

A RESIDENTIAL DEVELOPMENT FOR CAIRO, EGYPT

by

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INTRODUCTION

The population of Cairo, the Capital city of Egypt, is increasing all the time. In fact, it jumped from a million and a half people to over two millions between the years 1939 and 1947. This condition forced the Federal Government of Egypt to think about making some new additions to the residential districts in the outskirts of this city. The Government authorities thought about many places in the near vicinity of the city to meet this tremendous increase. This design is one of these projects.

The land for this new addition is on the west side of the Nile across from Cairo. It is going to be called the "Awkaf Town".

The land is bounded by the town of Imbaba on the north; the main railroad to upper Egypt on the west; the town of Dokki on the south and the Nile River on the east. The area of this land is approximately five hundred and forty faddans (1 faddan = 45,185 square feet; 1 acre = 43,560 square feet; 640 acres = 1 square mile). This is shown in yellow on the map of the area, Plate I.

Though there is no good record at hand that would show the history of this part of the country, yet presumably as Egypt is and always was an agricultural country, it is taken for granted that this area was used for farming during the time of the ancient Egyptians and has been used for this

purpose from that time on. At present, different crops are raised on it and as far as agriculture is concerned, it is a good fertile piece of land.

The temperature of this area varies from 35 degrees centigrade (95° F.) in summer to 15 degrees centigrade (59° F.) in winter and the atmosphere is usually dry, the percentage of humidity ranging from 50 to 70. Wind blowing in this area is usually a light breeze from the north except for 50 days in April and May when it starts blowing hard from the southwest loaded with particles of sand from the desert.

Egypt is well known for its sunshine and this area has an average of eight hours of sunshine daily the year round. Though the rainy season in Egypt is in the winter, the rain is never heavy. In fact, the rainfall is 1.6 to 2.0 inches per annum.

This part of Cairo has been selected for an extension of housing facilities by the Egyptian Government because of increased demand for middle income group housing caused by the many industrial plants and factories built around Cairo during the late war. The owners of those factories who made much progress and gained much money during the war now want to live in better places. It is a little far from the factories but is a residential district where people can enjoy the beautiful scenery of the Nile; have plenty of fresh air and be comfortable and away from heavy traffic hazards.

As might be understood from the preceding discussion,

the people who expect to live in this town are those of the medium income group, the average income of each family ranging from one hundred to two hundred Egyptian pounds per month (1 Egyptian pound = four dollars).

The size of the average family living in this project will be five to six people. This includes one to two servants per family.

SOIL INFORMATION

The soil of the Nile valley is mainly a layer of clay formed by the precipitation of silt from the Nile under which there are other layers of sand mixed with gravel. According to where you are in the country, the soil types are divided into the following kinds:

1. Soils which are not compressible or erodible.
 - a. Rocks and limestone
 - b. Gravel and aggregate which is always dry
 - c. Gravel, aggregate and sand which is always covered by water and exposed to currents
2. Compressible soils but not erodible, usually made up of:
 - a. Pressed aggregate and sand or mixed aggregate
 - b. Compact clay soil which is very convenient for building

3. Slightly compressible and erodible soils

- a. Clay mixed with gravel or sand or clay exposed to different degrees of dampness
- b. Compact clay exposed to different degrees of dampness
- c. Mud

4. Slightly compressible soil having no consistency under pressure. It is always changing. It is risky to build on this kind of soil; i.e., river precipitation.

From the above review of the different kinds of soil, it is evident that the best soil for building is the hard non-erodible soil.

In laying down foundations, the type of soil should always be taken into consideration.

1. On Rocks. Foundation in this case is not a very important matter to be considered as one can start building on the rocks.

2. On Compressible Soil. Foundation in this case should be spread on a large area so that the weight will be distributed and the unit stress smaller.

3. Piles. These are resorted to in soft or hard soil as the case may be.

The soil strata in this part of the country has many different combinations. Though it is mostly clay, it contains a high proportion of sand which differs in percentage in different places as well as in depth, although in places it might go as deep as many meters beneath the surface. The

EXPLANATION OF PLATE I

Map of Cairo showing the area used for "Awkaf" Town.

land gets its fertility from the topmost layer which is about one and one-half meters in depth. This soil has accumulated through the precipitation from the Nile River after the yearly floods.

The subsoil water level ranges from one to four meters in depth.

MATERIALS

Materials used for this project are divided into two kinds:

1. Materials used for buildings
2. Materials used for roads and sidewalks

Materials Used for Buildings

Materials for Masonry. The masonry materials used in the different houses and buildings of this project are listed as follows:

Stone
Bricks
Concrete
Mortars

Stone. The stones used for building purposes in Egypt are of three different geological classifications:

1. Igneous rocks as granite and basalt
2. Sedimentary rocks as sandstone and limestone
3. Metamorphic rocks as marble and slate

Chemically these rocks can again be divided into three categories:

- a. Siliceous stones as granite and sandstone
- b. Argillaceous stones (alumina) as slate
- c. Calcareous stones (carbonate of lime) as marble and limestone

Any one of these preceding kinds of stones can be used for building except the granite and basalt which are used only for building dams and barrages and have been used by the ancient Egyptians for their tombs and monuments. Basalt is still used for building roads and highways all over the country.

Quarrying is done by hand tools, by machinery and by the use of explosives from the Mokattam range of mountains on the east side of the Nile River. However, the granite and basalt quarrying is done by machinery and explosives from the same range of mountains but at the southern part of the country in the province of Aswan.

The most important building stones are limestone and sandstone.

Limestone. This contains carbonate of calcium and magnesium together with impurities of iron oxides, silica, clay, bituminous matter and many other compounds.

As a rule, limestone is not so durable as sandstone because it is liable to be attacked by acids and acid fumes.

A cubic meter of limestone weighs at least 2400 kilograms

and the minimum crushing strength is about 1,000 kilograms per square centimeter for Ashlar masonry stone and half this value for rubble masonry stones.

