelbarrows are rarely used. Although the use of mechanical dumpers is fairly new, there are good prospects for their further use.

Particularly in areas where human error and

material waste are high, industry experts believe that, with modest investment in improved tools, existing methods of manual excavation can be improved substantially. The introduction and development of modern but simple hand tools and alternative means of site transportation are essential to the effective execution of medium-to-large construction projects. Because of size constraints, however, and the lack of access to construction tools and equipment by small contractors, it is expected that the manual system will continue to be used for small projects.

In public services, large-scale trenching work, using modern equipment and techniques, is generally carried out satisfactorily. Pipework leakage, however, continues to be a major problem in public utilities groundwork. This is attributed mainly to poor workmanship in jointing pipes.

Structural Systems

Structural systems include elements for both building and non-building construction works. In building construction, structural works account for between 40-70 percent of a project's total cost. In civil engineering works, this cost ranges widely from a very small percentage of total cost in land development

projects to a significant proportion of the total cost of dam and bridge construction.

The structural systems used in Egypt are grouped into four major categories:

- o Concrete-based structures
- o Masonry work
- o Steel structures
- o Prefabricated housing structures

Concrete-based Structures

The use of concrete, in both plain and reinforced forms, is common in Egypt. The present standard of concrete work is generally considered inadequate. Although the quality of construction materials such as cement and reinforcing steel is acceptable, aggregates are poorly graded. Improvement in the facilities at quarries, particularly in mechanized screening plants, is required before the quality of concrete work in Egypt can be improved.

In recent years, a significant degree of mechanization has been introduced in the production of concrete for large projects. Concrete batching plants and truck mixers, for example, are now used extensively for various jobs. There are problems, however, in mix design and quality control. For example, reinforcement

is generally cut and bent on the construction site. The use of spacers is uncommon, and the bending of reinforcement is poorly done. As a result, on many construction sites, exposed steel is often seen on the face of finished concrete.

Until recently, almost all formwork in the construction sector consisted of timber boards and props held together with poles and clamps, or ropes. This technique, which is still common, has various applications, particularly in the housing sector. However, more sophisticated systems--including steel and plywood shutters, aluminum shutters, adjustable steel props, and moving shutter systems--are gradually being introduced to the market. It is thought that timber continues to be used in the construction market because the government continues to control its import, distribution, allocation, and pricing. As long as government-subsidized prices prevail in the market, the use of timber in construction formwork is expected to prevail.

Depending upon the size of the project, the distribution of concrete within construction sites is handled manually or by truck mixers or dumpers. On large construction jobs, crane distribution is

increasingly used. Despite these newer techniques, however, architects still tend to overdesign structures as a means of compensating for poor workmanship and concrete forming.

Masonry Work

For many years, the traditional material for erecting walls in Egypt has been the red bricks that are manufactured from Nile silt. Because the government has enacted legislation to prevent the further use of agricultural soil for brick manufacturing, this practice is declining. It has not disappeared, however, for although the government is encouraging the construction of new brick factories designed to utilize desert clay, sand, and lime instead of silt, the production of red bricks will continue as long as it is economically feasible to pass the added production costs along to the end-users.

Bricks and blocks are used in structures either as load-bearing or infill walling with a laid-in mix of cement/sand mortar. Because lime is readily available throughout Egypt, the use of lime/cement/sand gauged mortar should be further developed. The lime-based mortar is very cost effective in that it requires less cement per an equivalent measure of alternative mixes.

Some kind of render is used as a final cover for most walling in Egypt. It is not uncommon, for example, to see as much as five centimeters of render being applied to a wall to square up the surface. Although it is unclear whether or not this is the result of poor bricklaying, it is acknowledged that the quality of bricklaying could be improved by introducing new techniques and appropriate training programs.

The current practice of applying concrete to even the simplest structures should be discouraged. In many developing countries, cost-effective load-bearing masonry is successfully used for medium-rise buildings of, say, five floors. However, the quality of brick production in Egypt may have to be improved before load-bearing masonry can be used on a large scale.

Steel Structures

Until recently, steel structures were not widely used in Egypt except for industrial buildings such as plants and warehouses. In the past few years, however, because they facilitate speed of erection, there has been an increased use of steel sections in office buildings, hotels, and medium-rise apartment complexes. This practice is relatively expensive, since most of the required materials must be imported. However, as

concrete becomes costlier, the application of structural steel in large-scale construction projects and high-rise buildings is expected to become far more widespread.

Plans are underway in Egypt for increased steel production. Although additional output cannot be expected until the mid-1980s, industry experts believe that the widespread use of steel structures as a cost-effective substitute for concrete will begin sometime afterwards, when the new steel products find their way to the construction market.

Prefabricated Housing Structures

The Prefabricated Housing Industry. As noted earlier, Egypt's acute housing shortage requires the addition of 200,000 new housing units annually simply to meet the needs of its growing population. About 80,000 additional units also will be required annualy during the next 10-15 years to cover the present housing backlog of over 1 million units. To meet this challenge, the government has been trying to channel all available resources into housing. However, as needs and costs escalated, it was decided that mass production--and, consequently, the industrialization of the housing industry--was essential.

Industrialization, as initially conceived, was to be developed along three main lines, in the following order:

- o Mechanization of traditional construction
- o Development of load-bearing walls and precast floors
- o Complete mechanization through the use of prefabricated large-panel housing systems

With this in mind, the first prefabricated housing factory was purchased from East Germany in 1972, and a new company, Prefabricated Houses Company, was formed under the Ministry of Industry to produce housing units in the industrial area of Helwan, south of Cairo. In 1974, the government embarked on its first large prefabricated housing program.

Within a year, the Prefabricated Houses Company was transferred to the Ministry of Housing and Reconstruction, and nine more factories were purchased by nine public sector contracting firms under government guarantee. In 1977, an eleventh factory was contracted for. Each of these factories can produce, on a two-shift basis, up to 2,500 heavy, concrete-based, prefabricated housing units, or approximately 200,000 square meters, annually. Together, these

11 factories (see Table 6-1) have the capacity to produce 27,500 prefabricated housing units per year. Each factory is equipped to build five-story blocks of apartment houses for housing sites within a 25-30 kilometer radius of the plant.

Table 6-1

PREFABRICATED HOUSING PLANTS IN EGYPT

| Company in Charge of Plant | Equipment Supplier | Plant Location |
|---|---|---|
| Prefabricated Houses Company | Mash Export (East German) | Helwan |
| Arab Contractors Company | Setip (Swiss) | Heliopolis |
| El Nasr Company for Building and Construction (Egyco) | Lambert (French) | Helwan |
| General Contracting Atlas Company | M.I.T. (Austrian) | Hacsteppe |
| El Nile General Company for Concrete (Spico) | Lambert (French) | West Helwan |
| El Nasr General Company for Contracts (Hassan Allam) | Tracoba (French) | Alexandria |
| Cairo General Company for Contracts | Hirondele (French) | Cairo |
| El Gomhuria General Contracting Company | Kesting (German) | Suez |
| Misr Concrete Company | Larsen & Nielsen (Danish) | Ismailia |

Table 6-1 (cont'd)

| Company in Charge of Plant | Equipment Supplier | Plant Location |
|---|---|---|
| General Company for Construction (Rolin) | German Consortium for Prefabrication | Belbeis |
| Giza Company for Contracts | Larsen & Nielsen (Danish) | Giza Governorate |

Source: Ministry of Housing and Reconstruction, Programme of Reconstruction and Development, March 1977.

At present, only three of these 11 factories are operational, and the total number of units produced does not exceed 2,000 a year. About 40 percent of current production is reported to come from a single factory. The lack of available land for building is claimed as one reason for this greatly underutilized capacity. The government's sudden shift to competitive bidding in 1979 is another, since public firms no longer have guaranteed contracts and must find their own markets in competition with private firms.

Other reasons for the underutilization of these factories are complicated and seem to involve a combination of poor organization, an uncertain demand

for the products manufactured, and ineffective marketing. The operation of all but one factory was originally assigned to public sector firms that had little incentive to promote its products. Although this situation has been modified somewhat, the attention paid to the operation of these factories by public sector operators has not improved.

The poor access to these factories and surrounding sites is another source of difficulty. Bad roads cause costly damage to both panels and transport equipment. Another problem lies in the fact that prefabricated housing costs a minimum of L.E. 4,500 per unit. This is well beyond the government's allowable price tag of L.E. 3,500 for a 70-square-meter unit, despite the 15-percent preference allowed provided construction takes significantly less time than that required by conventional methods of building houses.

In addition, a widely held market opinion of the product as a "bad buy," together with the belief that similar factories have long since been discontinued in Europe, have also worked against the acceptance of the factories' products.

Nonetheless, substantial public funds have been invested in these plants, and they do offer a means of

providing badly needed housing.

Industry experts believe that competitive production costs and reasonable profit margins can be achieved if these factories operate at or near their designed capacity. Field interviews with experienced private sector contractors suggest that prefabricated housing can be built in Egypt within 10 percent of the cost of traditional housing, and that the return on investment for such projects can be within the normal range of profitability. Given sufficient volume, and in light of the private sector's renewed interest in prefabricated housing the last two years, this seems to be a valid claim.

Possible Alternative Applications of Prefabricated Units. There are a number of possibilities for using prefabricated units for buildings other than housing, and these are currently being examined. A prefabricated school project already has been successfully completed, and other projects such as health clinics are currently under consideration.

