5.7 Master Planning for Priority Airports

5.7.1 Identification of Priority Projects for Airports

It was necessary to identify airports which should be developed on a priority basis. Master plans will be prepared for these airports for the period to 2020, the target year of this study.

Airports were classified into three groups according to their intended future role and importance, based on the strategy for air transport development presented in the previous section, Nine airports in the first two groups, primary and secondary, were evaluated to identify priority projects.

Airport classification	Airport	Remarks
Primary airport (2)	Almaty Akmola	 due to capital relocation
Secondary airport (7)	Aktau Aktyubinsk Atyrau Karaganda Pavlodar Shimkent Ust Kamenogorsk	

5.7.2 Facilities Development Guideline

(1) General

This section explains the criteria for determining facility requirements during master planning for the Primary and Secondary airports selected in section 5.2.2. Airport facilities will be planned and constructed in accordance with the Standards and Recommended Practices of the International Civil Aviation Organization. Where ICAO SARP's are not sufficient or relevant, those of the Japan Civil Aviation Bureau (JCAB), United States Federal Aviation Administration (FAA) and International Air Transport Association (IATA) will be selectively applied.

The process for determining facility requirements appears in **Figure 5.7.2.1**.

(2) Classification of Aircraft and Seat Capacity

The ICAO SARP's are related to the physical dimensions of aircraft and take into account wing span, overall length. The following aircraft classifications were made for this Study based on ICAO SARP's and seating capacity of aircraft. It is assumed that the existing Russian-made aircraft, still widely used in Kazakhstan, will be progressively replaced with modern Western aircraft.

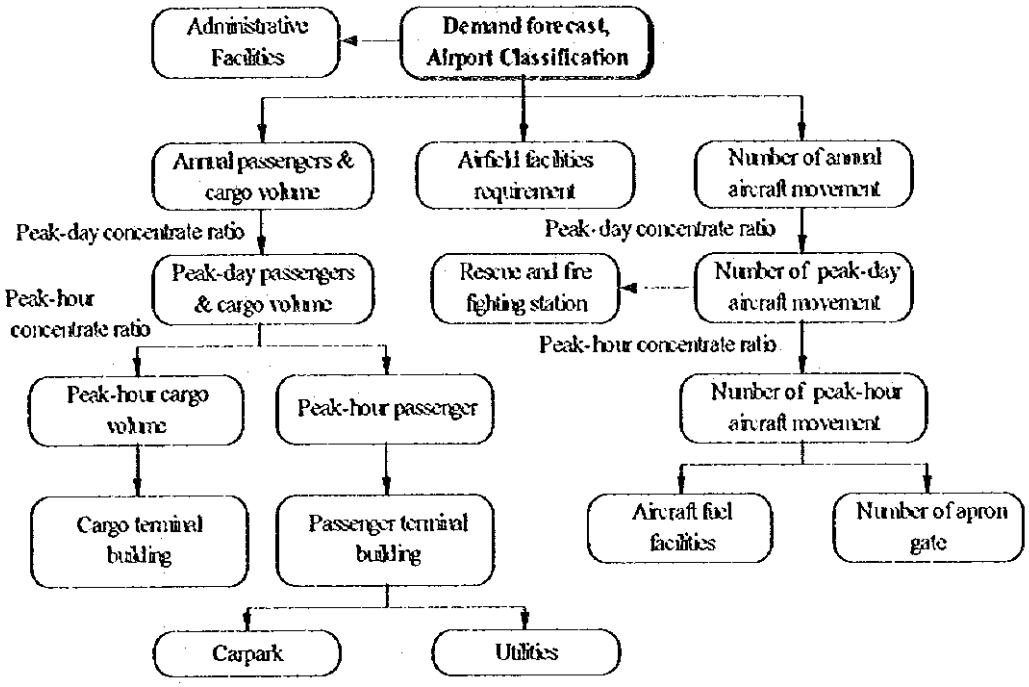


Figure 5.7.2.1 Work Flow of Facility Requirements Calculation

Table 5.7.2.1 Classification of Passenger Aircraft

Classification of aircraft	Representative Aircraft	Aircraft seat capacity
Large jet (LJ)	B747	400
Medium jet (MJ)	A300, B767	220
Small jet (SJ)	A320, B737	130
Turboprop (TP)	ATR72, F-50	60

(3) Airfield Planning Criteria

i. Runway Length

Runway length is determined by such factors as: type of aircraft, trip length, airport altitude and temperature, etc; however, due to the lack of this kind of information, the following assumptions were made and steps taken:

1. The basic runway length was calculated for the longest forecast route length.
2. The basic length was corrected as follows:
   - 7% per 300m elevation from sea level.
   - 1% for every 1°C by which the aerodrome reference temperature exceeds the temperature in the standard atmosphere for the aerodrome elevation.

The runway lengths required by aircraft at the airports are shown in **Appendix-5.7.1 (1)**.

ii. Taxiway System

In accordance with ICAO SARPS, parallel taxiways should be provided when at least one of the following operational conditions can be expected within 5 years:

- there are 4 instrument approaches during the peak hour
- annual movements total 50,000
- normal peak hour itinerant operations total 20
- hourly total (itinerant plus local) operation are 30

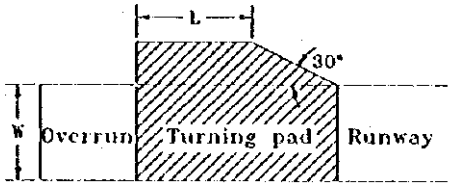
Also, parallel taxiways should be provided for airports which handle large aircraft.

For a runway without parallel taxiways, a turning pad should be provided at the runway end, and with the enlargement usually on the apron side. The dimensions of turning pads are shown in Table 5.7.2.2.

Some large airports in Kazakhstan should be provided with rapid exit taxiways to increase runway capacity in the future. When the peak hour traffic reaches approximately 25 movements (landing or take-oft), rapid exit taxiways should be provided in accordance with ICAO recommendations.

Table 5.7.2.2 Dimension of Turning Pad

Aircraft Type	W (m)	L (m)
MJ	75	70
SJ	60	60
TP	45	45



iii. Other Design Criteria

Other design criteria for aircraft movement areas appear in **Table 5.7.2.3**.

Table 5.7.2.3 Design Criteria of Airfield

Physical characteristics	Type of Aircraft LJ	MJ	SJ	TP
Runway				
-Width	45	45	30	23
-Width of Shoulder	10	7.5	7.5	5
Runway Strip				
-Length	R/W length +2×60	R/W length +2×60	R/W length +2×60	R/W length +2×60
-Width	* 300	* 300	* 300	* 150
Stopway				
-Length	45	45	30	23
-Width	60	60	60	60
Taxiway				
-Width	23	23	23	18
-Width of Shoulder	10.5	7.5	7.5	3.5

*: for precision approach runway

Unit:meter

(4) Terminal Area Planning Criteria

a) Planning Parameters

i. Aircraft Utilization

Planning standards for aircraft utilization appear in **Figures 5.7.2.2** and **5.7.2.3** and are based on the assumption that average aircraft size will increase with increased demand in order to benefit from lower unit operating costs.

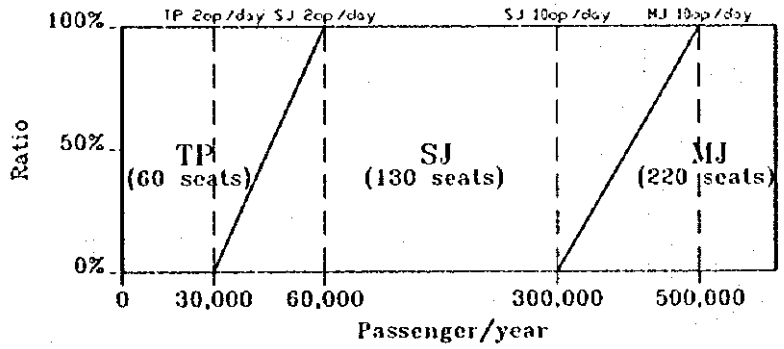


Figure 5.7.2.2 Aircraft Utilization for Domestic Air Service

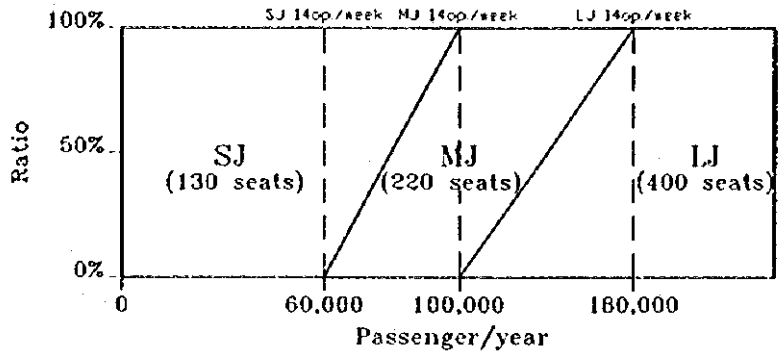


Figure 5.7.2.3 Aircraft Utilization for International Air Service

ii. Peak Day Ratio

Facility requirements are determined by the peak period of aircraft or passenger movements, mainly by designating the "typical peak hour". To avoid catering for extraordinary occurrences, the "typical peak hour" is commonly designated as the 30^{th} or 40^{th} busiest hour. Similarly the "typical busy day " is the 30^{th} or 40^{th} busiest day during a year.

Facilities for aircraft, for example an apron gate, should be provided in sufficient numbers to handle the second highest absolute yearly peak traffic levels. The planning criteria for passenger facilities is less stringent than for aircraft facilities. A typical peak day selection is often the 50^{th} or 60^{th} busiest day of the year. Peak day ratios appear in **Table 5.7.2.4**.

Table 5.7.2.4 Peak Day Ratio

Facility	Peak-day Concentration Ratio
Apron and refueling installation	1/330
Terminal Building, Parking Area	1/300

iii. Peak Hour Ratio

Peak hour ratios vary at each airport due to traffic volume, airport operating hours, time difference, flight times, etc. The peak hour ratio tends to decrease in relation to increases in aircraft movements. It can be calculated by equations using the number of aircraft movements as shown **Table 5.7.2.5**.

Table 5.7.2.5 Equations for Peak Hour Ratio

Service	Number of operation	Peak-hour concentration ratio (d)
Domestic	Less than 100 times	$d = 1.51 + a + 0.115$
	100 times or more	$d = 6.61 + a + 0.064$
International		$d = 1.05 + a + 0.114$

a: number of operations

iv. Average Load Factor

For planning purposes, the load factor (number of occupied seats/total seats available) for a peak month is set at 70 %.

v. Heavy Direction Ratio

The Heavy Direction Ratio is defined as the ratio of the aircraft movements in the heavier traffic direction (arrival or departure) divided by total peak hour movements. It is generally between 0.6 and 0.7. In this Study, it was set at 0.6.

(5) Apron

a) Loading Stands

The required number of aircraft stands for passenger loading and unloading are calculated based on the number of arriving aircraft at peak hour and gate occupancy time, using the following formula:

$$S = \sum_{i}^{n} \frac{T_i}{60} \times N_i \times a + b$$

where, S : number of loading stands
T_i : gate occupancy time in minutes of aircraft group i
N_i : number of aircraft movement of aircraft group i during peak hour
a : heavy direction ratio
b : number of extra aircraft stands

i. Gate Occupancy Time: Ti

Apron occupancy times vary depending on international or domestic services, aircraft type and other factors. **Table 5.7.2.6** gives the occupancy time by type of aircraft and service operated.

Table 5.7.2.6 Gate Occupancy Time for Aircraft Operating

Classification of aircraft	Typical Aircraft	Domestic service (minute)	International service (minute)
Large jet (LJ)	B747	75	115
Medium jet (MJ)	A300, B767	75	105
Small jet (SJ)	A320, B737	60	105
Turboprop (TP)	ATR72, F-50	50	-

b) Additional Stands

Some airports handle overnight aircraft stays. In this Study, it is assumed that those aircraft can be accommodated on the loading apron and no overnight stay stands will be required. At some airports, one additional stand will be provided for every 10 stands to deal with unexpected demands.

(6) Passenger Terminal Building

The floor area required for a passenger terminal building is calculated using the following equation:

$$R = P \times U$$

where, R : floor area requirement
P : number of peak hour passenger (both ways)
U : unit floor area requirement per passenger

a) Unit Floor Area Requirement per Passenger: U

Unit floor area requirement per passenger varies depending on international or domestic, number of airlines serving the airport, the level of services, etc. Under normal circumstances, however, the required building size per passenger during peak hours can be obtained by the following equation:

$$U = 21.6 - 0.91 \ln X$$

where, X : number of peak hour passengers

(7) Cargo Terminal Building

The size of a cargo terminal is determined based on: an in-depth analysis of individual facility requirements, types and physical distribution characteristics of cargo, and other pertinent factors. For average jet airports, the required terminal size can be obtained using the following procedure.

In the case of non-jet airports or airports handling cargo volumes of less than 500 tons, cargo handling space is provided as part of the passenger terminal building instead of providing dedicated cargo facilities.

In airports handling large cargo volumes, the cargo throughput per unit area tends to increase with aircraft size and cargo handling efficiency. The cargo throughput per unit area for determining the total size of cargo sheds is given by the following equations;

$$C_1 = 0.0096 X^{0.77}$$

$$C_2 = 2.201 \ln X - 8.78$$

where, C_1 : cargo through put per unit area of shed ($500<X<10,000$)
C_2 : cargo through put per unit area of shed ($10,000 \leq X<50,000$)
X : planned cargo volume

(8) Car Parking for Passengers

The following equation is used to calculate the required number of parking lots;

$L = P \times c$

where, L : number of parking lots required
P : number of peak hour passengers (both ways)
c : parking ratio
(In this Study, the Parking ratio was set at 0.8.)