Sandstone. This kind of stone is composed of grains of quartz and sand cemented together by silica or carbonate of lime. It weighs at least 2,000 kg per cubic meter and the minimum crushing strength is 500 kg per square centimeter.

Bricks. Bricks which are going to be the most important building materials for this project are locally made in Egypt and in most instances are made near the banks of the Nile.

The clay removed from the bed of the river and its tributaries during the months of low water level (December, January, February) is mixed with straw, Homra and water stirred together until it is made into a dough-like consistency. It is then poured into slabs of 25x12x6 cm and then left to dry in the sun for two or three weeks turning it over once or twice during this time.

At the end of this three-week period, the slabs are hard to break and are ready to be arranged on each other in layers with a thin sheet of coal between every three layers which is in the end a big solid cube.

This cube is then plastered with about a two-inch layer of clay. The coal is set on fire and left to burn for at least four or five weeks after which it takes two or three more weeks to cool off. The bricks at this time are ready to

be used for building purposes.

Concrete. Wood has been used in Egypt before the time concrete was discovered in building construction for ceilings, but since that time they started making construction cement in a town called "Maasarah" about 15 miles south of Cairo. Concrete has taken the place of wood in ceiling construction and has been used for other purposes since then. It has been used in laying foundations, slabs, beams, girders, and columns.

The sand aggregate used in the concrete mix is brought from many places around in the desert near Sakara town west of Cairo.

As Egypt does not have very much steel mining and no steel industry, steel used in reinforced concrete is imported from England, France, Germany, United States and many other countries. The plain concrete is always mixed to the following proportions:

1 cubic meter of aggregate
 $\frac{1}{2}$ cubic meter of sand
 350 kg of cement

The percentage of steel used for reinforcement varies according to the use the concrete is put, however, every unit of the preceding mix of concrete takes a minimum of

80 kg of steel in slabs
 100 kg of steel in beams
 70 kg of steel in columns

This percentage of steel varies according to the span of the beams and the design wanted.

Concrete in Egypt has proved to be very successful and long lasting as the weather variations and the temperature extremes do not vary a great deal from summer to winter.

Mortar. The mortar used in the different buildings varies according to the building material used and the amount of dampness in the location.

In floors underground: 2 parts lime; 2 parts Homra; 1 part sand with tile set in cement above this base.

The mortar used in laying of stone consists of 2 parts lime and 3 parts sand mixed with 100 kg cement per cubic meter of mix.

In brick buildings there are many different mix percentages of lime, cement and sand that vary according to the kind of bricks used and the value of the building itself.

Building Timber. Wood in building is of two kinds:

1. Soft wood as

a. Northern pine, Honey Yellow which is used for windows, doors and regular wooden floors.

b. American yellow pine, whitish or pale yellow color used for frames.

c. White fir or spruce used for trusses and ceilings.

d. Pitch pine; this is difficult to work with and is used where durability and strength are wanted.

2. Hard wood; mostly used in furniture but is sometimes used for construction.

a. Oak, light brown in color, very strong, used for ornamental work and heavy construction work.

b. Mahogany; strong, hard and dense wood. It is not difficult to work with and is used for ornamental joinery and for shop fittings.

c. Teak; it is easy to work with, stronger and stiffer than oak and has the advantage of being fire resistant.

d. Walnut. This wood takes a good polish and is used mostly for veneers and furniture.

e. Beech; mostly used for furniture and tools.

Kinds of Floors

House floors in this residential development are designed to be of one or more of the following kinds:

Floors made of one piece:

a. Cement floors 2 cm thickness and of the following mixture: one part cement and one part of sand.

b. Asphalt floors. A 2 to 3 cm thick layer of asphalt laid on a cement floor but the mixture of cement is 1 part cement and 3 parts of sand.

c. Terrazzo floors. Made up of two layers, the lower made of a mixture of cement and sand $1\frac{1}{2}$ cm thick and the top layer 5 mm in thickness of fine particles of marble and cement.

d. Cork floors laid in blocks 2x30x30 cm glued to

top of the plain concrete floor. The surface is then waxed.

e. Rubber floors - laid in squares 30x30x1 cm thick glued to plain concrete floor.

Floors made of many pieces put together:

a. Red tiles - used for places of secondary importance and varying sizes.

b. Cement tiles - used in bathrooms, verandas, and sometimes in basements. These tiles are usually of 2 cm thickness. Cement tiles of $1\frac{1}{2}$ cm are used on roofs.

c. Mosaic tiles. Many different colors are used in this type of tile. It is used for the same purposes as cement tiles except on roofs.

d. Marble tiles. A polished marble which is placed on a layer of sand over cement. This tile is mostly used in bathrooms, stairways and verandas.

e. Maasara tiles. Limestone used as flagging for gardens and walks where traffic is not too heavy. It is easily sawed when first quarried and is held in place by cement.

f. Wooden floors:

1. Regular wooden flooring

2. Parquet. Small pieces of wood are put together on the regular wooden floor

SANITATION

Purified water is supplied by the regular water supply

system from the Giza water purifying station which is about two miles south of this residential development. The water is drawn from the Nile River. The diameter of water pipes supplying each building are designed according to the number of apartments and stories in the building.

Sewer Pipes. Five different kinds are used for these pipes:

a. Clay Pipes. The inside diameter of these pipes varies from 4 to 18 inches and the thickness $\frac{1}{2}$ to $1\frac{1}{2}$ inches, the length being 60 to 90 cm. These pipes are laid on a layer of plain concrete. The junctions are filled with tarred rope and cement and the whole junction is covered with cement from the outside. The whole pipe after being laid down is then half embedded in plain concrete replacing the aggregate of the concrete with solid rubble.

b. Cast Iron Pipes. The inside diameter of these pipes is about 2 to 6 inches and the thickness $\frac{1}{4}$, $\frac{3}{16}$, or $\frac{1}{8}$ inch with a length of 1.9 meters. It is used for rain pipes and in bathrooms for stool connections.

c. Universal Cast Iron Pipes. These pipes are specially used for underground connections.

d. Galvanized Iron and Copper Pipes. These are used for hot and cold water connections and also for steam connections.

e. Lead Pipes. These are used in siphon outlets to the stool and connections from stool to outside sewers.