New products could be produced competitively by the existing factories in terms of both cost and time, for these factories are ideally designed to produce high-quality concrete, either in bulk or as building

elements such as beams or floor slabs. Further, the marketing range of such materials will be easily extendable beyond the existing 20-30 kilometer limit for heavy concrete panels.

The introduction and development of hollow-core flat slabs also have a good market potential for use in prefabricated apartment buildings.

Scaffolding Systems

Traditionally, scaffolding in Egypt consists of timber props and boards joined together with crude clamps and rope. This simple system is assembled quite skillfully for a wide range of applications, although it is not the safest method of scaffolding for large structures. The bulky wood sections used in this type of scaffolding tend to restrict the free movement of construction workers.

New methods of scaffolding are being successfully introduced to the construction market, particularly in medium-sized and large projects. Kwikform International (U.K.), for example, is actively marketing its scaffolding systems in Egypt. Its marketing approach illustrates the cost effectiveness of its system compared with traditional timber scaffolding.

Outinord of France, another supplier of new scaffolding systems in Egypt, is selling tunnel forms complete with all accessories. The tunnel form system is used mainly in middle-income housing projects and in some of the less sophisticated high-rise buildings. The vertical shoring system, in steel sectional frames and single steel props, as well as horizontal shoring, has good market potential. These systems are being used in conventional construction designs such as fly-overs, workshops, power stations, transformer stations, hangars, and warehouses.

The British Lift Slab system is used chiefly in high-rise luxury buildings and major hotel projects. The aluminum "flying form," however, has not yet been introduced. Market investigations indicate that this system could be used successfully in the erection of high-rise luxury buildings with flat slab structural design. Another method of modern scaffolding, which is rarely used, is movable scaffolding. This can be introduced in a number of ways, from simple sections which can be wheeled around a construction site, to moving cradles and movable panels that can be fixed to the structure.

The local manufacture of modern scaffolding systems

has already started in Egypt. Acrow Misr manufactures scaffolding and shuttering equipment for almost all applications according to the specifications of Acrow Systems (U.K.). Purchasing its steel tubing requirements from a local private sector manufacturer, Acrow Misr fabricates nearly 90 percent of its shuttering, forming, and scaffolding systems.

Given the extensive application of timber scaffolding in traditional housing, it may be useful to introduce improved forms of clamps and other fittings on an interim basis before the more modern systems of scaffolding take hold. Eventually, however, as the newer systems gain wider acceptance, timber scaffolding probably will be phased out altogether.

## Completion and Finishing Techniques

### Completion

The use of lightweight partitions is not common in Egypt. Partitions are usually part of the basic structure and, as such, are made of the same materials as the structural walls--namely, bricks and blocks. This type of partition not only places a heavy load on the structure and requires skilled construction labor, but it also requires the use of large quantities of mortar and plaster, thus adding unnecessary costs.

Because gypsum, a major input material, is readily available throughout Egypt, the Egyptian market is a good prospect for the introduction of the nonstructural, lightweight partitions that are now widely used in many other countries. Gypsum walling with a self-finish or a minimum skim plaster coat could be designed in block forms or hollow panels in a cost-effective manner.

Doors and windows are the major components in the completion stage of building, and timber is by far the most widely used material in the manufacture of doors and windows in Egypt. Although the workmanship in the manufacture of these items is generally adequate, site fitting leaves a good deal to be desired. Glazing, for example, is poorly done because bedding compounds are rarely used.

For the most part, steel windows and doors are used in industrial facilities and public buildings. In addition, the local aluminum industry manufactures a variety of standard sections from which doors and windows for all purposes can be fabricated. Local aluminum manufacturers believe that, as the specifications for building openings become increasingly standardized, aluminum doors and windows

will be used extensively in Egypt.

Finishing

Plastering and rendering are a traditional Egyptian specialty, and the variety of finishes currently used for floors, walls, and ceilings is quite impressive. The most common type of finish in Egypt is in-situ plastering and rendering. Most flooring is made from cast tiles, which consist of stone or marble chippings in a mortar mix.

Plastering and rendering are relatively expensive, averaging about 10 percent of total building costs in Egypt. However, costs can be minimized by using improved hand tools and techniques and by increasing the use of lime in building finishes, thereby reducing the proportion of cement used in the finishing mix.

Installation Techniques

The current methods of installing plumbing and electrical equipment in Egypt are considered adequate, though outdated. The chief problem in this area lies in the quality of the workmanship rather than in the technology itself. Also, because most experienced plumbers and electricians are attracted to high-paying jobs in building maintenance and repair, there is a shortage of skilled manpower in the construction field.

Despite these problems, several specialized private sector companies are successfully introducing new installation methods with modern job supervision techniques. Sepei Limited, for example, a leading private firm which maintains a large multi-disciplined and experienced technical staff for building installations, has to date executed a number of major electrical installations for various projects in Egypt. These include the instrumentation and the electrical control and connections for the Holiday Inn Pyramids Hotel, the Ramses Hilton Hotel, the Citibank building in Alexandria, a military factory at Sakr, the Marriott Omar Khayyam Hotel in Cairo, and the Sheraton Hurghada Hotel.

Building Standards

The use of building standards in the Egyptian construction market is uncommon. Though they are used in prefabricated housing, this is an isolated example, and even here the progress to date has not been encouraging.

As noted earlier, the almost complete lack of building codes and standards has required architectural firms to prepare elaborate plans that provide detailed specifications for all aspects of construction, from

project design to the implementation stage. This requirement, plus the need to maintain more semi-permanent skilled laborers on the construction site to erect formwork, cut and bend steel, and fit doors and windows of different sizes, has led to increased costs and excessive material waste on many construction projects in Egypt.

Although the testing of certain construction materials and techniques is required, there is an insufficient number of testing laboratories, and the procedure itself is so time-consuming that, in practice, it is not strictly enforced. Some individual architects are trying to introduce standardization wherever they can, but their efforts, at best, tend to be on a piecemeal, project-by-project basis, and thus have a limited impact on the construction industry as a whole.

To solve the problem at the industry level, construction experts believe that, as a first step, standardized modules and sub-modules--for structural grids, story heights, and door and window openings throughout the entire industry--must be introduced. These modules will, in turn, provide the basic standards for the manufacture of bricks, blocks,

prefabricated panels, doors, windows, and other building components, thus achieving economies of many kinds on various levels of the industry.

## 7. HUMAN RESOURCES IN THE CONSTRUCTION INDUSTRY

### Overview

Architects, construction workers, craftsmen, engineers, and managers constitute the work force of the Egyptian construction industry. Almost 90 percent of this group is classified as site labor, and, of this number, it is estimated that half is skilled and semi-skilled and half is unskilled labor. As was noted earlier, the migration overseas of skilled construction workers has required the institution of government-sponsored crash training programs.

On the management level, public sector contracting firms are being forced to adjust their techniques to changing market conditions. Because operating in an uncompetitive environment for fifteen years has taken its toll, practical training is perceived to be the single most important aspect of management improvement. And because the present system of small-scale, part-time architectural firms can no longer meet increased market needs, the professional sector of the industry is also ready for change. In response to new requirements, more sophisticated types of architectural and consulting firms--often working in cooperation with foreign architectural/engineering firms--have begun to

emerge in recent years.

To provide a balanced picture of the availability, skills, and requirements of construction manpower in Egypt, these issues and related topics will be discussed in the following pages.

## The Size and Structure of the Labor Force

The construction industry in Egypt currently employs 540,000 people. This represents about 4.4 percent of Egypt's total labor force (see Table 7-1). Site labor, which is composed of unskilled, semi-skilled, and skilled workers, accounts for about 85 percent of total workers in construction, with public sector contracting firms using less site labor than the private sector. About half of the site labor in Egypt is classified as skilled and semi-skilled labor: the remaining half is mostly unskilled.

Table 7-1

EMPLOYMENT IN CONSTRUCTION SECTOR, 1970-1980

| Year | Construction Manpower (thousands of persons) | Percentage of Total Labor Force |
|---|---|---|
| 1970 | 387 | 4.6 |
| 1971 | 354 | 4.2 |
| 1972 | 356 | 4.1 |
| 1973 | 302 | 3.4 |
| 1974 | 315 | 3.5 |
| 1976 | 434 | 4.5 |
| 1979 | 460 | 3.8 |
| 1980 | 540 | 4.4 |

Source: CAPMAS and Ministry of Planning.

Field investigations indicate that most Egyptian contractors typically maintain a small in-house team for structural works and rely heavily upon subcontractors for non-structural parts of a job. A large pool of construction workers is available for piecework in local gathering places, where hiring is done either on an individual or team basis. The number of labor subcontractors registered in Egypt has increased tremendously in recent years--from only

1,600 in 1971 to over 6,700 by 1977.

The scarcity of data on the performance of construction labor in Egypt makes it very difficult to assess or even make a general statement about labor productivity. However, a review of past trends in construction turnover, compared with the corresponding growth in the size of labor force, indicates that the average construction output per man has declined by almost 50 percent since the early 1960s. This is attributable in part to the emigration of Egyptian construction workers to other countries in the Middle East. It is also a result of the general decline in management standards and the deterioration of work discipline that followed the nationalization of the construction industry in the early 1960s.

Labor Emigration in the Construction Industry

Since the mid-1960s, an ever-increasing number of Egyptian construction workers have left the country to work in the oil-rich countries of the Middle East, particularly Libya, Saudi Arabia, Kuwait, and the United Arab Emirates. It is estimated that about 50 percent of all Egyptian workers in Libya are construction workers; the corresponding figures for Saudi Arabia and Kuwait are believed to be

30-35 percent and 50-55 percent, respectively. A recent study by the M.I.T./Cairo University research team puts the number of construction workers who left Egypt in 1976 alone at between 200,000-250,000--over half the construction industry's labor force in that year.