The required total car parking area is determined by applying a unit space of 35 m^2 for a parking lot. This includes internal roads and green belt in addition to net parking space.

(9) Airport Administration and Operations Facilities

a) Administrative Facilities Area

Administrative facilities are those used for such functions as: administration offices, control towers, air navigation service buildings, etc. The average total requirement for administrative areas at each airport appears in **Table 5.7.2.7**, according to the JCAB standards.

Table 5.7.2.7 Requirements for Administrative Facilities Area

Classification of airport	Requirement for administrative facilities area
Primary Airport	5,000 m^2
Secondary Airport	4,500 m^2
Regional Airport	2,400 m^2

b) Rescue and Fire Fighting Services

The required area for Rescue and Fire Fighting (RFF) services is determined using ICAO recommendations. These are based on aircraft type and frequency.

The required area for RFF services for each ICAO category appears in **Table 5.7.2.8**.

Table 5.7.2.8 Required Area for Rescuer and Fire Fighting Services

ICAO Airport Reference Number	Operational aircraft	Requirement area (m^2)
9	All	2,700
8	Large Jet	2,700
	Others	1,750
7	Large Jet	2,700
	Others	1,500
6	Large Jet	1,575
	Others	1,200
5	Medium Jet	1,200
	Others	1,050
4	Regular	1,050
	Charters,etc	900

c) Power Stations, Water Supply and Sanitation

Requirements for power station, water supply and sanitation facilities are calculated based on the unit demand shown in **Table 5.7.2.9**.

Table 5.7.2.9 Unit Demand of Utilities

Utilities	Unit	Facilities	Unit Demand
Electricity	VA/m^2	Passenger terminal building	100
		Cargo terminal building	60
		Administration building and others	80
Water/Sewage	$ton/m^2/day$	Passenger terminal building	0.023
		Cargo terminal building	0.003
		Administration building and others	0.010
Solid waste	$kg/m^2/day$	Passenger terminal building	0.072
		Cargo terminal building	0.005
		Administration building and others	0.025

d) Aircraft Fuel Facilities

The Aircraft Fuel Facility requirement is calculated by multiplying fuel consumption by number of departing flights, for each route and for each aircraft type. The required fuel storage capacity is estimated based on the calculated fuel requirements and a seven day reserve. The equations for calculating trip fuel consumptions appear in **Table 5.7.2.10**.

Table 5.7.2.10 Standard Amount of Fuel Consumption

Aircraft type	Fuel consumption :Y (kl)
LJ	$Y = 0.0098X + 4.80$
MJ	$Y = 0.0076X + 3.20$
SJ	$Y = 0.0041X + 0.75$
TP	$Y = 0.0010X + 0.60$

X: Route Distance (km)

(10) Airport Layout

A model airport layout plan is shown in **Figure 5.7.2.4**.

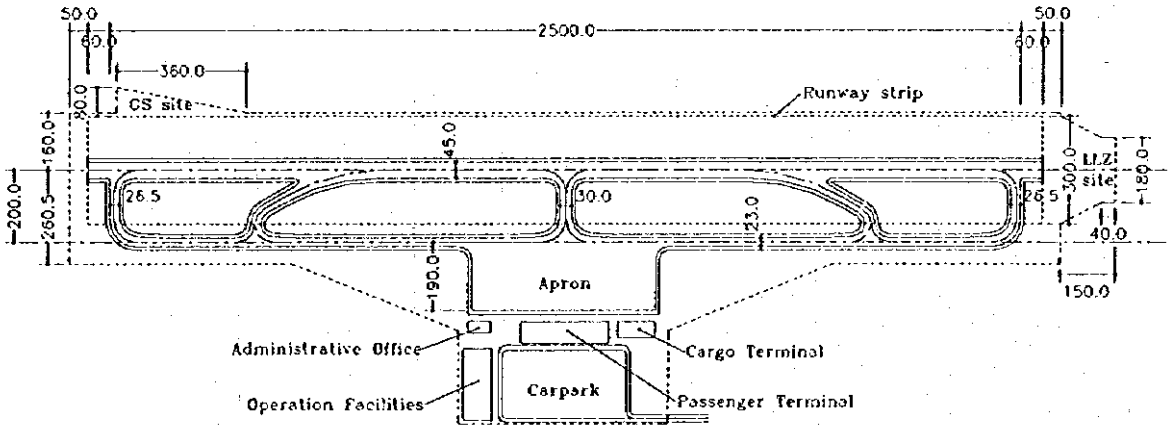


Figure.5.7.2.4 A Model Plan of Airport Layout (Runway length:2,500m)

5.7.3 Facility Development Plans

(1) Facility Requirement

An airport master plan defines the future role and function of the airport within the national airport structure, and then defines future facility and equipment requirements.

The future requirements to the year 2020 were determined qualitatively and quantitatively based on: the first site survey of existing facilities and equipment; collected data and layouts; the demand forecasts; and development guidelines and strategies. These appear in **Table 5.7.3.1**.

Table 5.7.3.1 Existing Facilities and Future Requirement

Airport (Region)	Akmola (Akmola)			Aktau (Mangistau)			Aktyubinsk (Aktyubinsk)			Almaty (Almaty)		
Year	1995	2005	2020	1995	2005	2020	1995	2005	2020	1995	2005	2020
1. Annual Passengers (,000)												
-Domestic	-	1,001	2,315	-	430	845	-	117	269	-	2,568	3,374
-International	-	237	1,294	-	56	225	-		61	-	2,163	3,057
-Total	154	1,237	3,609	281	486	1,070	69	117	330	1,615	4,731	6,431
2. Annual Cargo Volume (tons)												
-Domestic	-	12,560	29,936	-	5,265	9,871	-	1,213	2,544	-	23,731	25,143
-International	-	8,866	31,305	-	377	6,371	-		385	-	45,096	69,784
-Total	2,385	21,426	61,241	2,882	5,642	16,242	593	1,213	2,930	20,355	69,827	94,926
3. Annual Aircraft Movements	NA	17,820	49,500		6,600	15,180		1,320	5,280		67,320	74,580
4. Peak Hour Passengers (both way)												
-Domestic	-	500	1,000	-	280	440	-	190	220	-	1,040	1,330
-International	-	160	580	-	120	180	-		80	-	910	1,260
5. Peak Hour Aircraft Movements (one way)												
-Domestic	-	3.8	7.6	-	2.1	3.5	-	1.2	1.7	-	8.3	8.6
-International	-	1.5	4.2	-	0.8	1.2	-		0.9	-	6.8	7.7
6. ICAO Aerodrome Reference Code	4D	4D	4D	4D	4D	4D	4D	4D	4D	4E	4E	4E
7. Runway												
-length (m)	2,511	2,800	2,800	2,650	2,650	2,650	3,100	3,100	3,100	4,400	4,400	4,400
-width (m)	49	45	45	42	45	45	60	45	45	60	45	45
8. Runway Strip												
-length (m)	3,311	2,920	2,920	3,450	2,770	2,770	3,900	3,220	3,220	5,200	4,520	4,520
-width (m)	200	300	300	265	300	300	150	150	300	300	300	300
9. Taxiway	Partial Parallel Taxiway	Parallel Taxiway	Parallel Taxiway	2 Stub Taxiway	2 Stub Taxiway	2 Stub Taxiway	Partial Parallel Taxiway	Partial Parallel Taxiway	Partial Parallel Taxiway	4 Exit Taxiway	Parallel & 8 Exit Taxiway	Parallel & 8 Exit Taxiway
-System												
-max width (m)	18	30	30	NA	30	30	22.5	30	30	22.5	30	30
10. Apron												
-LJ (B747)							2			12	3	5
-MJ (B767,A300)	3	2	5	6		2	4		1	16	5	5
-SJ (B737,A320)	2	6	12		5	6	4	2	3	15	16	16
-TP (F50, ATR72)	13		1	13			16			17	1	
11. Passenger Terminal Building												
-Domestic (m^2)	-	8,800	16,500	-	5,240	7,740	-	3,550	4,110	-	17,160	21,950
-International (m^2)	-	2,990	10,210	-	2,240	3,370	-		1,580	-	15,020	20,790
-Total (m^2)	1,050	11,790	26,710	215	7,480	11,110	3,600	3,550	5,690	11,500	32,180	42,740
12. Cargo Terminal Building												
-Domestic (m^2)	-	1,050	2,150	-	750	870	-	530	640	-	1,770	1,860
-International (m^2)	-	840	2,240	-	-	780	-	-	-	-	3,050	3,200
-Total (m^2)	-	1,890	4,390	-	750	1,650	-	530	640	-	4,820	5,060
13. Administrative Area (m2)	*1,963	4,000	5,000	*226	2,400	4,000	*886	2,400	4,000	*1,769	4,000	5,000
14. Carpark												
-Parking Slots	NA	528	1,264	NA	320	496	NA	152	240	NA	1,560	2,072
-Area (m^2)	NA	18,480	44,240	NA	11,200	17,360	NA	5,320	8,400	NA	54,600	72,520
15. Air Navigation System	2ILS, 4NDB, RSBN, REDL, ALS, RWYTIL	CAT-I ILS, VOR/DME, NDB, RSBN, REDL, RWCL, PALS, RWYTIL, RTZL, ABN	CAT-II ILS/MLS, VOR/DME, NDB, RSBN, REDL, RWCL, PALS, RWYTIL, RTZL, ABN	2ILS, VOR/DME, 4NDB, RSBN, REDL ALS, RWYTIL	CAT-I ILS, VOR/DME, NDB, RSBN, REDL, RWCL, SALS, RWYTIL, RTZL, ABN	CAT-I ILS, VOR/DME, NDB, RSBN, REDL, RWCL, SALS, RWYTIL, RTZL, ABN	2ILS, VOR/DME, 4NDB, REDL, ALS, RWYTIL	CAT-I ILS, VOR/DME, NDB, RSBN, REDL, RWCL, SALS, RWYTIL, RTZL, ABN	CAT-I ILS, VOR/DME, NDB, RSBN, REDL, RWCL, SALS, RWYTIL, RTZL, ABN	2ILS, VOR/DME, 4NDB, REDL, ALS, RWYTIL	CAT-I ILS, VOR/DME, NDB, RSBN, REDL, RWCL, PALS, RWYTIL, RTZL, ABN	CAT-II ILS/MLS, VOR/DME, NDB, RSBN, REDL, RWCL, PALS, RWYTIL, RTZL, ABN
16. Rescue and Fire Fighting												
-Level of Protection	6	7	8	6	5	7	7	4	7	8	9	9
-Fire Station Area (m^2)	*438	1,500	2,700	* 94	1,050	1,500	*115	1,050	1,500	* 69	2,700	2,700
17. Utilities												
-Power Supply (KVA)	2,000	2,010	4,070	NA	1,230	1,910	NA	750	1,200	NA	4,530	6,030
-Water Supply (t/day)	NA	320	680	NA	200	300	NA	110	170	600	790	1,050
-Sewage Disposal (t/day)	NA	320	680	NA	200	300	NA	110	170	NA	790	1,050
-Solid Waste Disposal (kg/day)	NA	1,650	3,180	NA	960	1,570	NA	660	1,050	NA	3,490	4,400
18. Fuel Supply Facilities												
-Tank Capacity (kl)	8,000	1,930	5,350	3,000	610	1,580	9,000	140	440	22,000	10,120	13,160
-Fuel Farm Area (m^2)	NA	14,300	35,300	NA	8,500	14,300	NA	4,800	6,300	NA	63,000	63,000

Note: Data of 1995 is assumed by historical data.