All sewage is piped to the sewage disposal plant at

"Kanka" where it is turned into fertilizer for the outlying farms.

HIGHWAYS AND ROADS IN EGYPT

Egypt has about 14,900 kilometers of roads and highways of which 2600 kilometers are paved and 12,300 are country and gravel roads. The Federal and Provincial Governments have spent much effort during the past decade and a half paving the main highways and roads that connect the province capitals and county seats. However, there is a five year project for widening and paving of about 1,000 kilometers of country roads and repaving the different bridges and barrages that these roads pass over. This is a six million Egyptian pound project which is expected to be completed during 1951.

There is another project which is going to take the next ten years to complete and will include the widening and paving of three thousand kilometers and the sum of 17 million Egyptian pounds have been set aside for this.

Most of the country roads in Egypt are on the banks of the irrigation and drainage canals for the simple reason that it is easy to keep those roads nicely by spraying them with water whenever they need it. They are about six meters wide and the banks of the canal adjacent to the road are pitched at $2/1$ or $3/2$ according to the type of soil.

The Federal Government is giving special attention to the

desert roads and highways leading to the mining districts of which the following are under construction and repair now:

a. The road between Kena and Koseir on the Red Sea 200 kilometers in length.

b. The road between Idfu and Marsa Alam on the Red Sea 235 kilometers.

c. The road between Mankabad and Oasis of Kharga 215 kilometers in length.

The first two roads lead to the gold, phosphates, marble, zinc and copper mines.

METHODS OF PAVING ROADS IN EGYPT

1. Grouting Method: (See Plate II, Fig. 1) This method has been used in most of the highways in Egypt and it takes the following steps:

a. After leveling the ground to the levels wanted a layer of 25 to 35 cm of limestone is placed according to the kind of soil and its ability to carry weight. A steam road roller of about 15 tons in weight is then rolled over this limestone layer to make it compact.

b. The holes between those large limestones are filled with small pieces of stone about 3-6 cm in diameter and a 12 ton weight steam road roller is used to press these stones in place.

c. Hot asphalt is then grouted through the limestone

using an average of 6 kilograms per square meter.

d. A layer of gravel is spread after grouting and rolled to fill the spaces between the stones.

e. The upper surface of the highway is then painted with a layer of liquid tar $1\frac{1}{2}$ kg per square meter.

f. A layer of 1 cm thickness of coarse sand is spread over the paint and the highway is then ready to be open for traffic.

2. Mix in Place Method - M.I.P. (See Plate II, Fig. 2)

This method is used mostly in the desert roads to reduce expenses because sand is available on both sides of the road and does not need any expense for transportation. The traffic is not so heavy compared with the highways and the other parts of the country.

a. The ground is leveled up without waves or depressions and should have a slight crown in the middle of the road.

b. A gutter is dug on each side after leveling the ground. These gutters are 15x10 cm and are filled with asphalt. Shoulders three meters in width are constructed on both sides.

c. The asphalt mixture is spread all over the highway. At least 10 cm thickness is regular since it will settle down to about 7.5 cm. This asphalt is of the F80 type.

d. Sand used for asphalt mix is pure clean sand or aggregate free from any salts, shells, mica or gypsum. It

should pass through a 1 cm wide mesh sieve before use to remove any large aggregate. A cubic meter of this sand is mixed with 80 to 90 kg of asphalt. However, this ratio differs according to the kind of sand and how much aggregate it contains.

e. The mixture is then rolled by hand rollers and then a steam road roller of about 3 to 5 tons is used over it until the highway is well leveled up.

f. Asphalt of 500/700 type is then painted over the surface after removing the dust using 1.25 kg per square meter and then covered with a thin layer of sand after which the highway is ready for use.

3. Concrete Paving Method (See Plate II, Fig. 3)

a. Foundation.

1. The ground on which the highway is going to be built is rolled with a special kind of steam road roller after sprinkling water to fix the soil in the best compact condition.

2. A layer of sand 3 cm thickness is laid over this compact soil.

b. The upper layer is actually composed of two layers on top of each other.

1. The lower one which is 15 cm of plain concrete having 275 kg of cement per cubic meter of mix. This concrete is poured in slabs 28 m long and one-half the road width. Reinf. bars 40 cm long $\times \frac{1}{2} \phi \times .5$ meters o.c. are

placed in three sides of the slab and projecting 20 cm for bond to the adjacent slab. Expansion joints the full depth of the slab are located on these three sides.

2. The top layer 3 cm in thickness in which the aggregate used is smaller. The concrete used here has 300 kg of cement per cubic meter of mix. Expansion joints placed 4 m apart and 3 cm deep are tooled into this upper layer.

3. All expansion joints are then filled with asphalt. This two layer system has been changed in many main highways into a one layer of 15 cm thickness using asphalt paper instead of the sand layer as waterproofing. The cubic meter of concrete in this case contains 275 kg of cement.

4. Concrete and Asphalt Method (See Plate II, Fig. 4).

a. Foundation:

1. The ground is fixed and rolled as usual to the compactness wanted.

2. Asphalt is laid on this ground using 1 kg per square meter.

3. A 3 cm layer of sand is spread over the asphalt.

b. The Upper Layer:

1. Concrete blocks are placed along both sides of the highway and an 18 cm thick layer of plain concrete having 200 kg of cement is laid over the highway and then tamped with a hand tamping machine.

2. A 6 cm thick layer of asphalt concrete is laid

on top of the preceding layer. This mixture is made up of basalt aggregate, sand, limestone powder and 30-40 asphalt.