The magnitude of this migration has caused serious problems for the construction industry. First, it has led to a sharp jump in the wage level of all construction workers since 1973. The average daily wage rate for masons, for example, has more than doubled from L.E. 2.50 in 1973 to L.E. 5.70 in 1977. Electricians' daily wages have increased even more--from L.E. 1 in 1973 to L.E. 3.20 in 1977 (Table 7-2).

Table 7-2

AVERAGE DAILY WAGES FOR SELECTED TYPES OF CONSTRUCTION WORKERS IN EGYPT: 1973, 1975, 1977

(in Egyptian pounds)

| Skill Category | 1973 | 1975 | 1977 |
|---|---|---|---|
| Mason | 2.50 | 3.50 | 5.70 |
| Plumber | 1.50 | 4.00 | 5.00 |
| Carpenter | 1.25 | 2.00 | 3.25 |
| Electrician | 1.00 | 2.00 | 3.20 |
| Joiner | 1.25 | 2.00 | 3.50 |
| Painter | 1.00 | 2.00 | 3.00 |
| Concrete carrier | 0.80 | 1.75 | 2.75 |
| Concrete pourer | 0.90 | 2.00 | 3.00 |
| Steel fixer | 1.00 | 2.00 | 3.00 |
| Excavation worker | 0.60 | 1.00 | 1.50 |

Source: Fixed Investments, Building and Construction Components, 1961-1977, published by the Construction and Building Division, Ministry of Planning.

To compensate for the departure of so many construction workers overseas--most of whom are reported to be skilled and semi-skilled workers such as carpenters, builders, plumbers, electricians, and tile

fillers--large numbers of inexperienced agricultural workers have been recruited. This, in turn, has led to high wages in the agricultural sector. It is these same unskilled agricultural workers whose ranks have swelled the construction labor force in recent years. As a result, both public and private contractors have been forced to use a less productive work force, thus causing waste and work repetition. At the same time, contractors have been under pressure from rising wages. Although the government has established training programs for the new entrants into the construction sector, most medium-sized contracting firms have been forced to use supervisory staff to perform manual work, thereby further reducing their operational efficiency.

There are encouraging signs, however, that this is not a long-range problem, for a significant number of migrant construction workers have been returning to Egypt. As more Asian workers are being hired for construction jobs in the Middle E[illegible], Arab demand for Egyptian construction workers is gradually fading, and there is reason to believe that the peak of emigration may well have passed and that the situation may be stabilized or even reversed in the future. This, together with the rapid increase in construction wages

in Egypt, might eventually attract a good number of Egyptian expatriate workers back into the construction sector of their own country.

Government Training Programs

As has been noted, to replace the skilled construction workers who left the country, the Egyptian government instituted training programs to bolster the skills and productivity of the unskilled workers who took their place. These training programs, run by the Training Organization of the Ministry of Housing and Reconstruction (TOMOHAR), were established in 1976 with two main objectives:

- The establishment by 1979 of 62 worker training centers which would prepare 50,000 workers annually between 1976 and 1980
- The establishment of three instructor training centers to prepare 600 construction instructors annually

The cost of this project was set at L.E. 45.5 million over the targeted five-year period. Since 1976, however, because of frequent delays in government disbursements, only 16 vocational training centers and two instructor training centers have been established. An additional 15 centers are now being

completed. The training facilities now in operation have trained a total of some 40,000 semi-skilled workers, thus falling far behind the initial target of 50,000 trainees a year (Table 7-3).

Table 7-3

THE PERFORMANCE OF VOCATIONAL TRAINING PROGRAMS, 1975-1979

| Year | Semi-Skilled Labor | | Instructors | |
|---|---|---|---|---|
| | Target Number | Actual Number | Target Number | Actual Number |
| 1975 | - | 4,503 | - | - |
| 1976 | 50,000 | 8,295 | 600 | - |
| 1977 | 50,000 | 8,642 | 600 | - |
| 1978 | 50,000 | 9,652 | 600 | - |
| 1979 | 50,000 | 8,544 | 600 | 170 |
| TOTAL | 200,000 | 39,636 | 2,400 | 170 |

Source: CTIC analysis of Plans and Achievements, 1980, published by TOMOHAR.

Aside from budgetary problems, the limited progress of the training programs to date is attributable to a number of factors. Because vocational jobs are not yet

well regarded by most students, it has been difficult to attract prospective trainees from secondary schools. It also has been difficult to arrange suitable work programs for public sector employees. The chief reason for the program's limited success, however, is believed to be the shortage of qualified instructors. At present, only 250 instructors are involved in the program. Of the 170 instructors trained in 1979, it is believed that some have left TOMOHAR because of the agency's apparent inability to offer sufficient compensation to its trained personnel.

Among the major public sector construction companies, only Arab Contractors has set up its own in-house training program. This firm now trains about 800 staff members a year for various construction-related jobs, particularly as mechanics and equipment operators, both of which are in very short supply.

By providing mechanics, equipment operators, and other personnel now in short supply, the government training centers can make a significant contribution towards the solution of the manpower problem in the construction industry. Most government centers are still in their infancy, and will naturally require some time to implement their programs. In the meantime,

pressure on construction wages is expected to continue at least for the next four to five years.

## Construction Management

### Site Management

Field observations and discussions with a number of contractors in Egypt suggest that securing the effective management of construction sites presents a major problem for most contractors. Site managers and construction supervisors are engineers with academic qualifications, little knowledge of or training in modern construction management techniques, and no on-site construction experience.

Field observations further indicate that there is a visible skill gap between craftsmen and engineers, who usually are inexperienced in supervising craftsmen or support functions such as materials delivery, storage, personnel, and accounting. These problems could be met by involving craftsmen, engineers, and business graduates in a comprehensive training program aimed at preparing competent middle managers for the efficient supervision of construction jobs. The internal promotion of experienced craftsmen to higher managerial posts also could effectively narrow the skill gap.

Site management is also affected by the fact that

corporate managers do not generally consider the introduction of more effective techniques in this area as a means of achieving efficient material utilization or improved labor productivity. Planning and scheduling techniques are rarely used, and supervision of site work by engineers is, for the most part, poor. Time management is unknown in the construction industry in Egypt, and almost all jobs are behind schedule. Although the shortage of construction materials is often cited as the reason for such delays, there seems to be a lack of desire on the part of site managers and supervisors to resolve these problems to meet construction schedules.

These managerial problems can be also attributed to the overall structure of the construction industry in Egypt and the dominant role the government has played in its formation. Fifteen years of direct-order job-letting in a noncompetitive public sector environment, without serious budget plans and real incentives, have undoubtedly contributed greatly to the present situation.

Off-site Management

The quality of management within various construction firms in Egypt varies considerably and

depends upon size and specialty. In general, the best-managed firms are found in the heavy engineering fields, although very few of these firms completely understand the true objectives of management techniques. Most public sector contracting firms, on the other hand, have been constrained by government regulations for so many years that they have little or no authority to freely manage either manpower or financial matters.

In the private sector, most contracting firms, particularly the smaller ones, are managed by a single individual or, at best, a family. Because they have a limited support staff, the principals of such firms usually spend most of their time on construction sites. Private firms with an annual turnover of over L.E. 100,000 usually maintain some administrative staff, although even firms with a turnover of L.E. 1-4 million rarely employ more than three to five people.

Most industry experts in Egypt cite training as the single most important factor required for the improvement of management techniques in the construction sector. And, in conjunction with training programs, encouraging the internal promotion of

experienced junior managers to higher management levels would be an effective means of developing a much-needed source of middle-management personnel. Further, in the public sector, it is essential that, after proper training, major contracting firms be required to prepare sound management plans before they are granted administrative and budgetary freedom.

## Architectural and Engineering Services

### General Structure

The professional sector of the construction industry is made up of architects and engineers. Traditionally, the architect develops multi-unit residential, commercial, and institutional buildings. The engineer is confined primarily to the design of industrial buildings, roads, and other civil construction.

In Egypt, it is required by law that plans for every construction project over L.E. 5,000 in value carry the signature of a professional before a construction permit can be issued. Professional supervision during construction is also required. The professionals in Egypt are, by and large, well-educated. Most architectural/engineering services operate in the private sector, although public sector

firms also maintain large professional departments.

The private sector architectural/engineering firm in Egypt is composed largely of university professors, ex-government ministers trained as architects, and engineers who have formed numerous consulting partnerships, often on a part-time basis. Although public sector employees are prohibited from participating in such activities, in practice this rule is not strictly enforced.

A relatively large architectural firm in Egypt typically consists of 20 part-time professionals who work on design, and another 30 or so technical personnel who supervise construction. Only a few of these professionals work full-time. For large contracts, a consortium of consulting firms is often formed, particularly by firms that have worked together previously.

Modern Egyptian Architectural/Engineering Firms

Although small-scale, part-time consulting met the needs of Egyptian contractors in the past, it is no longer adequate, especially for large and sophisticated construction projects. In response to new market requirements, new kinds of design and consulting firms, with full-time staffs, have begun to

emerge.

Engineering Consultants Group (ECG) was the first such firm to be established, followed by Misr Consultant Engineers (MCE). Sabbour Associates was formed in 1975, and Arab Consultants in 1976. These are the only full-service, large consulting firms in Egypt at present. Two major public sector companies are also active in this field: Arab Bureau of Design and Development and Popular Housing Company.