*: Building Floor Area

Atyrau (Atyrau)			Karaganda (Karaganda)			Pavlodar (Pavlodar)			Shimkent (South Kazahstan)			Ust Kamenogorsk (East Kazahstan)		
1995	2005	2020	1995	2005	2020	1995	2005	2020	1995	2005	2020	1995	2005	2020
-														
-	242	519	-	343	774	-	292	675	-	322	712	-	255	496
	41	83	-	91	208	-	44	89	-	37	77	-		31
167	283	602	242	434	982	157	336	764	203	359	789	174	255	527
-	2,249	4,815	-	4,002	6,512	-	1,554	3,339	-	2,324	4,939	-	3,084	6,079
-	86	173	-	308	2,601	-	102	205	-	179	373	-		148
1,439	2,334	4,989	2,604	4,311	9,113	1,034	1,656	3,544	1,431	2,503	5,312	1,878	3,084	6,227
	3,960	9,240		5,940	12,540		4,620	10,560		4,620	7,260		3,300	7,260
-	220	310	-	250	420	-	230	380	-	260	470	-	230	320
-	90	110	-	110	200	-	100	110	-	80	100	-		60
-	1.6	2.6	-	1.9	3.1	-	1.7	2.8	-	1.7	2.1	-	1.6	2.3
-	0.8	0.9	-	0.9	1.0	-	0.8	0.9	-	0.8	0.9	-		0.8
4D	4D	4D	4E	4E	4E	4D	4D	4D	4D	4D	4E	4D	4D	4D
2,350	2,350	2,350	3,300	3,300	3,300	2,500	2,700	2,700	2,800	2,800	2,800	2,500	2,500	2,500
44	44	44	60	45	45	45	45	45	44	44	44	42	42	42
NA	2,470	2,470	4,100	3,420	3,420	3,300	2,820	2,820	3,080	2,920	2,920	NA	2,620	2,620
NA	150	300	200	300	300	130	300	300	NA	300	300	150	150	150
2 Stub Taxiway 18	2 Stub Taxiway 18	2 Stub Taxiway 30	2 Stub Taxiway 22.5	2 Stub Taxiway 22.5	2 Stub Taxiway 23	1 Stub Taxiway 18	2 Stub Taxiway 30	2 Stub Taxiway 30	Parallel Taxiway NA	Parallel Taxiway 30	Parallel Taxiway 30	Parallel Taxiway NA	Parallel Taxiway 23	Parallel Taxiway 23
			2						2		1			
NA		1	9	1	3	2		2	2	1	1	NA		
	4	4	9	3	4	3	4	4	16	4	2		2	5
						13					1			
-	4,110	5,460	-	4,680	7,390	-	4,300	6,690	-	4,860	8,270	-	4,300	5,630
-	1,780	2,060	-	2,060	3,740	-	1,870	2,060	-	1,580	1,870	-		1,190
2,880	5,890	7,520	13,500	6,740	11,130	3,600	6,170	8,750	1,177	6,440	10,140	394	4,300	6,820
-	610	730	-	700	780	-	560	670	-	610	740	-	660	770
-	-	-	-	-	630	-	-	-	-	-	-	-	-	-
-	610	730	-	700	1,410	-	560	670	-	610	740	-	660	770
* 2,674	4,000	4,000	* 437	2,400	4,000	* 689	2,400	4,000	* 990	2,400	4,000	* 2,310	2,400	4,000
NA	248	336	NA	288	496	NA	264	392	NA	272	456	NA	184	304
NA	8,680	11,760	NA	10,080	17,360	NA	9,240	13,720	NA	9,520	15,960	NA	6,440	10,640
2ILS, VOR/DME, 4NDB, RSBN, REDL, ALS, RWYTIL	CAT-I ILS, VOR/DME, NDB, RSBN, REDL, RWCL, SALS, RWYTIL, RTZL, ABN	CAT-I ILS, VOR/DME, NDB, RSBN, REDL, RWCL, SALS, RWYTIL, RTZL, ABN	2ILS, VOR/DME, 4NDB, RSBN, REDL, ALS, PAPI, RWYTIL	CAT-I ILS, VOR/DME, NDB, RSBN, REDL, RWCL, SALS, RWYTIL, RTZL, ABN	CAT-I ILS, VOR/DME, NDB, RSBN, REDL, RWCL, SALS, RWYTIL, RTZL, ABN	ILS, 4NDB, RSBN, REDL, ALS, RWYTIL	CAT-I ILS, VOR/DME, NDB, RSBN, REDL, RWCL, SALS, RWYTIL, RTZL, ABN	CAT-I ILS, VOR/DME, NDB, RSBN, REDL, RWCL, SALS, RWYTIL, RTZL, ABN	2ILS, 4NDB, RSBN, REDL, ALS, RWYTIL	CAT-I ILS, VOR/DME, NDB, RSBN, REDL, RWCL, SALS, RWYTIL, RTZL, ABN	CAT-I ILS, VOR/DME, NDB, RSBN, REDL, RWCL, SALS, RWYTIL, RTZL, ABN	2ILS, 4NDB, RSBN, REDL, ALS, RWYTIL	CAT-I ILS, VOR/DME, NDB, RSBN, REDL, RWCL, SALS, RWYTIL, RTZL, ABN	CAT-I ILS, VOR/DME, NDB, RSBN, REDL, RWCL, SALS, RWYTIL, RTZL, ABN
6	5	7	7	7	8	7	5	7	6	7	8	6	5	5
* 53	1,050	1,500	*339	1,500	1,750	* 84	1,050	1,500	*170	1,500	2,700	*820	1,050	1,050
NA	1,220	1,430	NA	1,140	1,900	NA	1,060	1,570	NA	1,100	1,740	NA	840	1,340
NA	180	220	1,200	180	300	12,000	170	240	NA	170	280	NA	120	200
NA	180	220	NA	180	300	NA	170	240	NA	170	280	NA	120	200
NA	1,060	1,190	NA	910	1,540	NA	850	1,270	NA	870	1,370	NA	730	1,150
9,000	330	700	10,000	480	970	10,000	360	1,020	7,000	310	780	NA	180	740
NA	6,300	8,500	NA	6,300	8,500	NA	6,300	8,500	NA	6,300	8,500	NA	4,800	8,500

(2) Facility Planning

The master plans determine the additional requirements (over and above existing facilities). The following specific requirements were identified. Facilities outside of airports, such as access roads, have not been included in master plans.

a) Pavement

The pavement requirements were determined based on assumptions because no detailed information except Pavement Classification Numbers (PCNs) was available. (see **Table 5.7.3.2)**

At Almaty and Akmola airports, the pavement bearing strength will be increased to facilitate the volume and type of forecast traffic. It will not be necessary to strengthen the pavement at the other remaining airports. An overlay of asphalt concrete (minimum 5 cm in depth) is planned every 10 year to correct pavement deterioration.

b) Aircraft Parking Configuration

A Nose-in/Push-out parking configuration is basically planned taking into account the improved level of airport services, except at Almaty International Airport. At Almaty, Power-in/Power-back maneuvering is applied for some SJ and TP class aircraft stands, in order to maintain the required area within the existing property.

c) Passenger Loading Bridge

Passenger loading bridges will be installed for passenger convenience.

d) Air Traffic Control Tower

Air traffic control towers are planned to replace the existing START cabs alongside runways, to provide better and safer air traffic control.

e) Perimeter and Security Fences

Perimeter and security fencing are planned to protect property and safeguard aircraft operations.

f) Aircraft Maintenance Hangars

At the hub airports, such as Almaty and Akmola, aircraft maintenance hangars for two larger aircraft are planned. At each of the remaining airports, two smaller aircraft hangars are planned.

Table 5.7.3.2 Pavement Thickness at Runway

Airport	Almaty	Aktyubinsk	Atyrau	Akmola	Aktau	Karakanda	Pavlodar	U'st-kamenogorsk	Shimkent
Design aircraft	B747	B767	B767	B747	B767	B767	B767	B737	B747
Design CBR	9	13	13	9	6	13	13	13	13
R/W K Value	90MN/m3	120MN/m3	120MN/m3	90MN/m3	42.5MN/m3	120MN/m3	120MN/m3	120MN/m3	120MN/m3
Equivalent Departure	3,167	458	520	1,614	917	1,070	795	1,375	690
Flexible/ Rigid	Rigid	Rigid	Flexible	Flexible	Flexible	Rigid	Flexible	Rigid	Rigid
Existing Thickness (R/W)	RC 24cm CC 20cm Sa 3cm AG 15cm SS 10cm	RC 24cm CC 22cm AG 8cm SS 38cm	AC 13cm RC 14cm CC 16cm Sa 10cm	AC 10cm AC 2cm AC 12cm CC 24cm Sa 35cm	?	RC 24cm CC 22cm Sa 3cm AG 38cm	AC 8cm MG 18cm AG 28cm Sa 16cm	?	?
Total	72 cm	92 cm	53 cm	83 cm		87 cm	70 cm		
Required Thickness	CC 36 AC 79	CC 30	AC 55	AC 79	AC 51	CC 30	AC 61	CC 24	CC 28
Overlay thickness to strengthen	need	no need	6	6		no need	no need		
Overlay thickness for superannuating	Overlay 7 cm thick with AC	5	5	5	5	5	5		
A/P PCN	62/F/C/Y/T	26/R/A/X/T	26/R/A/X/T	27/R/B/X/T	47/F/C/Y/T	49/R/B/X/T	9/R/A/X/T		
A/P Design CBR	6	13	13	9	6	9	13		
A/P K Value	42.5MN/m3	120MN/m3	120MN/m3	90MN/m3	42.5MN/m3	90MN/m3	120MN/m3		

(3) Master Plan

For the selected nine airports, master plans for airport development over the long term to the year 2020 have been prepared and layout plans drawn based on: the collected data and layout information, the demand forecast, the development guidelines and the development strategy. Particular considerations are described below for some of these airports.

a) Akmola Airport

This airport will serve the new capital airport as well as serving as a primary airport along with Almaty. The following facilities are required in addition to the usual airport facilities therefore.

- Runway for flights to western Europe by Boeing 747 class aircraft
- VVIP building separated from the public area

i. Runway Extension

It is planned to extend the runway by 1,000 meters to facilitate large aircraft flying directly to the western Europe.

The direction of the extension is in the 04 direction for the following reasons.

- The ground water level in the runway 22 extension area apears high. Geological conditions can be considered poor for airfield pavement.
- Construction cost will, therefore, be less 04 extension than for 22 regarding earthwork, pavement and drainage works.
- The impact of aircraft noise will be less because 04 is further from the City.

ii. Selection of Terminal Location

A new terminal area is planned because most of the existing facilities are more than 20 years old and because the airport operation must continue during any construction work.

There are two sites, i.e. northwest side of the runway (existing terminal side) and southeast side (lake side). On the other hand, there are two options: 1) both international and domestic are located on the same side; and 2) they are located on apposite sides.

A comparative study was carried out taking into account: airport operations, user's convenience, further expansion, landscaping and construction cost, as shown in **Table 5.7.3.1**.

- Case-1 (existing terminal side; see **Figure 5.7.3.1**)

  The new passenger terminal would be located on a vacant lot next to the existing terminal, utilizing the existing facilities as much as possible.

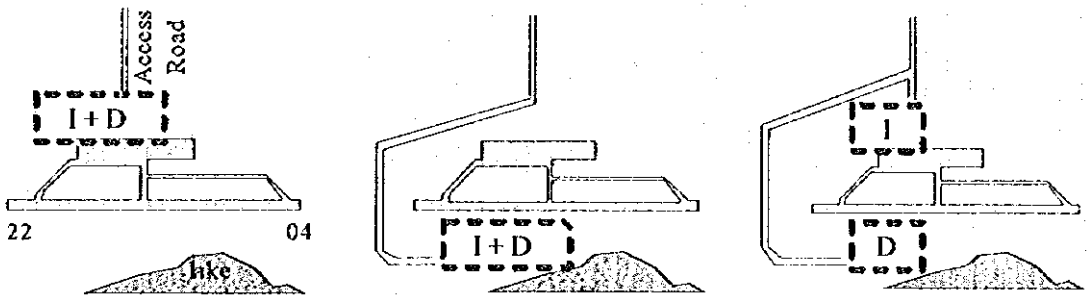
- Case-2 (lake side)

  The new terminal complex would be constructed on the southeast side of the

runway. It would require construction of all the necessary facilities, including access road and public utilities.

- Case-3 (combined)

  The new international passenger terminal would be located on the southeast side in. Other functions would remain on the other side of the runway.



Case-1 Case-2 Case-3

Figure 5.7.3.1 Alternative Locations of New Terminal Area

- Airport user (passenger and cargo): For this size of airport, one integrated terminal is usually more convenient for passengers especially those transiting with heavy accompanying baggage. For cargo handling, one terminal reduces loading and unloading transfer times of.
- Airport operation: Aircraft stands can be commonly used by both international and domestic flights where aircraft stands are continuous or adjacent. For airport administration and security, one integrated terminal can reduce the work load.

It is common practice to locate most terminal functions in one area, and in many cases near the mid-point the runway(s) as far as physical conditions permit. Some examples appear in **Figure 5.7.3.2.** Besides Tokyo's Narita Airport, the integrated terminal concept is used in modern, state-of-the-art new airports in Asian countries.

In the case of Moscow Sheremetyevo International Airport, terminal II was inaugurated in 1980 for the year of Olympic Games at the opposite the existing terminal I against the runway. This was because there was no room for development in the terminal I side, and the available construction period was so limited that phased construction, which involves demolition or relocation of the existing facilities was not practical. Now the terminal II is used for international flights while terminal I is for domestic flights.

- Further expansion: The airport is surrounded mainly by field. There is enough space for further development around the airport. Expandability will not be a problem in all cases.
- Landscape: The difference is not considered major regarding natural conditions. Man made factors will influence the esthetic more such as

architecture, street fixtures and lawns.

- Construction cost: Development in and around the existing area allows more utilization of the existing facilities such as aprons, taxiways, access road and utilities. This will reduce costs composed to developing a completely new terminal area.

Case-1 was considered the preferred alternative.

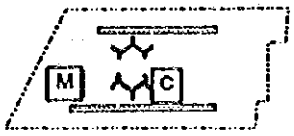
Table 5.7.3.1 Comparison of Terminal Area Development

Alternative / Evaluation Item		Case 1: Development in the existing area with combination of Domestic PTB and International		Case 2: Development in the lake side area with combination of Domestic PTB and International		Case 3: Development in two area with separation between Domestic PTB and International	
1.Convenience for Airport Users							
1.1 Passenger and Cargo							
1.1.1 Transfer between Int'l and Dom.	-	Good: Easy and time-saving	-	Good: Easy and time-saving	X	Poor: Complicated and time- consuming	
1.1.2 Accessibility from the city	-	Good: Easy and time-saving	X	Poor: Longer	X	Poor: Longer	
1.2 Airport Operation							
1.2.1 Vehicle circulation on airside	-	Good: Short	-	Good: Short	X	Poor: Long	
1.2.2 Apron spot assignment	-	Good: Easy and flexible	-	Good: Easy and flexible	X	Poor: Complicated and not easy	
1.2.3 Cargo handling & conveying between Int'l and domestic PTB	-	Good: Easy and time-saving	-	Good: Easy and time-saving	X	Poor: Complicated and time- consuming	
1.2.4 Airport administration & security	-	Good: Easy and efficient	-	Good: Easy and efficient	X	Poor: Not easy and inefficient	
2. Expandability of PTB for future	-	Easy	-	Easy	-	Easy	
3.Scenery consideration	-	Good	-	Good	-	Good	
4. Cost Consideration	-	US$ 17,601,000	X	US$ 38,231,000	X	US$ 34,521,000	
3.1 Land acquisition		10.5 ha		91 ha		103.8 ha	
3.2 Utilization of existing facilities		Apron, taxiway		None		Apron, taxiway	
3.3 Additional facilities for terminal		None		Extension of access road and utilities		Extension of access road and utilities	
Total Evaluation	0	1	2	2	7	3	

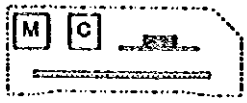
Note:

1. The above costs exclude the costs of common facilities for any of the three alternatives, such as runway extensions, overlay of runway, parallel taxiways, etc.
2. Width of access road is 40 m calculated for the land acquisition area.

