8.3 Financial Analysis

8.3.1 Objectives

The financial analysis is performed in order to evaluate Alt-B and Alt-C in terms of present value of total expenditure for the project including construction cost, operation and maintenance cost.

8.3.2 Methodology

Financial analysis is to project future financial inflows and outflows arising from an airport operation, both for current and investment expenditures and to determine what financial policies should be adopted to make the airport operation financially viable.

To make the financial analysis, it is firstly necessary to identify the entity which into undertakes the airport operation. The entity of this project would continue in the future to be a local branch of the existing Civil Aviation Authority.

Therefore, the planning function and the financial function are left to the Civil Aviation Authority and the operating entity will not have the function to plan its own financial conditions. Instead, it will receive budgetary allocations for the current and capital expenditures from the Authority.

However, as the Authority is not able to increase the investment without consideration of the revenue, it seems necessary to establish a new system of airport charges which will roughly balance revenue and expenditure. Therefore, it is assumed that the airport is a financially independent organization for convenience sake in this financial analysis.

In this Chapter, the financial analysis is performed based on the current system of airport charges. In PART IV, Chapter 14, study will be made on the influence of increases in the existing airport charges in order to balance revenue and expenditure for the project of the selected alternative.

For project life, refer to Section 8.2.2.

8.3.3 Expenditure

The expenditure of the project consists of the following items:

a) Construction cost for the airport facilities

b) Operation and maintenance costs which consist of maintenance and repair costs of the facilities, personnel cost, and materials and utilities.

It is assumed that the personnel cost will increase at the rate of 3.5% per annum, i.e., the forecast growth rate of per capita GDP in Egypt, since the staff of the entity should receive an increase of their income. The materials and utilities costs are also assumed to increase at the rate of 1.7% per annum, half the forecast growth rate of per capital GDP.

8.3.4 Revenue of the Project

(1) Aircraft Landing Charge

The revenue from the aircraft landing charges is calculated by multiplying the number of landings by type of aircraft, by aircraft landing charge, as shown in Table 8.3.1.

Table 8.3.1 Aircraft Landing Charges by type of aircraft

a) Day - time landing charges	For each ton or part thereof
- first 25 tons	1.1 £E
- following 75 tons	2.2 £E
- weights over 100 tons	3.3 £E
b) Night surcharges :	
A surcharge of 25% is to be charged for night landing.	
i) for winter season (from first of November till end of March) night period is determined from 1801 to 0600 next day. (local time)	
ii) for summer season (from first of April till end of October) night period is determined from 1901 to 0500 next day). (local time)	
c) A minimum landing charge is set at (10) ten Egyptian pounds.	
Source : Aeronautical Information Publication (AIP)	

(2) Air Passenger Service Charge

The revenue from the air passenger service charge is calculated by multiplying the number of international air passengers leaving Egypt by 7 Egyptian Pounds per passenger, as of August, 1984.

(3) Rent on Concessions in Terminal Building

It is assumed in this analysis that only the space for concessions will be rented, and that the concession space in international air terminal will be 5% of the total floor space required for the international air operation and 8% for the domestic. The annual rental charge is set at 90 Egyptian Pounds per sq.m.

(4) Vehicle Parking Charge

Number of vehicles parking is projected by multiplying the forecast number of air passengers by 0.52 vehicles per air passenger (based on data at Cairo airport in 1983). The vehicle parking charge is 25 Piastres per vehicle.

(5) Visitors Facilities Charge

Number of visitors is projected by multiplying the forecast number of international air passengers by 0.25 visitors per international air passenger (based on data at Cairo airport in 1983).

The charge is 50 Piastres per visitor.

8.3.5 Projection of Revenue and Expenditure

Tables 8.3.2 and 8.3.3 show the projected revenue and expenditure of the entity up to the year 2010. It can be pointed out from the projections that although the current revenue can not cover the construction cost, it can sufficiently cover the operation and maintenance costs of the airport(s) in both Alt-B and Alt-C.

Table 8.3.2 Projected Revenue and Expenditure of Alt-B (thousand £E, 1984)

YEAR	Expenditure			Revenue					
	CONST. COST	O & M COST	TOTAL EXP.	LANDING CHARGE	PAX.SVC CHARGE	RENTAL FEE	CAR PARKING	ADMISSION FEE	TOTAL REV.
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	1260.0	0.0	1260.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	2500.0	0.0	2500.0	0.0	0.0	0.0	0.0	0.0	0.0
1988	2700.0	0.0	2700.0	0.0	0.0	0.0	0.0	0.0	0.0
1989	11670.0	0.0	11670.0	0.0	0.0	0.0	0.0	0.0	0.0
1990	30820.0	0.0	30820.0	0.0	0.0	0.0	0.0	0.0	0.0
1991	21170.0	0.0	21170.0	0.0	0.0	0.0	0.0	0.0	0.0
1992	0.0	2200.0	2200.0	750.0	2940.0	150.0	140.0	110.0	4090.0
1993	0.0	2280.0	2280.0	830.0	3360.0	150.0	160.0	120.0	4620.0
1994	0.0	2370.0	2370.0	960.0	3850.0	150.0	180.0	140.0	5280.0
1995	0.0	2460.0	2460.0	1170.0	4410.0	150.0	210.0	160.0	6100.0
1996	0.0	2540.0	2540.0	1230.0	4620.0	150.0	220.0	170.0	6390.0
1997	0.0	2630.0	2630.0	1290.0	4830.0	150.0	230.0	170.0	6670.0
1998	1360.0	2730.0	4090.0	1360.0	5040.0	150.0	240.0	180.0	6970.0
1999	7080.0	2820.0	9900.0	1440.0	5250.0	150.0	250.0	190.0	7280.0
2000	10710.0	2930.0	13640.0	1530.0	5500.0	150.0	260.0	200.0	7640.0
2001	0.0	3210.0	3210.0	1580.0	5710.0	210.0	270.0	200.0	7970.0
2002	4330.0	3320.0	7650.0	1630.0	5920.0	210.0	280.0	210.0	8250.0
2003	0.0	3430.0	3430.0	1680.0	6160.0	210.0	300.0	220.0	8570.0
2004	0.0	3550.0	3550.0	1750.0	6410.0	210.0	310.0	230.0	8910.0
2005	0.0	3680.0	3680.0	1830.0	6650.0	210.0	320.0	240.0	9250.0
2006	0.0	3820.0	3820.0	1920.0	6900.0	210.0	330.0	250.0	9610.0
2007	0.0	3970.0	3970.0	2000.0	7140.0	210.0	350.0	260.0	9960.0
2008	950.0	4130.0	5080.0	2090.0	7390.0	210.0	360.0	260.0	10310.0
2009	950.0	4300.0	5250.0	2200.0	7670.0	210.0	380.0	270.0	10730.0
2010	0.0	4480.0	4480.0	2310.0	7950.0	210.0	390.0	280.0	11140.0

INTEREST RATE = 5. % REV./EXP. RATIO = 0.7017 NPV = -26854.60

INTEREST RATE = 10. % REV./EXP. RATIO = 0.5103 NPV = -28361.00

INTEREST RATE = 15. % REV./EXP. RATIO = 0.3757 NPV = -25111.80

Table 8.3.3 Projected Revenue and Expenditure of Alt-C (thousand £E, 1984)

YEAR	Expenditure			Revenue					
	CONST. COST	O & M COST	TOTAL EXP.	LANDING CHARGE	PAX.SVC CHARGE	RENTAL FEE	CAR PARKING	ADMISSION FEE	TOTAL REV.
1985	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
1986	1150.0	0.0	1150.0	0.0	0.0	0.0	0.0	0.0	0.0
1987	2290.0	0.0	2290.0	0.0	0.0	0.0	0.0	0.0	0.0
1988	2620.0	0.0	2620.0	0.0	0.0	0.0	0.0	0.0	0.0
1989	8730.0	0.0	8730.0	0.0	0.0	0.0	0.0	0.0	0.0
1990	26260.0	0.0	26260.0	0.0	0.0	0.0	0.0	0.0	0.0
1991	22440.0	0.0	22440.0	0.0	0.0	0.0	0.0	0.0	0.0
1992	0.0	2320.0	2320.0	750.0	2940.0	150.0	140.0	110.0	4090.0
1993	0.0	2400.0	2400.0	830.0	3360.0	150.0	160.0	120.0	4620.0
1994	660.0	2490.0	3150.0	960.0	3850.0	150.0	180.0	140.0	5280.0
1995	0.0	2580.0	2580.0	1170.0	4410.0	150.0	210.0	160.0	6100.0
1996	0.0	2660.0	2660.0	1230.0	4620.0	150.0	220.0	170.0	6390.0
1997	0.0	2750.0	2750.0	1290.0	4830.0	150.0	230.0	170.0	6670.0
1998	1860.0	2850.0	4710.0	1360.0	5040.0	150.0	240.0	180.0	6970.0
1999	9290.0	2940.0	12230.0	1440.0	5250.0	150.0	250.0	190.0	7280.0
2000	17070.0	3050.0	20120.0	1530.0	5500.0	150.0	260.0	200.0	7640.0
2001	0.0	3410.0	3410.0	1580.0	5710.0	210.0	270.0	200.0	7970.0
2002	4330.0	3520.0	7850.0	1630.0	5920.0	210.0	280.0	210.0	8250.0
2003	0.0	3630.0	3630.0	1680.0	6160.0	210.0	300.0	220.0	8570.0
2004	0.0	3750.0	3750.0	1750.0	6410.0	210.0	310.0	230.0	8910.0
2005	570.0	3880.0	4450.0	1830.0	6650.0	210.0	320.0	240.0	9250.0
2006	0.0	4020.0	4020.0	1920.0	6900.0	210.0	330.0	250.0	9610.0
2007	1650.0	4170.0	5820.0	2000.0	7140.0	210.0	350.0	260.0	9960.0
2008	0.0	4330.0	4330.0	2090.0	7390.0	210.0	360.0	260.0	10310.0
2009	0.0	4500.0	4500.0	2200.0	7670.0	210.0	380.0	270.0	10730.0
2010	0.0	4680.0	4680.0	2310.0	7950.0	210.0	390.0	280.0	11140.0

INTEREST RATE = 5. % REV./EXP. RATIO = 0.6943 NPV = -27818.50

INTEREST RATE = 10. % REV./EXP. RATIO = 0.5197 NPV = -27308.50

INTEREST RATE = 15. % REV./EXP. RATIO = 0.3921 NPV = -23431.30

8.3.6 Comparison and Evaluation of the Alternatives

Table 8.3.4 shows present values (at 1984) of the expenditure and revenue, and net revenue discounted at an annual rate of 13% (the current prime rate in Egypt).

Table 8.3.4 Present Values

(Unit: Million £E, 1984)

Items \ Alternatives		Alt-B	Alt-C
Present value	Expenditure	46.2	44.7
	Revenue	19.6	19.6
	Net Revenue	-26.6	-25.1

Table 8.3.5 shows the present value of costs of the project for Alt-B and Alt-C. Comparing Tables 8.3.4 and 8.3.5, the expenditure for airport operation and maintenance can be covered by the current aircraft landing charges and other charges.

It is, however, considered that the current airport charges are not sufficient to cover the total costs including the construction, operation and maintenance for the airport development.

Table 8.3.5 Present Value of Cost

(Unit: Million £E, 1984)

Items \ Alternatives	Alt-B	Alt-C
Construction Cost	38.0	36.1
Operation and Maintenance Cost	8.2	8.6
Total	46.2	44.7

The above table shows that the present value of the construction cost in Alt-C is 1.9 million Egyptian Pounds lower than Alt-B, because the parallel taxiway of the new airport is to be constructed in Phase II development.

On the other hand, the operation and maintenance costs in Alt-C are 0.4 million Egyptian Pound higher than Alt-B, because Alt-C requires duplicated operation and maintenance costs for both new and Nozha airport.

The present value of the total costs including construction, maintenance and operation in Alt-C is 1.5 million Egyptian Pounds cheaper than Alt-B. The higher operation and maintenance costs in Alt-C are considered to be offset by the lower present value of the construction cost.

From the viewpoint of the least expenditure in present value, Alt-C is recommended for the further study in PART IV Airport Master Plan for the selected scheme.

CHAPTER 9 COMPARATIVE EVALUATION OF ALTERNATIVE PLANS

CHAPTER 9 COMPARATIVE EVALUATION OF ALTERNATIVE PLANS

9.1 General

The three alternative airport development concepts as defined in Section 3.8 were assessed and evaluated analytically based on the various considerations in order to determine the most suitable concept for the future airport development in Alexandria region.

Table 9.2.1 shows the comparative evaluation of the alternatives. In this table, "x" indicates greater disadvantages or poorer performances.

As a result, Alt-C (Nozha airport to be utilized for a domestic airport with a little investment after the improvement works during the transition period, and a new airport to be constructed for international demand and also for relatively small domestic demand generated by New Ameriyah city and Northwest Coast Development area) is recommended for the reasons discussed in the subsequent section 9.2.

The following policy for the long-term airport development by Egyptian Civil Aviation Authority (ECAA) are taken into considerations for the recommendation of Alt-C.

- ECAA is planning the construction of several international trunk airports other than Cairo airport, in order to cope with the increasing demand and to improve the recent congestion in Cairo international airport. Construction of an international airport in Alexandria region is one of the projects and the international airport in Alexandria region is considered to be a northern gateway to Egypt.
- Luxor international airport is designated as an alternate airport of Cairo international airport. Luxor airport is not, however, willingly used as an alternate by foreign carriers for the following reasons:
    - The alternate distance from Cairo to Luxor is about 270 NM (500 km) and this distance is not appreciated.
    - Availability of hotel accommodation is low.

In this regard, ECAA wants an alternate airport in Alexandria region, within short alternate distance and with higher availability of hotel accommodation.

- ECAA has been planning construction of a new international airport in Ameriyah area from 1970's. ECAA expects that the construction of a new international airport, which has not yet been realized, will surely contribute to the Northwest Coast Development area as a basic infrastructure.

9.2 Overall Comparison

Three alternative airport development concepts were comparatively evaluated, and tabulated in Table 9.2.1. The superiority of Alt-C is explained in the following paragraphs:

(1) Economy in construction Cost

The construction cost for Alt-A (Redevelopment of Nozha airport) will require 75.9 million Egyptian Pounds and 23 million Egyptian Pounds in Phase I and Phase II respectively. This cost is 13.3 to 18.5 million Egyptian Pounds higher in Phase I, and 7.4 to 13.6 million Egyptian Pounds higher in terms of total construction cost than other alternatives.

The main reason for this is that the reclamation of the former marine airport and the replacement of subgrade soil under the pavement by sand in order to minimize pavement overlay works after the construction are very costly.

In the comparison of the total construction cost for civil works only, Alt-A will require 40 to 50 percent higher cost than the other two alternatives, which cost was estimated on the conditions that Nozha airport will be closed and the civil works will be made in the daytime. Higher construction cost will be required for such civil works as pavement overlay if the construction would be made at night without interrupting the airport operation.

On the other hand, Alt-B will require 85 million Egyptian Pounds including Phases I and II development while Alt-C will require 88 million Egyptian Pounds. Thus, Alt-B is about 3 million Egyptian Pounds cheaper than Alt-C.

Alt-C is, however, 2 million Egyptian Pounds cheaper than Alt-B in terms of the present value (as of 1984, discounted by the prime-rate (13%) of Egypt). This is because the Phase I investment in Alt-C is about 5 million Egyptian Pounds cheaper than Alt-B. The main reason is that Alt-B will require the construction of a complete parallel taxiway in Phase I while Alt-C will not require the complete parallel taxiway in Phase I, because the major domestic traffic will be accommodated in Nozha airport.

(2) Construction Considerations

Nozha airport was constructed in 1945 by reclamation from Lake Maryut and the airport elevation is 3.35 m below mean sea level.

The soil investigation indicates that the reclaimed area is generally formed by two strata, i.e., the upper stratum of about 6 m thick is of silty clay (N = 0 to 3) and the lower stratum of stiff clay with N value of 14 to 26. The airport elevation is about 1 m lower than the water level of Lake Maryut and the former marine airport, and water is drained by the pumps in order to lower the underground water table.

For these reasons, the pavement and buildings have been suffering from the residual settlement.

Alt-A will require the following countermeasures for the residual settlement.

a) The concrete pile foundation is required for the passenger terminal building and control tower.

b) The replacement of weak soil by sand is required under the pavement area.

c) On the runway extension area (the former marine airport), very soft clay (N value of 0 to 2) of 6 m thick lies below the ground. The improvement of subgrade soil is required and the improvement by sand drain is planned in order to avoid an adverse uneven settlement due to the consolidation of the foundation by movement of wide body jet aircraft.

On the other hand, the soil conditions of the new airport site are better than Nozha airport because the site is formed by solid silt and/or clayey soil (N value of 20 to 80) which is covered by soft silty clay.

Hence, Alt-A needs many countermeasures which require higher cost and are not found in Alts-B and C.

(3) Aircraft Noise and Compatibility with Land use

Night flights from 22:00 to 6:00 A.M. constitute at present 25 percent of the daily flights at Cairo international airport. It can be considered that an international airport fully developed in Alexandria region will continuously operate 24 hours daily as an international airport and as a gateway to Egypt. Many night flights will be operated at the international airport developed in Alexandria region.

Nozha airport is located near the township of Alexandria city and has a potential to cause aircraft noise influence to the airport neighbourhood. In Alt-A, it was estimated that about 600 ha of adjacent area (excluding lake Maryut and the former marine airport) will be covered by the noise contour of WECPNL 70 in the year 2000 and about 60 ha of the residential area will suffer from serious aircraft noise influence in the future. Although noise problem might not arise soon considering the present situation in Egypt, serious noise problems may arise in the future from the airport neighbourhood which might protest the airport operation and the further development of the airport, and consequently require the airport to be replaced, otherwise an exorbitant compensation will be requested for the airport operation.

For Nozha airport in the development concept of Alt-C, the area influenced by the aircraft noise will greatly be reduced to smaller area because only domestic flights will be operated. Furthermore, the area affected by the aircraft noise will be very limited area if Comprehensive Plan Alexandria 2005 (Alexandria Governorate) will be realized and the surrounding area of Nozha airport will be changed to industrial and green area.

Many obstacles protrude the obstacle limitation surfaces of Nozha airport at present and obstacles to runway 04/22 should be removed as soon as possible, in order to ensure safe aircraft operations. At the same time, height restrictions, which will control and limit the height of buildings and structures, etc., below the obstacle limitation surfaces, will be very necessary to enact.

For the new airport development, there is no densely populated area and no aircraft noise problem is foreseen. By the Comprehensive Plan Alexandria 2005, however, a residential area has been allocated between Lake Maryut and the planned road (connecting New Ameriyah city to the existing Desert Road).

The residential area will be covered by the noise contour of WECPNL 70 in the year 2000. However, the area can be easily changed to other land use such as industrial area, agricultural area, etc.

In this regard, the new airport development concept has greater advantage in that such arrangements can be positively planned:

- Coordination with land use in the airport vicinity
- Harmonization of the airport with the surrounding area within the framework of the regional development in Ameriyah city and Northwest Coast

Development area

- Establishment of a regional plan with mutual benefit for both sides.

(4) Compatibility with NW Coast Development

The center of industrial activities will gradually move to the west from Alexandria city in the future. New Ameriyah city located about 10 kilometers west of the new airport will contain free zone, warehouses and various kind of industries. In order to promote industrial business activities and to attract investors into this area, not only a seaport, but also an airport is required in the vicinity area as basic infrastructure. Although it is difficult to speculate the future industrial structure in this region based on the present situation, it is at least necessary to take into account that the air transport will become closely related with the industry and play an important role for the regional economic development if the airport is conveniently located to the user. In this regard, the new airport is superior to Nozha airport because both the new airport and its vicinity can be developed with a lot of flexibility in harmony with each other while Nozha airport has little possibility to be in harmony with the present community in the future because of its location encompassed by the township.

(5) Airport Accessibility

Nozha airport is located 7 km from Alexandria city center and about 50 km from Northwest Cost Development area and New Ameriyah city. In Alt-A, the accessibility from Alexandria city is very good but poor from Northwest Coast Development area and New Ameriyah city.

The new airport is located 45 km from Alexandria city and 10 km from Northwest Coast Development area. In Alt-B, the accessibility from Northwest Coast Development area is good but poor from Alexandria city.

In Alt-C, domestic passenger, (for which airport access time is considered more important than that for international passengers) generated from Alexandria city can use Nozha airport and domestic passenger generated from Northwest Coast Development area and New Ameriyah city can use the new airport with the shortest access distance for both passenger.

The existing highway connecting Alexandria to Mersa Matruh is 2 - lane. The expansion to 4 lanes is underway at present and it will be completed by the early 1990s'. Also there is a plan to construct a new road connecting the existing Desert Road to New Ameriyah city. After completion of those trunk roads, they can be used as a part of the airport access road connecting to Alexandria in 30 minutes.

Hence, Alt-C is the best one in airport accessibility.

(6) Aircraft Operational Considerations

A danger area HE/D12 "El Maamura", a sector of a circle centered 311740N, 300200E, radius 20 km between directions 305 and 035 , is established at the northeast end of Nozha airport.

Aircraft operations procedures should be established avoiding the danger area and also the township (northwest of Nozha airport) of Alexandria city.

For the new airport site, no constraints for aircraft operations are found, but close coordination with the adjacent military airport will be required. (ASR/SSR equipment is planned in the new airport for this purpose.)

Alt-B is superior to Alt-A from the view point of aircraft operation, and Alt-C has both characteristics.

(7) Airport Operation and Maintenance

Alt-A is the worst one in airport operation and maintenance for the following reasons:

a) Redeveloped airport on weak foundation will suffer from uneven settlement in the future, although extent of the settlement is greatly reduced by the sand drain method. More frequent maintenance works will be required for the pavement.

b) Pumping up of water to outside the airport will always be required in order to lower the ground water table.

c) Cleaning of weeds will also be frequently required because of the damp ground.

d) Complete closure of the airport operation or night works stopping night flights will be required in maintenance works such as pavement overlay of runway.

e) Airport operation has a potential to require compensation, sound-proof construction or relocation of houses, schools, etc.