ECG and MCE have about 200 staff employees each. About 40-50 percent of the employees in each firm are engineers and architects, with the balance composed of draftsmen, surveyors, and technical staff. Both firms provide a full range of consulting services, from technical feasibility studies to construction supervision and even construction management.

The new firms concentrate principally on large turnkey projects, for which the client may wish to bring in foreign consultants. This is the case with ECG and MCE, for which major public sector projects account for 90 percent of their business. Stiff competition for private sector projects, however, is another reason for the two firms' heavy concentration on public sector contracts. Estimates

of the total value of construction projects undertaken by ECG and MCE vary considerably--from L.E. 200-300 million a year for MCE and from L.E. 500-700 million for ECG.

Arab Bureau of Design (ABD) and Development and Popular Housing Company (DPHC) are the only public sector firms with engineering consulting services. ABD, which provides architectural design, construction supervision, and feasibility study services, among other activities, has some 450 full-time employees, of which about 40 percent are technical staff. Its current business volume is estimated at L.E. 10 million.

Foreign Architectural/Engineering Firms

Foreign architectural/engineering (A/E) firms in Egypt are involved primarily in large-scale, sophisticated, government projects. A multinational firm working in Egypt is required to have a local partner who represents the foreign firm or, more likely, serves as a joint-venture partner or subcontractor to the firm.

Although over 800 foreign A/E firms are officially registered in Egypt (see Table 7-4), only 30-35 of these firms are believed to be operating on a joint-

venture basis. Field investigations suggest that, at present, local architectural firms generally prefer to subcontract to foreign firms and rely on them to get the job done. Over the next few years, however, the Egyptian firms will probably take a more active role in the operation of joint-venture companies since Decree 1684 of 1972 requires that they contribute not less than 50 percent of the services performed for the joint venture.

Table 7-4

REGISTERED FOREIGN ARCHITECTURAL/ENGINEERING FIRMS IN EGYPT, BY FIELD OF ACTIVITY: 1976

| Field of Activity | Number of Firms by Country of Origin | | | | | |
|---|---|---|---|---|---|---|
| | U.K. | U.S.A. | Germany | France | Italy | Japan |
| Planning | 78 | 74 | 40 | 14 | 13 | 12 |
| General civil works | 111 | 73 | 42 | 19 | 17 | 15 |
| Land reclamation and irrigation | 45 | 40 | 22 | 13 | 6 | 10 |
| Sanitary engineering | 69 | 66 | 36 | 16 | 8 | 13 |

Table 7-4 (cont'd)

| Field of Activity | Number of Firms by Country of Origin | | | | | |
|---|---|---|---|---|---|---|
| | U.K. | U.S.A. | Germany | France | Italy | Japan |
| Transportation and communications | 75 | 68 | 33 | 15 | 10 | 13 |
| Marine engineering | 56 | 49 | 21 | 14 | 7 | 9 |
| Tunneling | 29 | 25 | 14 | 4 | 5 | 9 |
| Architecture | 116 | 85 | 49 | 23 | 19 | 14 |
| Electrical/ mechanical engineering | 67 | 54 | 33 | 14 | 6 | 14 |
| Industrial plants | 72 | 51 | 33 | 16 | 14 | 2 |
| Fundamental studies * | 116 | 85 | 45 | 18 | 9 | 11 |
| General A/E (excluding civil services) | 19 | 15 | 13 | 10 | 4 | 2 |
| TOTAL ** | 273 | 181 | 100 | 48 | 32 | 25 |

* Engineering studies.

** These totals represent the number of registered A/E firms from each country. Columns do not add to totals as each firm is registered in more than one field of consulting activity.

Source: Consultants Registration List, 1976, Ministry of Housing and Reconstruction.

Contracts and Fees

The architectural design and supervision of construction works in Egypt are generally handled separately. Fees for architectural design typically range between 4-6 percent of the total construction cost; supervision fees are usually set at from 2-4 percent of the total cost. These rates may be significantly lower or higher on certain jobs--ranging from 1 percent up to 12 percent, depending upon the client, the nature of the work, timing, and the degree of specialization required. The design of hospitals, hotels, and industrial plants, for example, commands higher fees. More routine projects, such as apartment buildings, fall in the lower end of fee structure.

Contract fees that are less commonly used in the market include a percentage of construction costs up to a maximum amount, man-month rates, lump sum fees, a percentage plus fixed fee, and expense plus fee. Because, technically, government agencies cannot sign a contract with a private firm unless the project is budgeted for, delays in payment by government clients appear to be less of a problem for private firms than for public sector firms. In practice, however, delays of up to two to three months occur quite often,

particularly for supervision works.

If a letter of guarantee or performance bond is required from the private A/E firm, it must be backed in full by a public sector bank, unless the consultant has fixed assets or is very well established in the business. Foreign joint-venture banks require a back-up guarantee of only 10-20 percent, and some of the newly established Egyptian banks offer even more flexible terms.

Professional liability insurance is not generally available in Egypt, although it may be required by foreign clients. Under Egyptian civil law, the engineer and the contractor are jointly liable for building collapse for up to ten years after the completion of construction. The owners of structures over L.E. 10,000 in value are required by law to purchase liability insurance to protect themselves and third parties during the construction stage and for at least ten years thereafter.

Labor Requirements and Constraints

The Training Organization of the Ministry of Housing and Reconstruction (TOMOHAR) has prepared estimates of demand for construction labor in Egypt over the 1980-1984 period. These estimates, shown in

Table 7-5, are based on meeting the projected output requirements of the construction sector that have been proposed by the Ministry of Planning. Although the demand for various skills has been incorporated into TOMOHAR's overall projections, a breakdown of the amount of unskilled, semi-skilled, and skilled labor required has not been made.

Table 7-5

PROJECTED DEMAND FOR
CONSTRUCTION SITE LABOR, 1980-1984

| | 1980 | 1981 | 1982 | 1983 | 1984 |
|---|---|---|---|---|---|
| Construction turnover (L.E. millions) | 1,543 | 1,590 | 1,680 | 1,813 | 1,955 |
| Demand for site labor (man-years) | 459,000 | 520,000 | 553,000 | 593,000 | 640,000 |
| Input co-efficient (man-years/ L.E. millions) | 298 | 327 | 327 | 327 | 327 |

Source: Training Organization of the Ministry of Housing; Ministry of Planning.

On the supply side, the size of labor force in the construction sector now stands at around 540,000, of

which some 460,000, or 85 percent, is site labor. To meet the expected construction work load as estimated by TOMOHAR, the supply of site labor must increase by an average of 8.4 percent per year, for a total of 42 percent over the 1980-1984 period. Increasing the supply of unskilled labor at this rate seems feasible, for there is already a large pool of unskilled workers in Egypt.

For semi-skilled and skilled labor, however, this is a very ambitious goal, particularly in view of TOMOHAR's limited success in training a significant number of workers at its vocational centers. As noted earlier, the public sector training centers in Egypt turned out only 40,000 of the 200,000 construction workers it expected to train over the 1976-1980 period.

Judging from TOMOHAR's performance to date, industry experts anticipate a gap in the supply of semi-skilled and skilled construction workers over the next four to five years. Given the time-consuming nature of training programs, the existing supply gap can be narrowed either by reducing labor requirements--through further mechanization, for example--or by increasing the productivity of labor. Industry observers believe that an increase of 10 percent in

labor productivity could be achieved in a relatively short period of time. This, of course, would require certain work incentives in addition to efforts on the part of management to make construction materials available when needed.

In the interim, with some improvement in both on-site and off-site management, the average output per man could be increased even further to 20-25 percent. In the long run, however, the shortage of skilled construction labor must be met by large-scale training programs at the industry level. Thus current government plans will probably be realized well beyond the 1980-1984 period.

## 8. CONSTRUCTION FINANCE

### Overview

The contracting segment of the Egyptian construction industry is inadequately financed and has grave liquidity problems. Long delays in payment by public sector clients, coupled with substantial amounts of money locked up in front-end payments for construction materials, often force both public and private sector contractors to borrow funds in order to continue operations.

The contractors' problems are further complicated by insufficient institutional financing in the construction market. In 1979, for example, total construction financing from all domestic lending sources in Egypt amounted to L.E. 230 million, accounting for only 15 percent of Egypt's total construction turnover in that year. About L.E. 160 million, or some 75 percent of total financing in 1979, went to public sector contracting firms, chiefly to those working under the Ministry of Housing and Reconstruction.

Few financial institutions in Egypt specialize in

construction financing. Although a number of institutions have been established for housing finance in recent years, most of these banks--with the exception of a few state-owned mortgage banks--do not provide long-term financing for housing projects.

To resolve contractors' financial difficulties, the Egyptian government recently established the National Investment Bank (NIB) to assist in the financing of investment projects under the 1980-1984 Development Plan.

Major Sources of Construction Finance

Banque du Caire is the largest commercial bank in Egypt which has traditionally served the needs of public and private sector contractors. In 1979, the last year for which statistics are available, the bank's total loans to contracting companies amounted to about L.E. 160 million. This is nearly 70 percent of the financing provided by all Egyptian banks to the contracting sector in the same year.

The Development and Industrial Bank (DIB), another major Egyptian bank specializing in financing industrial projects, offers medium- and long-term credits for the expansion of existing construction projects as well as for new projects, particularly

those requiring construction machinery and equipment. During the 1976-1979 period, DIB lent a total of L.E. 145 million for over 3,000 small industrial projects in the private sector, and some L.E. 16 million for 17 public sector projects. The bank's total direct lending to the construction sector, loans mainly for building materials projects, amounted to L.E. 14 million in 1979. In 1980, DIB's lending to the construction sector reached L.E. 18 million, of which about L.E. 8 million, or over 40 percent, went to contracting firms.