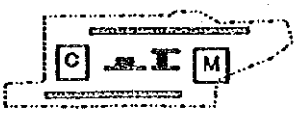
Jakarta (Seokarno-Hatta) 1,800 ha



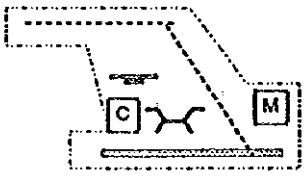
Osaka (Kansai) 511 ha



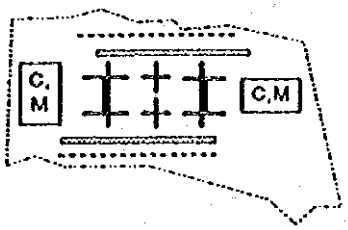
Singapore (Changi) 1,663 ha



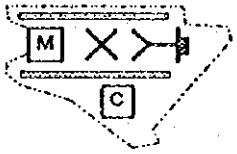
Tokyo (Narita) 1,065 ha



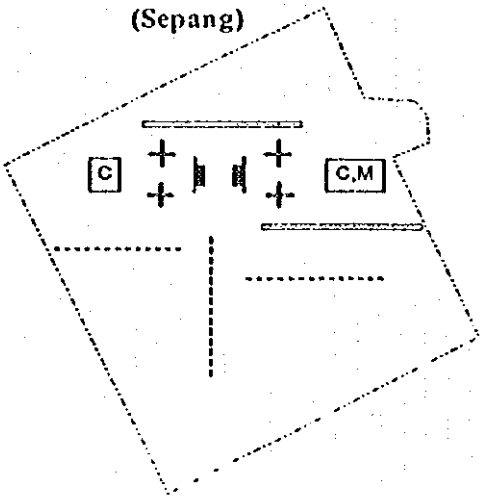
Second Bangkok (Nong Ngu Hao) 3,200 ha



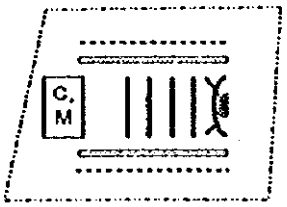
New Hongkong (Chek Lap Kok) 1,248 ha



New Kuala Lumpur (Sepang) 10,000 ha



New Seoul (Metropolitan) 3,300 ha



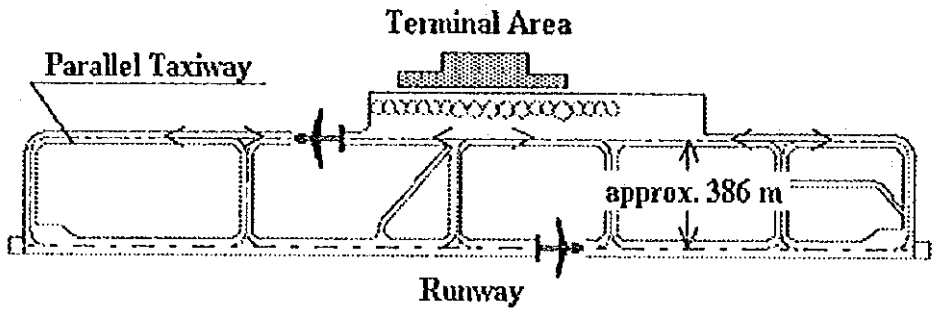
Runway
Passenger Terminal
C Cargo Terminal
M Aircraft Maintenance

Figure 5.7.3.2 Examples of Terminal Siting

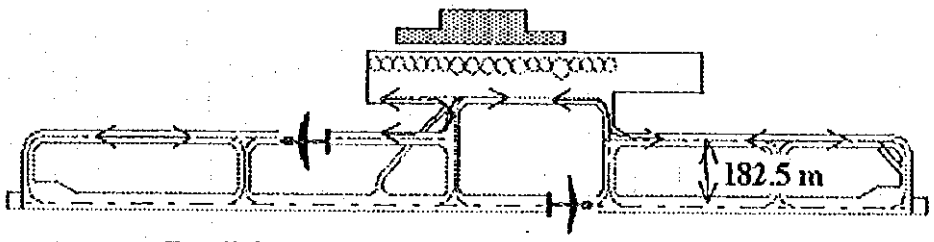
iii. Taxiway Alignment

If an airport facilitates large aircraft, a separation between parallel taxiway centerline and runway centerline shall be more than 182.5m, due to the ICAO standard.

Because of apron's being for apart from the runway and the enough airport area at the Akmola airport, an alignment of the parallel taxiway was planned to achieve simple aircraft taxiing. So that the separation became bigger than the minimum separation distance.



Simple Aircraft Taxiing, Parallel Taxiway Planned to Meet the Existing Apron Edge



Parallel Taxiway at minimum separation distance from Runway center line

Figure 5.7.3.3 Parallel Taxiway Alignment

Figure 5.7.3.4 shows the overall airport layout.

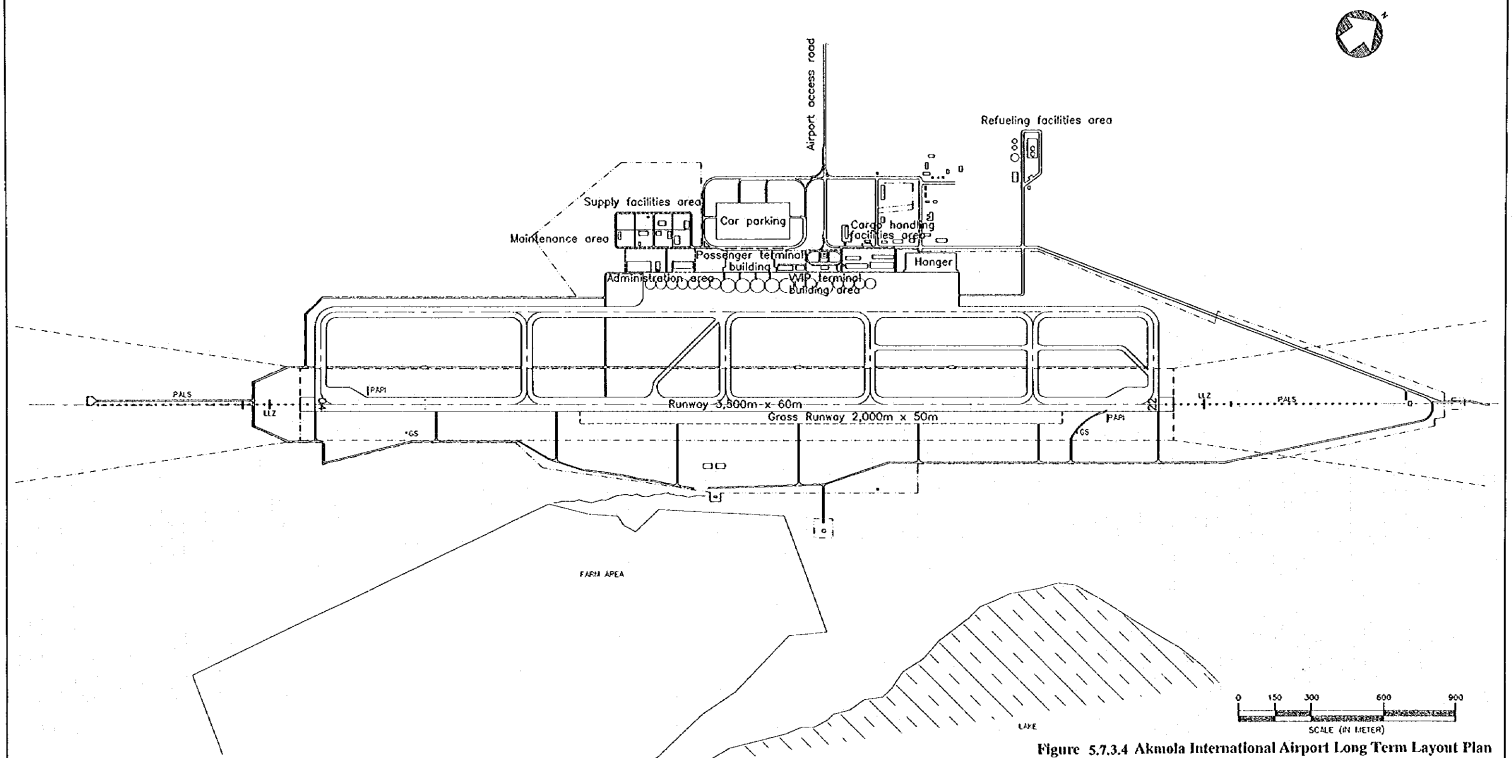


Figure 5.7.3.4 Akmola International Airport Long Term Layout Plan (Year 2020)

BASIC DATA TABLE			
AIRPORT CLASS	PRIMARY	INSTRUMENT RUNWAY	04, 22
AIRPORT STATUS	Int. Dom	PAVEMENT STRENGTH	63/R/B/X/T
AIRPORT REF. ELEVATION	353 m		
AIRPORT REF. POINT (ARP) COORDINATES	N 51°01.8' E 71°28.3'	NAV. AIDS CATEGORY	CAT-I
AIRPORT REF. TEMP	20.7 °C	DISTANCE FROM CITY	18.5 km
RUNWAY DIRECTION	04 / 22		

LEGEND	
	ROAD
	AIRPORT BOUNDARY
	RUNWAY STRIP
	GRASSED MOVEMENT AREA
	PERIMETER ROAD
	BUILDINGS

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	CHECKED BY:
AKMOLA AIRPORT	DRAWN BY:
DRAWING TITLE AIRPORT LAYOUT PLAN (Year 2020)	DRAWING No.
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b) Almaty International Airport

i. Runway Capacity

The following considerations were applied for a master planning.

1. Preferential Runway

At present, preferential runway operation is used for aircraft noise abatement. In future, single preferential runway operation will not cope with additional traffic. The second runway, presently under construction, will not increase the total runway capacity because the separation distance between both runways is below ICAO standards.

The environmental standard for noise in Kazakhstan is based on absolute measured noise levels in dB(A) instead of internationally adopted and more practical indices based on: noise levels, frequency of aircraft operation and time. In most developed countries, these kinds of indices are also used for noise countermeasures and land use control.

The environmental impact of aircraft noise will be assessed on the assumption that the runway will be used to its full capacity.

2. Runway Length

The basic required runway length is 3,500 meters to accommodate large aircraft flying to Western Europe. The current length is 4,400 meters and this will be retained to deal with possible future requirements.

3. Pavement Strength

Major improvement work is being conducted by "Lufthansa Almaty International Airport Ground Service" in 1997. In the Master Plan, it is assumed that no major work will be required until 2020 given this imminent improvement work.

4. Underground Structure Crossing the Runway

There is a major structure crossing underneath the runway and the airport. Since no information was available regarding the design and existing condition of the structure, it was left out of the plan.

ii. New Terminal Area

The existing terminal area is almost fully utilized and there is no room for expansion to meet traffic demands to 2020. Major development in this area requires difficult adjustments for users. Recently, Lufthansa Almaty International Airport Ground Service started to improve the passenger terminal buildings. However, expansion of the car park is not included in this work and there is no space for the expansion even it the grass area is converted to car park. Airport operation must also continue during construction term. Hence a new terminal area has been included in the master plan.

There are two alternative locations for new the terminal. They respective features . are as shown below.

Alternative-1 (see **Figure 5.7.3.5**)

- Sufficient space within the airport property
- Near the existing terminal area

however,

- New access road will be required.

Alternative-2

- Shorter access from the city

however,

- Land acquisition is required which usually takes a long time to .
- Building a parallel taxiway on this side would be difficult because a residential areas would approaches close to the runway. Conversion of a runway into a taxiway would be difficult because runway improvement works has already been started.
- Airside access between the new and existing terminals requires crossing the runway.

Of these, Alternative-1 has been selected because:

- Alternative-1 provides better facility layout in terms of airport operations because terminal activities are located closer.
- Land acquisition may be problematic for Alternative-2.