Alt-B is good one in terms of operation and maintenance cost, but still has a disadvantage in the above item d).

In Alt-C, two airports are simultaneously operated and either airport can alternate with the other one when closure of airport operation is required, thus Alt-C has a flexibility which can not be expected in other alternatives.

However, the disadvantages of Alt-C is that operation of two airports requires duplicated facilities, manning, cost for operation and maintenance, etc.

For example, airport staff (ECAA) for operation, maintenance and administration will be 270 persons in Phase I for Alts-A and B but increase to 330 persons for two airports for Alt-C. The preliminary financial analysis for the comparative evaluation of the alternatives indicates that the operation and maintenance cost for Alt-C requires 0.4 million Egyptian Pounds higher (present value discounted by 13 percent of Egyptian prime rate) than Alt-B.

Alt-C is, however, 1.5 million Egyptian Pounds cheaper than Alt-B in terms of the present value of all expenditures including investment, operation and maintenance in Phases I and II.

Hence, higher operation and maintenance cost of Alt-C is compensated by its lower investment cost.

(8) Effective Utilization of Nozha Airport

The greatest advantage of Nozha airport is that it is located near from Alexandria city center, thus the access time is very short, and that there are existing airport facilities at present. The continuous operation of Nozha airport will be realized by considering positively the above advantages.

On the other hand, there is a possibility in Alt-B that the existing airport property area of about 350 ha can be sold for other land uses and this profit can be used for part of the new airport construction cost.

In terms of use, Nozha airport can be used for VIP or general aviation airport because of its good accessibility from Alexandria city. Regardless of the airport development alternatives, Nozha airport will be expanded as the improvement works during the transition period to the capacity to accommodate the demand up to the end of 1991 (650,000 annual passenger). After these improvement works, Nozha airport can fully accommodate the target domestic demand in Phase II (730,000 annual passenger) with a little investment such as pavement overlay of at least 3 cm, for the runway, taxiways and apron, expansion (about 2,000 sq.m) of the passenger terminal building, etc. In this regard, Nozha airport can be used as a domestic airport in Phases I and II, which is the concept of Alt-C. In this case, domestic demand generated from Northwest Coast Development area and New Ameriyah city can be accommodated by the domestic flights establishing between the new airport and Cairo.

Alt-C has also a great flexibility that Nozha airport can easily be replaced to the new airport when the airport facilities become obsolescent, or when unexpected demand arises and large-scaled expansion works are required. In this case, the existing airport property can be sold for other land uses.

(9) Expansibility

Although Nozha airport has adequate space to accommodate the forecast demand up to 2010, it is difficult to cope with unexpected passenger and freight traffic in connection with Northwest Coast Development because of its limited land and the existence of the cross-wind runway. The new airport has an ample space along the runway and is much more flexible with regard to terminal facilities and any other future possible requirements including airport industrial planning as necessary.

Hence, Alts-B and C are superior to Alt-A, and Alt-C is recommended because the new airport of Alt-C has a great expansibility as discussed above and Nozha airport has flexibility to move to the new airport when unexpected increases in passenger and freight traffic arise.

(10) Economic Analysis

Preliminary economic analysis has been performed in this Chapter in order to analytically evaluate the three alternatives and also to study the preliminary result whether or not the selected alternative is economically feasible.

The result is that Alt-C shows the highest EIRR (Economic Internal Rate of Return) of 12.3 percent while Alt-B is 12.0 percent, the second highest one. Alt-A is not recommended whereas its EIRR is 11.0 percent, which is lower than 12 percent of Egyptian opportunity cost of capital and it is not considered to be economically feasible.

Although the EIRR is not so different between Alts-B and C, Alt-C has the greater advantage that Alt-C is 5.6 million Egyptian Pounds cheaper than Alt-B in the first investment (Phase I), and thus contributes to the national economy of Egypt by the reduction of the first investment, and that Alt-C has more flexibility to change with air traffic demand in the future.

Table 9.2.1 Comparison Table of Alternative Airport Development Concepts

Comparison Item \ Alternative Airport Development Scheme	ALT. - A Nozha Airport (International and Domestic)	ALT. - B New Airport (International and Domestic)	ALT. - C Nozha Airport and New Airport	
			Nozha Airport (Domestic)	New Airport (International and Limited Domestic)
I. Aerodrome Data				
1. Airport Name (Tentative)	NOZHA AIRPORT	NEW ALEXANDRIA INTERNATIONAL AIRPORT	NOZHA AIRPORT	NEW ALEXANDRIA INTERNATIONAL AIRPORT
2. Airport location	31° 11' 00" N 29° 56' 45" E	30° 55' 00" N 29° 43' 00" E	31° 11' 00" N 29° 56' 45" E	30° 55' 00" N 29° 43' 00" E
3. Airport elevation	- 3.35m (-11ft)	42.0m (138ft)	- 3.35m (-11ft)	42.0m (138ft)
4. Airport reference temperature	30.6°C	30.6°C	30.6°C	30.6°C
5. Aerodrome reference code	4 E	4 E	4 D	4 E
6. Runway designation number	Runway 04/22 Runway 18/36	Runway 14/32	Runway 04/22 Runway 18/36	Runway 14/32
7. ILS Category	Category I	Category I	Non precision	Category I
8. Runway dimension	1,440m x 30m 3,000m x 45m	3,250m x 45m	1,440m x 30m 2,200m x 45m	3,250m x 45m
9. Airport property area	350 ha	1,300 ha	350 ha	1,300 ha
II. Aircraft Operational Considerations				
1. Obstacles	x - RWY 04 Approach Surface: Trees and lighting poles to be removed - Inner Horizontal Surface: Chimneys and antenna - RWY 18 Approach Surface: Many buildings, trees, mosque, for instrument approach.	None	x - RWY 04 Approach Surface: Trees and lighting poles to be removed - RWY 18 Approach Surface: Many buildings, Trees, mosque, for instrument approach.	None

Table 9.2.1 Cont'd

Comparison Item \ Alternative Airport Development Scheme		ALT. - A Nozha Airport (International and Domestic)		ALT. - B New Airport (International and Domestic)		ALT. - C Nozha Airport and New Airport	
						Nozha Airport (Domestic)	New Airport (International and Limited Domestic)
2. Aircraft operations procedures	x	- Establishment of aircraft operations procedures will be limited to southern side due to the township on the north side. - Establishment of ILS RWY 22 approach is difficult due to danger area HE/D12.		- No restriction, except circling area to be limited to the east side.		- Establishment of aircraft operations procedures will be limited to southern side due to the township on the north side.	- No restriction, except circling area to be limited to the east side.
3. Air space utilization	x	- Danger Area HE/D12		- Close coordination with Air Force to be necessary for air space use.	x	- Danger Area HE/D12	- Close coordination with Air Force to be necessary for air space use.
4. Cross-wind coverage		- Small aircraft requires both two runways.					
			13kt / 20kt		13kt / 20kt		
		RWY 04/22	92.6% / 99.7%	RWY 14/32	96.3% / 99.4%	Same as ALT.-A	Same as ALT.-B
		RWY 18/36	94.5 / 99.4				
		Total	97.2 / 99.9				
5. Main approach and take-off runway		Runway 04		Runway 32		Runway 04	Runway 32
Main Disadvantages	x x x	- Strict control of obstacles (Height restrictions) to be mandatory - Danger area HE/D12 and township limit aircraft operations procedures		- No problem	x	- Strict control of obstacles (Height restrictions) to be mandatory	- No problem
III. Airport Development Considerations							
1. Distance from Alexandria city and North West Coast Development area		- 7km from Alexandria station - About 50km from North West Coast		- 45km from Alexandria station - About 10km from North West Coast Development Area - Near from the center of industrial business area		- Same as ALT.-A(7km from Alexandria city, where is major market for domestic flight.)	- Same as ALT-B

Table 9.2.1 Cont'd

Comparison Item \ Alternative Airport Development Scheme		ALT. - A Nozha Airport (International and Domestic)		ALT. - B New Airport (International and Domestic)		ALT. - C Nozha Airport and New Airport	
						Nozha Airport (Domestic)	New Airport (International and Limited Domestic)
2. Airport accessibility from/to Alexandria from/to Northwest Coast		- Good	x	- Further for both International and Domestic Passengers		- Good	- Further for International Passengers
	x	- Further for both International and Domestic Passengers		- Good		- Further, but for a part of dom. pax from/to NW coast	- Good
3. Expansibility	x	- Terminal area is limited to accommodate				- No ploblem (No large-scale expansion of terminal area and no runway extension to be required for the domestic demand.)	- No restrictions
	x	unexpected demand.					
	x	- Further extension of the runway requires relocation of desert		- No restrictions			
4. Others		road, drinking water canal, and reclamation.	x	- Close coordination between ECAA and military to be necessary for airport development.	x	Possible to replace to the new airport when large-scale development is required.	- Close coordination between ECAA and military to be necessary for airport development.
Main Disadvantages	x	- Longer access distance from North Coast Development Area.	x	- Longer access distance from Alexandria city.		- The best airport accessibility due to short distance to demand center: Nozha (Alexandria city) New Airport (New Ameriyah city, Northwest Cost Development area)	
	x	- Lesser expansibility for unexpected future demands.	x				
IV. Operation and Maintenance of Airport						- Either airport can alternate with the other in case of emergency, accident, maintenance work of air side facilities, etc.	
1. Countermeasure for the airport closure.	x	- No alternate airport in the vicinity.	x	- Same as ALT.-A			
2. Staff required for airport operation and maintenance (persons)		- Phase I: 270 Phase II: 360		- Phase I: 270 Phase II: 360	x	Phase I: 100 Phase II: 100	Phase I: 230 Phase II: 300
3. Others	x	- Weak foundation and airport elevation below sea level require higher operation and maintenance cost.			x	- Operation of two airports requires duplication of airport facilities, staffs, cost for operation and maintenance, etc.	
V. Social Considerations							
1. Aircraft noise influence	x	- Area influenced by aircraft noise (more than WECPNL 70): 600 ha. including 60 ha. of residential area.		- None.	x	- Less aircraft noise influence compared to ALT.-A due to small domestic air traffic.	- None.
	x						

Table 9.2.1 Cont'd

Alternative Airport Development Scheme / Comparison Item	ALT. - A Nozha Airport (International and Domestic)		ALT. - B New Airport (International and Domestic)		ALT. - C Nozha Airport and New Airport		
					Nozha Airport (Domestic)		New Airport (International and Limited Domestic)
2. Land use		- Many houses and small buildings exist within contour line of WECPNL 70 and sound proof construction or relocation might be required in the future.		- Coordination with other projects to be necessary.		- Same as ALT	- Same as ALT-B
	x	- Restrictions of height and smoke to be given to the industrial development area.		- Land use regulation to be established.			
		- Strict land use regulation being compatible with the airport surrounding area to be planned.		- Possible to sell the existing airport property (Nozha) area for other land uses.			
3. Compensations	x	- Marine club, boat house, fish farm, road, drinking water canal, lighting poles, house to be compensated.		- None.		- None. (No runway extension)	- None.
Main Disadvantages	x	- High compensation cost to be necessary for aircraft noise measures.		- No problem	x	- Compensation for air craft noise might be required in the future. Possible to move to the new airport when serious noise problem arises.	- No problem.
	x	- More facilities to be compensated.					
	x	- Restriction of building height, land use regulation and its excution are first priority.					
VI. Constructional Considerations							
1. Topographical and geological conditions	x	- Runway extension involves reclamation from the former marine airport (24 ha) and soil improvement (replacement and sand drain).	x	- Longer runway length to be required.	x	- No runway extension	- Same as ALT.-B
			x	- Maximum runway slope of 1.2% is applied for central portion due to the existing terrain.			

Table 9.2.1 Cont'd

Alternative Airport Development Scheme / Comparison Item	ALT. - A Nozha Airport (International and Domestic)		ALT. - B New Airport (International and Domestic)		ALT.- C Nozha Airport and New Airport		
					Nozha Airport (Domestic)		New Airport (International and Limited Domestic)
	x	- Additional pump station to be required. - Approach lighting system to be installed in the lake.		- Existing terrain call for large scale of earth work. (1 million cu. m. of cut)			
2. Special measures to be taken		- Land acquisition of 5.2 ha to be required. - Establishment of obstacle limitation surfaces and adjustment of land use in adjacent area to be required, prior to the runway extension. - Diversion of the drinking water canal.		- Expansion of the airport property area presently reserved to be necessary.		- None.	- Same as ALT. - B
Main Disadvantages	x x x x	- Reclamation and soil improvement to be necessary for RWY extension. - Longer construction period will be required to avoid a conflict with the existing air traffic.	x	- Existing terrain calls for large scale earth work and steep gradient but less than the allowable maximum slope. - Longer runway length to be required.	x x	- No problem.	- Same as ALT.-B.

Table 9.2.1 Cont'd

(Unit: Million Egyptian Pounds)

Alternative Airport Development Scheme / Comparison Item		ALT. - A Nozha Airport (International and Domestic)			ALT. - B New Airport (International and Domestic)			ALT. - C Nozha Airport and New Airport		
								Nozha Airport (Domestic)	New Airport (International and Limited Domestic)	
3. Construction Cost (Preliminary Estimate)		Phase-I	Phase-II	Total	Phase-I	Phase-II	Total	Phase-I	Phase-II	Total
(1) Land Acquisition and Compensation Cost		4.6	-	4.6	-	-	-	-	-	-
(2) Civil Works		31.2	5.1	36.3	20.9	3.1	24.0	16.8	8.5	25.3
(3) Building and Equipment Works		21.9	9.1	31.0	21.4	8.9	30.3	20.6	8.7	29.3
(4) Navaids Works		6.1	3.8	9.9	9.1	5.6	14.7	9.4	7.7	17.1
(5) Utilities Works		3.4	2.6	6.0	3.8	2.6	6.4	3.6	2.9	6.5
(6) Special Service Facility Works		1.8	0.3	2.1	1.7	0.4	2.1	1.7	0.4	2.1
Total of Construction Works		69.0	20.9	89.9	56.9	20.6	77.5	52.1	28.2	80.3
Contingency (10%)		6.9	2.1	9.0	5.7	2.1	7.8	5.3	2.8	8.1
GRAND TOTAL	x	75.9	23.0	98.9	62.6	22.7	85.3	57.4	31.0	88.4
4. Economic Internal Rate of Return (EIRR) (* Preliminary economic analysis)	x	Low (11.0 Percent*)			Middle (12.0 Percent*) (In case of sale of the existing property: 13.1 Percent)			High (12.3 Percent*)		

9.3 Considerations on Design Conditions for Preparation of the Subsequent Master Plan

9.3.1 General

The comparative evaluation of the three alternative airport development schemes resulted in the selection of Alt-C as reported in the previous Sections 9.1 and 9.2.

After the selection of Alt-C as the most suitable airport development scheme, it is of vital importance to further consider the planning conditions of Alt-C in order to refine it for the airport master plan within the extent that the basic concept for Alt-C should not change and the order of costs of alternatives as evaluated in Chapter 8 (the present value of the total expenditure of Alt-C is the lowest) should not change among the three alternatives.

The major refinement will be as follows:

In Alt-C, the runway itself was located just inside the reserved area and the runway longitudinal slope was designed to be 1.2% (within the limit of ICAO standards) in the central portion of the runway in order to perform the minimum cut and fill operations of earth work volume.

The consideration can be given:

i) To locate the runway and navigation aids completely within the reserved area, and

ii) To reduce the runway slope as much as possible.

The airport layout (basic configuration of runway, taxiways and apron) was planned to meet the forecast air traffic at each phase of development in compliance with the basic requirements of the relevant standards and regulations.

It will, however, be important to consider the further expandability of the airport facilities in order to cope with an unexpected increase of air traffic in the future.

Such considerations are:

iii) To separate the apron area from the parallel taxiway to allow more expandability for future expansion of the apron, and to facilitate a possible use of the taxiway for emergency landing and take-off, and

iv) To consider the possibility of high speed exit taxiways instead of the rectangular exit taxiways.

The following sections indicate the studies on the above-mentioned considerations in order to establish the design conditions for the following AIRPORT MASTER PLAN in PART IV.

9.3.2 Runway Location and Separation

The runway of the new airport was originally oriented N 142° E in parallel with the adjacent military runway with a separation of 1,900m and the southern threshold of the runway was staggered 1,925m south from the southern threshold of the military runway. (Refer to Fig. 7.4.1.)

In order to locate the runway and navigation aids (approach lighting system and a middle marker of ILS) completely inside the reserved area, the runway should be moved at least 700m northwestward maintaining the above-mentioned orientation of the runway.

However, the cut and fill volume of earth work will increase much more due to the undulating terrain as the runway is moved northwestward.

Accordingly, the runway should be located as far southeast as possible in order to minimize the earth work volume. Thus, the runway is located 700m northwest of the original location and the southern threshold, 1,225m south from the southern threshold of the military runway. In this longitudinal location, the earth work volume will be further minimized if the runway is laterally separated 2,000m from the military runway.

As a result, the runway is located 700m northwestward from the original location in parallel with the military runway with a separation of 2,000m. The revised location of the runway is shown in Fig. 9.3.1.

Fig. 9.3.1 Revised Locationof the Runway

9.3.3 Earth Work Volume and Runway Slope

The runway slope of the new airport was originally established to be longitudinally 1.2% in the central portion, and 0.19% and 0.8% for the southern and northern quarter of the length of the runway respectively. (Refer to Fig. 7.5.1.)

These runway slopes were determined, in compliance with the ICAO requirements, to yield the minimum earth work volume of approx. 1 million cu.m in the undulating terrain.

It is possible to reduce the runway longitudinal slope if the earth work volume of cut and fill operation is increased. A few trials have been performed to reduce the longitudinal slope to a practically acceptable one.

As a result, the runway longitudinal slope is planned to be 0.75% overall and 0.86% maximum in the central portion (1,450m length). This plan is shown in Fig. 9.3.2 and requires about 2.1 million cu.m of earth work volume and 8.4 million Egyptian Pounds.

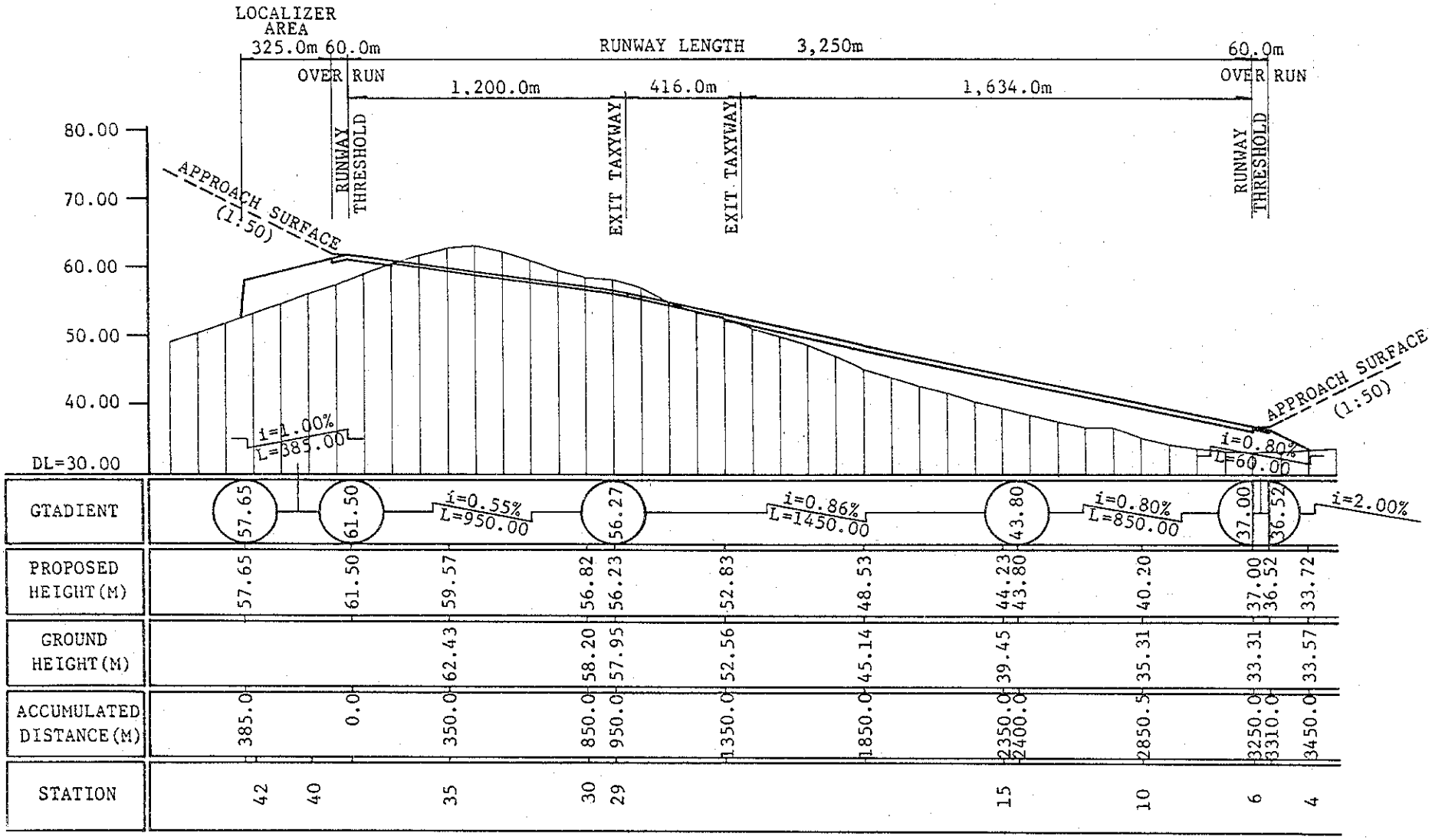


Fig. 9.3.2 Revised Runway Slope

9.3.4 Taxiways and Apron

The configuration of taxiways and apron has been studied and modified in order to cope with any unexpected increase of air traffic in the future.

i) The apron is located 95m further from the original location (the apron edge is located 453.5m from the center line of the runway), because the obstacle limitation surface for the non-instrument approach has been established for the parallel taxiway for emergency use as a runway and the introduction of Jumbo-II in the apron will be allowed.

ii) The rectangular exit taxiways has been modified to high speed exit taxiways for possible increase of traffic on the runway.