Most Egyptian banks do not provide long-term financing for housing. This has resulted in a market situation in which almost all credit facilities are, at best, short- to medium-term and available only for selected luxury and semi-luxury housing projects. Very limited commercial financing is available for housing projects, particularly low-cost schemes.

Despite these general limitations, a few special provisions for institutional housing finance do exist. For example, joint-venture real estate companies, such as Kuwaiti/Egyptian Real Estate Development Corporation, are actively involved in building housing and developing land for sale. Public sector

development companies usually finance their housing projects through state-owned mortgage banks, while private developers often finance projects either internally or through bank credits against guarantees. Bank credits, however, are made available only after a sizable portion of the construction work is completed with the developers' own funds. Private companies also channel savings from potential buyers into their projects by selling housing units prior to the start of construction.

State-owned mortgage banks in Egypt provide low-interest loans for non-luxury housing to both housing companies and cooperatives. The General Authority for Building and Housing Cooperatives, for example, extends soft loans to various housing cooperatives at interest rates as low as 3 percent per year. In addition, the Housing and Reconstruction Bank has recently been established to channel private savings into large-scale housing projects. Because of inadequate financing and shortages of land, however, the bank is now limiting its lending facilities to housing projects for above-average income groups.

In its continuing efforts to resolve current financing problems and constraints, in 1980 the

government formed the National Investment Bank to provide part of the financing required for the implementation of construction projects under the 1980-1984 Five-Year Plan. In addition to partially financing projects with its own resources, the bank is also chartered to secure additional loans from a variety of sources, including:

- o Local and foreign financial institutions and banks
- o Bond issues
- o Domestic savings

Financial Problems in the Construction Industry

The Egyptian government's role in the construction sector as prime regulator, supplier, and end-user has in recent years created a series of complex operational and financial problems for public and private contracting firms. The long delays in payment for construction work undertaken for public sector clients and government agencies is a major problem. Another is the amount of money locked up in advance payments for the purchase of construction materials. The major bottleneck in the operations of most private and public companies is insufficient working capital.

Public Sector Contracting

Because of the large amounts of working capital required, the financial performance of most public rcontracting firms in Egypt is, in general, inefficient. Accounts receivable, for example, are unusually high, chiefly because of the payment delays and large front-

?r?rend payments for materials already mentioned. Payment delays also have a direct effect on accounts payable, inasmuch as cont.-ctors tend to compensate by withholding payments to their suppliers and subcontractors. As a safeguard against frequent shortages and the erratic delivery of supplies, public contractors also stockpile materials and maintain unusually large inventories.

The financial difficulties of public contracting firms and their concern over liquidity are best described in the following example concerning their dealings with public sector clients. Until recently, large front-end payments made to public contractors for public jobs were credited against portions of work completed by the contractor. As a result, most contractors were inclined to take on as many public jobs as possible so as to secure substantial front-end

payments. There was little incentive to proceed very far with the construction work since doing so would have seriously reduced their cash flow. Despite a recent government regulation calling for the reduction of front-end payments on public jobs, this practice is expected to continue as long as effective financing alternatives are unavailable.

Insufficient financing often forces contractors to secure loans to continue their operations and to incur the added burden of interest and finance charges for such funds. Although contractors pay high interest on the borrowed funds, compensatory interest penalties in public sector contracts for government payment delays to contractors are not allowed. Further, public contractors are contractually obliged to pay taxes on government payments that are overdue, for it is generally assumed that the contractor has been paid upon the completion of each segment of the construction work.

Private Sector Contracting

Because they are required to make larger deposits and give greater guarantees for borrowed funds than public contractors do, private contracting firms in Egypt have even greater difficulties in obtaining

commercial financing. Working capital, particularly accounts receivable, is high. This is not unusual, for payments to private subcontractors are often delayed by public sector contractors.

Payment problems are so acute that private contracting firms are often reluctant to work for the public sector. Yet, because their financial resources are so very limited, they continue to work as subcontractors for public firms even for a fraction of the payment due. As most private contracting firms in Egypt are small and highly dependent on large public companies for new work, this trend is expected to continue for some time.

## 9. COMPETITION IN THE CONSTRUCTION SECTOR

### Overview

In recent years, foreign construction companies and suppliers of construction materials and equipment have become increasingly involved in the Egyptian market. In the import market, liberalized trade policies and large-scale government construction programs have resulted in a major shift in favor of West European and U.S. suppliers. Egypt has emerged as an important market for Western suppliers of construction equipment and machinery. Today the Egyptian market, still relatively untapped, continues to be approached by new suppliers with a wide range of construction goods and services.

Since the initiation of the "Open Door" policy in 1974, foreign companies have begun to penetrate the Egyptian market through several joint-venture investment projects with both public and private Egyptian firms. The strength of Egyptian private investment has been surprising: nearly 60 percent of the L.E. 5.5 billion Law 43 investment projects approved through the end of 1979 represented Egyptian capital. A further 10 percent came from other Arab sources, and the remaining 30 percent came from still

other foreign investors, particularly West Europeans.

To help in determining the market position of U.S. construction firms and suppliers against major European competitors in Egypt, this chapter will provide a general assessment of local and foreign competition in the construction sector. Market areas with good potential for further market penetration by U.S. and Egyptian joint ventures will also be investigated.

Local Suppliers and Producers

The local suppliers of construction materials and equipment in Egypt, who also fabricate construction components and equipment, are generally small and highly specialized private firms. Many of the local manufacturers, on the other hand, are large public sector companies. Most Egyptian supplier firms specialize in building materials; a relatively smaller number of companies, chiefly distributors for large import/export companies, supply construction equipment and machinery.

Of the roughly 26,000 local suppliers and producers of building materials in Egypt, most operate on a very small scale with a limited product range. There are significantly fewer suppliers of construction equipment and machinery--about 1,200, according to official

registration figures provided by the Ministry of Commerce (Table 9-1).

Table 9-1

LOCAL SUPPLIERS/PRODUCERS OF CONSTRUCTION MATERIALS AND EQUIPMENT

| Category | Number of Firms |
|---|---|
| Suppliers and producers of construction materials | 25,955 |
| Suppliers of construction equipment and machinery | 1,221 |
| TOTAL | 27,176 |

Source: Commercial Registry (May 1978), Ministry of Commerce.

Field surveys indicate that local suppliers in major Egyptian market areas such as Cairo and Alexandria tend to specialize in one or more related products and that such firms are generally formed as proprietorships or partnerships. For example, many small shops sell paints, nails, railings, and plumbing and electrical fixtures, while local manufacturers sell bricks, ceramic and cement tiles, and doors and windows directly.

Although the construction market is now composed of a large number of small suppliers/producers dispersed in various locations throughout the country, this general structure has begun to change because of the recent introduction of large, general supplier companies such as ICON and INCOMAS. The operation of these companies and their impact on the market environment will be discussed later in this chapter.

As noted earlier, public sector involvement in the production and supply of construction materials in Egypt is widespread, as it has been since the early 1960s, when the government, in the interest of controlling costs, began to regulate the production, pricing, and distribution of basic building materials such as cement, wood, glass, and steel.

Import/Export Firms

In the years since the reopening of the import field to the private sector in 1975, following the initiation of the "Open Door" policy, a number of private trading companies dealing in construction materials and equipment have been established in Egypt. In addition to these companies, over 12,000 local firms are now involved in the import/export business and the commercial representation of foreign suppliers. These

private firms range in size from a simple proprietorship with an annual turnover of a few thousand pounds to partnerships and corporations in the million-pound range.

Because import/export companies generally represent a broad range of products, most of them are not directly involved in construction. However, the number of trading firms directly involved in the construction sector has been growing and is now quite impressive. Official statistics show that, as of May 1978, about 202 Egyptian firms were registered as representatives of 337 foreign suppliers of building materials and construction equipment in Egypt (Table 9-2).

Table 9-2

LOCAL SALES AGENTS FOR IMPORTED BUILDING MATERIALS AND EQUIPMENT IN EGYPT, MAY 1978

| Import Category | Number of Egyptian Agents | Number of Foreign Suppliers |
|---|---|---|
| Building materials | 68 | 140 |
| Construction equipment | 118 | 192 |
| Materials and equipment | 16 | 5 |
| TOTAL | 202 | 337 |

Source: Registry of Commercial Representation (May 1978), Ministry of Commerce.

The origin of these foreign suppliers depends, for the most part, upon type of import. For example, some 42 West European manufacturers sell building equipment such as concrete plants, cranes, hoists, formwork and scaffolding, and foundation equipment to Egypt. On the other hand, as shown in Table 9-3, a relatively large number of U.S. and Canadian manufacturers export transport equipment to Egypt.

West European firms, however, dominate the construction market. Some 261 suppliers sell a wide range of construction materials and equipment to

Egypt--from transport equipment to pumps, tools, spare parts, wood, finishing materials, doors, sanitary fixtures, and electrical appliances.