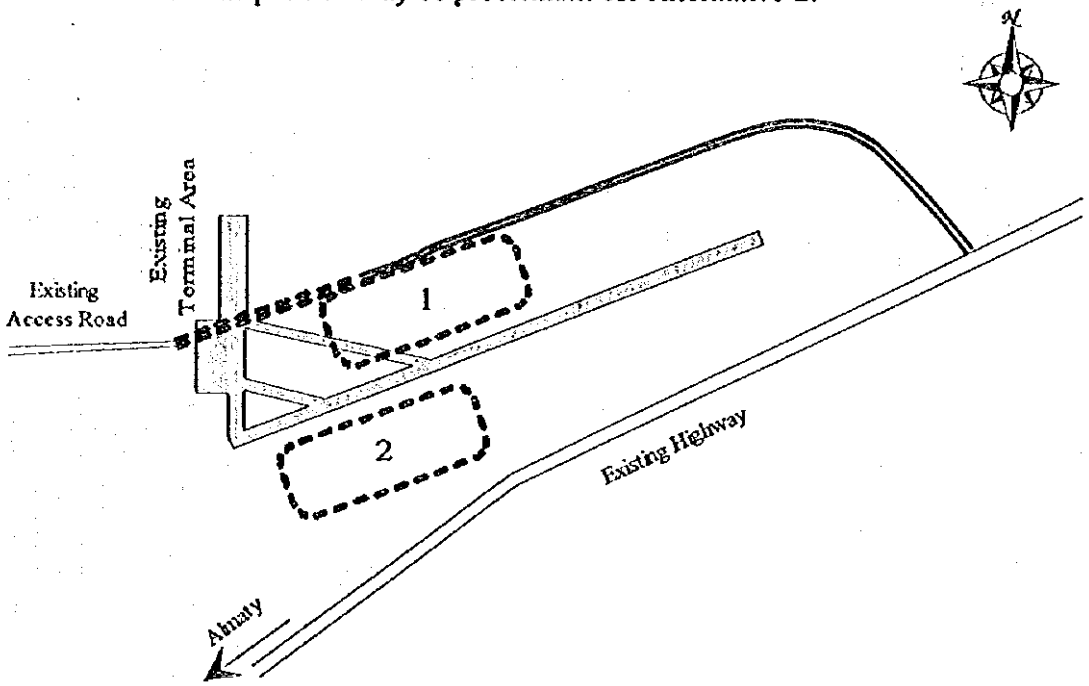

Figure 5.7.3.5 Alternatives of New Terminal Location

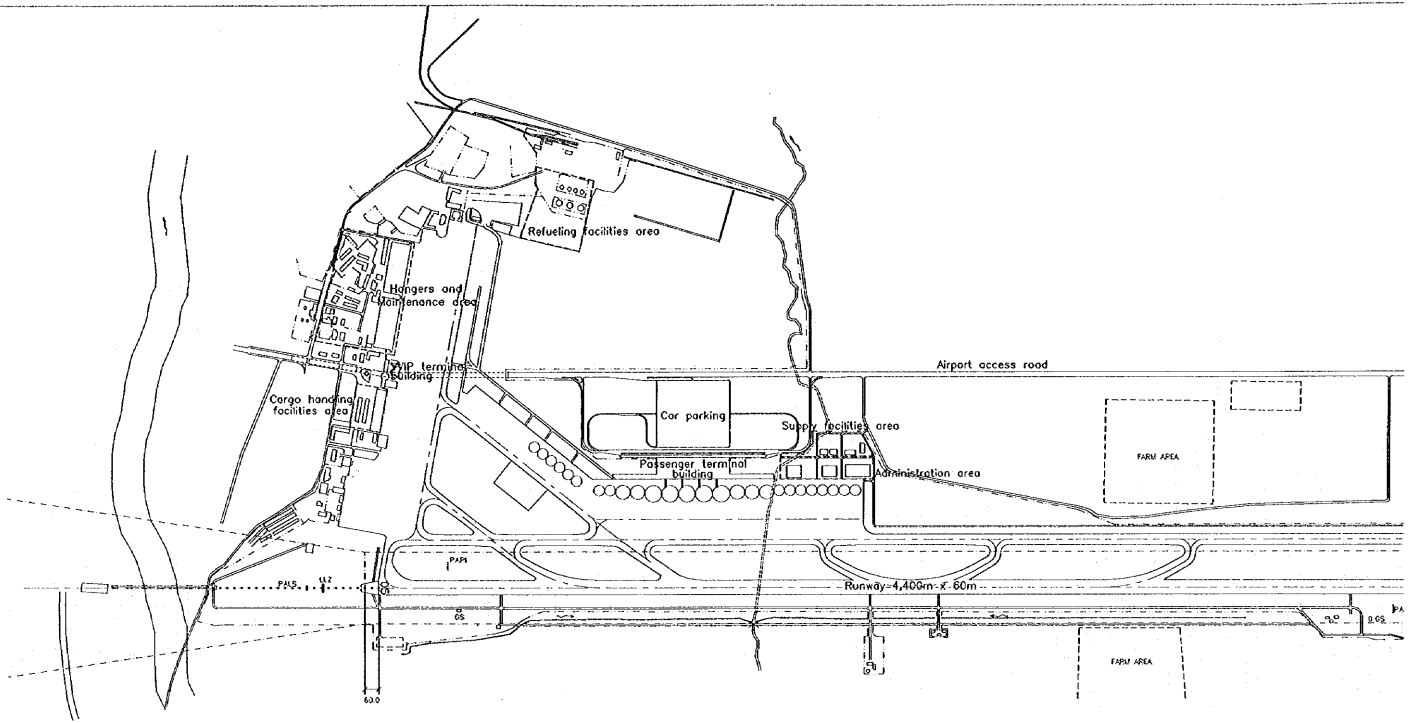

Figure 5.7.3.6 Almaty International Airport Long Term Layout Plan (Year 2020)

BASIC DATA TABLE			
AIRPORT CLASS	PRIMARY	INSTRUMENT RUNWAY	05, 23
AIRPORT STATUS	Int. Dom	PAVEMENT STRENGTH	
AIRPORT REF. ELEVATION	681 m		
AIRPORT REF. POINT (ARP) COORDINATES	N 43'21.1' E 77'02.3'	NAV. AIDS CATEGORY	CAT-II
AIRPORT REF. TEMP	30.8°C	DISTANCE FROM CITY	10 km
RUNWAY DIRECTION	05 / 23		

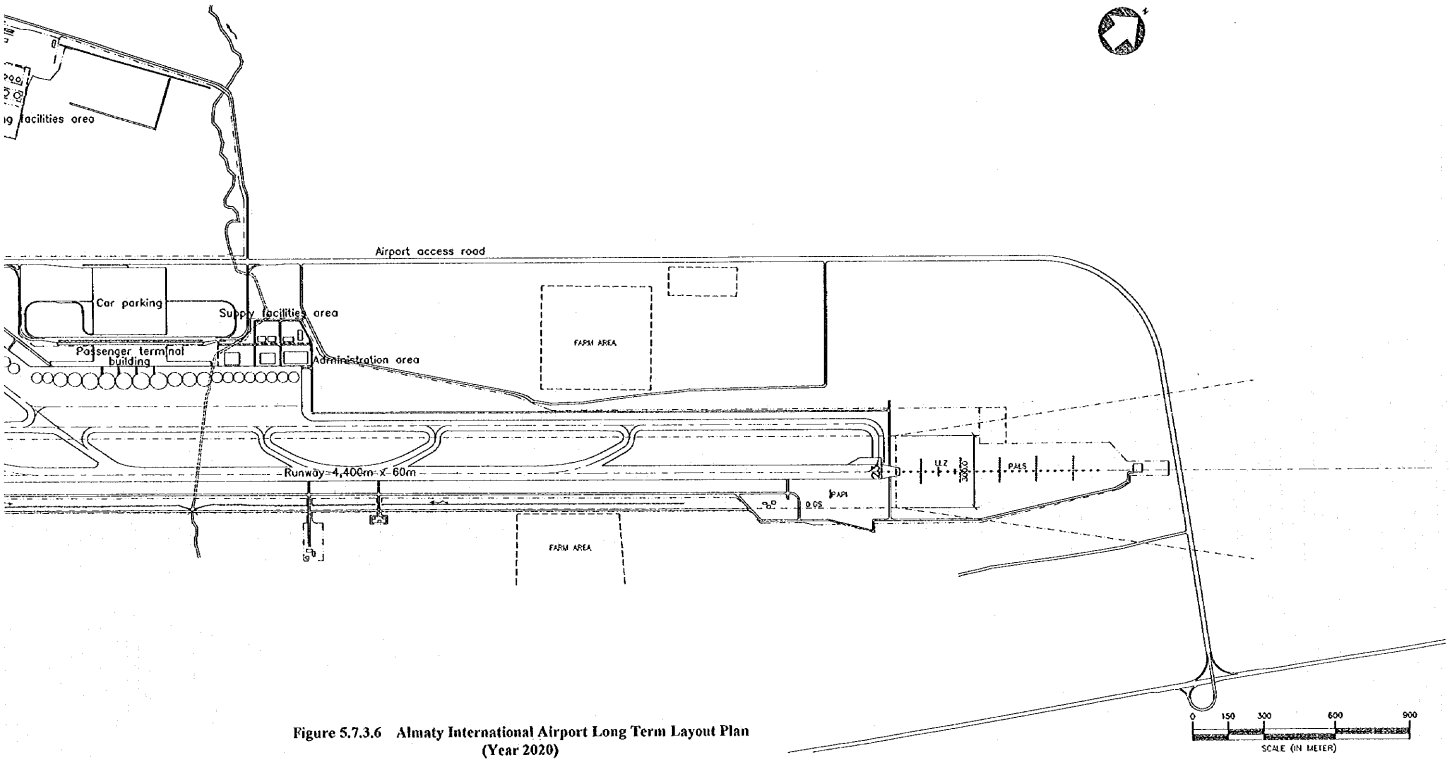

Figure 5.7.3.6 Almaty International Airport Long Term Layout Plan (Year 2020)

BASIC DATA TABLE			
AIRPORT CLASS	PRIMARY	INSTRUMENT RUNWAY	05, 23
AIRPORT STATUS	Int, Dom	PAVEMENT STRENGTH	
AIRPORT REF. ELEVATION	681 m		
AIRPORT REF. POINT (ARP) COORDINATES	N 43°21.1' E 77°02.3'	NAV. AIDS CATEGORY	CAT-II
AIRPORT REF. TEMP	30.8°C	DISTANCE FROM CITY	10 km
RUNWAY DIRECTION	05 / 23		

LEGEND	
	AIRPORT FENCE
BS	BUILDINGS
	PERIMETER ROAD
	RAILWAY
	RIVER
	ROAD
	RUNWAY STRIP

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DRAWING TITLE AIRPORT LAYOUT PLAN (Year 2020)	DRAWN BY:
	DRAWING No.
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	DATE: JAN. 1997

c) Secondary Airports

i. Runway

It is planned to extend the runway lengths at Pavlodar Airport by 200 meters to handle medium size aircraft flying directly to Western Europe.

ii. Terminal area

The terminal areas are generally planned to remain in the existing locations. New terminal facilities are laid out in these areas. Layout plans appear in **Figures 5.7.3.6** through **5.7.3.12.**

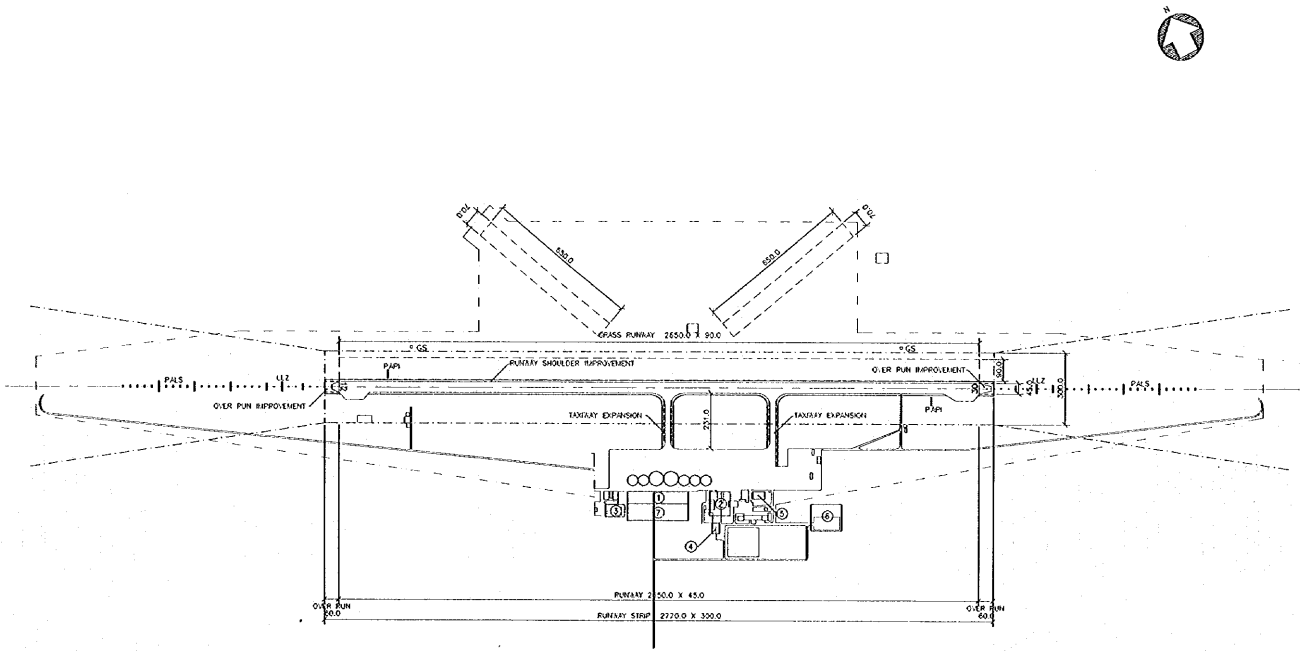


Figure 5.7.3.7 Aktau Airport Layout Plan (Year 2020)

BASIC DATA TABLE			
AIRPORT CLASS	SECONDARY	INSTRUMENT RUNWAY	12, 30
AIRPORT STATUS	Int. / Dom	PAVEMENT STRENGTH	
AIRPORT REF. ELEVATION	22 m		
AIRPORT REF. POINT (APP) COORDINATES	N 43°51.6' E 51°05.5'	NAV. AIDS CATEGORY	CAT-I
AIRPORT REF. TEMP		DISTANCE FROM CITY	10 km
RUNWAY DIRECTION	12/30, 16/34, 08/26		

BUILDING AREA			
No.	NAME OF BUILDING	No.	NAME OF BUILDING
①	PASSENGER TERMINAL	⑦	CAR PARK
②	CARGO TERMINAL		
③	ADMINISTRATION BUILDING		
④	POWER HOUSE		
⑤	FIRE STATION		
⑥	FUEL FARM		