Fig. 9.3.3 shows the modified configuration of taxiways and apron.

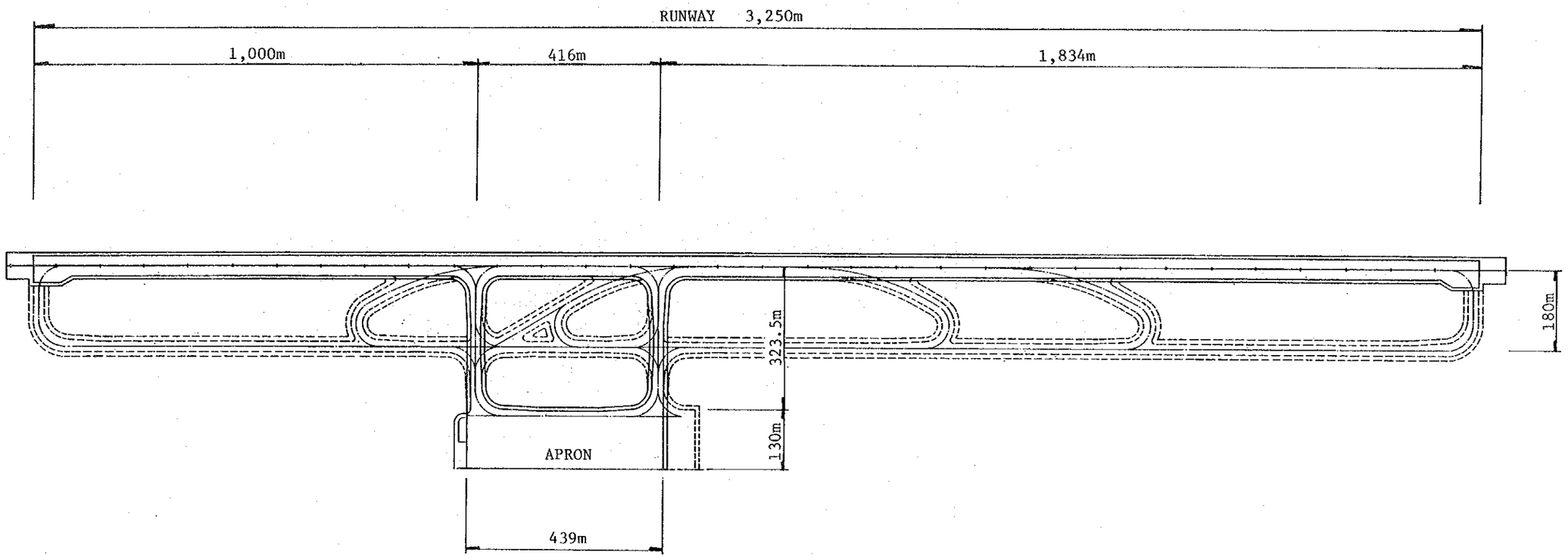


Fig. 9.3.3 Revised Configuration of Taxiways and Apron

9.3.5 Revised Cost and Evaluation

The total expenditure including construction, operation and maintenance costs is estimated based upon the aforementioned studies and modifications in order to reconfirm that Alt-C is the most superior to other alternative airport development schemes.

It is noted that the following studies and the necessary costs other than the above-mentioned modifications are also taken into consideration for this cost revision.

(1) Improvement work for the existing drainage system at Nozha airport has been studied and the necessary cost is added to the construction cost of the redevelopment plan of Nozha airport. A new drainage system consisting of water drainage pipes covered by crushed stones will be required at the edges of the runway, taxiways and apron in order to lower the water table in the subgrade under the pavement. The cost required for this improvement is estimated to be approx. 180 thousand Egyptian Pounds.

(2) Other than pavement overlay to cope with traffic increase, additional pavement overlay works will be required 5 years after the construction works of Phases I and II for leveling the uneven settlement of the three portions of the runway at Nozha airport, i.e., old runway portion, 1,540m, the existing extended portion, 660m, and the planned extension area, 800m. The cost for every leveling of the pavement surfaces is estimated to be approx. 380 thousand Egyptian Pounds, which is included in the maintenance cost of the redevelopment plan of Nozha airport.

(3) Since Nozha airport was constructed on reclaimed land on Lake Maryut, wild grasses grow. They will need to be cut and eradicated periodically in order to ensure visibility and security. The cutting and eradication cost, which is estimated to be approx. 14 thousand Egyptian Pounds annually, is also included in the maintenance cost.

Table 9.3.1 shows the summary of the revised costs, the net present value discounted by the prime rate (13%) and the economic internal rate of return (EIRR).

Table 9.3.1 indicates that Alt-C is the lowest in terms of the total project cost evaluated by the net present value, and the highest in terms of the EIRR. Thus, the considerations on the runway location, longitudinal slope, taxiway configuration,

Table 9.3.1 Summary of the Revised Cost

(Cost unit in Million Egyptian Pounds)

	Alt-A	Alt-B	Alt-C	Remarks
Construction Cost (Note)				
Phase I	76.7 (75.9)	66.5 (62.6)	61.0 (57.4)	( ) indicates the cost previously estimated in Chapters 6 and 7.
Phase II	22.8 (23.0)	23.1 (22.7)	32.4 (31.0)	
Total	99.5 (98.9)	89.6 (85.3)	93.3 (88.4)	
Net Present Value of construction, operation and maintenance costs (at interest rate of 13%)				
Construction Cost	47.4 (47.0)	40.0 (38.0)	38.0 (36.1)	
Operation & Maintenance Cost	8.6 (9.7)	8.3 (8.2)	9.9 (8.6)	
Total Expenditure	56.0 (56.7)	48.3 (46.2)	47.9 (44.7)	
EIRR (Preliminary Evaluation)	10.4% (11.0%)	11.3% (12.0%)	11.6% (12.3%)	

Note : The construction cost includes 10 percent of contingency, but excludes engineering services and administration cost. The construction cost is estimated for comparison purpose.

apron location, etc., do not change the result of the comparative evaluation explained in the previous sections 9.1 and 9.2.

It should be noted that the EIRR indicated in Table 9.3.1 was preliminarily estimated for economic comparison of the alternative airport development schemes, and the EIRR of Alt-C is subject to revision by the further detailed economic analysis (introduction of economic prices, etc.) in Chapter 14.

9.3.6 Design Conditions for the Airport Master Plan

The airport master plan will be prepared based upon the following design conditions:

(1) Runway Location and Separation

The runway of the new airport is oriented N 142° E in parallel with the adjacent military runway with a separation of 2,000m, and the southern threshold of the runway is staggered by 1,225m south from the military runway.

(2) Runway Longitudinal Slope

The slope computed by dividing the difference between the maximum and minimum elevation along the runway center line by the runway length is 0.75%.

The runway longitudinal slope is planned to be 0.8% in the first southern portion (850m), 0.86% in the central portion (1,450m) and 0.55% in the northern portion (950m).

(3) Basic Configuration of Runway, Taxiways and Apron

The runway is 3,250m long and 45m wide, and it is planned for the precision approach category I. Two rectangular exit taxiways connecting the runway and apron are planned in Phase I and a complete parallel taxiway with high speed exit taxiways in Phase II. The apron is separated far from the parallel taxiway in order to establish obstacle limitation surfaces for the taxiway for emergency landing and take-off.

PART IV AIRPORT MASTER PLAN FOR THE SELECTED SCHEME

CHAPTER 10 AIRPORT FACILITIES

CHAPTER 10 AIRPORT FACILITIES

10.1 General

The airport master plan for the selected scheme, which is to continue Nozha airport for domestic service and to construct a new airport for international service including a limited domestic service for North west coast regional development area, New Ameriyah city, etc., is prepared for the target years 2000 (Phase I) and 2010 (Phase II).

The new airport is aimed to handle international and limited domestic passengers numbering 1.6 million and 2.4 million annually in Phases I and II, respectively. The largest aircraft anticipated is B-747 class and the longest route is Alexandria to London. The runway is 3,250 m long (Code 4 E) and precision approach category I is available.

Nozha airport is aimed to handle domestic passengers numbering 0.4 million and 0.7 million annually in Phases I and II, respectively. The largest aircraft anticipated is B-767 class and A300 class in Phases I and II, respectively, and the longest route is Alexandria to Aswan. The runway is 2,200 m long (Code 4 D) and non-precision, instrument approach is available.

The planning concepts including basic conditions and assumptions, applied design criteria, study considerations, result of the planning, etc., for the airport facilities of both the new airport and Nozha airport are explained hereinafter.

This chapter consists of the following ten(10) sections:

- General
- Airport Site Planning
- Site Preparation
- Runway, Taxiways and Apron
- Passenger Terminal Building
- Other Buildings
- Access Road and Car Parking Area
- Air Navigation Systems
- General Services
- Airport Utilities

10.2 Airport Site Planning (New Airport)

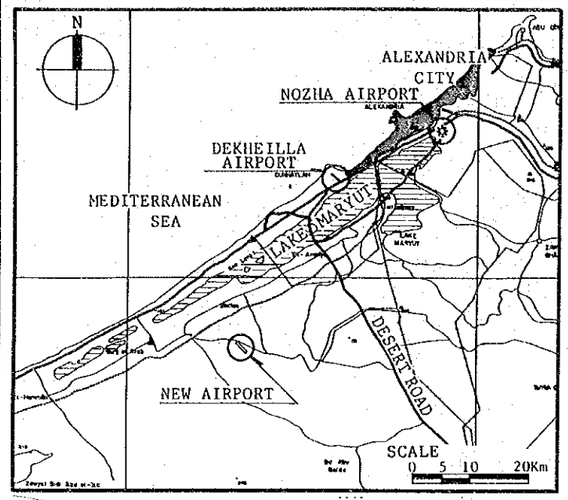
10.2.1 Layout Plan of the New Airport

The new airport is located at one-third area of 36 km^2 (6 km x 6 km) which has been reserved in desert area approx. 45 km southwest of Alexandria city and is completely separated from the adjacent military airport which is now under construction.

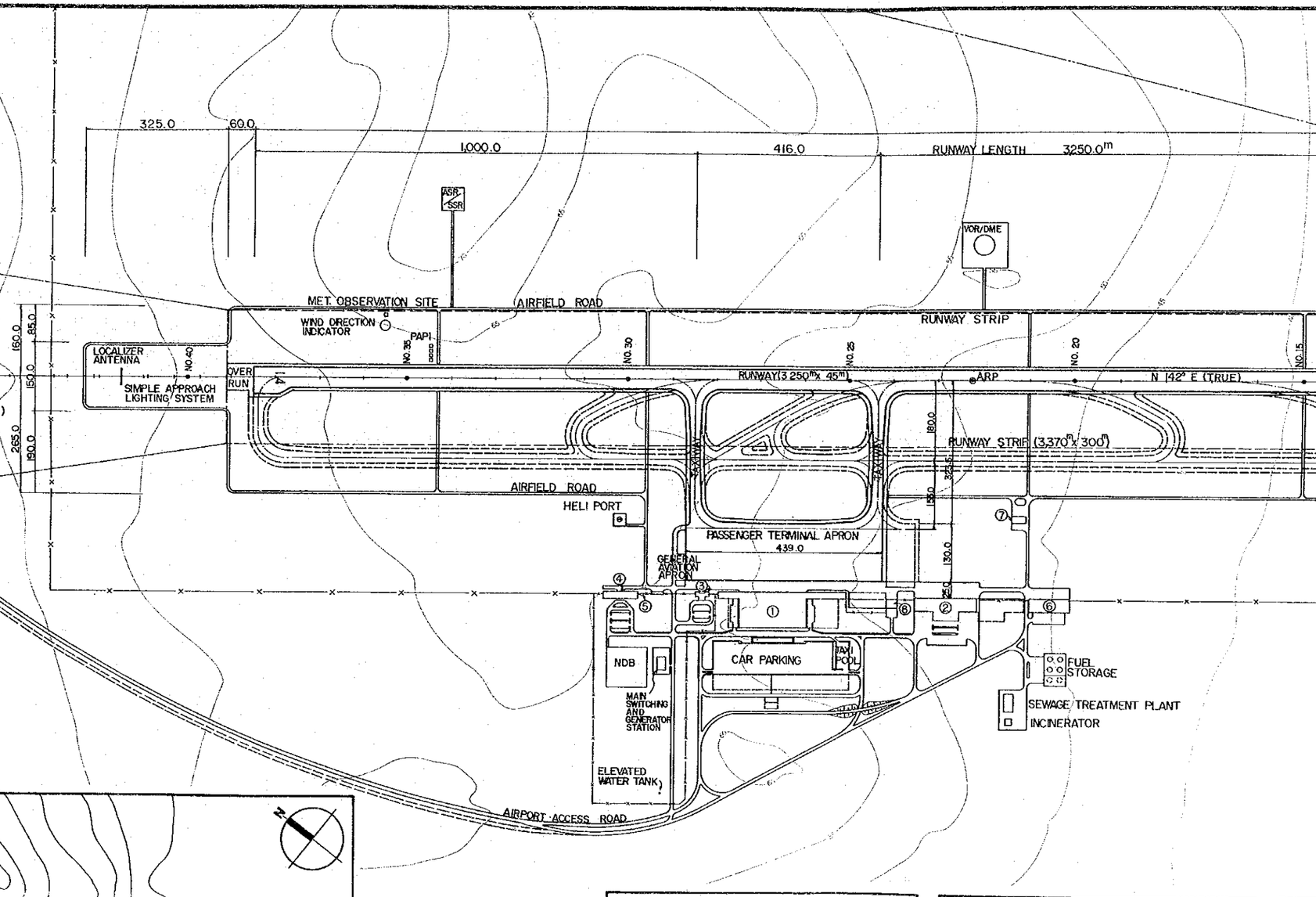
The layout plan of the new airport is prepared within the allocated area and based on considerations of the following factors:

- Construction of all the airport facilities within the reserved area.
- Efficient air space use with the adjacent military airport
- Construction economy
- Compatibility with the land use plan
- Meteorological conditions
- Topographical features
- Future expansibility
- Airport accessibility

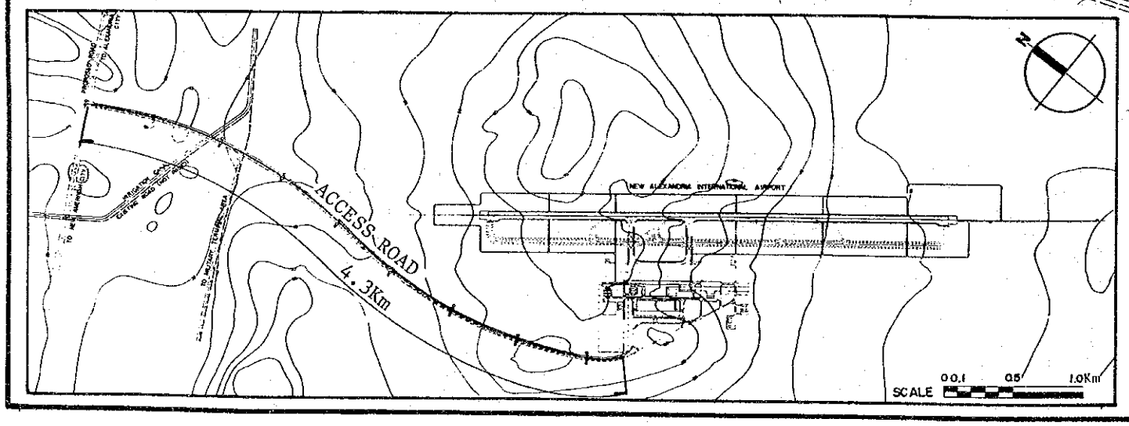
The layout plan of the new airport and the summary of airport facilities are shown in Fig. 10.2.1 and Table 10.2.1, respectively.



LOCATION MAP

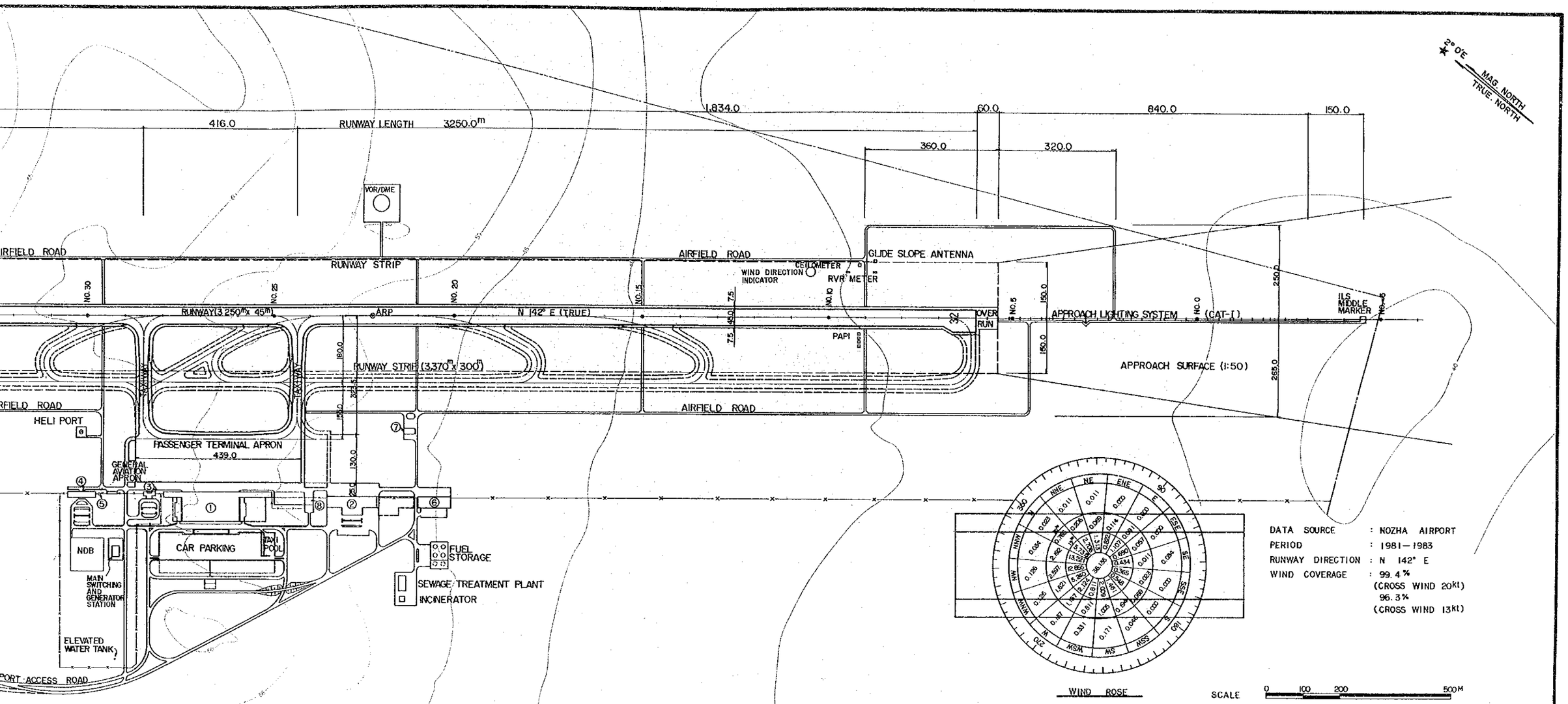


APPROACH SURFACE (1:50)



BASIC DATA TABLE	
RUNWAY DATA	
EFFECTIVE RUNWAY GRADIANT	0.75%
WIND COVERAGE	20KNOT 99.4% 13KNOT 96.3%
INSTRUMENT RUNWAY	✓
PAVEMENT STRENGTH	B-747 AND DC-10
APPROACH SURFACE	1/50
RUNWAY LIGHTING	HIRL
RUNWAY MARKING	ALL WEATHER
NAVIGATIONAL AIDS	ILS, ALS, PAPI

BASIC DATA TABLE	
AIRPORT DATA	
AIRPORT ELEVATION	50.5m
AIRPORT REFERENCE POINT (ARP) COORDINATES	LAT. 30° 55' 15" LNG. 29° 42' 55"
AIRPORT AND TERMINAL NAVAIDS	ASR/SSR, NDB VOR/DME
AIRPORT REFERENCE TEMPERATURE	30.6°C



DATA SOURCE : NOZHA AIRPORT
PERIOD : 1981–1983
RUNWAY DIRECTION : N 142° E
WIND COVERAGE : 99.4% (CROSS WIND 20kt)
96.3% (CROSS WIND 13kt)

BASIC DATA TABLE	
RUNWAY DATA	
EFFECTIVE RUNWAY GRADIANT	0.75%
WIND COVERAGE	20KNOT 99.4% 13KNOT 96.3%
INSTRUMENT RUNWAY	✓
PAVEMENT STRENGTH	B-747 AND DC-10
APPROACH SURFACE	1/50
RUNWAY LIGHTING	HIRL
RUNWAY MARKING	ALL WEATHER
NAVIGATIONAL AIDS	ILS, ALS, PAPI

BASIC DATA TABLE	
AIRPORT DATA	
AIRPORT ELEVATION	50.5m
AIRPORT REFERENCE POINT (ARP) COORDINATES	LAT. 30° 55' 15" LNG. 29° 42' 55"
AIRPORT AND TERMINAL NAVAIDS	ASR/SSR, NDB VOR/DME
AIRPORT REFERENCE TEMPERATURE	30.6°C

LEGEND	
——·—·——	AIRPORT BOUNDARY FENCE
——x——	SECURITY FENCE
~40~	GROUND CONTOURS
———	PHASE I DEVELOPMENT
– – – –	PHASE II DEVELOPMENT

BUILDINGS	
①	PASSENGER TERMINAL BUILDING
②	CARGO TERMINAL BUILDING
③	V.V.I.P TERMINAL BUILDING
④	ADMINISTRATION BUILDING
⑤	CONTROL TOWER
⑥	CATERING BUILDING
⑦	FIRE STATION
⑧	GSE MAINTENANCE SHOP