Table 9-3

FOREIGN SUPPLIERS OF CONSTRUCTION MATERIALS AND EQUIPMENT, BY ORIGIN: MAY 1978

| Product | Number and Origin of Suppliers | | | | |
|---|---|---|---|---|---|
| | Eastern Europe | Western Europe | U.S. and Canada | Japan | Developing Countries |
| Construction equipment [1] | | | | | |
| Transport | 4 | 22 | 15 | 4 | India |
| Earthmoving | - | 5 | 1 | 1 | - |
| Building | - | 42 | 2 | 1 | - |
| Civil engineering | - | 9 | 4 | 1 | - |
| General | - | 7 | 4 | 1 | - |
| Pumps | 1 | 25 | 7 | - | India |
| Tools and small equipment [2] | - | 28 | 2 | 2 | - |
| Spare parts | 3 | 20 | 7 | 3 | India, Australia |
| Building materials | | | | | |
| Wood | 7 | 28 | 1 | - | India, Taiwan |
| Cement | - | 9 | - | 1 | - |
| Steel | - | 4 | 1 | - | - |

Table 9-3 (cont'd)

| Product | Number and Origin of Suppliers | | | | |
|---|---|---|---|---|---|
| | Eastern Europe | Western Europe | U.S. and Canada | Japan | Developing Countries |
| Secondary building materials [3] | - | 24 | 1 | - | Cyprus, Turkey |
| Mechanical and electrical | - | 7 | - | - | - |
| Building components and fixtures [4] | 1 | 23 | 2 | 1 | - |
| General building materials | - | 8 | 3 | - | - |
| TOTAL | 16 | 261 | 50 | 15 | |

[1] Includes all equipment for making concrete; cranes, hoists, formwork and scaffolding, and foundation equipment.
[2] Includes all compressors and tools for reinforcing steel, plastering, and painting as well as small hand tools.
[3] Includes all finishing materials (paints, wallpaper, tiles, carpets, etc.).
[4] Includes doors, windows, knobs, sanitary fixtures, and electric appliances.

Source: Registry of Commercial Representation (May 1978), Ministry of Commerce.

In addition to the private trading firms that have been established in the construction market in recent years, there are also a number of relatively new and fairly large and diversified investment and trading firms which offer a multitude of construction-related products and services. The Industrial Engineering Company for Construction and Development (ICON) is an example. ICON supplies imported materials, equipment, and related services, and develops industrial facilities for the production of construction materials and equipment. Founded by 85 employees of Arab Contractors, with over 6,200 employees of Arab Contractors as stockholders, ICON distributes through its own network all the construction materials and equipment it produces locally.

Since its formation, ICON has initiated a number of joint-venture investment projects in various construction-related activities in Egypt. Among its current projects are:

- The manufacture of aluminum profile sections and pipes
- The manufacture of metal shuttering and scaffolding
- The manufacture of wood and aluminum doors,

windows, and frames

- A construction development company using slip-form and lift-slab construction techniques

In addition to its joint-venture activities, the commercial division of ICON represents several foreign manufacturers in Egypt with a wide range of construction equipment and building systems. These include Coles Cranes Ltd.; Euclid Europe, S.A.; John Deere; Acrow Ltd.; and Reynolds International, Inc. ICON's annual sales have grown rapidly from L.E. 1.2 million in 1976 to over L.E. 15 million in 1978.

Established in 1976 as a partnership to distribute construction materials and equipment for foreign suppliers, International Commerce and Services (INCOMAS) is another example of the diversified construction trading companies that have been formed in Egypt in recent years. The company started in 1976 with a turnover of about L.E. 2 million. Quickly increasing its sales and services, it achieved a total sales volume of L.E. 6 million by 1978. INCOMAS has a full service center for the repair and maintenance of equipment, and it is considering the development of a branch or department for leasing construction equipment

in Egypt.

These trading/investment activities demonstrate the role that private sector companies, together with foreign partners, can play in the development and diversification of the construction sector. Such companies can provide new materials, equipment, spare parts, and maintenance facilities, and they can introduce new construction systems and services such as improved scaffolding systems, equipment rentals, supplier's credit, and so on.

Payment Terms and Markups

In dealing with public sector clients in Egypt, private trading firms, like local suppliers of construction materials and equipment, must submit a letter of guarantee of 5 to 10 percent. A letter of credit from the customer is required for orders of equipment or material. For special orders a 10-25 percent advance payment may be required. Orders are generally paid for in full upon delivery. This practice is gradually changing, however, as customers seek financing by local banks or by obtaining some form of supplier's credit.

Commissions on equipment, including a guarantee and maintenance (labor) for a predetermined period

(one year) currently range from 8-15 percent, although some suppliers cite 5 percent as a more customary commission. Net profits, reportedly far below sales commissions, average around 2-5 percent for materials and 2-3 percent for construction equipment.

To control suppliers' markups on goods imported into Egypt, Law 119 was enacted in 1978. This regulation, which specifies that the combined profit margins of importer/wholesaler/distributor must not exceed 30 percent, has never been strictly enforced, for increasing competition in the material and equipment market has made the law almost unnecessary.

## The Market Exposure of U.S. Firms vs. Major Competitors

### Direct Export Sales to Egypt

The liberalization of Egypt's trade policies has resulted in a marked change in the overall pattern of Egypt's foreign trade. Imports from the Soviet Union and Eastern bloc countries, which represented over 50 percent of total imports in 1975, have dropped to a little over 15 percent in recent years.

The United States, which accounted for 18 percent of total imports in 1979, is now Egypt's largest single foreign supplier. Western Europe, however, which supplies some 46 percent of Egypt's imports and takes

55 percent of its exports, is the most important trading partner.

Until a few years ago, imports of construction equipment and components into Egypt were quite insignificant. Today, Egypt has become an important market for exporters of construction equipment, machinery, and materials, largely as a result of huge development programs for new cities, housing, tourist facilities, port expansion, and so on. The implementation of reconstruction programs under the 1980-1984 Plan will, no doubt, require the importation of still larger amounts of construction equipment and building materials over the next four to five years.

In the private sector also, strong demand for building construction is drawing additional imports for a wide range of construction materials, equipment, and related building components. Because there is a large supply gap in the production of such products in Egypt, this trend also is expected to continue for the next five to six years.

OTIC analysis of Egyptian import statistics indicates that, in a relatively short period of time, U.S. suppliers have captured a good market share of certain categories of construction materials and

equipment. These include items such as iron and steel structures, lifting and loading machines, builders' hardware and construction tools, liquid pumps, and iron/steel tubes and pipes.

The United States, with an annual sales volume of over L.E. 20 million, or 36 percent of the import market, supplies the bulk of the iron and steel structures that are imported into Egypt. Italy, with a total L.E. 8 million in sales, or about 15 percent of the market, ranks second. West Germany and the United Kingdom, with an 11-percent market share each, are among the other major suppliers (see Table 9-4).

Table 9-4

U.S. MARKET SHARE OF IRON AND STEEL STRUCTURES IMPORTED INTO EGYPT, 1979

| | Value (L.E. 000) | Percentage of Market Share |
|---|---|---|
| United States | 19,686 | 36 |
| Italy | 8,172 | 15 |
| United Kingdom | 5,912 | 11 |
| West Germany | 5,788 | 11 |
| Netherlands | 3,244 | 6 |
| France | 2,984 | 6 |
| Other countries | 8,948 | 15 |
| TOTAL | 54,734 | 100 |

Source: CMIC analysis of 1979 CAPMAS import statistics.

Although U.S. suppliers have also captured a good market share of other major construction items imported into Egypt, they still rank behind major European competitors such as West Germany, the United Kingdom, France, and Italy. West German suppliers are the top competitors in the sales of liquid pumps, builders' hardware, and lifting and loading equipment.

In 1979, for example, West German sales of lifting and loading equipment to Egypt accounted for 40 percent of total imports. In the same year, U.S. sales for the same items accounted for 12 percent of total imports, ranking fourth after Germany, France, and Switzerland. In the sales of liquid pumps and builders' hardware, U.S. also ranked fourth, with a 12 percent and 7 percent market share, respectively (see Table 9-5).

Table 9-5

U.S. MARKET SHARE AND VALUE OF
SELECTED CONSTRUCTION EQUIPMENT IMPORTED INTO EGYPT, 1979

| | Lifting and Loading Equipment | | Liquid Pumps | | Builders' Hardware | |
|---|---|---|---|---|---|---|
| | Value (L.E. 000) | Market Share (percent) | Value (L.E. 000) | Market Share (percent) | Value (L.E. 000) | Market Share (percent) |
| West Germany | 7,726 | 40 | 4,051 | 29 | 5,071 | 22 |
| France | 3,313 | 17 | | | 1,568 | 7 |
| Switzerland | 2,611 | 14 | | | | |
| U.S.A. | 2,263 | 12 | 1,603 | 12 | 1,638 | 7 |
| Italy | 1,248 | 7 | 2,960 | 21 | 2,690 | 12 |
| United Kingdom | | | 1,512 | 11 | 3,122 | 13 |
| India | | | 1,694 | 12 | 1,614 | 7 |
| Japan | | | 830 | 6 | 1,106 | 5 |

Table 9-5 (cont'd)

| | Lifting and Loading Equipment | | Liquid Pumps | | Builders' Hardware | |
|---|---|---|---|---|---|---|
| | Value (L.E. 000) | Market Share (percent) | Value (L.E. 000) | Market Share (percent) | Value (L.E. 000) | Market Share (percent) |
| The Netherlands | | | | | 1,046 | 4 |
| Other countries | 2,000 | 10 | 1,206 | 9 | 5,297 | 23 |
| TOTAL | 19,161 | 100 | 13,856 | 100 | 23,152 | 100 |

Source: CTIC analysis of CAPMAS import statistics for 1979.

Imports of wood and wood products--inlaid wood, plywood, blockboard, panels and building boards--come largely from the Soviet Union, Finland, Sweden, Yugoslavia, and Italy. U.S. sales of wood products to Egypt, which account for less than 1 percent of Egypt's total imports, are insignificant. Similarly, the U.S. market share of certain building materials such as iron/steel rods and bars is quite small (3 percent). However, U.S. suppliers command a 7 percent share of all iron/steel angles, shapes, and sections that are imported into the country.