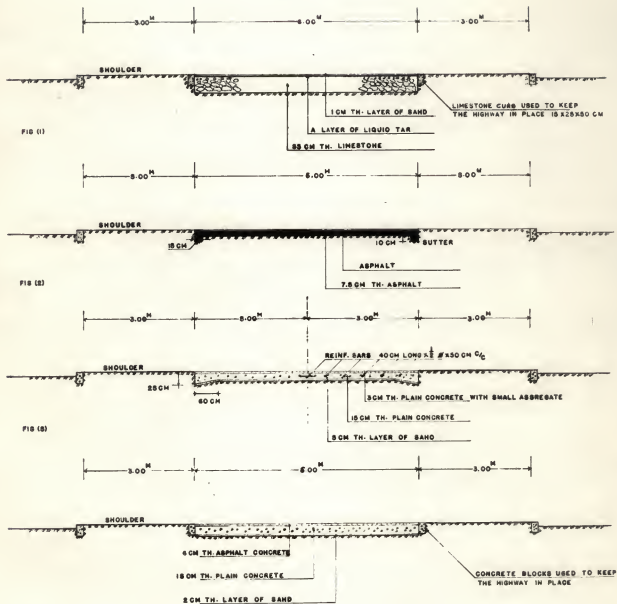
The lengths of highways in Egypt in different years.

Year	: Country road : kilometer	: Paved road : kilometer	: Total kilometer
1913	875	6	881
1918	3794	35	3829
1923	3268	46	4314
1928	5765	181	5946
1933	6426	386	6812
1938	7978	868	8846
1943	9863	1782	11645
1948	12303	2596	14899

EXPLANATION OF PLATE II

Diagrams showing construction of roads.

PLATE II

SCALE $\frac{1}{50}$

LANDSCAPING

Landscaping is one of the most important elements in the design of this residential development. In this development it will be noted that large areas are given over to recreation and parks. Children have access to these areas without crossing any roads in the project. In Egypt where the outdoor life is most important all the year, gardens receive special care and attention. Summer sunshine in Egypt is really bright and the shade produced by the trees in the streets is always appreciated by those who live in such places.

The greater percentage of the area in the parks and gardens is going to be green lawns with evergreen trees, vines and bushes here and there. The different trees used for this project are going to be selected for their wide shade such as:

A. Indialaurel Fig	<u>Ficus nitida</u>
Sycamore	<u>Ficus sycomorus</u>
Jacaranda	<u>Jacaranda ovalifolia</u>
Mueberrey	<u>Morus sp.</u>
Royal Poinciana	<u>Poinciana regia</u>
Willow	<u>Salix sp.</u>
Peppertree	<u>Schinus sp.</u>
Lebbek Albizzia	<u>Albizzia kalkora</u>
Sessoo Rosewood	<u>Dalbergia sissoo</u>
Beakpod Eucalyptus	<u>Eucalyptus rostorata</u>

Lemon Eucalyptus Eucalyptus citriodora

Argan Terminalia Terminalia arjuna

The green lawns are going to be planted with:

Bermuda grass Cynodon dactylon

Manila grass Zoysia matrella

Flowers depend very much upon the individual taste.

Therefore, it will be left to the choice of the tenant of each house to cultivate in his back and front yard the flowers he wishes. Shrubbery and trees are part of the general landscaping and will be planted when the project is built.

Creeping plants are used by many people in Egypt as decoration in the front and back yard, so the planting of these is going to be left to the tenants.

The following flowers and creepers are the most popular in Egypt. The people in this town will probably use many of them.

1. Summer flowers (March to October)

Amaranthos Amaranthus candatus

Feather Cockscomb Celosia cristata

Common Cosmos Cosmos bipinnatus

Sunflower Helianthus annus

Common Zinnia Zinnia elegans

2. Winter flowers (August to March)

Rocket Larkspur Dalphinium ajacis

Common Gypsophila Gypsophila elegans

Rose Sunray	<u>Helipterum roseum</u>
Chinese Pink	<u>Diantus chinensis</u>
Annual Stock	<u>Matthiola incana</u>
Common Nasturtium	<u>Tropaeolum majus</u>
Pansy	<u>Viola tricolor</u>
Garden Verbena	<u>Verbena hybrida</u>

Creepers

Silver Asiaglary	<u>Argyreia splendens</u>
Bignonia	<u>Bignonia jasminoides</u>
Lesser B.	<u>Bougainvillaea glabra</u>
Azores Jasmine	<u>Jasminum azoricum</u>
Common Jasmine	<u>J. grandiflorum</u>
Gowelgourd	<u>Luffa aegyptiaca</u>

EXPLANATION OF PLATE III

Proposed future plan for "Awkaf" Town.

TOWN PLANNING

This residential development which is going to be one of the newest developments in Egypt will be designed in accordance with the latest planning techniques in contrast to what has been done in the past in Egypt. Large green areas have been designed in order to give the residential development a more beautiful appearance and provide the houses with ample fresh air and sunshine besides being an ideal playground for the children. Elimination of roads with only one perimeter road for each neighborhood with the houses arranged around the greens has been the main idea in this project. Each neighborhood is designed in such a way that the through-traffic roads are separated from the neighborhoods by a green belt of 300 feet. The whole town is designed to allow residents to walk in green parks thus foot-paths are arranged all over the residential development.

The green belt around the two neighborhoods is designed as a lovely park with many paths. No cars are allowed inside the neighborhood, however, each house on the main road has its own garage and the houses in the inside have access to four big garages in each neighborhood.

Each of the two neighborhoods of the residential development has the following:

- | | |
|-----------------------|-------------------|
| 1. Houses | 5. Primary school |
| 2. Apartment houses | 6. Swimming pool |
| 3. Shopping center | 7. Tennis courts |
| 4. Four large garages | |

The neighborhood to the north has a social club besides the above facilities. The neighborhood to the south has a Mosque, a secondary school, a football field in addition to the facilities common to both neighborhoods.

The fire station and police department are placed in a central location and occupy both sides of the entrance to the residential development from Cairo. Though the main shopping center, fire station, police department and other facilities in Cairo are about two miles from this town, the author thought it would be better to have these facilities within the residential development. The Islam welfare society hospital is only half a mile south of this town. Nursing of young children is a family project until the child is four years old. Specially trained nurses take care of the children all day long in and outside the houses. At four they are sent to the primary school which will have separate rooms for kindergarten.