Fig. 10.2.1 Airport Layout Plan of New Airport

Table 10.2.1 Outline of New Airport in Phase 1

"X" indicates services available

Country	Name of Airport	INT./DOM. ICAO CODE	Commencement of Services	Airport Total Area	Aerodrome Ref. Point	Airport Elevation	Runway Orientation	Aerodrome Ref. Temp.	Operation Hours	Seasonal Availability	Note: Control Agency;
Arab Republic of Egypt	Alexandria (Ameriyah)	INT./DOM. 4E	1992	1,300 ha	30°55'15"N 29°42'55"E	50.5 m (166 ft)	N142°E (TN)	30.6°C	24 hours	All Seasons	Egyptian Civil Aviation Authority

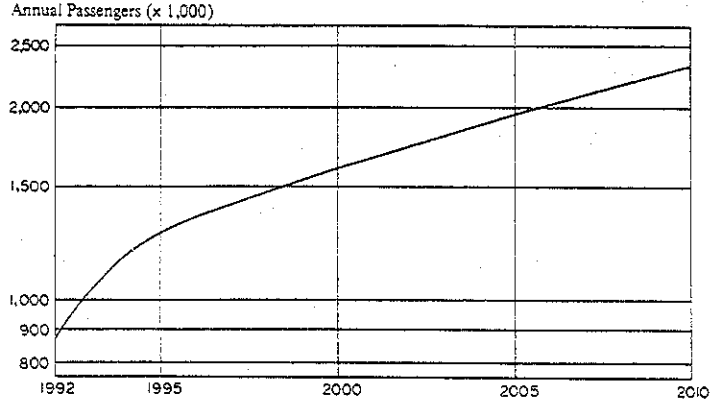
City/Town		Transportation			Wind Coverage	Operational Minimum					Note: Approach Category; Instrument, Precision Approach
Name	Population	Distance to Airport	Railway	Taxi	Bus		Runway	Procedure	OCL		
Alexandria	2.6 Million (1982)	24 NM by Road	N.A.	X	X	96.3% (13kt) 99.4% (20kt)	14	VOR	585/383		
							32	ILS	CAT-C 294/173	CAT-D 305/184	
								VOR	585/464		

Air Navigation																				Note: Phase II: MLS
Navaids	NDB		VOR		DME		TACAN		ILS		LOCATOR		VHF D.F.							
	X		X		X		–		X		X		–							
ATC/COM	ASR		SSR		PAR		ASDE		ARTS		VHF A/G		AFS		TTY		MICROWAVE		ATIS	
	X		X		–		–		–		X		X		X		X		–	
Lights	ALS	SFL	SALS	ALB	CGL	RWL	RWCL	RWTL	ORL	TDZL	REIL	DML	PAPI	TWL	TWCL	TGS	ABN	IWDI	AFL	O.L.
	X	–	X	–	–	X	–	X	X	–	–	–	X	X	–	X	X	X	X	X
MET	RWY Surface Sensors				RVR		Ceilometer		WX-FAX		APT-RX		Radiosonde		WX Radar		WX-TTY			
	X				X		X		X		–		–		–		X			

Basic Facilities			Size	Pavement	Note
Runway Strip			3,370m x 300m	–	
Runway			3,250m x 45m	Asphalt	
Taxiway			600m x 23m	Asphalt	
Apron	Design Aircraft	No. of Stands	Pavement	Area	
	B747 class	2	Concrete	57,100 m²	Nose-in
	DC10 class	4			Nose-in
	F27 class	1			Self-maneuvering

Other Facilities	Size	Structure	
Passenger Bldg.	26,300 m²	RC	
Cargo Building	7,500 m²	S & RC	
Administration Bldg.	2,700 m²	RC	
Control Tower	60 m²	RC	Height 31 m
Fire Station	400 m²	2 Air Crash Tenders 2 Fire Engines	CAT-8
P.O.L.	(Jet A1 2,900 kℓ)		
Hangar	–		
Carparking Lot	790 cars		

Annual Passengers (x 1,000)



Note: Completion of Phase I development: End of 1991

Traffic Demand						
LDG and TOF	–	9,430	11,030	11,150	12,790	Drawn by JICA As of 1985
Annual Freight (ton)	–	37,040	50,070	66,100	87,140	
Annual Passengers DOM.	–	30,000	40,000	60,000	70,000	
Annual Passengers INT.		1,300,000	1,600,000	1,900,000	2,300,000	
Year	1983	1995	2000	2005	2010	

(1) Runway Location

The runway of the new airport is oriented N 142° E in parallel with the adjacent military runway with a separation of 2,000 m, and the southern threshold of the runway is staggered 1,225m south from the southern threshold of military runway taking into consideration the following factors (Refer to Section 9.3) :

- The runway and navigation aids including approach lighting system and middle marker are completely located inside the allocated airport area. However, the runway is located as southeast as possible in order to achieve the minimum earth work volume.

- The runway is oriented in parallel with the military runway with a lateral separation of 2,000 m in order to allow simultaneous aircraft operations for both the new and military airports.

- The lateral separation of 2,000 m can also achieve the minimum earth work volume.

The runway location is shown in Fig. 9.3.1.

(2) Main Approach Direction

Direction of main approach is planned to be southeast (RWY32) since the prevailing wind is from the northwest. Therefore, ILS, approach lighting system, etc., for precision approach category I is planned for runway 32 approach.

(3) Basic Configuration of Runway, Taxiways and Apron

The runway is 3,250 m long and 45 m wide, and it is planned to allow precision approach category I. Two rectangular exit taxiways connecting the runway and apron are planned in Phase I and a complete parallel taxiway with high speed exit taxiways in Phase II. The apron is separated far from the parallel taxiway in order to establish assumed obstacle limitation surfaces of the non-instrument approach for the taxiway which will be used as a runway in an emergency. Hence, the apron edge facing the terminal building is located 453.5 m from the center line of the runway taking into account accommodation of future Jumbo-II.

(4) Location of the Terminal Area

There is no space for the terminal area east of the runway. The terminal area is located west of and in centre part of the runway where cut and fill volume will balance and, thus, economize the earth work.

(5) Obstacle Limitation Surface

There is nothing in the planned area to infringe upon the obstacle limitation surfaces nor to limit the establishment of aircraft operations procedures. (Refer to Section 11.2)

(6) Aerodrome Location

The location of the new airport has been planned as follows:

Runway Orientation	:	N 142° E
Airport Reference Point	:	30°55'15"N 29°42'55"E
Airport Elevation	:	50.5 m

10.2.2 Terminal Area Layout of the New Airport

The terminal area consists of apron, passenger terminal building, cargo terminal building, control tower, administration building, car parking and other facilities necessary for civil air transport.

The layout of the terminal area at the new airport has been designed based on the linear concept that passenger and cargo terminal buildings, administration building, etc., are in a line facing the apron, as shown in Fig. 10.2.2.

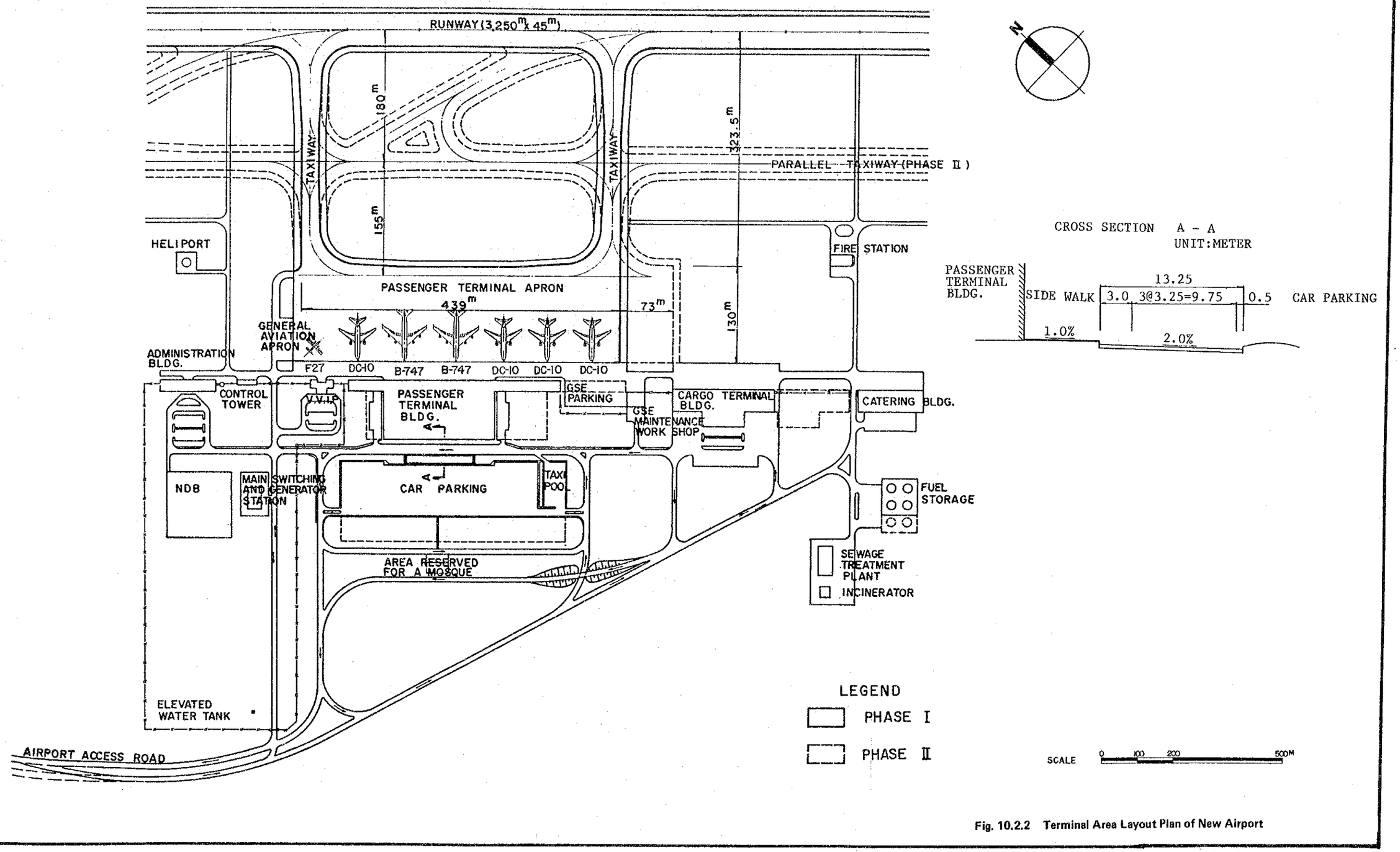


Fig. 10.2.2 Terminal Area Layout Plan of New Airport

Consideratins for terminal facilities are as follows:

(1) Passenger Terminal Apron

Location of the passenger terminal apron is as described in "Basic Configuration of Runway, Taxiways and Apron" of Section 10.2.1.

The direction of the expansion of the apron in Phase II is planned to be south taking into account the topographical features, and functional and efficient operation of aircraft.

(2) Passenger Terminal Building

The passenger terminal building follows the aforementioned linear concept and is located in front of the central portion of the apron taking into consideration the shortest and easiest access of passenger and baggage from/to the aircraft stands.

The direction of the expansion in Phase II is planned to be both north and south for domestic and international services, respectively. Sufficient space for the expansion of the passenger terminal building is assured even if the domestic traffic at Nozha airport is transferred to the new airport.

(3) Cargo Terminal Building

The cargo terminal building is located on the south side of the passenger terminal building reserving future expansion spaces in-between for both the cargo and the passenger terminal buildings. This siting will allow efficient cargo handling because of the proximity of the proposed apron including future apron expansion.

(4) Control Tower and Administration Building

Control tower and administration building are located north of the passenger terminal building so as not to compete with the expansion area of the passenger terminal building. This location meets the necessary siting criteria for the control tower.

(5) Fire Station

The fire station is located adjacent to the proposed runway in due consideration of the ICAO requirements with respect to response times of not exceeding 3 minutes in

an aircraft accident. The building does not infringe upon the obstacle limitation surfaces in this location.

(6) VVIP Building

Independent building, car parking and internal road for VVIP (very very important person) are separately located from the public area bordered by the security fence and at the north of the passenger terminal building. This location is considered best because of easy access from the apron and independent acess road from the public.

(7) Car Parking and Internal Road

The public car parking area is located in front of the passenger terminal building in order to minimize walking distance between the terminal building and carpark for the convenience of passengers and visitors. Staff car parking is also provided in front of each building.

The taxi pool is located to the right of public carpark facing the terminal building so that only incoming taxis without passengers can enter the taxi pool directly but waiting taxis can easily reach the taxi stand to pick up passengers.

The internal road is planned to be basically regulated in an oneway - anti-clockwise direction - in order to provide orderly vehicular movements and to ease pedestrian crossing.

(8) Parking for Ground Service Equipment

Ground service equiment (hereinafter referred to as "GSE") such as towing tractors, passenger stair cars, etc., will be supplied by airlines. Therefore, the area for parking, maintenance workshop and fuel station is reserved for GSE in this master plan. GSE parking area is located at future expansion area of the passenger terminal building adjacent to both apron and the passenger and cargo terminal building. The maintenance workshop and fuel station for the GSE are also located next to the GSE parking area.

(9) General Aviation Apron and Heliport

A general aviation apron and heliport are located beside the passenger terminal apron and in front of the administration building for convenience of users and to facilitate administration.

The clearance between the heliport and the runway center line is planned to be 210 m in accordance with FAA standards in order to allow simultaneous helicopter and aircraft operations under VFR conditions.

(10) Airport Utilities

The airport utilities such as power supply, water supply, sewage treatment and incinerator are located in the proximity of the load center and the airport administration area in order to minimize the length of cables and pipes, and to allow easy operation and maintenance.

The major facilities of power supply and water supply are located within the area isolated from the public access area, in order to ensure enhanced security.

Sewage treatment and incinerator are located down the prevailing wind and at the south of the passenger terminal building so as not to disturb passengers.

(11) Others

Fuel storage and catering facilities will be constructed by other related authorities. Hence, the areas for the fuel storage and catering facilities are prepared and reserved at the south of the terminal area in order to allow easy access from/to airside and landside.

The area for a mosque is also reserved in front of the passenger terminal building beyond the car parking area taking into account convenience of airport employees, passengers, drivers, etc.

10.3 Site Preparation (New Airport)

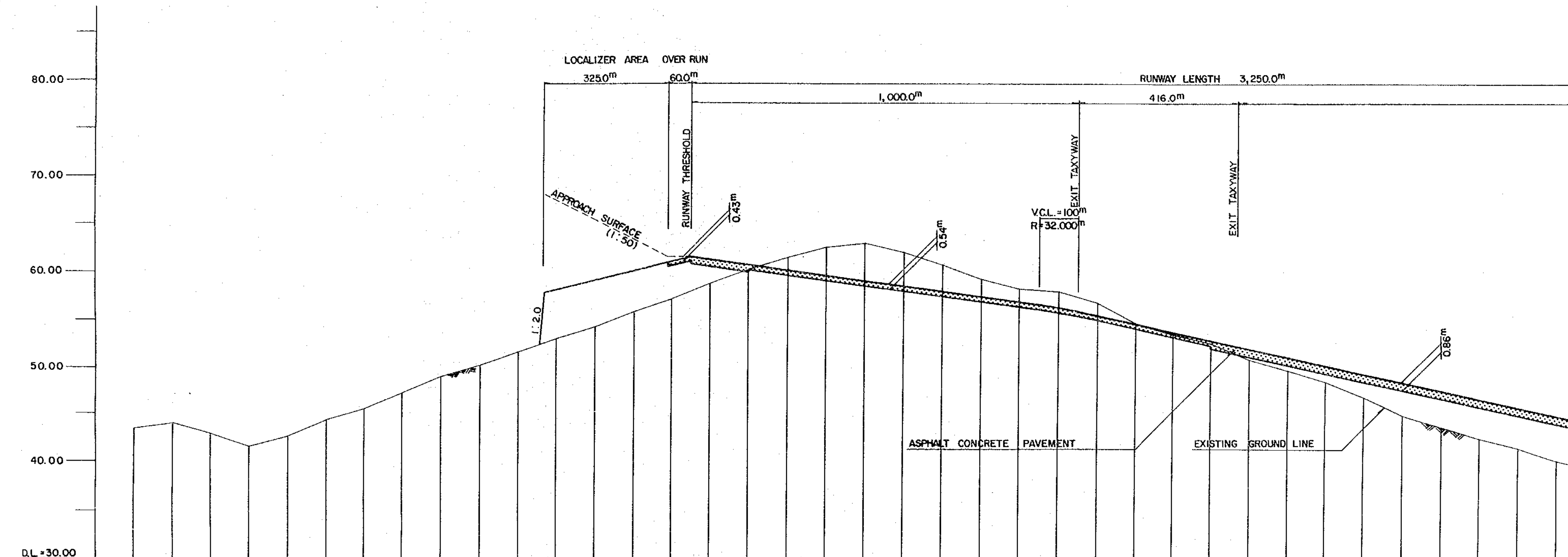
The grading plan of the new airport site has been conceptually designed in acordance with ICAO requirements and recommendations after due considerations reported in Section 9.3.

Figs. 10.3.1 and 2 show the runway profile and typical cross sections, respectively.

The existing terrain on the runway is gently undulated with an average elevation of approx. 50 m above mean sea level. The runway elevation and the longitudinal slope are planned in order to carry out as economical earth work as possible. The runway elevation at the northern and southern thresholds are 61.5 m and 37.0 m, respectively and the longitudinal slope is 0.75 percent down toward the south. The maximum runway slope in the center portion is 0.86 percent. The cut volume of the earth work is estimated to be 2.1 million cu.m based upon the proposed profiles and cross sections.

The graded area is planned to be sodded by seeding in order to protect the graded surface from erosion by jet-blast and storm wind, etc.

A part of the earth works at the parallel taxiway where to be constructed in Phase II will also carried out at the Phase I stage taking into consideration the minimum earth movement operation.



STATION	53	52	51	50	49	48	47	46	45	44	43		42	41	40	39
GRADIENT												57.645		i=1.000% l=385.0		
CUT(M)																
FILL(M)													5.065	4.755	4.295	3.495
PROPOSED HEIGHT(M)												57.645	57.995	58.995	59.995	60.995
GROUND HEIGHT(M)	43.54	44.09	43.05	41.72	42.76	44.45	45.62	47.34	48.90	50.26	51.56		52.93	54.24	55.70	57.07
ACCUMULATED DISTANCE(M)	-1450.000	-1350.000	-1250.000	-1150.000	-1050.000	-950.000	-850.000	-750.000	-650.000	-550.000	-450.000	-385.000	-350.000	-250.000	-150.000	-10.000 -50.000
DISTANCE(M)	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	65.000	35.000	100.000	100.000	90.000	10.000 50.000

STATION		38	37	36	35	34	33	32	31	30	29	28	27
GRADIENT	61.495					i=0.550% l=950.0					56.270		
CUT(M)			0.060	1.330	3.400	4.450	4.070	3.280	2.340	1.920	2.259	1.880	0.650
FILL(M)		1.890											
PROPOSED HEIGHT(M)	61.495	61.220	60.670	60.120	59.570	59.020	58.470	57.920	57.370	56.820	56.231	55.410	54.550
GROUND HEIGHT(M)		58.77	60.19	61.41	62.43	62.93	62.00	60.66	59.17	58.20	57.95	56.75	54.66
ACCUMULATED DISTANCE(M)	0.000	50.000	150.000	250.000	350.000	450.000	550.000	650.000	750.000	850.000	950.000	1050.000	1150.000
DISTANCE(M)	50.000	50.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000

STATION	26	25	24	23	22	21	20	19	18	17	16
GRADIENT					i=0.860% l=1450.0						
CUT(M)	0.380	0.580									
FILL(M)			0.260	0.460	0.820	1.530	2.530	2.950	3.240	3.380	3.840
PROPOSED HEIGHT(M)	53.690	52.830	51.970	51.110	50.250	49.390	48.530	47.670	46.810	45.950	45.090
GROUND HEIGHT(M)	53.53	52.58	50.85	49.79	48.57	47.00	45.14	43.86	42.71	41.71	40.39
ACCUMULATED DISTANCE(M)	1250.000	1350.000	1450.000	1550.000	1650.000	1750.000	1850.000	1950.000	2050.000	2150.000	2250.000
DISTANCE(M)	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000	100.000