LEGEND	
	ROAD
	AIRPORT BOUNDARY
	RUNWAY STRIP
	GRASSED MOVEMENT AREA
	BUILDINGS

THE REPUBLIC OF KAZAKHSTAN MINISTRY OF TRANSPORT AND COMMUNICATIONS	APPROVED BY :
	CHECKED BY:
AKTAU AIRPORT	DRAWN BY:
DRAWING TITLE AIRPORT LAYOUT PLAN (Year 2020)	DRAWING No.
THE STUDY ON AIR TRANSPORT DEVELOPMENT IN THE REPUBLIC OF KAZAKHSTAN JAPAN INTERNATIONAL COOPERATION AGENCY	SCALE: 1 / 15,000 DATE: JUN. 1997

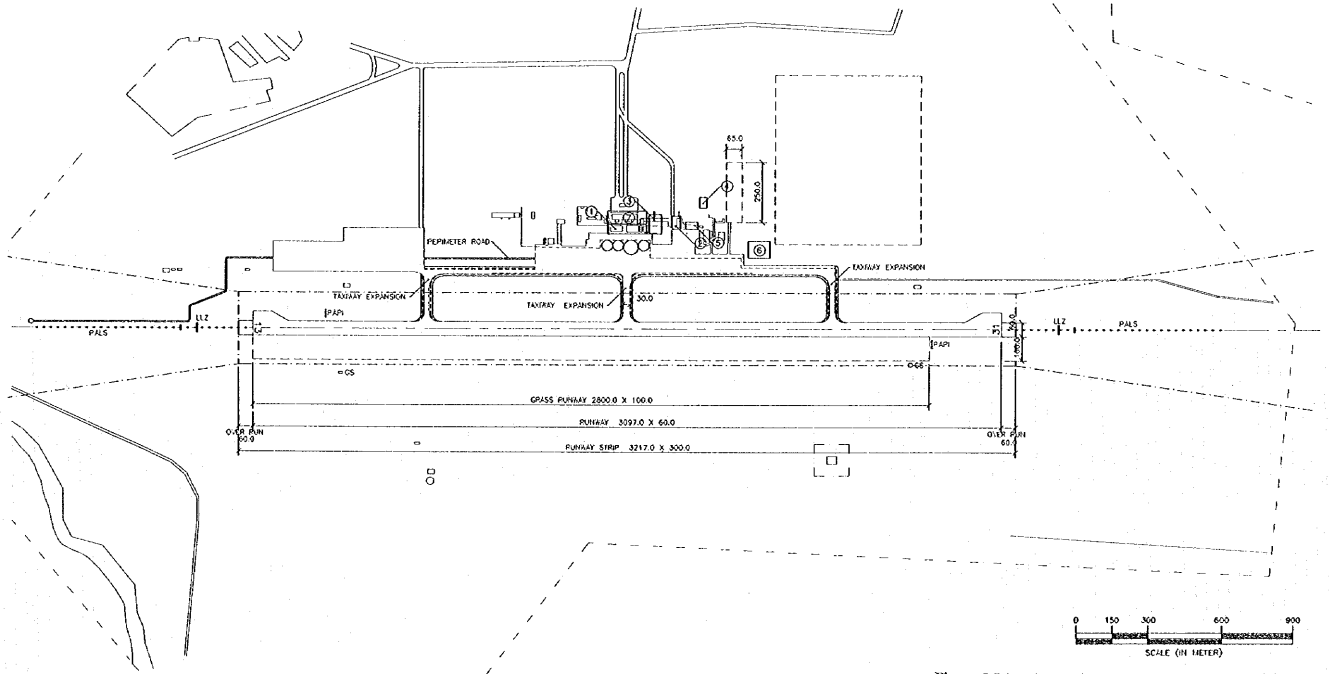


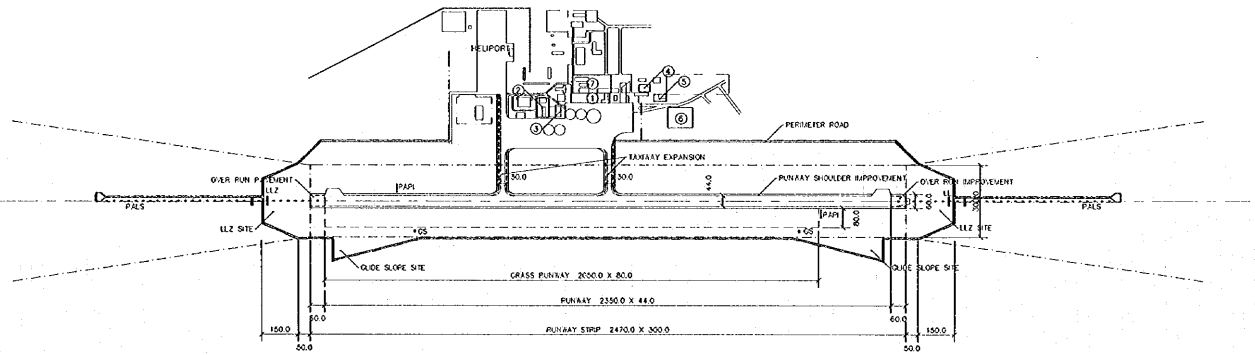
Figure 5.7.3.8 Aktyubinsk Airport Layout Plan (Year 2020)

BASIC DATA TABLE			
AIRPORT CLASS	SECONDARY	INSTRUMENT RUNWAY	13, 31
AIRPORT STATUS	Int. Dom	PAVEMENT STRENGTH	
AIRPORT REF. ELEVATION	220 m		
AIRPORT REF. POINT (ARP) COORDINATES	N 50°14'2" E 57°12'2"	NAV. AIDS CATEGORY	CAT-I
AIRPORT REF. TEMP	28.0°C	DISTANCE FROM CITY	5 km
RUNWAY DIRECTION	13 / 31		

BUILDING AREA			
No.	NAME OF BUILDING	No.	NAME OF BUILDING
①	PASSENGER TERMINAL	⑦	CAR PARK
②	CARGO TERMINAL		
③	ADMINISTRATION BUILDING		
④	POWER HOUSE		
⑤	FIRE STATION		
⑥	FUEL FARM		

LEGEND	
	ROAD
	AIRPORT BOUNDERY
	RUNWAY STRIP
	GRASSED MOVEMENT AREA
	RIVER
BS	BUILDINGS

THE REPUBLIC OF KAZAKHSTAN MINISTRY OF TRANSPORT AND COMMUNICATIONS	APPROVED BY :
	CHECKED BY:
AKTYUBINSK AIRPORT	DRAWN BY:
DRAWING TITLE AIRPORT LAYOUT PLAN (Year 2020)	DRAWING No.
THE STUDY ON AIR TRANSPORT DEVELOPMENT IN THE REPUBLIC OF KAZAKHSTAN JAPAN INTERNATIONAL COOPERATION AGENCY	SCALE: 1 / 15,000 DATE: JAN. 1997



0 150 300 600 900

SCALE (IN METER)

Figure 5.7.3.9 Atyrau Airport Layout Plan (Year 2020)

BASIC DATA TABLE			
AIRPORT CLASS	SECONDARY	INSTRUMENT RUNWAY	14, 32
AIRPORT STATUS	Int. Dom	PAVEMENT STRENGTH	17/R/A/X/T
AIRPORT REF. ELEVATION	23 m		
AIRPORT REF. POINT (ARP) COORDINATES	N 47°07.2' E 51°49.5'	NAV. AIDS CATEGORY	CAT-I
AIRPORT REF. TEMP		DISTANCE FROM CITY	5 km
RUNWAY DIRECTION	14 / 32		

BUILDING AREA			
No.	NAME OF BUILDING	No.	NAME OF BUILDING
①	PASSENGER TERMINAL	⑦	CAR PARK
②	CARGO TERMINAL		
③	ADMINISTRATION BUILDING		
④	POWER HOUSE		
⑤	FIRE STATION		
⑥	FUEL FARM		

LEGEND	
	ROAD
	AIRPORT BOUNDARY FENCE
	RUNWAY STRIP
	GRASSED MOVEMENT AREA
	PERIMETER ROAD
	BUILDINGS

THE REPUBLIC OF KAZAKHSTAN MINISTRY OF TRANSPORT AND COMMUNICATIONS	APPROVED BY :
	CHECKED BY:
ATYRAU AIRPORT	DRAWN BY:
DRAWING TITLE AIRPORT LAYOUT PLAN (Year 2020)	DRAWING No.
THE STUDY ON AIR TRANSPORT DEVELOPMENT IN THE REPUBLIC OF KAZAKHSTAN JAPAN INTERNATIONAL COOPERATION AGENCY	SCALE: 1 / 15,000 DATE: Sept. 1996

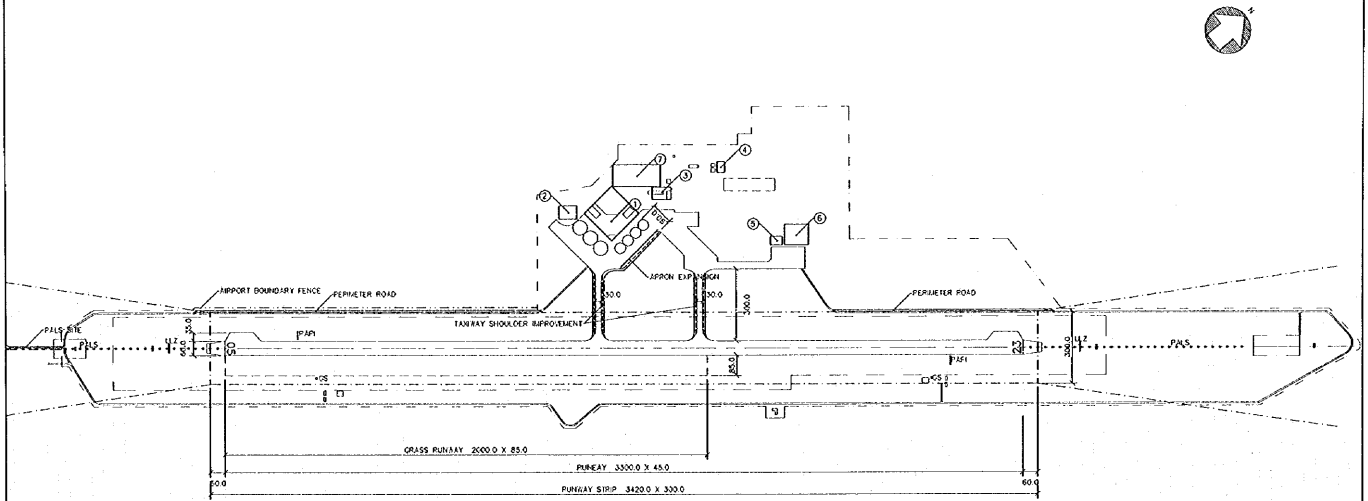


Figure 5.7.3.10 Karaganda Airport Layout Plan (Year 2020)

BASIC DATA TABLE			
AIRPORT CLASS	SECONDARY	INSTRUMENT RUNWAY	05, 23
AIRPORT STATUS	Int. Dom	PAVEMENT STRENGTH	40/R/B/X/T
AIRPORT REF. ELEVATION	537 m		
AIRPORT REF. POINT (ARP) COORDINATES	N 49°40.1' E 73°20.3'	NAV. AIDS CATEGORY	CAT-I
AIRPORT REF. TEMP		DISTANCE FROM CITY	20 km
RUNWAY DIRECTION	05 / 23		

BUILDING AREA			
No.	NAME OF BUILDING	No.	NAME OF BUILDING
①	PASSENGER TERMINAL	⑦	CAR PARK
②	CARGO TERMINAL		
③	ADMINISTRATION BUILDING		
④	POWER HOUSE		
⑤	FIRE STATION		
⑥	FUEL FARM		

LEGEND	
	ROAD
	AIRPORT BOUNDARY
	RUNWAY STRIP
	GRASSED MOVEMENT AREA
	PERIMETER ROAD
⑤	BUILDINGS

THE REPUBLIC OF KAZAKHSTAN MINISTRY OF TRANSPORT AND COMMUNICATIONS	APPROVED BY :
	CHECKED BY:
KARAGANDA AIRPORT	DRAWN BY:
DRAWING TITLE AIRPORT LAYOUT PLAN (Year 2020)	DRAWING No.
THE STUDY ON AIR TRANSPORT DEVELOPMENT IN THE REPUBLIC OF KAZAKHSTAN JAPAN INTERNATIONAL COOPERATION AGENCY	SCALE: 1 / 15,000 DATE: Sept. 1998