CTIC field investigations suggest that U.S. construction materials and equipment, particularly those with high technology, have an excellent reputation in the Egyptian market. However, because the Egyptian construction market is still very cost-conscious, the higher American prices are believed to hinder the direct sales of some U.S. equipment. This price differential could be compensated for by providing further support to local distributors for the proper maintenance and upkeep of equipment.

Joint-Venture Investment in the Construction Sector

The Nature of Foreign Joint-Venture Investment. Since the enactment of Law 43 of 1974 and the initiation of

the "Open Door" policy, an increasing number of foreign construction firms have begun to penetrate the Egyptian construction market. These firms have found that cooperating with local firms on a joint-venture basis is essential to securing additional contracts and expanding into new market areas.

Most of the joint-venture companies in Egypt are involved in the execution of specific construction projects, for which the foreign firm provides construction management as well as the necessary equipment, training personnel, and supervision. Among the examples of this type of project-oriented foreign involvement in the construction sector are the Giza Company/Tarmac (U.K.) joint venture for bidding on the Intercontinental Hotel Project in Cairo and the Arab Contractors/Tarmac joint venture for the construction of the $110-million Ahmed Hamdi Tunnel under the Suez Canal.

In several instances, joint-venture companies have been formed on a more permanent basis. The Universal Company for Mechanical Foundations, a joint venture between Hassan Allam and Steep (Belgium), is one example of such new ventures. Acrow Misr, a joint venture with Acrow (U.K.) for the manufacture of

scaffolding and shuttering equipment, is another.

U.S. Joint-Venture Investment. Despite promotional efforts made by the U.S.-Egypt Business Council, U.S. companies have been slow to invest in Egypt's construction sector. There are several reasons for this. First, prior to the oil boom, the Middle East in general and Egypt in particular was an unknown quantity to most U.S. businesses. Secondly, until recently, because of the expropriation of U.S. private property in the late 1960s and the subsequent break in diplomatic relations, most U.S. companies did not consider Egypt a good investment risk.

In light of the numerous business opportunities in the construction field, created by the massive U.S. AID and World Bank projects, this situation is bound to change.

The U.S.-Egypt Business Council also has defined a number of investment opportunities for U.S. construction companies, among them a pump-manufacturing facility and a joint venture in housing. Both of these projects are in the process of getting underway.

One type of U.S. collaboration with Egyptian companies, though not a joint venture, is architectural/engineering consulting. Engineering

Consultants of Cairo, for example, has been working with Engineering Science and Ralph M. Parsons on low-income housing schemes and the master plan for Cairo's waterworks. Similarly, Sabbour Associates, a leading Egyptian architectural firm, has worked with Peat Marwick Mitchell on the design of a master plan for the development of Sadat City.

Joint-Venture Investment by U.S. Competitors. The position and attitude of major U.S. competitors toward investment in Egypt's construction industry are quite different from that of U.S. firms. West German firms, for example, are increasingly interested in investing in Egypt. In general, they are more interested in upgrading existing manufacturing plants than in building new ones, and through employing effective management techniques, they expect productivity gains from existing plants.

At present, however, there are few German joint ventures in the construction sector. Bavaria Fire Extinguishers is operating in the Free Zone of Port Said, and Ferrostal is reportedly involved in the production of steel construction equipment.

French companies are making fresh inroads in the construction market. A French foundry is helping the

giant Helwan Iron and Steel Complex to modernize its steel-making and assist in marketing its end products. The Egyptian Company for Prestressed Concrete, another French joint-venture firm, is producing prestressed concrete pipes, primarily for use in the Tenth of Ramadan City. Fives-Cail, yet another French investor, is now active in the construction aspects of a land-reclamation scheme at Kafr al-Sheikh to grow and refine sugar beets.

British firms have been particularly active in the construction field for the last four or five years. British Lift Slab, for example, has set up a joint venture with Arab Contractors to produce precast concrete, and Acrow (U.K.) has a joint venture with Acrow Misr to produce metalwork forming and scaffolding equipment. Maryatt & Scott, another U.K. firm, has entered a joint venture with an Egyptian company, Raco, to manufacture elevators and related equipment.

[Acrow Misr is a Law 43 success story.] Arab Contractors and its affiliate company, ICON, hold half of the L.E. 1.5 million equity and Acrow (U.K.) and Nasr Tube Company, a major supplier to Acrow Misr, hold 33.3 percent and 16.6 percent, respectively. The project to manufacture metalwork forming and

scaffolding equipment was financed through an L.E. 2.5 million credit facility extended by Misr Iran Development Bank.

Since the start of its operation, Acrow Misr has had the advantage of a ready untapped market for metal scaffolding. A growing number of private and public sector contractors recognize the economic advantages of Acrow's quick erection system as a cost-effective alternative to traditional timber scaffolding.

Because of growing demand for scaffolding systems in Egypt, Acrow Misr plans to add new production shifts and increase its production to 3,600 tons annually. The factory's product mix is already expanded to include metal racks and storage systems both for industrial and commercial applications. Among its operating problems are occasional power cuts, the high cost of spare parts, and the quality of the steel tubes and angle forging suplied by Nasr Tube Company and the Helwan Iron and Steel Complex, respectively.

Japanese construction companies have been somewhat slow to enter the Egyptian market, despite the signing of a 1977 investment protection agreement with the Egyptian government. Japanese firms almost always insist on management control and rarely commit

themselves to a majority equity position. Private joint-venture projects currently under negotiation with Japanese firms include Nippon Kokan's interest in the Dekheila Steel Complex and an investment scheme to manufacture PVC pipes.

Potential Investment Opportunities for U.S. Firms

The results of CTIC field investigations, market analysis, and interviews with construction experts in Egypt suggest that the most potentially lucrative areas for private U.S. investment in the Egyptian construction sector are in specialized processes, techniques, and materials. Such projects include precast concrete slab production and the manufacture of scaffolding and forming equipment. As noted earlier, Lift Slab (U.K.) has already set up a profitable joint venture for manufacture of precast concrete slabs for slipform construction, and U.K.'s Acrow has established a highly successful manufacturing facility for metal scaffolding and shoring systems.

There is good potential for U.S. involvement in similar projects. Construction experts believe that, although American construction firms cannot compete on price in the Egyptian market, they can sell quality and efficient management. Projects in which U.S. companies

could have a competitive advantage, therefore, are limited to high-technology, joint-venture investments.

There are also a number of opportunities for U.S. investors in industrial development. These range from factory building to pipe manufacturing and the manufacture of specialized materials, equipment, and components for building projects. The Egyptian government is also encouraging U.S. investors to participate in low-cost housing schemes, particularly in new urban areas and satellite cities.

# 10. SPECIFIC INVESTMENT OPPORTUNITIES FOR U.S. COMPANIES

## Overview

During its initial market investigations and field interviews with over 70 private and public sector construction firms and relevant state agencies in Egypt, Chase Trade Information Corporation identified a total of 2' potential investment opportunities for U.S. firms in the Egyptian construction sector. Based on the current and anticipated market needs of a representative pool of construction firms and end-users, these projects represent a fairly balanced inventory of potential investment opportunities.

After the initial project listing was compiled, information for specific project opportunities was developed. This data was based on a broad selection of criteria emphasizing national economic considerations and market forces, the U.S. market position and technological advantage, and the degree of Egyptian interest in setting up joint-venture operations with U.S. construction firms. The results of this evaluation led, in turn, to the development of the five project profiles. These profiles describe the most immediate investment opportunities for U.S. firms in

the Egyptian construction sector.

Areas of Potential Investment Opportunities

The 27 potential investment projects identified by CTIC as a result of canvassing state agencies and 70 public and private sector construction firms are listed below in five separate groups.

1. Construction Materials and Components

   The manufacture of

   - o PVC pipes and fittings
   - o Gypsum-based plaster and blocks
   - o Sand bricks
   - o Asbestos cement pipes
   - o Pre-stressed concrete pipes
   - o Lightweight concrete wall panels
   - o Small-diameter reinforcing bars
   - o Large-diameter fiberglass pipes

2. Construction-Related Tools and Equipment

   The assembly or manufacture of

   - o Concrete mixers
   - o Vertical pumps for deep-well irrigation
   - o Air-conditioning equipment
   - o Improved hand tools and builders' hardware
   - o Overhead cranes

3. Finishing and Completion Materials and Components

The manufacture of

- o Paints and varnishes
- o Rolling doors
- o Wallpapers and other coverings
- o Aluminum doors, windows, and angles

4. Construction Systems

The manufacture/assembly of

- o High-rise steel structures
- o Scaffolding and shoring systems
- o Prefabricated low-cost housing
- o Pre-engineered steel buildings
- o Foundation piling systems

5. Construction Services

The establishment of

- o Modern architectural/engineering firms
- o Electrical, plumbing, and sanitary installation firms
- o Building materials trading companies
- o Equipment repair and leasing firms
- o Construction management firms

Evaluation Criteria

The five areas of potential investment opportunity were evaluated against a broad array of criteria aimed at satisfying the mutual business objectives of Egyptian and U.S. construction firms in the context of Egypt's national development program for the construction industry. These criteria included:

1. National Economic Considerations
    - o Resource base; stage of industrial development in local feeder industries
    - o The modernization of production techniques; the transfer of know-how and technology
    - o The employment and training of Egyptian nationals
    - o Foreign-exchange savings/earnings
    - o The availability of local resources; labor, materials, components
    - o Forward and backward linkages
2. Market Factors
    - o Current and expected demand
    - o Local production; product range, volume, and quality
    - o Imports: product range, volume, and

quality

- o Competition and price levels
- o Duties, subsidies, and regulations

3. U.S. Market Position

- o Direct sales exposure
- o Investment exposure
- o The degree of U.S. technological advantage vis-a-vis non-U.S. competitors
- o Competition and price levels

4. Egyptian Interest

- o Interest in specific project opportunities expressed by one or more Egyptian concerns
- o Interest in preliminary discussions with U.S. construction firms for possible joint-venture operations
- o General assessment of project viability and degree of profitability

A careful screening of all potential projects against the above criteria resulted in the five high-potential investment opportunities that are described in the following pages. As noted earlier, these five profiles represent the most immediate

investment opportunities for U.S. private firms in the Egyptian construction industry. The remaining 22 joint-venture investment projects that were identified by this CTIC survey have good potential as medium-term opportunities. Every effort should be made to develop further information regarding these projects so that negotiations can be entered into with prospective Egyptian entrepreneurs and state agencies.