VERTICA

HORIZO

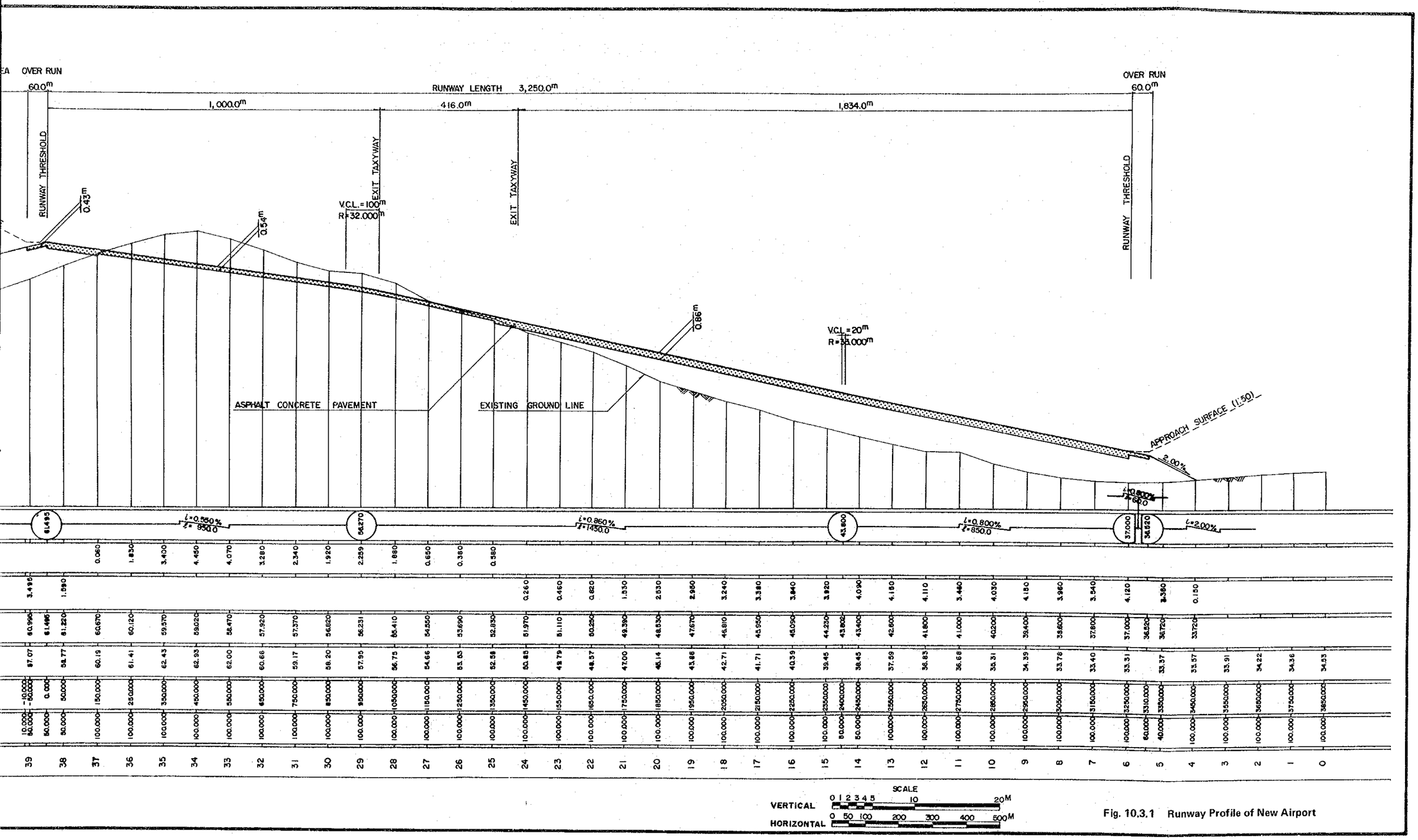
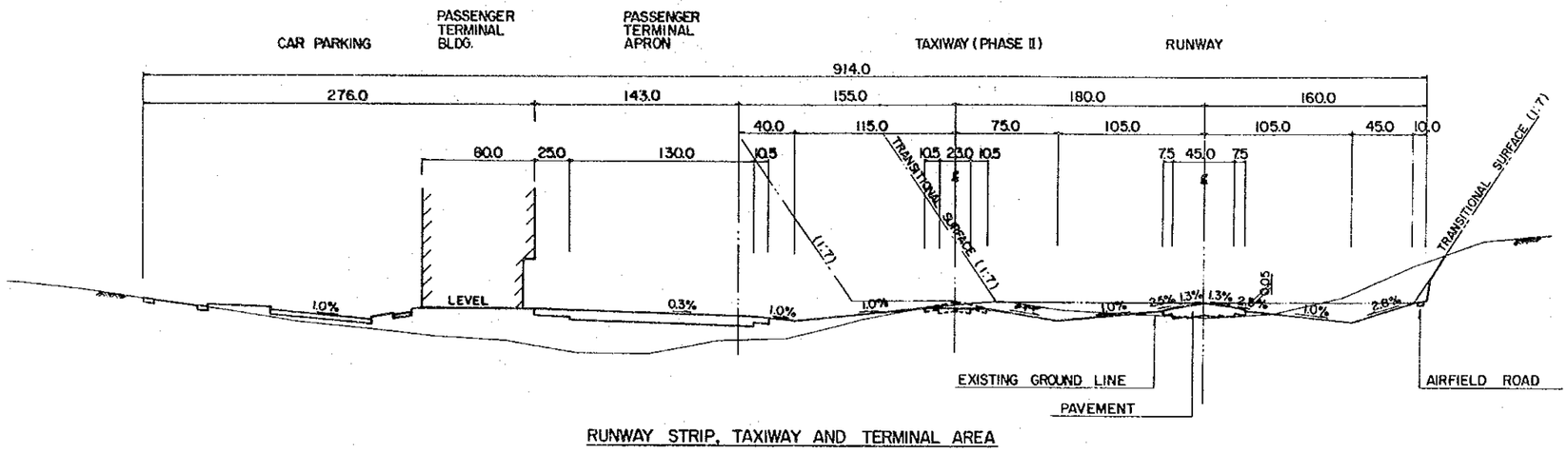
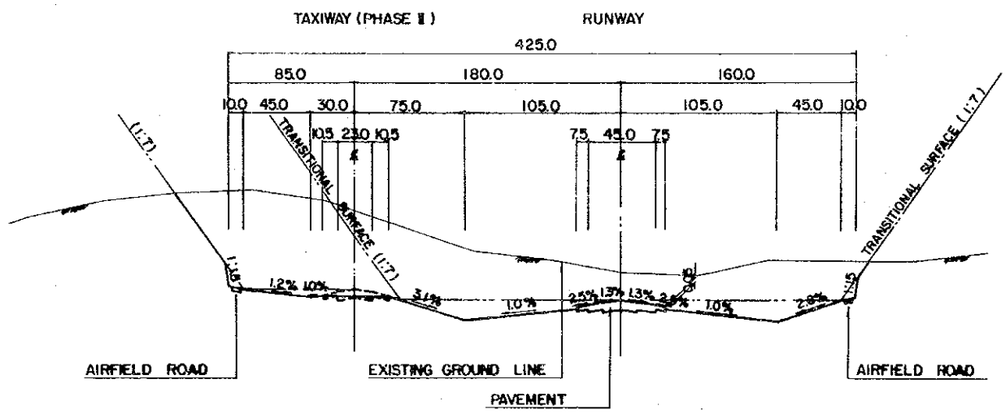


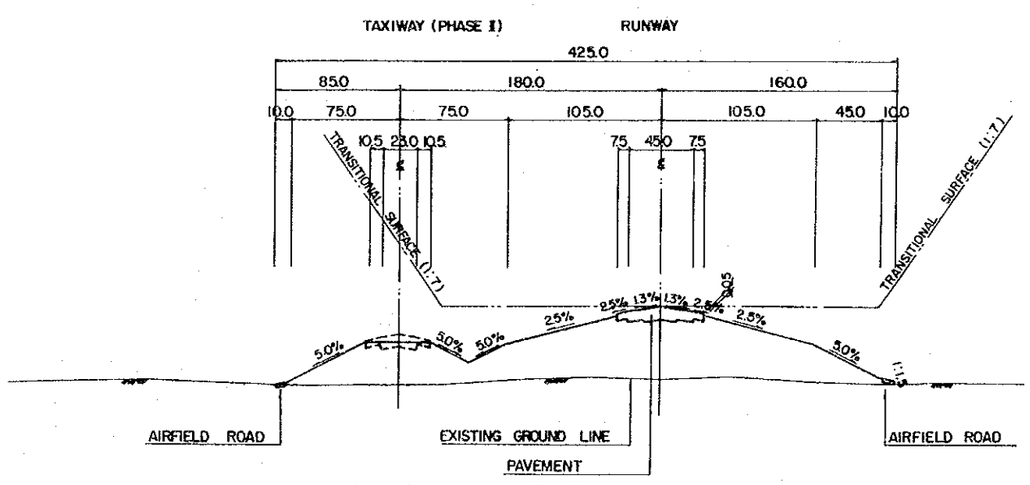
Fig. 10.3.1 Runway Profile of New Airport



RUNWAY STRIP, TAXIWAY AND TERMINAL AREA



RUNWAY STRIP AND TAXIWAY (CUT PORTION)



RUNWAY STRIP AND TAXIWAY (FILL PORTION)

SCALE

VERTICAL 0 1 2 3 4 5 10 20M

HORIZONTAL 0 10 20 30 40 50 100 200M

Fig. 10.3.2 Typical Cross Sections of New Airport

10.4 Runway, Taxiways and Apron (New Airport)

10.4.1 Runway

At the new airport, the runway of 3,250 m long and 45 m wide with a 7.5 m wide shoulder is planned in Phase I, and no extension will be required in Phase II.

Since a complete parallel taxiway is planned in Phase II, turnpads for the largest aircraft, B-747 class, will be required in Phase I at both ends of the runway. Although no extension will be required for the runway based on the demand forecast, possibility of runway extension to approximately 4,300 m toward the south should be considered in order to cope with any unexpected change of demand. This 4,300 m long runway is based on the assumption that the length will be the same as that of Cairo airport but with correction for slope.

10.4.2 Taxiways

The facility requirements for the new airport indicate that no parallel taxiway will be required in Phase I. Two rectangular exit taxiways are planned to connect the runway and apron. A complete parallel taxiway with high speed exit taxiways will be constructed in Phase II.

The dimensions of taxiways such as width, radius of taxiway centerline, radius of fillet, etc., are determined based on ICAO standard. The width of taxiway is planned to be 23 m with 10.5 m wide shoulder in order to acommodate B-747 class aircraft.

10.4.3 Apron

The apron of the new airport is designed to accommodate two B-747 class, four DC-10 class aircraft adopting nose-in parking configuration and one F27 class aircraft adopting 45 degree nose-out parking configuration in Phase I. (Extension of the apron will be required in Phase II in order to accommodate three B-747 class and five DC-10 class aircraft.)

10.4.4 Pavement

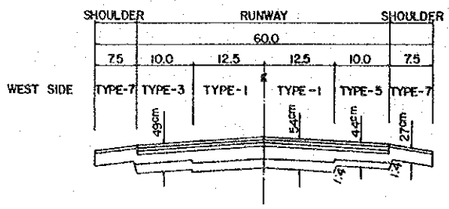
The pavement of the new airport is planned as shown in Fig. 10.4.1. (Also refer to Section 7.5.1)

Asphalt concrete pavement is planned for runway and taxiways except passenger loading apron where cement concrete pavement is adopted.

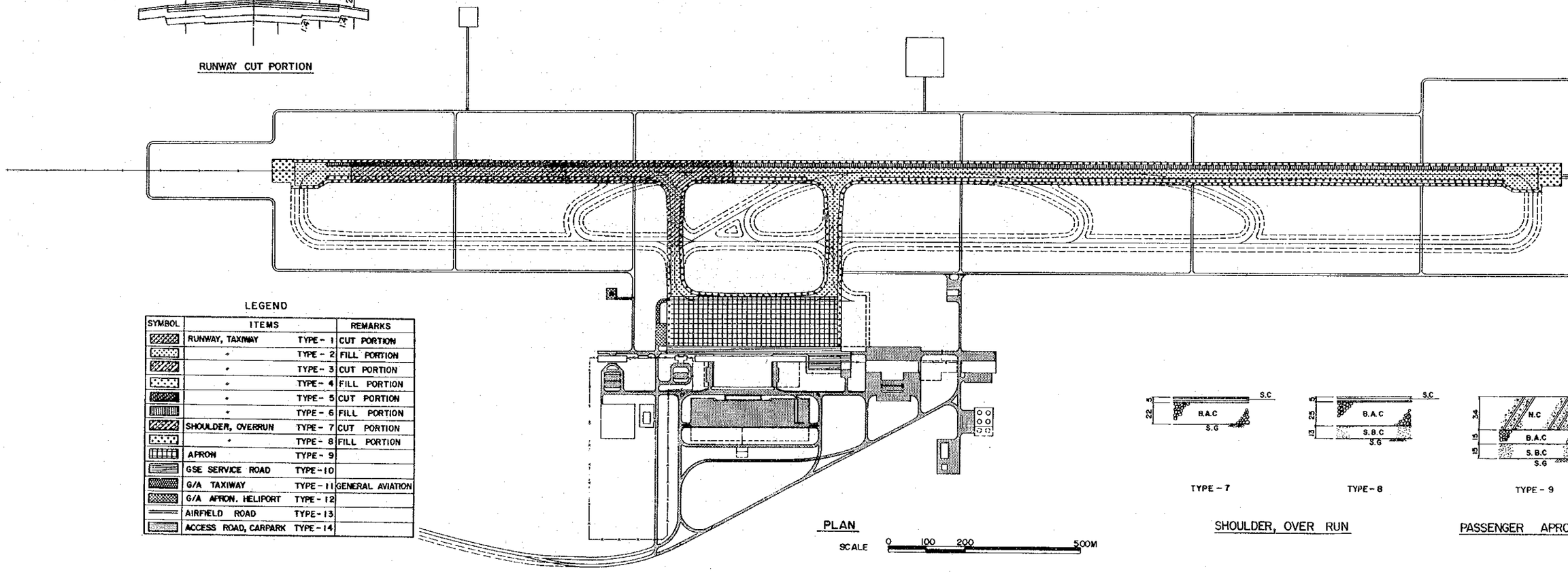
As for the subgrade bearing strength, 20% and 10% are adopted as subgrade CBR for design of cut and filled area, respectively. In section 7.5.1 it is recommended that the cement stabilization method is adopted in order to increase the subgrade CBR for design from 5% to more than 10% for economic reasons. After the further study on measures to strengthen subgrade CBR of filled area, use of rock and gravel is considered to be more economical than cement stabilization method, because rock and gravel can be procured at the site. More than 10% of CBR is expected to be obtained on the filled subgrade by this measure.

The total thickness of the asphalt concrete pavement is established to be 54 cm for cut area and 80 cm for filled area based on 3,000 repetitive loadings from B-747 class aircraft. This standard thickness can be reduced by 10% to 20% considering the actural load application characteristics.

A 34 cm thick cement concrete pavement slab with 15 cm thick base course and subbase course each is planned for the loading apron. These thicknesses are based on the modulus of subgrade reaction estimated to be 5.5 kg/cm^3 from CBR 10% for the filled subgrade.



RUNWAY CUT PORTION

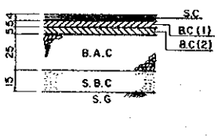


PLAN

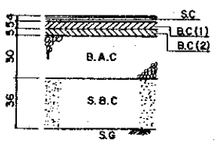
SCALE 0 100 200 500M

LEGEND

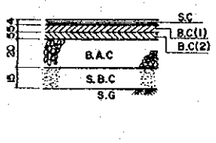
SYMBOL	ITEMS		REMARKS
	RUNWAY, TAXIWAY	TYPE-1	CUT PORTION
	"	TYPE-2	FILL PORTION
	"	TYPE-3	CUT PORTION
	"	TYPE-4	FILL PORTION
	"	TYPE-5	CUT PORTION
	"	TYPE-6	FILL PORTION
	SHOULDER, OVERRUN	TYPE-7	CUT PORTION
	"	TYPE-8	FILL PORTION
	APRON	TYPE-9	
	GSE SERVICE ROAD	TYPE-10	
	G/A TAXIWAY	TYPE-11	GENERAL AVIATION
	G/A APRON, HELIPORT	TYPE-12	
	AIRFIELD ROAD	TYPE-13	
	ACCESS ROAD, CARPARK	TYPE-14	



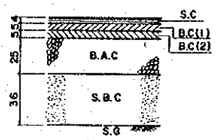
TYPE-1



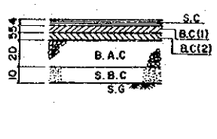
TYPE-2



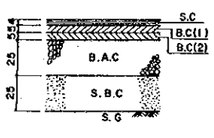
TYPE-3



TYPE-4

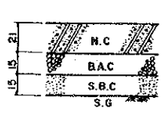


TYPE-5



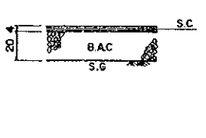
TYPE-6

RUNWAY, TAXIWAY



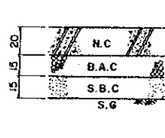
TYPE-10

GSE SERVICE ROAD



TYPE-11

GENERAL AVIATION TAXIWAY



TYPE-12

GENERAL AVIATION APRON

SECTION

SCALE 0 10 20 30 40 50 100 200Cm

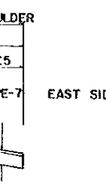
TYPE-7

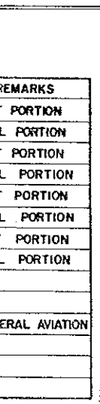
TYPE-8

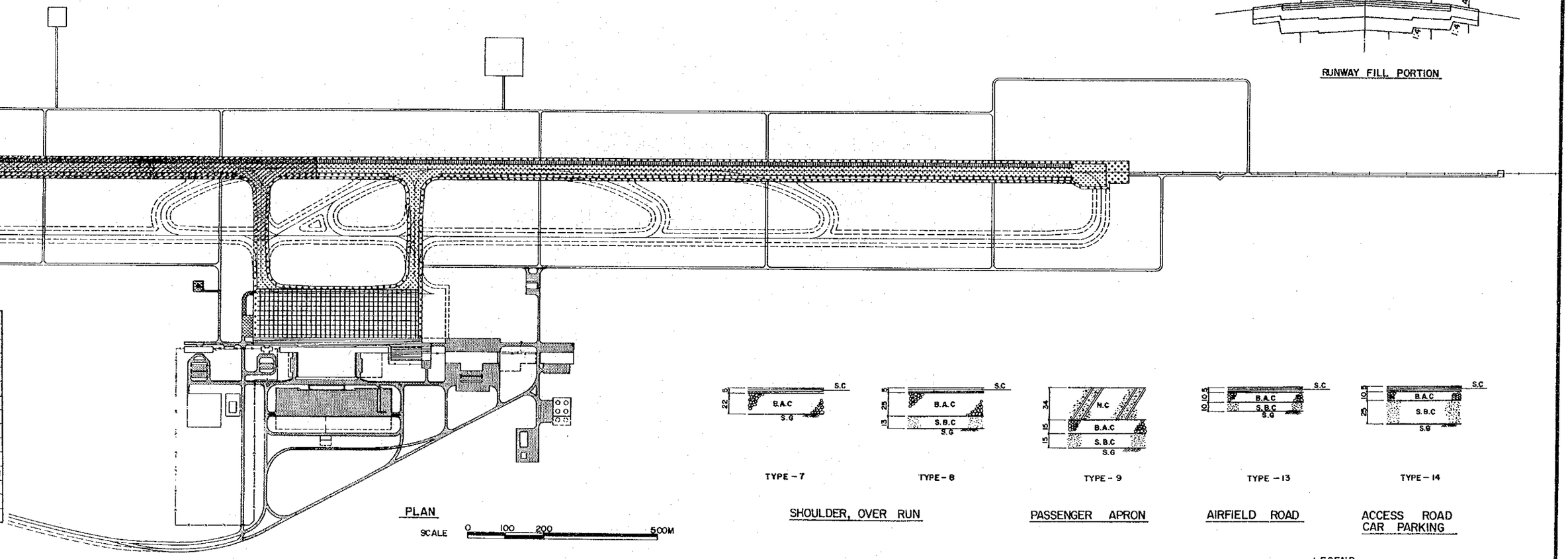
TYPE-9

SHOULDER, OVER RUN

PASSENGER APRON

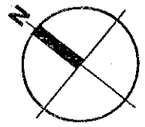


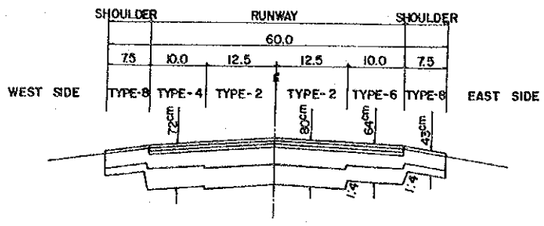




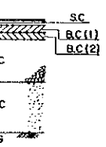
PLAN

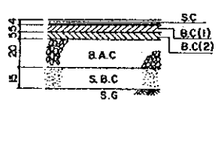
SCALE 0 100 200 500M



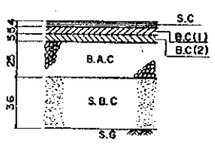


RUNWAY FILL PORTION

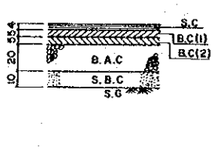




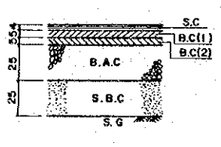
TYPE - 3



TYPE - 4

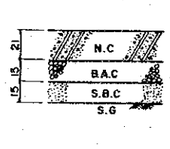


TYPE - 5

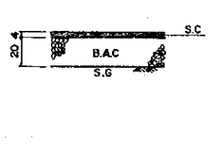


TYPE - 6

RUNWAY, TAXIWAY



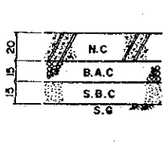
TYPE - 10



TYPE - 11

GSE SERVICE ROAD

GENERAL AVIATION TAXIWAY



TYPE - 12

GENERAL AVIATION APRON

SECTION

SCALE 0 10 20 30 40 50 100 200cm

TYPE - 7

TYPE - 8

TYPE - 9

SHOULDER, OVER RUN

PASSENGER APRON

TYPE - 13

AIRFIELD ROAD

TYPE - 14

ACCESS ROAD
CAR PARKING

LEGEND

SYMBOL		ITEMS
	S.C	SURFACE COURSE (ASPHALT CONCRETE)
	B.C	BINDER COURSE (ASPHALT CONCRETE)
	B.A.C	BASE COURSE (GRADED AGGREGATE)
	S.B.C	SUB BASE COURSE (CRUSHER - RUN)
	N.C	PORTLAND CEMENT CONCRETE SLAB
	S.G	SUBGRADE

Fig. 10.4.1 Pavement Plan of New Airport

10.5 Passenger Terminal Building (New Airport)

Passenger terminal building of the new airport is planned as shown in Figs. 10.5.1 through 3.