SHOPPING CENTER

Each of the two neighborhoods has its shopping center. The shops and stores are located on both sides. A green

area is planned to be in the middle with parking places around it. This shopping center will include the following kinds of stores and shops:

1. Clothing stores for both men and women
2. Grocery stores
3. Restaurants
4. Movie theatres
5. Drug stores
6. Barber shops
7. Laundries and cleaners
8. Photo studios
9. Gasoline stations
10. Jewelry stores
11. Book stores
12. Bakery
13. Beauty shops

FINANCIAL STATEMENT

This residential development is going to take a more or less triangular shape. It is going to occupy a 540 faddan area. The residents of this town are going to be approximately 6,019 in number as calculated from the accommodations given in the houses and apartment houses. The cost of this town is explained below.

Cost of Land:

Area = 540 faddan

Cost = 1000 pounds per faddan

= 1000 pounds x 540 faddan = 540,000 pounds

Cost of Houses:

House No. 1

203 houses x 3700 pounds per house = 750,000 "

44 houses without garages x 3500
pounds per house = 154,000 "

House No. 2

45 houses x 4500 pounds per house = 202,000 "

House No. 3

171 houses x 5050 pounds per house = 940,000 "

Cost of Apartments: (108 apts. per bldg.)

11 Apt. Bldgs. x 280,000 pounds
per Apt. Bldg. = 3,090,000 "

Cost of Mosque = 80,000 "

Cost of Shopping Centers

75,000 pounds per block x 4 blocks = 300,000 "

Cost of Social Club	=	20,000 pounds	
Cost of Primary Schools (2)	=	200,000	"
Cost of Secondary School (1)	=	300,000	"
Cost of Swimming Pools (2)	=	100,000	"
Cost of Tennis Courts (8)	=	1,200	"
Cost of Garages (8 groups) = 268 cars	=	76,000	"
Total		<u>6,754,000</u>	"
Cost of Landscaping at 2% of 6,754,000 pounds	=	135,080	"
Cost of Roads at 2% of 6,754,000 pounds	=	135,080	"
Cost of Sanitation at 2% of 6,754,000 pounds	=	135,080	"
Cost of Police Department	=	40,000	"
Cost of Fire Station	=	<u>40,000</u>	"
Total cost of project		7,239,240	"
Interest at 2% per year		<u>144,785</u>	"
		7,384,025	"

House rent per year:

No. of houses	Rent per mo.	Total rent per month	
247 No. 1	25 pounds	6,200 pounds	
45 No. 2	30 pounds	1,350 pounds	
171 No. 3	30 pounds	<u>5,130 pounds</u>	
Total rent per year 12 mos. x	12,680	=	152,000 "

Apartment rent per year:

Size	Rent/mo.	No. of apts.	Total rent per mo.
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0 BR	15 pounds	36 0 BRx11 Bldgs.	5,950 pounds
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1 BR	20 "	32 1 BRx11 "	6,400 pounds
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2 BR	30 "	28 2 BRx11 "	6,500 pounds
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3 BR	30 "	12 3 BRx11 "	<u>3,430 pounds</u>
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Total rent per year 12 months x	22,280	=	266,000 pounds
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Total rent per year = 152,000 pounds			
+ 266,000 pounds		=	418,000 "

<u>Total cost of project (7,384,025 pounds)</u>			
<u>Total rent per year (418,000 pounds)</u>		=	17.7 years or

an assumed amortization period of 20 years. It is assumed that the total rents from apartments and houses can be used for interest and amortization of the 7,384,025 pound loan. The income received from leases on theatres, gasoline stations, shops and stores of different types will be used for superintendent services, maintenance, depreciation, etc.

DESCRIPTION OF HOUSES
(See Plate IV)

As discussed before, the houses in this project are going to be one of three kinds but each of them will have the following elements in common. However, the number of each of those elements will vary from one type of house to another.

Living Rooms. In this project the living room has been so located that privacy is obtained at the front entrance.

Access is possible to bedroom, kitchen and bath without going through the living room. It is designed to be rectangular in shape but not too long. Wide areas of glass windows have been placed in these rooms to give better light and more enjoyable view of the outside. Fire places, though not very often used in Egypt, have been placed in these living rooms in case they are needed and to serve as a decorative feature.

Bedrooms. The location of the bedrooms should receive first consideration. Adequate passage space should always be ample. The bed should always be placed where no draught can reach it. Sufficient space should be provided for an easy chair, a dresser, and dressing alcove. Bedrooms with only one window have been avoided and windows designed to provide sufficient light for dressing, reading, sewing and for ventilation have been planned. Bedroom closets of ample space, shallow and wide, have been designed to give sufficient storage space.

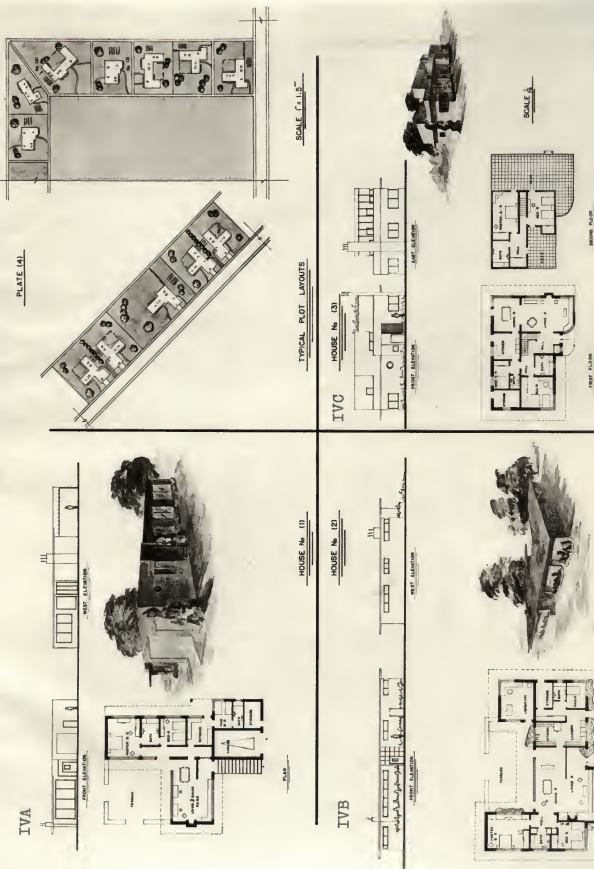
Dining Rooms. In this project all living rooms and dining rooms are combined with the dining area adjacent to the kitchen. In this case an archway or a partial partition will be the dividing line between both rooms.