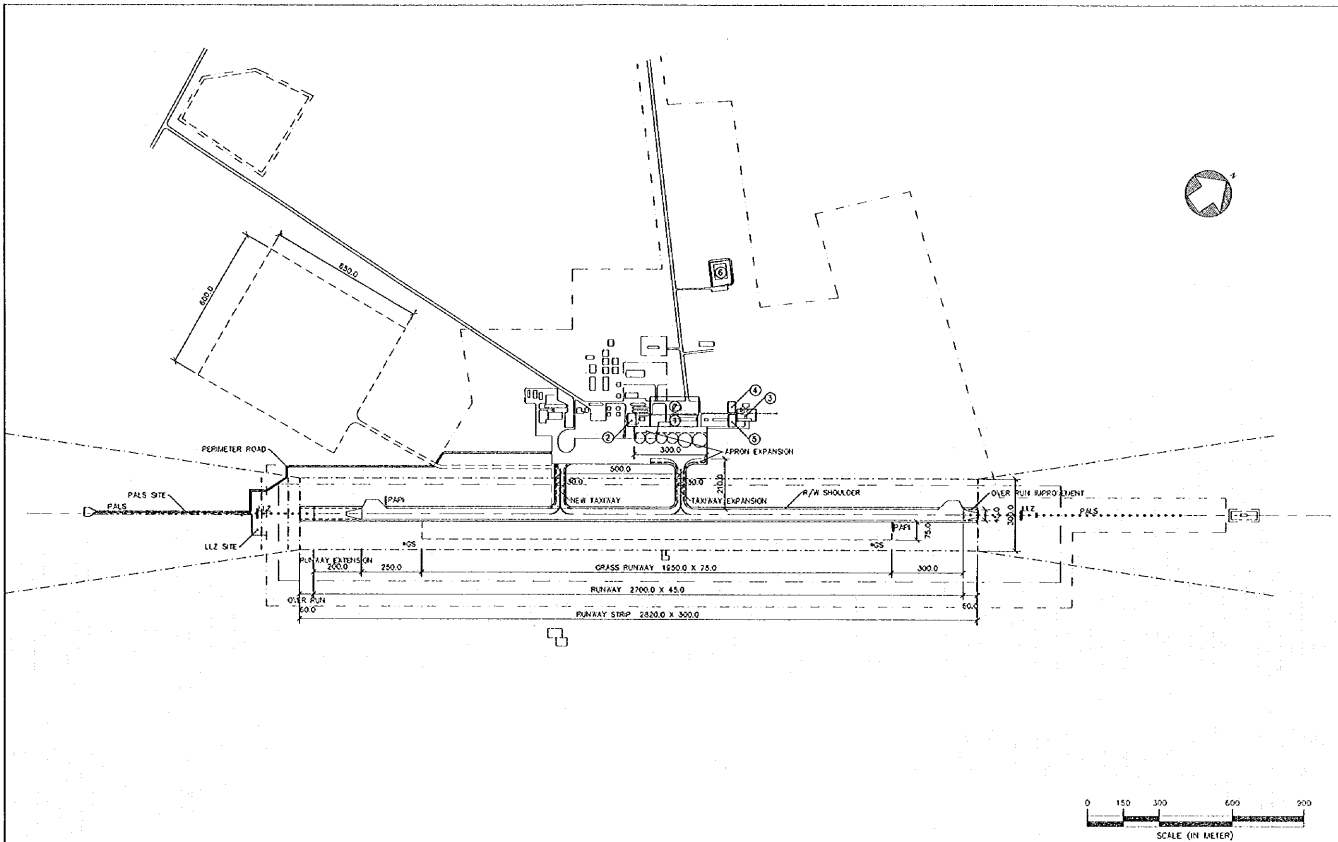


Figure 5.7.3.11 Pavlodar Airport Layout Plan (Year 2020)

BASIC DATA TABLE			
AIRPORT CLASS	SECONDARY	INSTRUMENT RUNWAY	04, 22
AIRPORT STATUS	Int. Dom	PAVEMENT STRENGTH	14/R/A/X/T
AIRPORT REF. ELEVATION	125 m		
AIRPORT REF. POINT (APP) COORDINATES	N 52°11'6" E 77°04.4'	NAV. AIDS CATEGORY	CAT-I
AIRPORT REF. TEMP		DISTANCE FROM CITY	12.8 km
RUNWAY DIRECTION	04 / 22		

BUILDING AREA			
No.	NAME OF BUILDING	No.	NAME OF BUILDING
①	PASSENGER TERMINAL	⑦	CAR PARK
②	CARGO TERMINAL		
③	ADMINISTRATION BUILDING		
④	POWER HOUSE		
⑤	FIRE STATION		
⑥	FUEL FARM		

LEGEND	
	ROAD
	AIRPORT BOUNDARY
	AIRPORT BOUNDARY FENCE
	RUNWAY STRIP
	PERIMETER ROAD
	GRASSED MOVEMENT AREA
	BUILDINGS

THE REPUBLIC OF KAZAKHSTAN MINISTRY OF TRANSPORT AND COMMUNICATIONS	APPROVED BY :
	CHECKED BY:
PAVLODAR AIRPORT	DRAWN BY:
DRAWING TITLE AIRPORT LAYOUT PLAN (Year 2020)	DRAWING No.
THE STUDY ON AIR TRANSPORT DEVELOPMENT IN THE REPUBLIC OF KAZAKHSTAN JAPAN INTERNATIONAL COOPERATION AGENCY	SCALE: 1 / 15,000 DATE: Sept. 1996

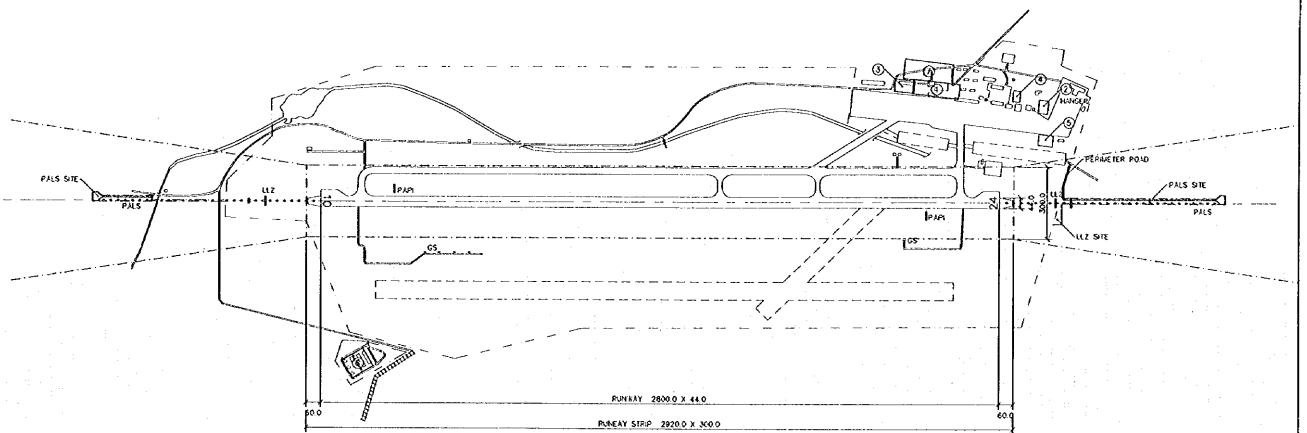


Figure 5.7.3.12 Shimkent Airport Layout Plan (Year 2020)

BASIC DATA TABLE			
AIRPORT CLASS	SECONDARY	INSTRUMENT RUNWAY	10, 24
AIRPORT STATUS	Int, Dom	PAVEMENT STRENGTH	
AIRPORT REF. ELEVATION	411 m		
AIRPORT REF. POINT (ARP) COORDINATES	N 42°21.8' E 64°28.7'	NAV. AIDS CATEGORY	CAT-I
AIRPORT REF. TEMP		DISTANCE FROM CITY	12 km
RUNWAY DIRECTION	10 / 24		

BUILDING AREA			
No.	NAME OF BUILDING	No.	NAME OF BUILDING
①	PASSENGER TERMINAL	⑦	CAR PARK
②	CARGO TERMINAL		
③	ADMINISTRATION BUILDING		
④	POWER HOUSE		
⑤	FIRE STATION		
⑥	FUEL FARM		

LEGEND	
	ROAD
	AIRPORT BOUNDARY
	RUNWAY STRIP
	GRASSED MOVEMENT AREA
	RAIL WAY
	RIVER

THE REPUBLIC OF KAZAKHSTAN MINISTRY OF TRANSPORT AND COMMUNICATIONS	APPROVED BY :
	CHECKED BY:
SHIMKENT AIRPORT	DRAWN BY:
DRAWING TITLE AIRPORT LAYOUT PLAN (Year 2020)	DRAWING No.
THE STUDY ON AIR TRANSPORT DEVELOPMENT IN THE REPUBLIC OF KAZAKHSTAN JAPAN INTERNATIONAL COOPERATION AGENCY	SCALE: 1 / 15,000 DATE: Sept. 1998

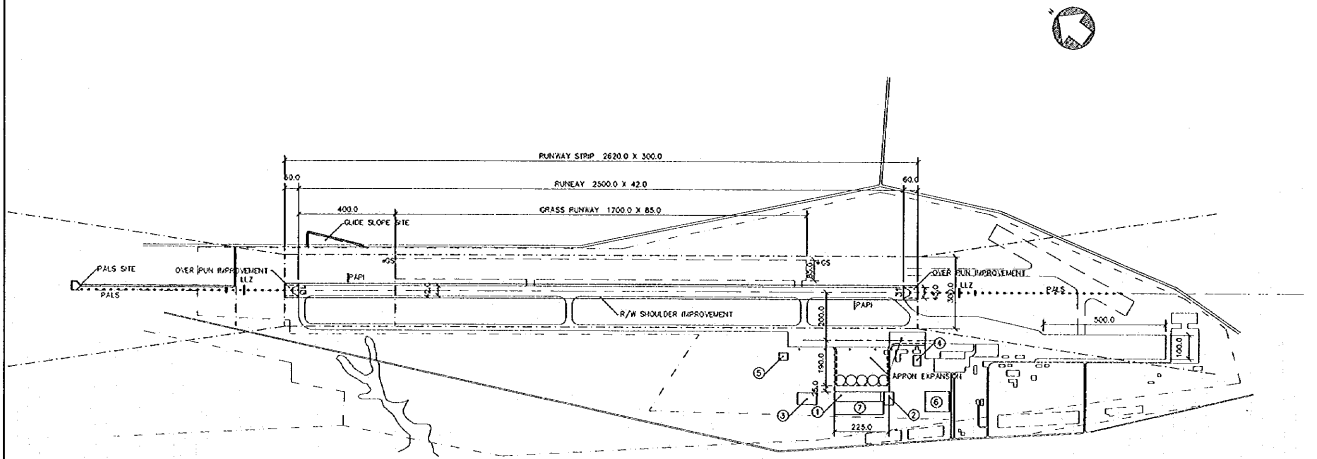


Figure 5.7.3.13 Ust Kamenogorsk Airport Layout Plan (Year 2020)

BASIC DATA TABLE			
AIRPORT CLASS	SECONDARY	INSTRUMENT RUNWAY	13, 31
AIRPORT STATUS	Int, Dom	PAVEMENT STRENGTH	
AIRPORT REF. ELEVATION	284 m		
AIRPORT REF. POINT (ARP) COORDINATES	N 50°02.1' E 82°29.8'	NAV. AIDS CATEGORY	CAT-I
AIRPORT REF. TEMP		DISTANCE FROM CITY	13 km
RUNWAY DIRECTION	13 / 31		

BUILDING AREA			
No.	NAME OF BUILDING	No.	NAME OF BUILDING
①	PASSENGER TERMINAL	⑦	CAR PARK
②	CARGO TERMINAL		
③	ADMINISTRATION BUILDING		
④	POWER HOUSE		
⑤	FIRE STATION		
⑥	FUEL FARM		

LEGEND
ROAD
AIRPORT BOUNDARY
AIRPORT BOUNDARY FENCE
RUNWAY STRIP
GRASSED PAVEMENT AREA
RESIDENTIAL AREA
RIVER

THE REPUBLIC OF KAZAKHSTAN MINISTRY OF TRANSPORT AND COMMUNICATIONS	APPROVED BY :
	CHECKED BY:
UST-KAMENOGORSK AIRPORT	DRAWN BY:
DRAWING TITLE AIRPORT LAYOUT PLAN (Year 2020)	DRAWING No.
THE STUDY ON AIR TRANSPORT DEVELOPMENT IN THE REPUBLIC OF KAZAKHSTAN JAPAN INTERNATIONAL COOPERATION AGENCY	SCALE: 1 / 15,000 DATE: Sept. 1996

5.7.4 Preliminary Cost Estimate

The summary of project cost estimates is shown in **Table 5.7.4.1** and the detailed calculations appear in **Appendix-5.7.4.**

It was difficult to obtain construction cost data during the first site survey due to the immature business market in Kazakhstan; therefore, unit cost from similar airport projects conducted in the South East Asia have been applied.

5.7.5 Implementation Plan of an Airport Project

The general schedule for implementing an airport project is shown in **Table 5.7.5.1**. the land acquisition, if necessary, should be clarified before the start of the construction work, the acquisition should be done by the local airport authority.

As the construction work varies at each project, the construction term should be examined in detail quantitatively and qualitatively considering local weather condition.