10.5.1 General Concept

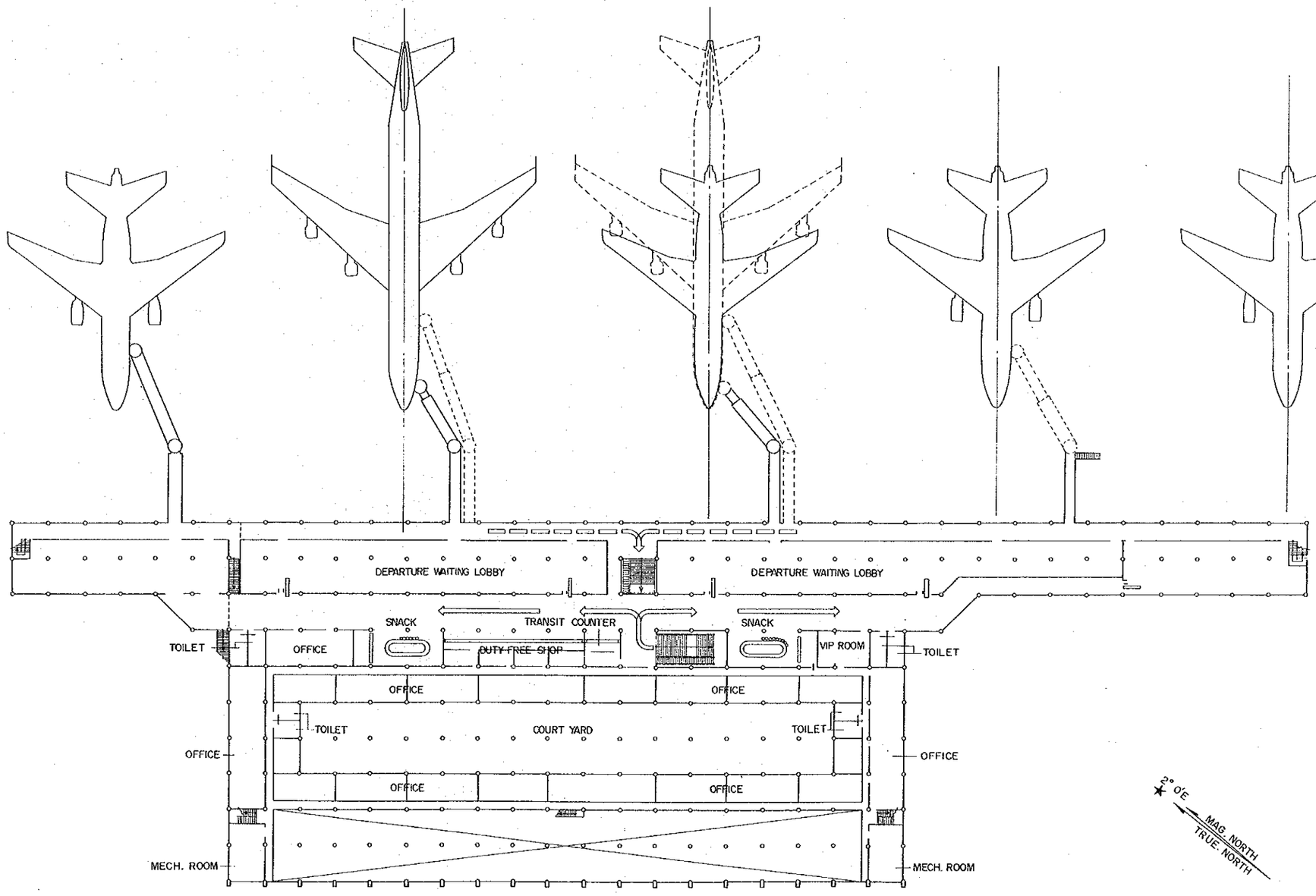
A linear type with one and half floor level concept will be employed for the passenger terminal building considering the number of aircraft stands and the number of passengers to be served.

In order to meet the anticipated domestic passenger demand, an area exclusively for domestic services will be provided at the north side of the ground floor. The processing flows of international and domestic passengers are planned to be completely separated each other.

As the installation of boarding bridges is considered necessary in Phase I taking into account the international trend for improved service for passengers, 3 boarding bridges will be initially installed for 3 wide-bodied aircraft (LJ) stands which may be occupied simultaneously.

The aesthetic design should be a combination of the Greco-Roman traditional features and modern architecture with modern functions considering the characteristics of this airport as the gateway to Alexandria for international flights. This will convey Mediterranean atmosphere to the passengers.

The internal arrangement is planned to be as flexible as possible in order to cope with the extreme seasonal peak conditions and with future expansion and/or internal rearrangement as well.

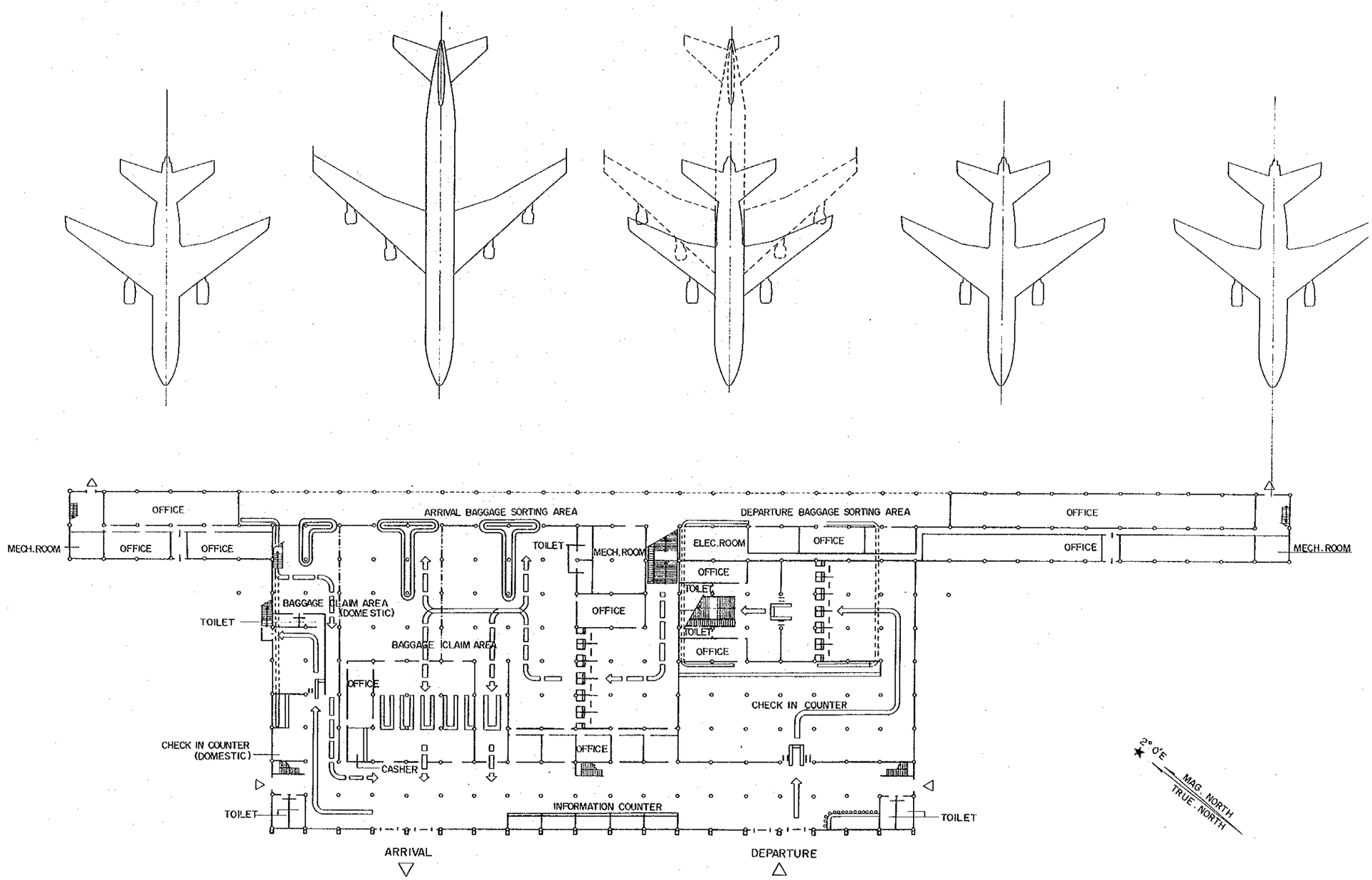


FIRST FLOOR PLAN

Note: This drawing does not bind the final concept of the building

Fig. 10.5.1 Passenger Terminal Building Plan of New Airport (Ground Floor Plan)

SCALE 0 5 10 20 30 40 50M

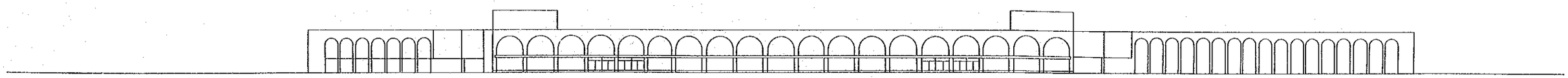


GROUND FLOOR PLAN

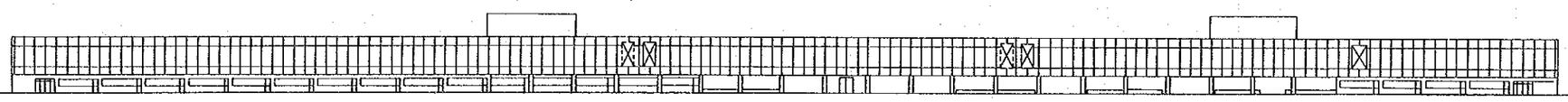
Note: This drawing does not bind the final concept of the building

Fig. 10.5.2 Passenger Terminal Building Plan of New Airport
(First Floor Plan)

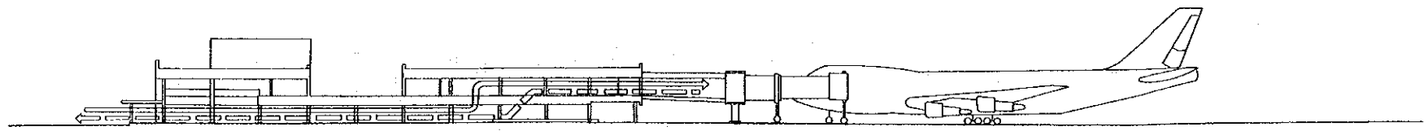
SCALE 0 5 10 20 30 40 50M



LANDSIDE ELEVATION



AIRSIDE ELEVATION



SECTION

Note: This drawing does not bind the final concept of the building

SCALE 0 5 10 20 30 40 50M

Fig. 10.5.3 Passenger Terminal Building Plan of New Airport (Elevation)

10.5.2 Planning

Although the planning of the terminal building in this Report does not dictate the final concept, the passenger terminal building is planned for the purpose of cost estimate as shown in Figs. 10.5.1 through 3 and will be 26,500 sq.m in total floor area in Phase I. In this building area, about 1,000 peak hour international passenges and 50 peak hour domestic passengers can be handled. The building is designed as a reinforced concrete structure with 8 m x 8 m spans which will be applied for economy of construction. In this concept, structures preventing future expansion in longitudinal directions are eliminated as much as possible, as shown in Figs. 10.5.1 through 3.

The passenger terminal building will be expanded by 11,000 sq.m in Phase II. The domestic passenger service area will be expanded to the north and the international area to the south.

The passenger terminal building will be capable of orderly expansion at least up to the year 2010 even if the domestic demand at Nozha airport is transferred to the new airport.

10.6 Other Building (New Airport)

10.6.1 Cargo Terminal Building

The cargo terminal building with approx. 7,500 sq.m total floor area which consists mainly of a cargo storage area and an office area is planned at the new airport as shown in Fig. 10.6.1.

The cargo storage area is planned to be a single storey steel frame structure with high ceiling for free cargo handling, flexibility in internal rearrangement, and provision for possible future mechanization. This area will be divided into inbound storage located on the left and outbound storage on the right with bonded storage in-between. The office area will be a two-storey reinforced concrete structure.

10.6.2 Control Tower and Administration Building

Control tower and administration building of the new airport are planned in Phase I as shown in Fig. 10.6.2.

The height of the control tower is planned to be 31 m above ground level in compliance with FAA standards. This height is considered to be adequate functionally, even if the runway is extended approx. 1,000 m more southward to cope with unexpected demand change in the future. The control tower will be a reinforced concrete structure.

The administration building of the new airport is planned to have about 2,700 sq.m total floor area to meet the requirement for Phase I. The building will comprise two storeys and be made of reinforced concrete.

10.6.3 Fire Station

The fire station of the new airport will have a floor area of approx. 400 sq.m to meet the facility requirements. The fire station will be made of reinforced concrete and have one storey. The layout plan is shown in Fig. 10.6.3.

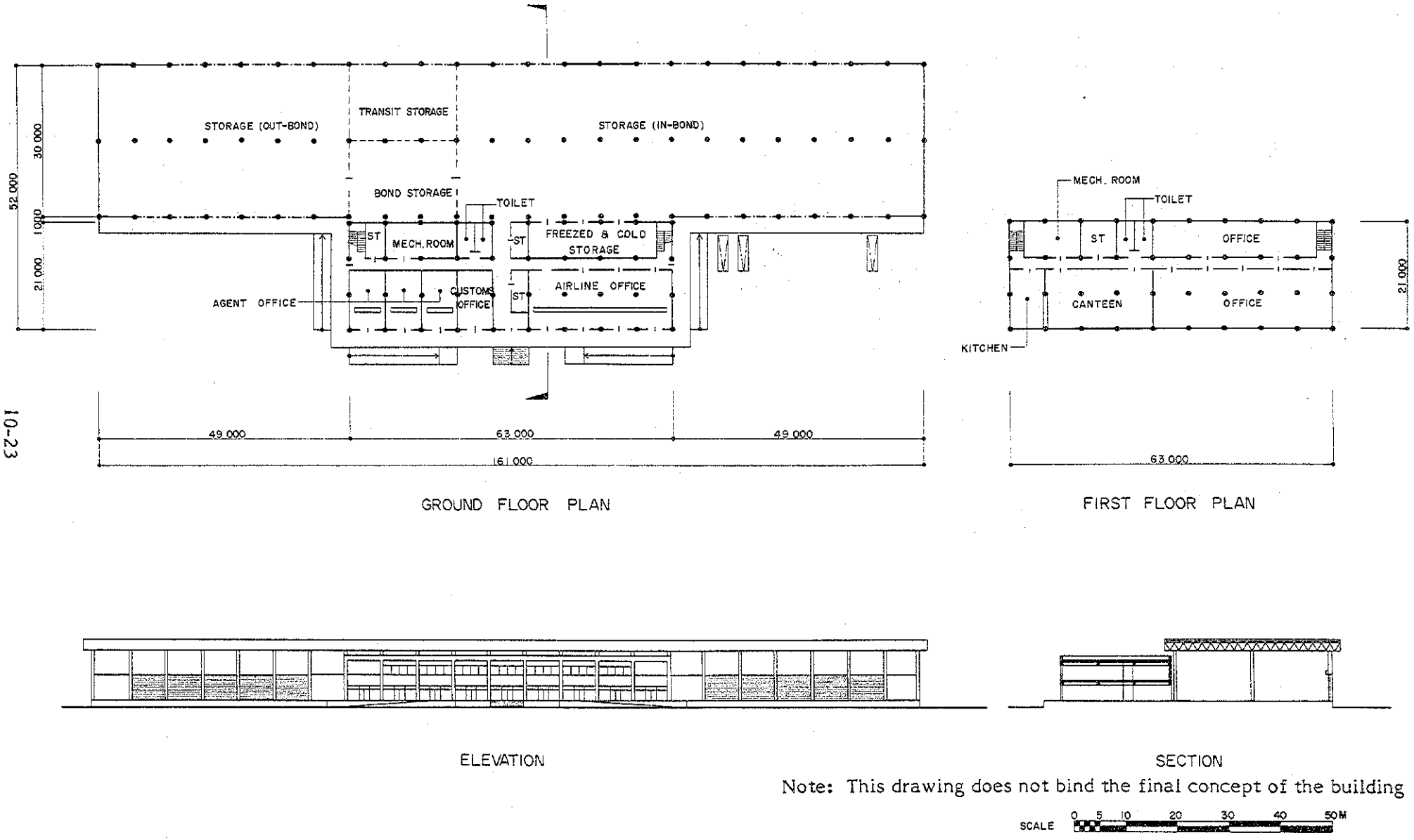
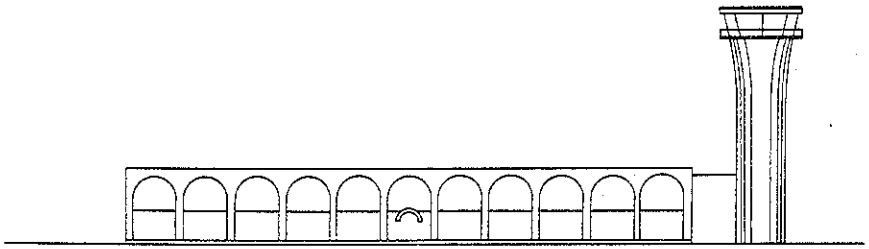
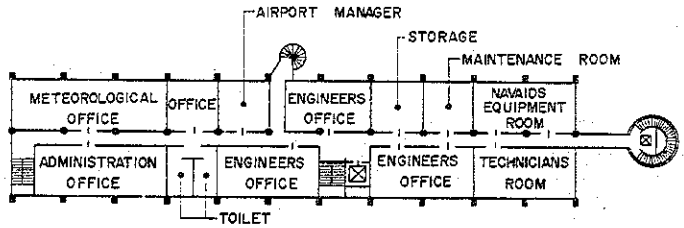


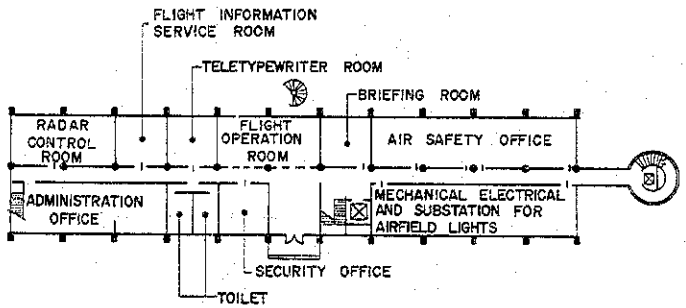
Fig. 10.6.1 Cargo Terminal Building Plan of New Airport



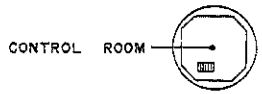
ELEVATION



FIRST FLOOR PLAN



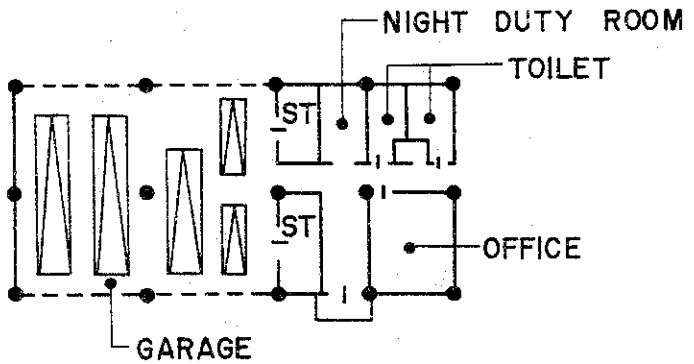
GROUND FLOOR PLAN



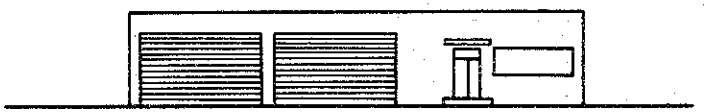
Note: This drawing does not bind the final concept of the building

SCALE 0 5 10 20 30 40 50M

Fig. 10.6.2 Administration Building Plan of New Airport



GROUND FLOOR PLAN



ELEVATION

Note: This drawing does not bind the final concept of the building

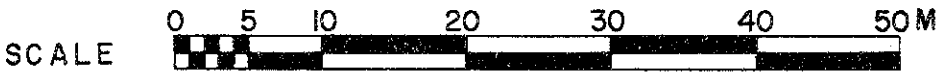


Fig. 10.6.3 Fire Station Building Plan of New Airport

10.7 Access Road and Car Parking Area (New Airport)

10.7.1 Airport Access Road

The layout plan of the airport access road is studied and shown in Fig. 10.7.1.

The access road is planned to link with a proposed road between the Desert Road and New Ameriyah city. One lane for each direction is planned in Phase I and it is expanded to two lanes for each direction in Phase II. The route was selected on the 1 : 25,000 scale topographic map, considering the shortest and flatest route to minimize the earth work volume. Total length of the selected route is about 4.3 km with one box culvert across the irrigation canal.

The width of the access road with two lanes for both directions will be 7.5 m.

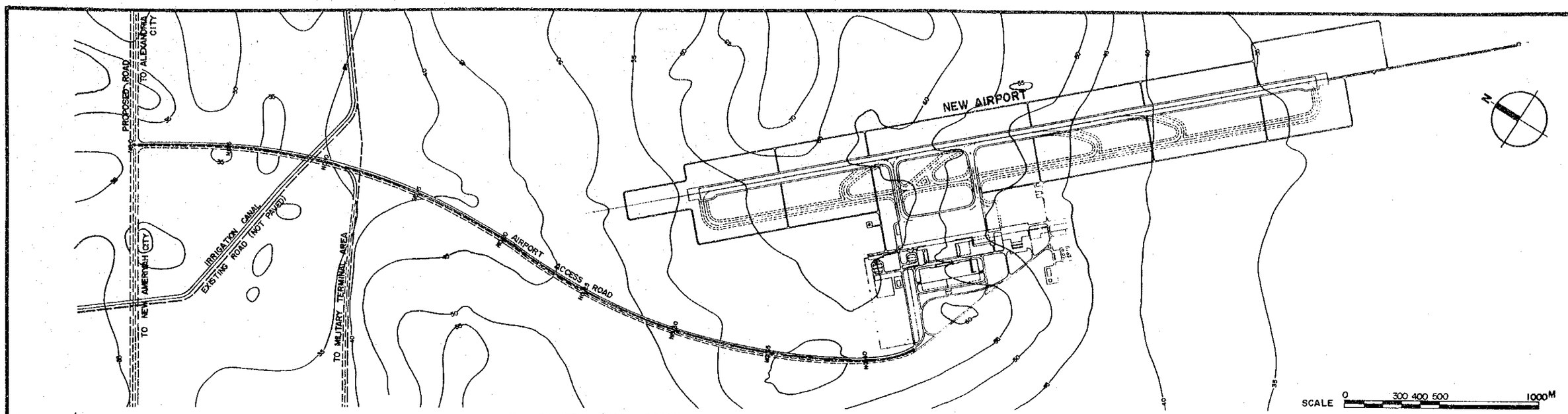
The pavement for the access road will be asphalt concrete with a total thickness of 40 cm. This thickness will consist of 5 cm surface, 10 cm base course and 25 cm subbase course. The thickness is designed based on the CBR design method, assuming 250 to 1,000 daily trucks with a 5 ton wheel load and CBR 10 percent for the subgrade.