Kitchens. A relatively narrow kitchen is always the ideal type for saving of steps according to home economics authorities and housewives since equipment ranging along either wall may be reached without too many steps. However, the kitchens designed for this project will vary a little

EXPLANATION OF PLATE IV

Proposed typical house designs for "Awkaf" town.

PLATE IV



since the houses will be used by medium income people where cooks will be hired in many instances. A breakfast table can be furnished in any of the kitchens to provide an agreeable dining corner since these kitchens are more nearly square. Swinging doors between the dining room and the kitchen have been found to be ideal. Each kitchen has rear door for deliveries.

Bathrooms. Bathrooms are not usually located on the front of houses but towards the back or sides. It is always located next or near the bedrooms. The water closet, lavatory and tub should be so grouped that the supply lines and drains are in one wall avoiding the necessity for added expense of maintenance and repair.

Closets and Storage Spaces. A separate closet for each person in the house is a desirable thing to have. Extra closet and storage place has also been planned to hold coats and guest belongings in the living room. Sufficient kitchen cabinets and extra closet space for general storage, luggage, linen and other items are provided. Wide and shallow closets furnished with one shelf above the clothes pole is the standard taken in this project.

Library. There will be a library in house type No. 2. It is away from the noise in the house and overlooking the backyard to give quiet and a comfortable place for reading and reception of business guests. A big luxury desk and comfortable chairs are the main furnishings of this room.

Bookshelves all around the walls to give ample space for books are planned. A place for a safe is also provided to keep money and valuable papers.

SPECIFICATIONS OF HOUSE NO. 1 (See Plates IV and IVA)

This is a one story house the shape of which simulates more or less the letter T. It was assumed that the following materials will be used:

Foundation of plain concrete

Walls of brick

Slabs, beams and columns of reinforced concrete

Northern yellow pine for woodwork is to be used for doors, windows, closets and cabinets. All the inside of the house is plastered with pure gypsum and painted with oil paint.

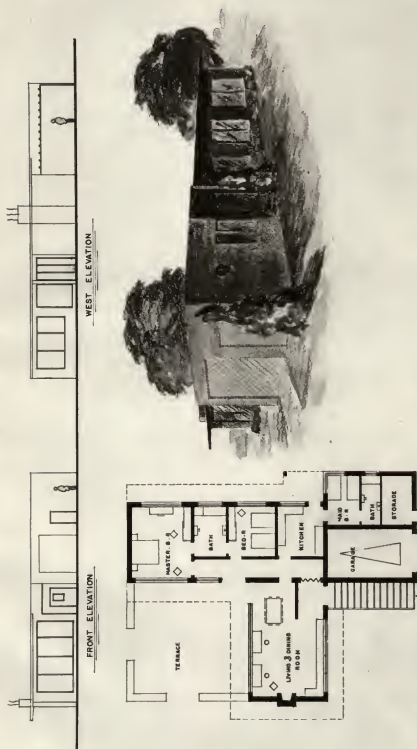
Flooring Required:

1. Living and dining room (Parque flooring)
2. Master bedroom (Oak floor)
3. Bedroom (Oak floor)
4. Bathroom (Marble tile flooring, wainscot of glazed tile)
5. Kitchen (Linoleum floor)
6. Maid's room (Regular wooden floor)
7. Maid's bathroom (Cement tile flooring)
8. Garage (Plain concrete floor)
9. Storage room (Cement tile flooring)

EXPLANATION OF PLATE IVA

Typical House No. 1

PLATE IVA



HOUSE No (1)

SPECIFICATIONS OF HOUSE NO. 2
(See Plates IV and IVB)

This is also a one story building U shape in plan. Materials for building are the same as in House No. 1 except stone is used instead of the bricks for the building walls.

Oak wood is the kind selected for woodwork in this house. Plastering of the inside is the same as in House No. 1.

Flooring Required:

1. Living and dining room (Parque flooring)
2. Master bedroom (Parque flooring)
3. Bedroom (Oak floor)
4. Bathroom (Marble tile flooring, wainscot of glazed tile)
5. Kitchen and laundry (Linoleum floor)
6. Maid's room (Regular wooden floor)
7. Maid's bathroom (Cement tile flooring)
8. Storage room (Cement tile flooring)
9. Library (Parque flooring)

SPECIFICATIONS OF HOUSE NO. 3
(See Plates IV and IVC)

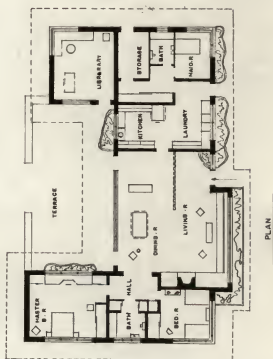
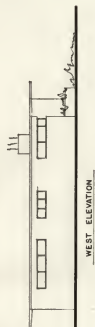
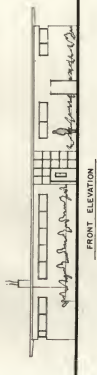
The only two story house of the three types in this project is almost rectangular in shape. Materials to be used are bricks and stones for the walls of the building added to plain concrete in the foundation and reinforced concrete for

EXPLANATION OF PLATE IVB

Typical House No. 2

PLATE IVB

HOUSE No (2)



slabs, beams and columns. Inside plaster made of gypsum and oil paint are going to be used to cover the stones and bricks. Woodwork of oak is the kind chosen for this house.