## Profile 1

## PREFABRICATED LOW-COST HOUSING

Project Description: To establish a facility for the manufacture of concrete-based low-cost housing through the introduction and development of hollow-care flat-slab systems. The project should be designed to utilize as fully as possible the prefabrication infrastructure already in existence in Egypt.

Market Potential: Egypt has an acute shortage of housing in all urban areas. To meet the needs of the annual population increase of 1.2 million, Egypt must build 200,000 housing units per year for the next 20 years. In addition, some 80,000 units must be built annually to cover the present housing backlog of over 1 million units.

Local Production: The public sector builds 10,000 housing units per year--usually 4-room, five-story, walk-up flats with a floor area of 80 square meters and a unit cost of L.E. 4,000. The 11 prefabricated housing factories in the public sector have a combined annual production capacity of 27,500 units per year. Because of operational and marketing difficulties, however, no more than 2,000 units have been produced annually.

U.S. Market Position: Insignificant. The Ministry of Housing and Reconstruction strongly encourages U.S. and European construction firms to invest in prefabricated low-cost housing in Egypt through joint-venture operations.

Egyptian Interest: El Nasr General Contracting Company, a large public sector contracting company; Sami Saad Company, a large private contracting firm; and SCIB, a private contracting and trading company.

Role of U.S. Firm: Equity position; supply of equipment, technology, and job-site training.

Preliminary Project Estimates:

| | |
|---|---|
| Production volume: | 5,000 units per year |
| Market share: | 5-7 percent of total housing requirements |
| Total costs: | $3-5 million range |
| Profitability: | Reasonable profit on volume production |

Economic Factors: The introduction of modern prefabricated building systems will contribute to the mechanization of the Egyptian housing industry as well as to Egypt's national objective for providing adequate housing for its people. By employing the country's existing underutilized prefabrication capacity, the project may also have strong backward linkages.

## Profile 2

## PRE-ENGINEERED STEEL BUILDINGS

Project Description: The local assembly and/or manufacture of rigid-frame, pre-engineered steel buildings (open-span type) for industrial, commercial, and military uses. Computerized design technology will be required for standard and custom-made building systems.

Market Potential: Total demand is estimated to be about $80 million per year, of which $20-25 million is in the private sector. The market for pre-engineered steel buildings is expected to grow in line with the projected growth of industrial construction in Egypt--that is, by at least 10 percent annually for the next five years.

Local Production and Imports: The demand for computer-designed steel buildings is currently met by imports. Steelco and Metalco are the major local producers of steel structures in Egypt. Because of limited design specifications, however, these companies operate outside the import market.

U.S. Market Position: Strong. U.S. firms--which have an annual sales volume of L.E. 20 million--supply more than a third of the iron and steel structures imported into Egypt. Italy, which has 15 percent of the market, ranks second.

Egyptian Interest: Arab Contractors, the largest public sector building and engineering firm in Egypt; SCIB, a private contracting and trading company; and Egyptian Building Systems, a private contracting firm specializing in the erection of steel buildings.

Role of U.S. Firm: Equity position, supply of equipment, and transfer of technology.

Preliminary Project Estimates:

| | |
|---|---|
| Production volume: | 7,000-10,000 MT per year |
| Market share: | 20 percent of targeted market segment |
| Total costs: | $12-15 million |
| Profitability: | Quick return within two to three years. Benefit can also be derived from the 55-percent import duty that is imposed on fabricated metal systems. |

Economic Factors: Initially, about 30 percent of input materials can be supplied by local sources. According to industry experts, with the continuing development of local feeder industries, local content could eventually reach 50 percent. Through the transfer of technology and the introduction of modern building systems, the project contributes to the development of the local construction industry.

## Profile 3

## METAL SCAFFOLDING, FORMING, AND SHORING

Project Description: The manufacture of metal scaffolding, forming, and shoring systems for the erection of commercial, industrial, and civil works.

Market Potential: The present market size, estimated at $25 million, has a projected growth rate of about 20 percent annually for the next five to six years.

Local Production and Imports: Acrow Misr, which satisfies about 25 percent of market requirements, is the only large firm involved in the fabrication of metal scaffolding and forming equipment in Egypt. Foreign suppliers, particularly from the U.K. and Western Europe, cover the remaining 75 percent of the market.

U.S. Market Position: Freight differentials have enabled British and West European manufacturers/ suppliers to establish a competitive edge over U.S. suppliers. The local production of U.S. products, however, is expected to close this cost differential rather quickly, particularly in light of the 20 percent duty that is imposed on imported systems.

Egyptian Interest: El Nasr General Contracting Company. The Everest Company, a private construction equipment trading firm, is a potential partner.

Role of U.S. Firm: Equity position; supply of design, engineering, and job-site service.

Preliminary Project Estimates:

| | |
|---|---|
| Production volume: | 5,000-6,000 MT per year |
| Market share: | 20-25 percent |
| Total costs: | $3-4 million |
| Profitability: | Quick payback and high return on investment |

Economic Factors: Because over 90 percent of all components can be obtained from local industries, there are strong backward linkages. By introducing modern and cost-effective erection systems and by training local staff, the project contributes still further to the development of the Egyptian construction industry.

## Profile 4

## CENTRAL AIR-CONDITIONING

Project Description: To establish a joint venture for the manufacture of central air-conditioning systems in Egypt. The markets include hotels, administrative buildings, hospitals, factories, and other commercial/institutional end-users.

Market Potential: Climate-control devices, particularly central units, have a ready and growing market in Egypt. The current demand for central air-conditioning units, estimated at 42,000 refrigerated tons annually, is expected to increase by at least 12 percent annually for the next five years.

Local Production and Imports: Miraco and Koldair, which have a combined annual production of 20,000 units, or 47 percent of the market, are the major domestic producers of residential window and split A/C units in Egypt. The remaining 53 percent is imported from the United States, Japan, Taiwan, and Western Europe. All central air-conditioning units are imported, primarily from the United States.

U.S. Market Position: Very strong. Almost all central air-conditioning units imported into Egypt are made in the USA.

Egyptian Interest: Miraco, which has completed a prefeasibility study to expand its air-conditioning production line.

Role of U.S. Firm: Equity position; supply of equipment, transfer of technology, marketing.

Preliminary Project Estimates:

| | |
|---|---|
| Production volume: | 3,000 refrigerated tons annually to start |
| Market share: | 7-10 percent |
| Total costs: | $7-10 million |
| Profitability: | Quick return: market is wide open, and duties on imported units are high (167.5 percent on complete units and 40-60 percent on components). |

Economic Factors: Compressors and electrical parts must be imported during the initial phase of the project. About 40-60 percent of all components (aluminum parts, fans, sheet metal, etc.) can be made locally. The project contributes to the development of feeder industries in the construction market, and introduces modern production techniques through the transfer of training and technology. Possible exports to other Middle East countries.

## Profile 5

## REINFORCING STEEL BARS

Project Description: The establishment of a rolling mill plant, using imported billets, for the manufacture of small-diameter reinforcing bars (sizes 6-25 mm). The plant would consist of a billet yard, a reheating furnace, and roughing/finishing facilities.

Market Potential: The demand for rebars, now around 800,000 MT per annum, is projected to grow by 6 percent annually over the next five years and reach well over 1,000,000 MT annually by 1985.

Local Production and Imports: Of the 300,000 MT of rebars produced annually, 90 percent is produced by four large public sector companies and the remaining 10 percent by some 20 private firms that specialize in small-diameter rebars. Imports fill the supply gap of about 500,000 tons a year. The shortage of rebars is expected to reach 669,000 MT by 1984. Significant imports will therefore be required before the 700,000 MT per annum Dekheila project comes on stream in the late 1980s.

U.S. Market Position: Three percent of the import market. West Germany, Bulgaria, Czechoslovakia, and Italy, which have a combined market share of 50 percent, are the chief suppliers.

Egyptian Interest: Cairo Iron & Steel Company, a private sector Egyptian firm.

Role of U.S. Firm: Equity position; supply of equipment and transfer of technology.

Preliminary Project Estimates:

| | |
|---|---|
| Production volume: | 30,000 MT per annum |
| Market share: | 8-10 percent of the targeted market segment |
| Total costs: | $4-6 million |
| Profitability: | Quick payback: demand is high and project also can benefit from the 20 percent duty imposed on imported rebars. |

Economic Factors: Billets and spare parts must be imported. It is estimated that the initial foreign exchange cost will account for 60 percent of total project costs.