10.7.2 Carparking and Internal Road

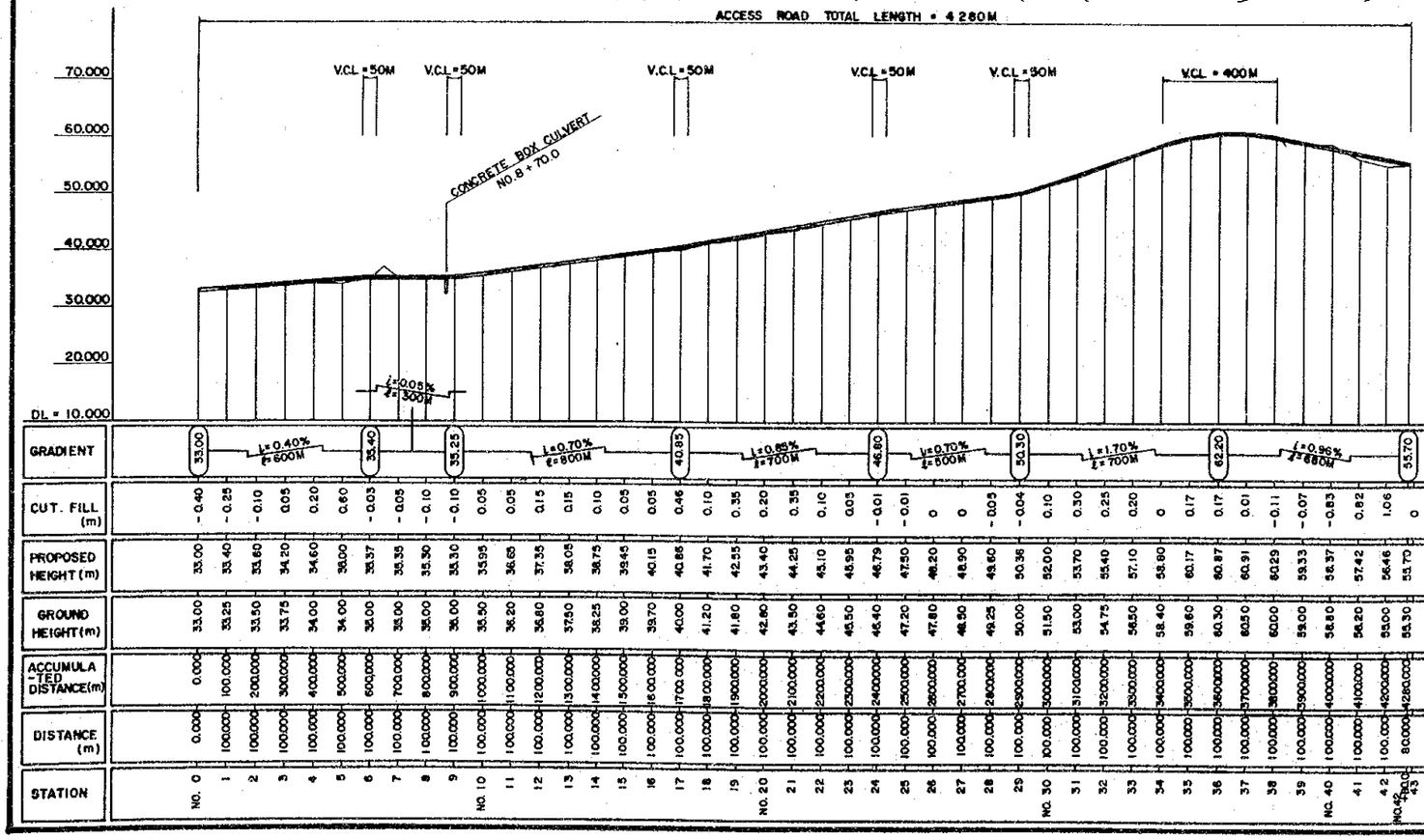
The public carpark with about 800 lots at the new airport is planned to cope with the requirement in Phase I. Because it requires the smallest unit parking space, 90° parking configuration is adopted for this plan. The dimensions for the unit parking space are 5 m x 2.5 m and the width of the aisle in the parking area is determined to be 6 m.

The width of the internal road with two lanes will be 7.5 m except for the terminal frontage road. Terminal frontage road consists of two through traffic lanes, one weaving lane and one standing lane, and is 13.25 m in width as shown in Fig. 10.2.2.

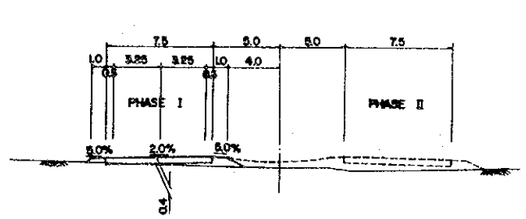
The pavement for the carpark and internal road will be asphalt concrete with the same thickness of 40 cm as the pavement for the access road.



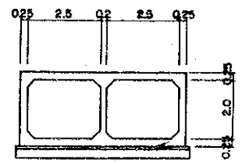
ACCESS ROAD TOTAL LENGTH = 4.280M



TYPICAL CROSS SECTION
UNIT : METER



SECTION OF CONCRETE BOX CULVERT
UNIT : METER



SCALE
VERTICAL 0 5 10 20 30 40 50M
HORIZONTAL 0 100 200 300 400 500 1000M

Fig. 10.7.1 Access Road Plan of New Airport

10.7.3 Airfield Road

The airfield road at the new airport, consisting of a perimeter road and security road is planned for both airport maintenance and security patrol, as shown in Fig. 10.2.1.

Pavement thickness of the airfield road will be 25 cm. This thickness will consist of 5 cm surface, 10 cm base course and 10 cm subbase course to meet the design conditions of low frequency of heavy weighted vehicles and CBR 10 percent for the subgrade.

10.8 Air Navigation Systems (New Airport)

10.8.1 General

Air navigation systems at the new airport, which include radio navigation aids, air traffic control system, aeronautical telecommunications system, meteorological system and aeronautical ground lights are planned to meet the aircraft operations category: precision approach category I.

The plan of air navigation systems is shown in Fig. 10.8.1 and the necessary equipment are listed in Table 10.8.1. These equipment which are installed in Phase I will be required to be replaced by new equipment in Phase II.

10.8.2 Radio Navigation Aids

The following radio navigation aids (Navaids) are planned as terminal navaids and also for precision approach category I.

i) ILS Category I
ii) VOR/DME
iii) NDB
iv) Locator

An ILS is planned for runway 32 since the major operation of the runway will be runway 32 due to the meteorological conditions. The glide slope angle will be 3.0 degree based on the international standards. A VOR/DME facility is located at the east of the runway where no course error can be expected and straight-in approach is available for both runways 14 and 32.

NDB equipment is planned as a back-up facility to the VOR/DME and a homing beacon for smaller aircraft. A compass locator is collocated with the outer marker of ILS, both of which will unavoidably be located outside the airport and will be linked to the administration building by VHF radio.

The ILS facilities will be replaced by a microwave landing system (MLS) in Phase II.

Fig. 10.8.2 shows the layout plan of navaids.

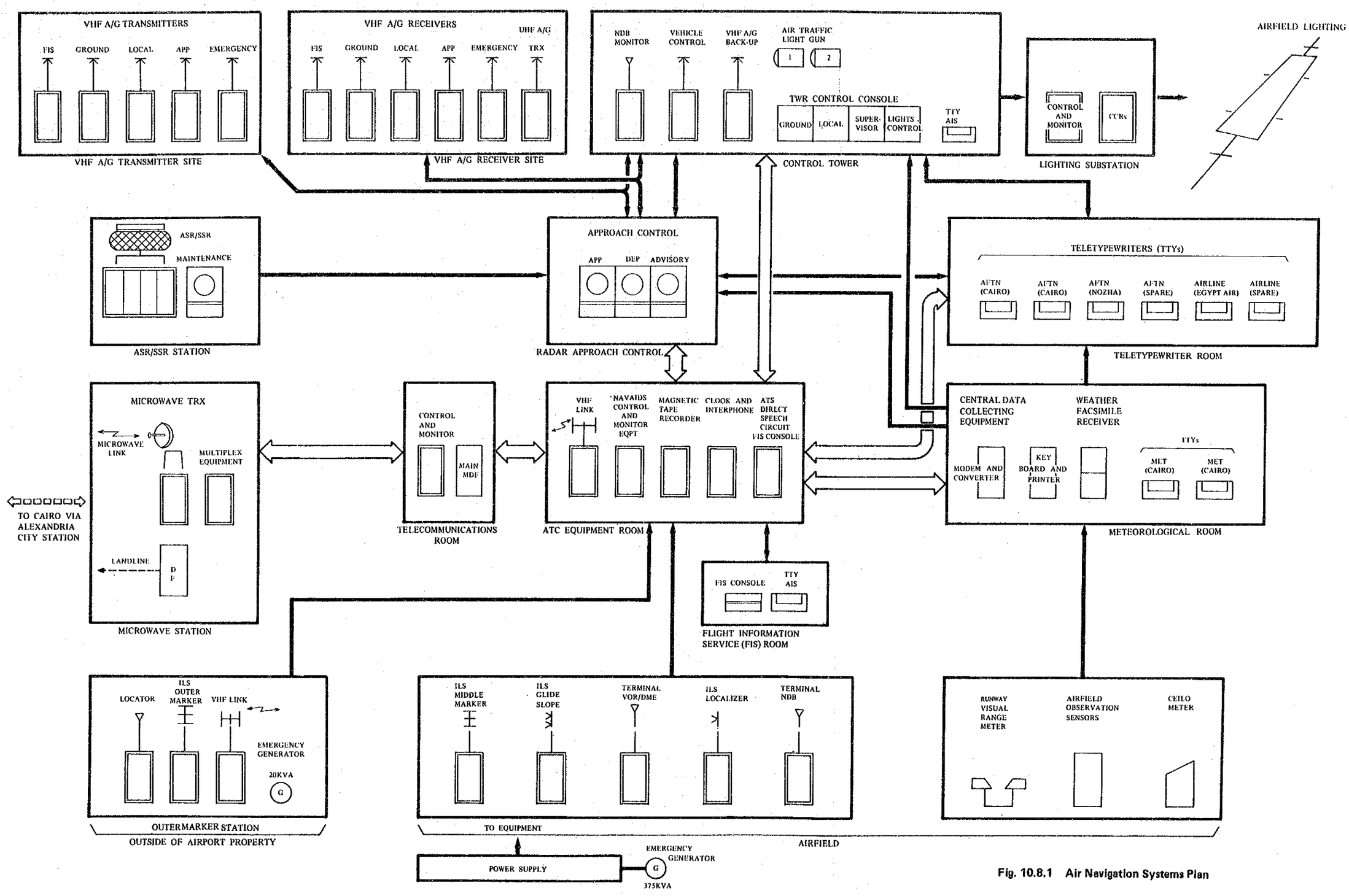


Fig. 10.8.1 Air Navigation Systems Plan

Table 10.8.1 Air Navigation Systems Plan (New Airport)

Equipment	Nr.	Outline	Remarks
NAVAIDS			
ILS	1 set	Precision approach category I	RWY32
Locator	1 set	To be collocated at outer marker station	
MLS	1 set	Replacement of the ILS above in Phase II	
NDB	1 set	Terminal use	
VOR / DME	1 set	Terminal use	
Navaids control and monitor equipment	1 set		
ATC/COM			
ASR/SSR and console	1 set	Short range (200 NM)	
VHF air/ground radios	20 sets	5 frequencies	
UHF air/ground radio	1 set	Transciever	
VHF link	2 sets	Between outer marker station and airport	
Control console	1 set	For control tower	
AFTN teletypewriters	8 sets	Automatic send and receive type	
Magnetic taperecorder	1set	ATC use	
Master clock and interphone	1 set	ATC use	
DC power supply equipment	1 set		
MET.			
Surface sensors	1 lot	Surface wind, temperature dew point, rainfall and air pressure.	
Central data collecting equipment	1 set	Automated data collecting and recording equipment	
Runway visual range equipment	1 set	RVR measurement	

Table 10.8.1 Cont'd

Equipment	Nr.	Outline	Remarks
Ceilometer	1 set	Cloud height measurement	
Weather facsimile	2 sets	Between airport and Cairo	
Weather teletypewriter	2 sets		
LIGHTS			
Precision approach category I lighting system	1 lot	RWY32	
Simple approach lighting system	1 lot	RWY14	
Runway edge light	1 lot		
Runway threshold and wing bar lights	1 lot	Wing bar lights only for RWY 32	
Runway end lights	1 lot		
PAPI	2 units	RWY14/32	
Taxiway edge lights	1 lot		
Taxiway guidance system	1 lot		
Apron floodlights	1 lot		
Illuminated wind direction indicator	2 sets	RWY14/32 touchdown points	
Aerodrome beacon	1 set	On the roof of the control tower	
Air traffic light gun	2 sets	In the control tower	
Power supply and control equipment	1 lot		
Control console	1 set	In the control tower	
OTHERS			
Spare parts	1 lot		
Measuring equipment	1 lot		
Consumables	1 lot	Recording paper etc.	

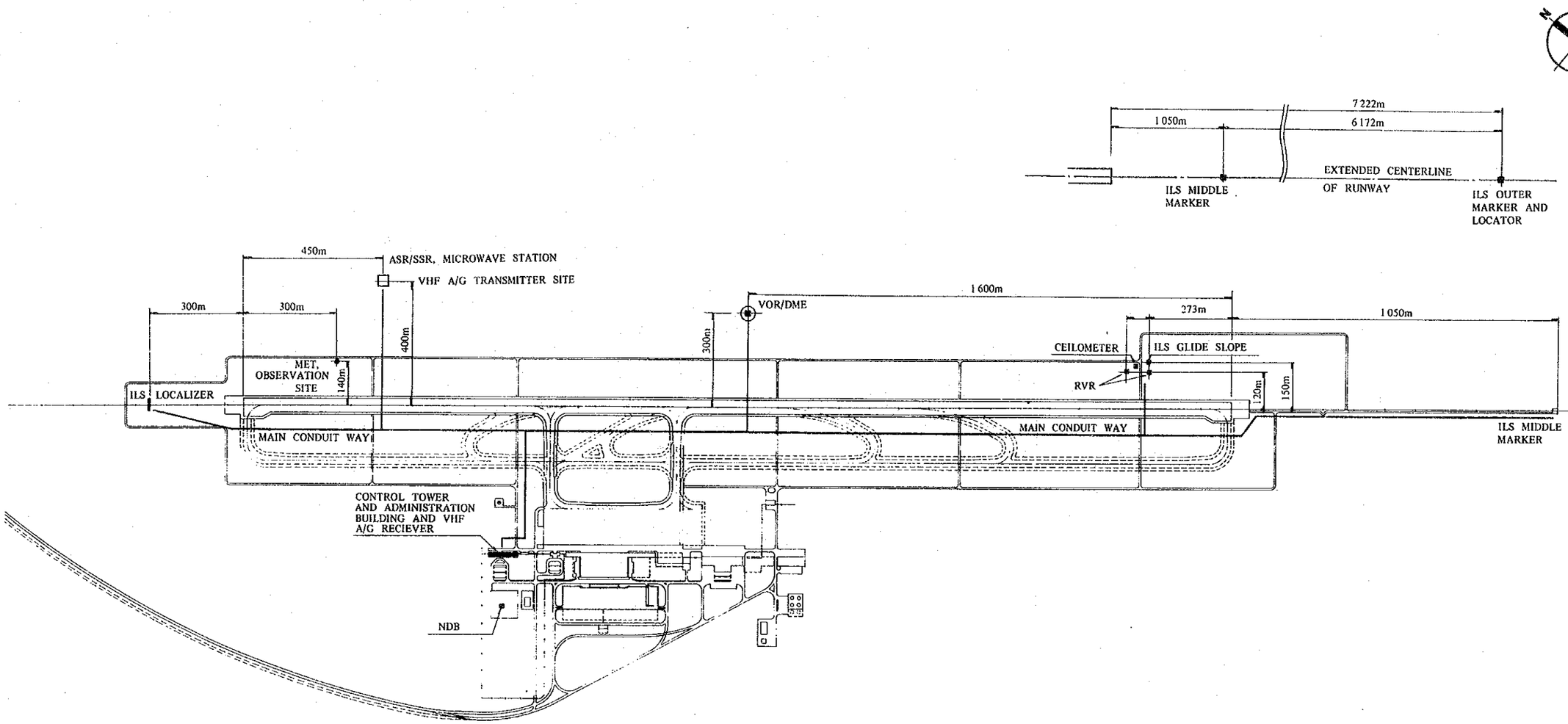


Fig. 10.8.2 Navaids Layout Plan

10.8.3 Aeronautical Telecommunications and Air Traffic Control System

The following three control positions are basically planned for air traffic control:

- Aerodrome control
- Approach control
- Flight information service

Five VHF air-to-ground radios will be required for the above positions, i.e., local, ground, approach, flight information and emergency. UHF air-to-ground radio is also planned for close coordination between the new airport and the adjacent military airport. ASR/SSR facility is planned as an indispensable equipment in order to maintain the necessary separation from the military aircraft. Thus, installation of ASR/SSR and UHF air-to-ground radio will contribute to safe aircraft operations of civil transport.

A microwave link between the new airport and Alexandria city is planned for aeronautical and meteorological telecommunications such as ATS direct speech circuits, AFTN teletypwriter circuits, etc.

10.8.4 Meteorological System

The following meteorological equipment are required for precision approach category I:

i) RVR meter
ii) Ceilometer
iii) Anemometer
iv) Thermometer
v) Precipitation gauge
vi) Barometer

All the data observed will be collected automatically by a central data collecting equipment which shall process, distribute and display the meteorological information to the control tower, radar control room, etc.

10.8.5 Aeronautical Ground Lights

Aeronautical ground lights as listed in Table 10.8.1 are planned to meet the operational requirements: precision approach category I. Fig. 10.8.3 shows the layout of aeronautical ground lights. All the lights will be controlled by a lighting control desk in the control tower. Power supply and control equipment for the lights, such as constant current regulator, logical control equipment, etc., are located at the substation in the administration building.

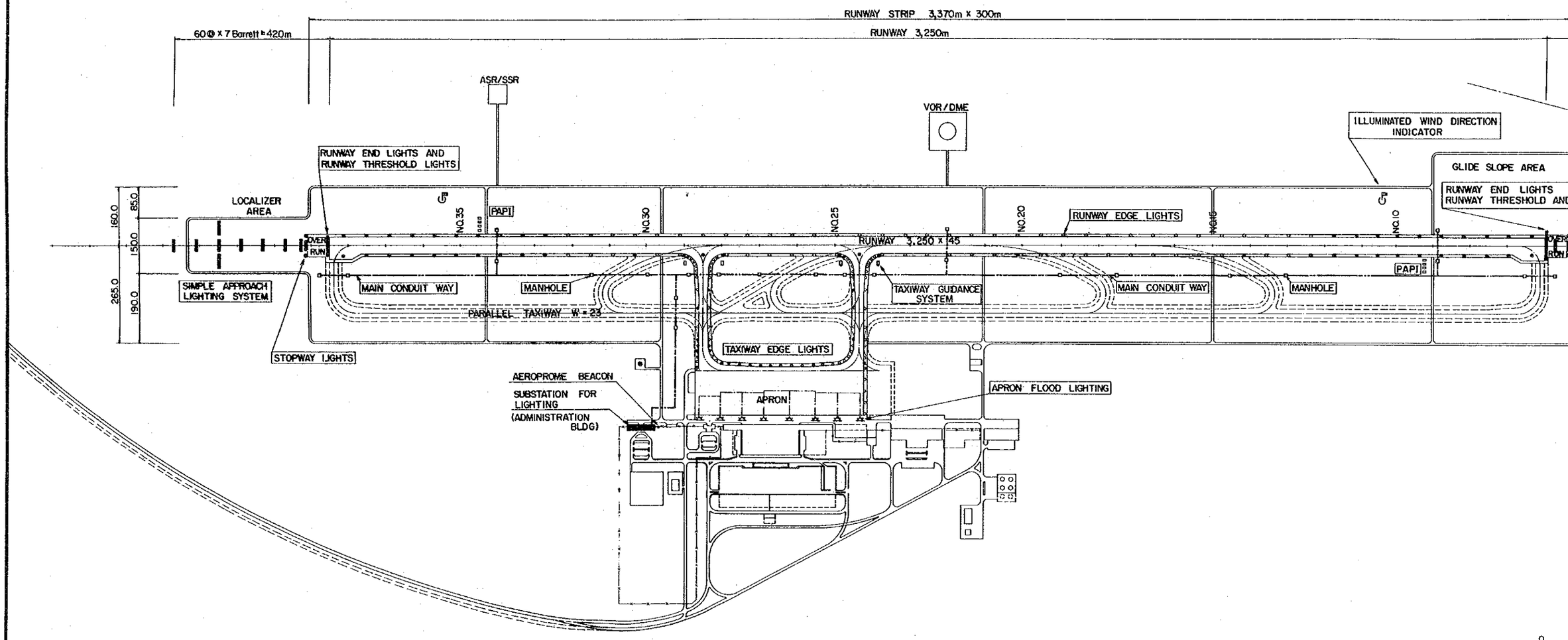

RUNWAY STRIP 3,370m x 300m
RUNWAY 3,250m
60Φ x 7 Barrett 420m
ASR/SSR
VOR/DME
ILLUMINATED WIND DIRECTION INDICATOR
GLIDE SLOPE AREA
RUNWAY END LIGHTS AND RUNWAY THRESHOLD LIGHTS
LOCALIZER AREA
160.0
85.0
150.0
265.0
190.0
NO.35
PAPI
NO.30
NO.25
NO.20
RUNWAY EDGE LIGHTS
NO.15
NO.10
RUNWAY 3,250 x 45
SIMPLE APPROACH LIGHTING SYSTEM
MAIN CONDUIT WAY
MANHOLE
TAXIWAY GUIDANCE SYSTEM
PARALLEL TAXIWAY W = 23
TAXIWAY EDGE LIGHTS
STOPWAY LIGHTS
AEROPROME BEACON
SUBSTATION FOR LIGHTING (ADMINISTRATION BLDG)
APRON
APRON FLOOD LIGHTING
SCALE