Flooring Required:

First floor:

1. Living and dining room (Parque flooring)
2. Bedroom (Oak floor)
3. Bathroom (White cement tile flooring)
4. Kitchen (Linoleum flooring)
5. Maid's room (Regular wooden floor)
6. Maid's bathroom (Cement tile floor)
7. Storage room (Cement tile flooring)

Second floor:

1. Master bedroom (Parque flooring)
2. Bedroom (Oak flooring)
3. Bathroom (Marble tile flooring)
4. Two open decks (White cement tile flooring)

APARTMENT HOUSES (See Plates V, VI, VII)

The apartment houses in this project are designed for the middle income people.

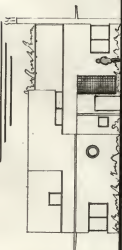
Five of these apartment houses placed are in the north neighborhood and six in the south neighborhood. The apartment buildings are scattered in the green belt around each neighborhood.

EXPLANATION OF PLATE IVC

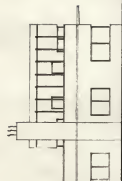
Typical House No. 3

PLATE IVC

HOUSE No (3)



FRONT ELEVATION



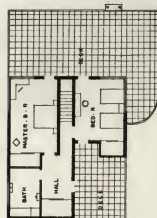
EAST ELEVATION



SCALE $\frac{1}{32}$



FIRST FLOOR



SECOND FLOOR

Each building is composed of nine floors beside the basement and the roof. The number of apartments in each floor varies on different floors as shown in Plate V.

Types of Apartments:

0 Bedroom Apartments	36
1 Bedroom Apartments	32
2 Bedroom Apartments	28
3 Bedroom Apartments	<u>12</u>
Total	108 per building

The ground floor contains no apartments but the following elements are included:

1. Lobby including an office and mail clerkroom
2. Restaurant
3. Kitchen
4. Storage room
5. Social room
6. Games room

The basement contains the air conditioning system and a large storage place. A nursery on each floor for young children besides the greens around the whole building are ideal playgrounds for the younger generation.

Parking areas in front of the apartment houses will provide a space for car storage besides the eight large garages in the two neighborhoods.

Two fire escapes in each building seem to be adequate in case of fire besides the main stairway and elevators.

Balconies and corridors on both sides of the building look over greens and the Nile will give beautiful scenery all the year.

EXPLANATION OF PLATE V

Typical floor plans of Apartment Houses

PLATE V

—PLANES—

TYPICAL FLOOR PLANS

000

3BR



0BR



1BR



2BR



S-1



41-7



1-33

EXPLANATION OF PLATE VI

Part of first floor and main entrance
detail of Apartment House

PLATE VI

PLATE (6)

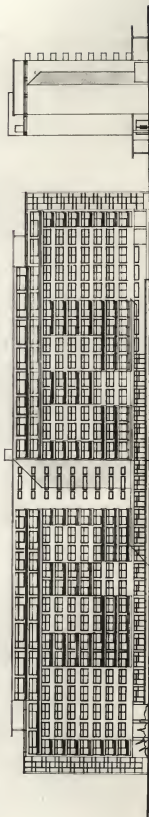
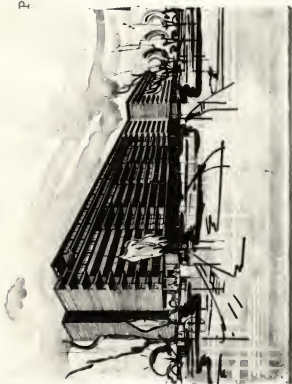


EXPLANATION OF PLATE VII

Basement plan, elevations section and perspective
of a typical Apartment House

PLATE VII

PLATE (7)



THE MOSQUE

Egyptian people are mostly Moslems. Out of the twenty million people that live in Egypt, there are 18,000,000 Moslems and the rest Christians and Jews. One of the first things to be thought about in planning any town of any size in Egypt is certainly the Mosque. This is considered the most outstanding symbol of the prevalence of the Islamic religion in any town.

The people go there five times a day to perform their prayers to God. On Friday noon, the people from all over the town and nearby places gather for special prayers at the Mosque the same way Christians go to their church every Sunday morning. Because of its importance in a town, the Mosque should be one of the better designed buildings. It is always designed after the Islamic type of architecture. This type of architecture was first introduced in Egypt in the year 633 A. D. when the Arabs invaded Egypt. The first Mosque to be built in Egypt was in 641 A. D. The ruins of this Mosque still stand. The Mosque of Ibn Toloon was built in 876 A. D. and is still in good repair. The Mosques are always designed so that those praying will face towards "Mecca" which is southeast of Egypt in Higaz in the Arabian desert. In the "Awkar" town the Mosque is going to be in about the center of the south neighborhood. The Mosque always has the following elements:

1. The Ewan:

This is the main part of the Mosque in which prayers are made. It is a wide hall with the roof carried on columns. A part of the center of this roof is either open or covered with a dome. The "Kebila" is the place where the leader of the prayers stands. It is a concavity in the southeastern wall with Islamic painting and decorations around it and a sentence of the "Koran" on top. On the right hand side of this "Kebila" there is the Manbar where the priest stands and gives his preaching. The Ewan floor is totally covered with carpets over mats.

2. Toilet Rooms:

Before performing any prayer a Moslem should wash his hands, face, arms and feet. A group of toilet rooms and faucets are always in an annex to the Mosque. In this Mosque there is a special entrance to these toilet rooms from the outside to prevent people that have not washed from passing through the main Ewan. The ceiling height in this annex is lower than the Ewan ceiling.

3. The Minaret:

Callings for prayers are done from the top of the minaret five times a day. This is a very tall tower. A spiral type of stairway in the inside provides a means of getting to the top of the minaret. Storage rooms for different items in the Mosque and an office for a priest are also provided for in this design.