Fig. 10

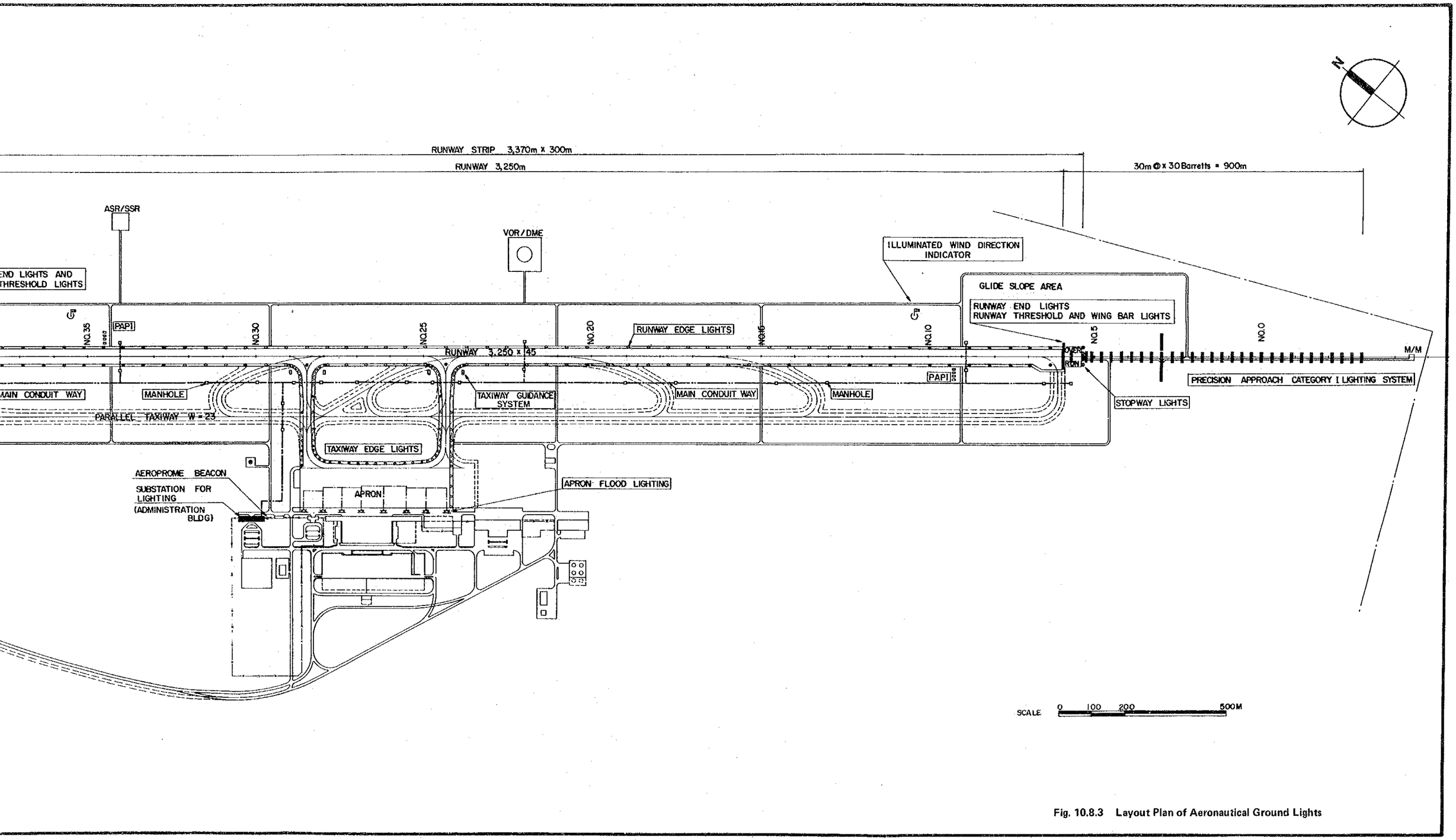


Fig. 10.8.3 Layout Plan of Aeronautical Ground Lights

10.9 General Services (New Airport)

10.9.1 Rescue and Fire Fighting

Airport category for rescue and fire fighting at the new airport will be category 8 in Phases I and II.

Fire station of the new airport which will have a floor area of approx. 400 sq.m and accommodate two major vehicles, one ambulance and one command car is located adjacent to the runway in order to meet the ICAO requirements for response times of not exceeding 3 minutes in an aircraft accident. No upgrading will be necessary in Phase II.

10.9.2 Fuel Supply

The required aviation fuel quantity is estimated to be 2,900 kl and 3,900 kl in Phases I and II, respectively. The fuel storage yard of 11,000 sq.m to meet the requirement in Phase II is located south of the terminal area and is reserved for the construction of fuel supply facilities.

The fuel storage and supply facilities are assumed to be constructed by other authority concerned. Thus, only necessary area is reserved and the cost for the facilities is excluded from the cost estimates in Chapter 13.

10.9.3 Ground Services

Ground service equipment (GSE) such as towing tractors, passenger stair cars and so on, will be supplied by airlines. Only an area necessary for parking of ground service equipment is studied and reserved at the new airport.

The required parking area is estimated to be about 5,000 sq.m based on the number of aircraft stands in Phase I. The apron and GSE road in front of the apron is partially available as a parking area. Therefore, exclusive parking area for GSE of about 1,700 sq.m is provided in the vacant space in front of the apron as shown in Fig. 10.2.2.

In Phase II, GSE parking area of approx. 7,000 sq.m will be required in the vacant space near the apron.

10.9.4 Airport Security

An airport boundary fence to define the airport property area will be set up along the boundary.

Security fence of the new airport is planned as shown in Fig. 10.2.1, in order to ensure safe aircraft operations. The security fence also serves to separate the area exclusively for VVIP and administration purposes from the public access area.

10.10 Airport Utilities (New Airport)

Airport utilities of the new airport which include power supply system, water supply system, sewage system, incinerator, etc., were planned to meet the demand requirements in Phases I and II as estimated in Section 4.7.

For power supply system, water supply system and telecommunications system which will be fed by or linked to national or regional network, utilities facilities are planned within the airport boundary up to the assumed interface point as shown in Fig. 10.10.1, except for the telecommunications system which will be interfaced at the planned microwave facilities at the radar station.

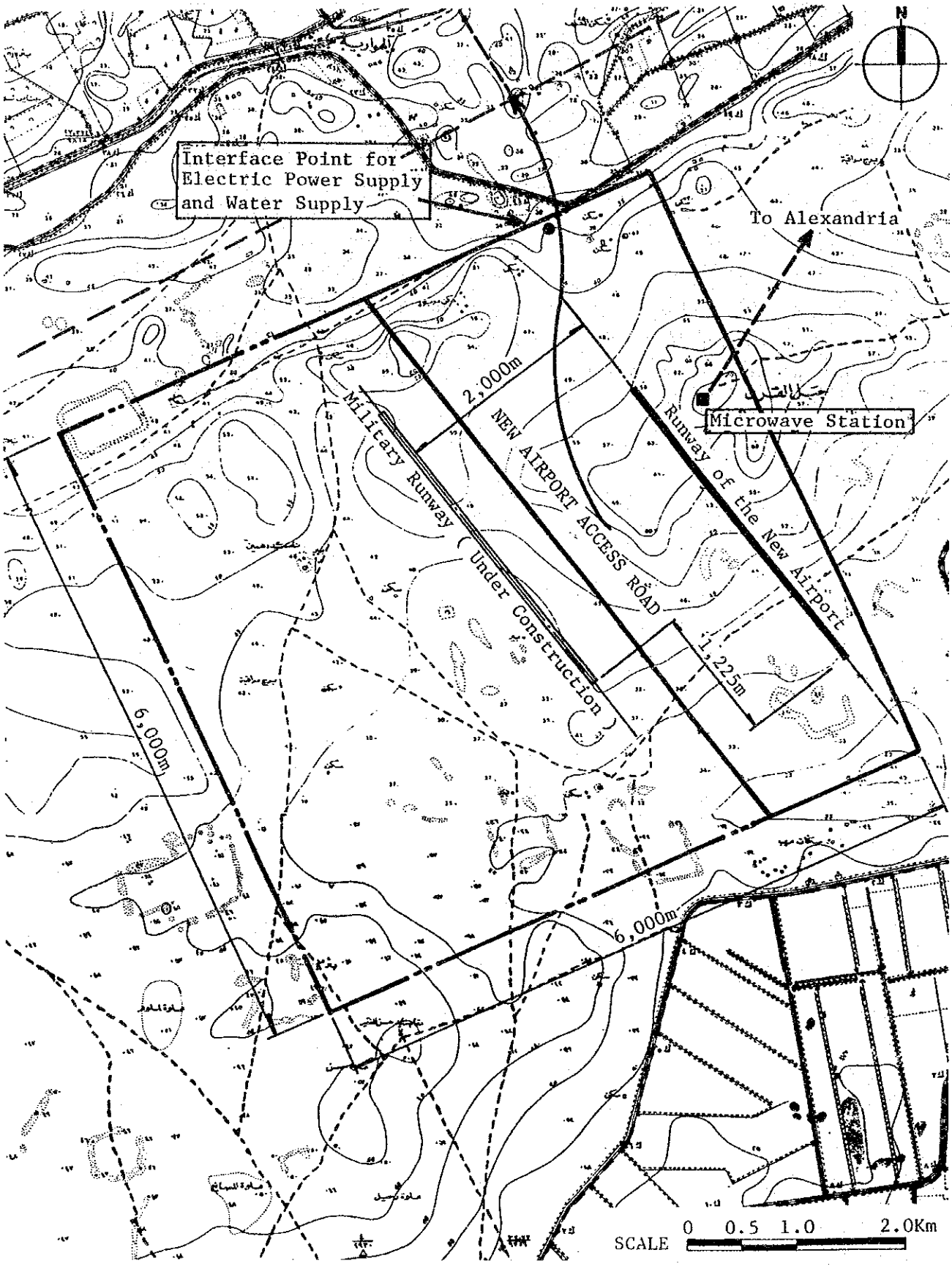


Fig. 10.10.1 Assumed Interface Point for Airport Utilities

10.10.1 Power Supply System

Power supply system at the new airport is planned to meet the following target demand in Phases I and II.

	Phase I	Phase II
Electricity Demand (KVA)	2,600	3,700

Fig. 10.10.2 shows the power supply system plan and the major considerations on the plan are summarized as follows:

i) It is assumed that the power supply system of the new airport consisting of a 11 kV feeder line, 11 kV distribution lines, a main switching and generator station, substations, etc., will be linked to the national transmission network in Alexandria region via an interface point which is assumed to be at the airport boundary and beside the airport access road as shown in Fig. 10.10.1. The cost required for the power supply system includes all the facilities inside the airport boundary (the interface point).

ii) Electricity is assumed to be fed by an underground 11 kV distribution line.

iii) A main switching and generator station, which will accommodate switch gears for distribution lines in the airport, and emergency generators for buildings and navigation aids, is located west of the administration building taking into consideration security and easy connection to the main distribution line.

iv) Substations which will transform high tension voltage (11 kV) to low tension (380/220 V) are planned at the passenger terminal building, the cargo terminal building, the administration building, etc. Expansion of these substations will be required in Phase II as shown in Fig. 10.10.2.

v) Two emergency generators consisting of a conventional generator for building use and a special generator for navigation aids are planned in Phase I at the main switching and generator station.

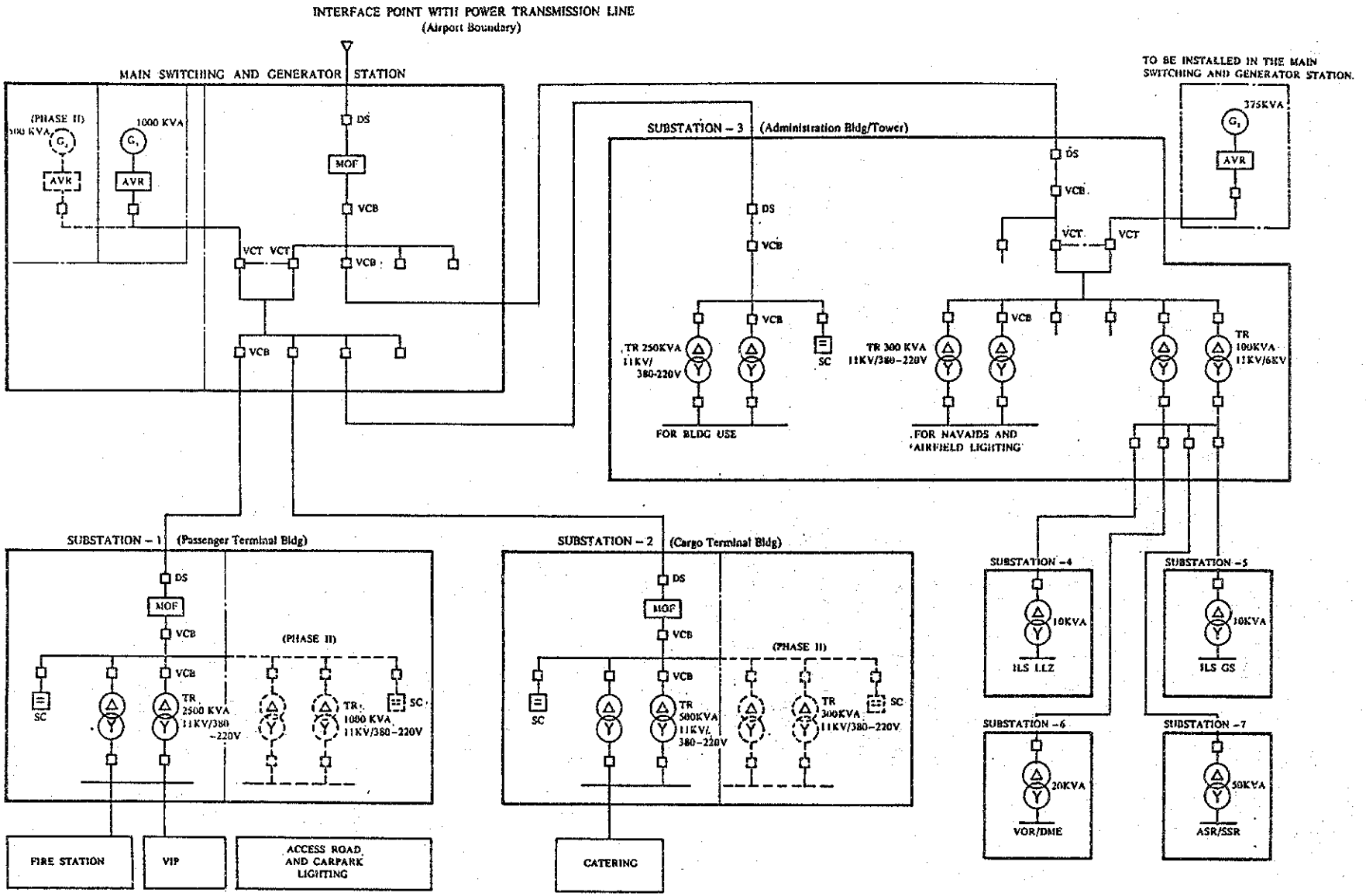


Fig. 10.10.2 Power Supply System Plan

Navigation aids will require a generator that gives a high switch-over time of less than 15 seconds in order to meet the ICAO requirements for precision approach category I. An additional generator for building use will be required in Phase II.

10.10.2 Water Supply System

Water supply system of the new airport is planned to meet the following target demand in Phases I and II.

	Phase I	Phase II
Water Demand (ton/month)	20,300	28,400

Fig. 10.10.3 shows the concept of water supply and the major considerations on the plan are summarized as follows:

i) Potable water can be supplied from the existing transmission main pipe of 1 metre in diametre which has already been constructed for New Ameriyah city development.

ii) A service reservoir is planned at the interface point as shown in Fig. 10.10.1, from which the potable water will be pumped up into an elevated tank via the main distribution line.

iii) The elevated tank is separately located from the public access area, beside the airport access road and near the airport entrance for easy connection to the main distribution line and for maintaining security.

iv) The planning conditions are assumed for cost estimates as follows:

Service reservoir:	Capacity of about 8 hours supply of daily maximum
Main Distribution line and Distribution Pumps:	Capacity of peak hourly demand
Elevated Tank:	Capacity of about 1 hour

v) Costs necessary for the water supply system include a service reservoir with distribution pumps, a main distribution line, elevated tank, and distribution lines to buildings, but exclude a distribution line beyond the airport boundary (the interface point).

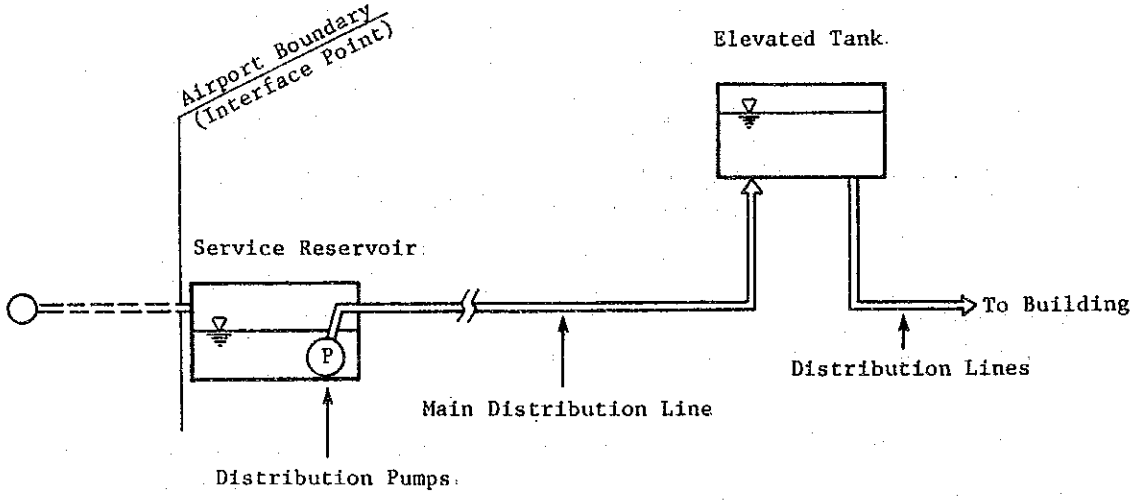


Fig. 10.10.3 Water Supply System Concept

10.10.3 Sewage System

A wastewater treatment and collection system are planned based upon the following conditions and assumptions:

(1) Quantity of Wastewater

Phase I:	680 cu.m/day
Phase II:	950 cu.m/day

(2) Quality of Wastewater (Influent)

BOD_5:	200 mg/litre
SS:	250 mg/litre

(3) Quality of Wastewater (Effluent)

BOD_5:	Less than 20 mg/litre
SS:	Less than 30 mg/litre

The following treatment methods are studied for the new airport.

i) Extended aeration

ii) Rotating biological contactor

iii) Oxidation ditch

iv) Oxidation pond

The rotating biological contactor can be considered as the most suitable method at the present stage and the cost estimate include a marginal value. The effluent water can be used as water for trees, lawn, etc.

The concept of the rotating biological contactor method is shown in Fig. 10.10.4.

The wastewater treatment facilities are located down the prevailing wind and at the south of the passenger terminal area.

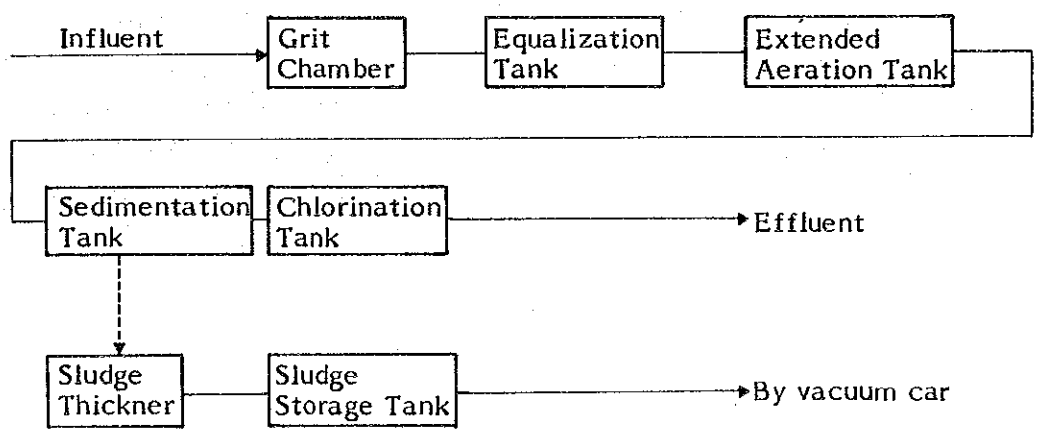


Fig. 10.10.4 Concept of Wastewater Treatment

10.10.4 Incinerator

Waste disposal at the new airport is planned to meet the following demand.

	Phase I	Phase II
Waste Deposit (ton/month)	90	140

Combustible waste materials will be carried to an incinerator which is located at the same area as the sewage treatment facilities. Residual refuse from the incinerator will be disposed in desert by land-fill method.

10.10.5 Telecommunications System

A microwave link which will connect with the new airport and national telecommunications network in Alexandria region is planned for telephone, telex, data communications, etc.

The microwave facilities comprising microwave transmitter and receiver, parabolic antenna, multiplex equipment, main distribution frame, etc., are planned at the radar (ASR/SSR) station and shall be linked to the passenger terminal building, etc., by underground communications cable links (Refer to Fig. 10.8.1). This microwave link will be used also for air traffic services such as AFTN, ATS direct speech circuit, meteorological data link, etc.