Materials used for building this Mosque are:

1. Foundation of reinforced concrete
2. Walls of stone
3. Slabs and beams of reinforced concrete
4. Columns and floors of white marble
5. The manbar, windows and doors oak wood
6. Door steps of white marble

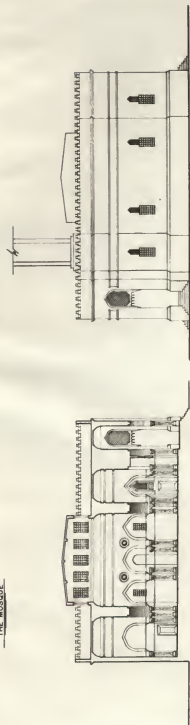
EXPLANATION OF PLATE VIII

The Mosque. Plan, elevations, section and perspective

PLATE VIII

THE MOSQUE

PLATE (B)



EAST ELEVATION

SECTION



1/2 INCHES
1/4 INCHES
1/8 INCHES
1/16 INCHES



FRONT ELEVATION

SCALE

SCHOOLS

Primary and secondary education in Egypt is different from that in the United States. Young children around four years of age are sent to the kindergarten which is of three years' duration. The kindergarten is an annex to a primary school. After finishing kindergarten the children are ready to go to the primary school which is of four years' duration. This is more or less like the grade schools in the United States. Upon graduation from the primary school, boys and girls go to the secondary schools for five years after which they can go for higher college education.

Primary School

There is a primary school with a kindergarten annex in each neighborhood of this residential development. Each one of them has the following rooms:

1. Kindergarten (2 classrooms)
2. Primary (8 classrooms)
3. Administration
4. Gymnasium
5. Cafeteria and kitchen
6. Toilets
7. Services

Secondary School

One secondary school is quite sufficient for this residential development. It is located in the south neighborhood as close as possible to the north neighborhood. It has the following rooms:

1. Classrooms
2. Auditorium
3. Gymnasium
4. Cafeteria and kitchen
5. Administration
6. Toilets
7. Services
8. Science Laboratories
9. Botany Laboratories
10. Domestic Science Laboratories

SOCIAL CLUB

In planning a residential development of this type, a place for recreation and group meetings should always be included. Residents of a place who have no recreational and social activities are always bored and have to look outside their district for such recreation. A social club in a residential development tends to group the people of the district into one large family where help could be offered to

any one when needed and healthy discussions would be encouraged. Moreover, a social club would provide a place where celebrations would be held. It is a well known fact that towns with social centers have better cultured and better educated residents than those that do not have them, due to the fact that facilities for outside speakers on different subjects are encouraged. It is surprising to know how much good the residents of such a district would gain by spending their time in profitable recreation rather than sitting lazily at home in the evenings.

A social center has been designed for this residential development to fulfill the preceding requirements. It is going to be located in the north neighborhood with a large green area round it. Besides providing a large hall for group meetings, dances and celebrations, rooms for different inside games such as billiards, and pingpong are provided. A well equipped kitchen is provided for the larger meetings besides the regular refreshment stand for the daily use. Rest rooms for men and women are also included in this building.

A football field and a swimming pool in the south neighborhood which may be used also by the secondary school students is a part of the outdoor recreation provided by the social club. Four tennis courts in each neighborhood would also provide sports facilities for adults in this residential development.

CONCLUSIONS

The proposed plan for "Awkaf" town was studied on a modern basis giving wide green areas for light, fresh air and beauty to the town. Houses were designed to meet the requirements of the middle class people whose housing problem is increasing in Cairo. Traffic roads were cut to minimum to give the children of this residential development a chance to be safe in their play. Educational, recreational and safety problems were taken into consideration in planning.

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BIBLIOGRAPHY

- (1) Neutra, Richard.
Architecture of social concern in regions of mild climate. Gerth Todtmann Sao Paulo. Brazil.
p. 37-55; 198-212. 1948.
- (2) Carter, Deane G., and Keith H. Hinchcliff.
Family housing. p. 44-108. 1949.
- (3) Lewis, Harold MacLean.
Planning the modern city. Vol. I, p. 1-58; 118-136; 188-214. Vol. II, p. 1-16; 91-117; 168-198. 1949.
- (4) Mumford, Lewis.
The culture of cities. New York. Harcourt, Brace and Company. p. 402-493; 497-508. 1938.
- (5) Stillman, Seymour and Leonard Logan.
Planning 1948 planning problems in large cities. Training the planner. Chicago. American Soc. Planning Officials. p. 57-131; 149-177. 1948.
- (6) Tripp, H. Alker, C. B. E.
Town planning and road traffic. London. Edward Arnold and Co. p. 60-113. 1942.
- (7) McAllister, Gilbert and Elizabeth Glen McAllister.
Town and country planning. London. Faber and Faber, Ltd. p. 132-160. 1942.
- (8) Towndrow, F. E. A.R.I.B.A. editor.
Replanning Britain. London. Faber and Faber, Ltd. p. 84-115. 1941.
- (9) Schwan, Bruno.
Town planning and housing throughout the world. Berlin. Verlag Ernst Wasmuth, G.M.B.H. p. 1-4. 1935.
- (10) McAllister, Gilbert, M.A., Editor.
Town and country planning. 13 Suffolk Street, Pall Mall, London, S.W.1. Vol. VII, p. 80-84. January, 1939, December, 1939.
- (11) Pickering, Ernest.
Shelter for living. New York. John Wiley and Sons. p. 3-7; 15-43; 49-136; 323-362. 1941.

- (12) Bulletin of the American Institute of Architects.
Regional climate analysis I - The Columbus Region.
Regional climate analysis II - Metropolitan New
York and New Jersey. Published bimonthly at the
Octagon, Washington 6, D. C. September and No-
vember. p. 15-36; 23-38. 1949.
- (13) Architectural Record.
F. W. Dodge Corporation. p. 86-93; 94-99; 110-
130. December, 1948.
- (14) Fletcher, Sir Banister, D. Lit. (Lond.).
A history of Architecture on the comparative
method. Charles Scribner's Sons. New York.
p. 934-964. 1948.

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