Table 5.7.4.1 Cost Estimation for Nine Airports

	Work Items	Akmola	Aktau	Aktyubinsk	Almaty	Atyrau	Karakanda	Pavlodar	Shimkent	U'st-Kamenogorsk
		(US$)	(US$)	(US$)	(US$)	(US$)	(US$)	(US$)	(US$)	(US$)
A	Compensation	87,482	0	0	400,000	0	0	0	0	0
B	Preliminary and General	31,284,412	14,300,345	11,423,122	26,652,616	15,980,911	3,205,190	9,031,747	20,344,356	18,688,781
C	Construction / Installation	166,868,085	94,151,490	103,259,737	291,026,164	97,242,834	17,551,902	93,217,501	108,790,330	109,077,683
	1 Civil Works	26,905,586	13,825,111	19,265,043	38,394,996	13,016,328	6,803,962	11,777,098	24,654,832	22,132,884
	i Airside	23,154,761	11,685,701	16,933,031	30,099,782	11,108,859	5,852,045	10,529,867	22,510,439	20,180,255
	ii Landside	3,750,825	2,139,410	2,332,012	8,295,214	1,907,469	951,917	1,247,231	2,144,393	1,952,628
	2 Architectural Works	68,953,500	32,860,350	44,401,500	131,714,100	42,663,500	0	43,435,050	60,882,800	54,979,350
	3 Air Navigation Systems	18,101,207	20,998,230	22,230,088	32,658,000	20,715,044	1,490,217	20,998,230	12,135,467	11,944,847
	4 Supporting Facilities	42,652,445	18,725,076	10,182,389	61,748,000	13,423,070	1,515,000	9,165,221	3,430,000	12,329,558
	i Power Supply	4,400,000	2,850,000	4,672,566	3,115,000	2,522,124	855,000	2,850,000	2,850,000	2,850,000
	ii Outdoor Lighting	500,000	420,000	800,000	133,000	371,681	400,000	420,000	420,000	420,000
	iii Sanitary Works	1,350,000	2,020,740	1,010,000	3,300,000	1,061,947	100,000	160,000	0	50,000
	iv Communication system	1,004,215	160,000	160,000	200,000	160,000	160,000	160,000	160,000	160,000
	v Heating and air-conditioning system	19,469,027	13,274,336	3,539,823	35,000,000	9,307,318	0	5,575,221	0	8,849,558
	vi Fuel Supply System	15,929,204	0	0	20,000,000	0	0	0	0	0
	5 Special Equipment	10,255,346	7,742,723	7,180,717	26,511,067	7,424,892	7,742,723	7,841,902	7,687,231	7,691,045
D	Total of B + C	198,152,497	108,451,835	114,682,859	317,678,780	113,223,744	20,757,092	102,249,248	129,134,686	127,766,465
E	Contingencies	16,686,808	9,415,149	10,325,974	29,102,616	9,724,283	1,755,190	9,321,750	10,879,033	10,907,768
F	Total of B + E	214,839,306	117,866,984	125,008,833	346,781,397	122,948,028	22,512,283	111,570,998	140,013,719	138,674,233
G	Consulting Cost	18,355,489	10,356,664	11,358,571	32,012,878	10,696,712	1,930,709	10,253,925	11,966,936	11,998,545
H	Grand Total	233,282,277	128,223,648	136,367,404	379,194,275	133,644,739	24,442,992	121,824,924	151,980,656	150,672,778

Table 5.7.5.1 ImplementationSchedule of an Airport

Work Items \ Year		1	2	3	4	5	6
1	Financial Arrangement, Loan Agreement of Project and Contract of Consultant	====					
2	Topographic Survey and Soil Investigation	===					
3	Basic Design and Detailed Design	======	======				
4	Land Acquisition		(===)				
5	Pre-qualification, Tendering and Contract for Construction		======				
6	Construction Works			==========	==========	==========	
6.1	Airside Facilities (Runway, Taxiway, Apron and Other Civil Works)			==========	==========	==========	
6.2	Landside Facilities (Terminal Road, Car Park and Other Civil Works)			==========	==========	==	
6.3	Buildings			==========	==========	==========	
6.4	Airport Utilities				==========	==========	
6.5	Air Navigation Systems				==========	==========	
8	Test Operation and Flight Check,etc.					==	
9	Implementation of New Services						=========>>

Note : 1. The above program is the fastest case in smooth negotiation between Japan and Kazakhstan.
2. The building work shall be tight program because of only 6 months to work per year.
3. Contraction for construction shall be in winter season to provide mobilization to shortening idle season.

5.8 Selection of Priority Projects of Airport for Feasibility Study

(1) Evaluation Criteria

Airport projects for feasibility studies for the target year 2005 were selected using the following evaluation criteria:

a) urgency of need to improve airport safety and services
b) national development priority
c) impact on industry development
d) importance of air transport in modal competition
e) maturity of airport development projects
f) project cost
g) level of environmental impact from airport development

(2) Evaluation for Selection

a) Urgency to improve airport safety and airport services

Except for Karaganda, all of airports need development due to their deteriorated and outmoded facilities and equipment. Almaty airport has the highest priority, as it is the busiest and most important airport, being a hub and an international gateway. Karaganda airport is the most modern airport in Kazakhstan in terms of international standards, so its development needs are low.

b) National development priorities

Because of increasing international air transport demand, Almaty has the highest priority in terms of national development. With the capital relocation from Almaty to Akmola, airport development of Akmola will also be accorded a high priority. Atyrau and Aktau airports are next in order of priority due to their strategic location for exploiting oil and gas reserves.

c) Impact on industrial development

Air transport and airports are very important factors in promoting development generally. All airports have a fairly abundant facilities and equipment; therefore, there will be almost no differences on the impacts of airport development between the various locations.

d) Importance of air transport in modal competition

If other transportation such as road and or railway are available to compete with air transport to meet certain needs, the importance of airport development will be lessened. However, the infrastructure requirements for the surface transportation modes are quite different from those of the air mode. These can also to develop and require large investments, often making them non-competitive with air. Therefore, there are no differences in the relative importance of air transport in the area served by each airport.

e) Maturity of airport development projects

Due to the importance of developing Almaty and Akmola airports, both airport projects are relatively well advanced and have received much attention from the Government and Kaz Air.

Atyrau city faces an increasing future risk of flooding due to the rising water level of the Caspian Sea. However the risk has yet to be determined scientifically. At the same time, the government has not yet decided on any countermeasure, such as whether to relocate the city or to install protective dikes around the city. Airport development of Atyrau will depend on the countermeasures adopted.

f) Project cost

Most of project costs are occupied by the necessary costs for airport operation and functions. the cost of Karaganda is relatively low due to being newly constructed. Therefore the selection should be done in terms of the necessity and the impacts, not of amount of project cost.

g) Environmental impact of airport development

All of airports already exist and operate on a 24 hour basis. Because there will be no new airport construction and most of development works will only involve refurbishment, there should be minimal environmental impact on surrounding communities at each location.

(3) Conclusion

Table 5.8.1 shows the comparative evaluation of the priority projects.

Ust-Kamenogorsk and Shimkent airports are excluded from the feasibility study because these are of jointly used for civil and military operations. Official Development Assistance from the Japanese Government is only available for civilian activities.

Karaganda airport is the most modern airport in Kazakhstan and its facilities exceed the requirement to meet forecast demand; therefore, it has the lowest development priority.

The following six airports have been selected for the feasibility study for the target year 2005. The main consideration for Akmola airport is the capital relocation, while at Atyrau airport, it is the measures to be taken to deal with growing flooding risks from the Caspian Sea.

Airport selected for feasibility study	Requirement for project implementation
Almaty	
Akmola	relocation of the capital
Atyrau	
Aktau	countermeasures against flooding from the Caspian Sea
Aktyubinsk	
Pavlodar	

Table 5.8.1 Comparison of Priority Projects of Airports

airport classification / evaluation item	primary airport		secondary airport							remarks
	Almaty	Akmola	Pavlodar	Aktyubinsk	Karaganda	Atyrau	Aktau	Ust-Kame	Shimkent	
urgency of airport development (safety and service)	1	2	2	2	3	2	2	2	2	
priority in the national development	1	1	3	3	3	2	2	3	3	
impact of airport development on promoting other industries	2	2	2	2	2	2	2	2	2	
importance of air transport in modal competition	1	1	1	1	1	1	1	1	1	
maturity of airport development project	1	1	2	2	2	2	2	2	2	
project cost per forecast passengers at 2020 (dollars/PAX)	2 ($29)	3 ($65)	5 ($159)	9 ($413)	1 ($25)	7 ($222)	4 ($119)	8 ($256)	6 ($193)	
sustainability of environment effects of airport development	1	1	1	1	1	1	1	(-) *	(-) *	* not examined at the sites
airport use for civil or military	civil	civil	civil	civil	civil	civil	civil	joint use	joint use	
total evaluation point	7	8	11	11	13	10	10	(10+a)	(10+a)	
order of priority	1	2	5	5	7	3	3	(-)	(-)	Joint use airports are excluded.

note 1 : evaluation point (1: high, 2: medium, 3: low)

note 2 : Akmola in a case of the capital relocation

CHAPTER 6

FEASIBILITY STUDIES FOR SELECTED AIRPORTS

Chapter 6 Feasibility Studies for Selected Airports

6.1 Planning and Preliminary Design

Facility planning and preliminary design for the selected six priority airports was conducted based on the National Airport System Development Plan described in Chapter 5. The main purpose of the planning and design work was is to describe the facilities sufficiently for cost estimation and environmental impact assessment in a feasibility study. **Table 6.1.1** summarizes the development items for each airport to the year 2005.

Table 6.1.1 Scope of Development Plan to Target Year 2005 (1)

Construction Item	Aktnola	Almaty
1. Civil Works		
1.1 Runway		
1) Extension of length	1,000 x 45 m, 7.5 m s/d	
2) Expansion of width		
3) Pavement overlay	125,500 sq.m, min.t = 11 cm	217,200 sq.m, ave. t = 30 cm
4) Provision of overrun	60 x 60 m	
5) Improvement of shoulder	Widening: 2 >> 7.5 m	
1.2 Taxiway		
1) Extension / new taxiway(s)		5,500 x 23 m
2) Expansion of width	L = 2,190 m, 18 >> 23 m	L = 1,800 m, 20 >> 23 m
3) Pavement overlay	39,500 sq.m	41,400 sq.m
4) Improvement of shoulder	w = 7.5 m both sides	w = 7.5 m both sides
1.3 Apron		
1) Expansion	2,000 sq.m	
2) Pavement overlay	72,900 sq.m	177,500 sq.m
3) Apron service road	13,300 sq.m	
1.4 Drainage System		
1) Replacement of existing storm water pumps	L.S.	
2) System expansion in development area	L.S.	L.S.
1.5 Road and Car Park		
1) Access road, terminal road and car parking	58,900 sq.m	54,600 sq.m
2) Expansion /repair of perimeter road and security road at airside	l = 10,600 m	7,400 m
1.6 Demolition of START cabin	2 nos.	2 nos.
1.7 Earthworks in expansion area	L.S.	L.S.
1.8 Landscaping at terminal area	L.S.	L.S.
1.9 Miscellaneous civil works	Fencing, cable duct, traffic sign, marking, etc.	Cable duct, traffic sign, marking, etc.
2. Building Works		
2.1 New passenger terminal building	22,600 sq.m	32,800 sq.m
Passenger boarding bridges	4 nos.	8 nos.
Special equipment	Baggage handling system, elevator, escalator, etc.	Baggage handling system, elevator, escalator, etc.
2.2 New cargo building	1,890 sq.m	
2.3 V.V.I.P terminal building	450 sq.m	
2.4 Administration building	4,000 sq.m	4,000 sq.m
2.5 Fire station	L.S.	600 sq.m
2.6 Control tower and navigation office	L.S.	600 sq.m
2.7 Building for heating and cooling facilities	L.S.	
2.8 Main power station for buildings	L.S.	
2.9 Main power station for the air navigation systems	L.S.	600 sq.m
2.10 Sub-station(s) for airfield lighting	L.S.	L.S.
2.11 Sub-station(s) for air navigation	L.S.	L.S.
2.12 Sub-station(s) for air communication	L.S.	L.S.

Aktau	Aktyubinsk	Atyrau	Pavlodar
			200 x 45 m, 7.5 m s/d
L = 2,650 m, 43>>45 m 119,200 sq.m, min.t = 5 cm	139,400 sq.m, min.t = 5 cm 60 x 60 m, both ends	L = 2,500 m, 44>>45 m 103,400 sq.m, min.t = 5 cm 60 x 60 m, both ends w = 7.5 m both sides	110,800 sq.m, min.t = 5 cm 60 x 60 m
			420 x 30 m
L = 460 m, 18 >> 23 m 15,500 sq.m w = 7.5 m both sides	L = 800 m, 20 >> 23 m 19,400 sq.m w = 7.5 m both sides	L = 400 m, 18 >> 30 m 7,200 sq.m w = 7.5 m both sides	L = 200 m, 18 >> 30 m 7,200 sq.m w = 7.5 m both sides
		32,400 sq.m,	27,900 sq.m
40,500 sq.m	90,000 sq.m 10,000 sq.m	15,000 sq.m	2,200 sq.m 8,000 sq.m
L.S.	L.S.	L.S.	L.S.
18,200 sq.m 400 m	12,400 sq.m	19,500 sq.m	23,300 sq.m
2 nos. L.S. L.S. Cable duct, traffic sign, marking, etc.	1 no. L.S. L.S. Cable duct, traffic sign, marking, etc.	1 no. L.S. L.S. Cable duct, traffic sign, marking, etc.	2 nos. L.S. L.S. Fencing, cable duct, traffic sign, marking, etc.
7,500 sq.m 2 nos. Baggage handling system, elevator, escalator, etc.	7,500 sq.m 2 nos. Baggage handling system, elevator, escalator, etc.	7,500 sq.m 2 nos. Baggage handling system, elevator, escalator, etc.	L.S. Baggage handling system, elevator, escalator, etc.
	530 sq.m	610 sq.m	560 sq.m
	2,000 sq.m	3,000 sq.m	1,400 sq.m
L.S. L.S.	L.S. L.S.	L.S. L.S. L.S.	L.S. L.S.
L.S. L.S. L.S. L.S. L.S.	L.S. L.S. L.S. L.S. L.S.	L.S. L.S. L.S. L.S. L.S.	L.S. L.S. L.S. L.S. L.S.

Table 6.1.1 Scope of Development Plan to Target Year 2005 (2)

Construction Item	Akmola	Almaty
2.13 Miscellaneous buildings	Airport maintenance office, airline office, pilot training center, storage, equipment workshop and garage, guard house, GSE maintenance station, radar station	Storage, equipment garage, guard house, radar station
3. Air navigation Systems		
3.1 Radio navigation Aids		
3.1. 1) Replacement of the existing ILS	L.S. CAT I or II	L.S. CAT II
2) Replacement of the existing VOR/DME	L.S.	
3) Replacement of the existing NDBs	L.S.	L.S.
3.2 ATC and communication systems		
1) Installation of ATC consoles and equipment for the new control tower	L.S.	L.S.
2) Installation of ARTS	L.S.	L.S.
3) Installation of ASDE	L.S.	L.S.
3.3 Aeronautical Ground Lighting System		
•1) Installation of PALS for the runway	L.S. CAT II	L.S. CAT II
2) Installation of SALS for the runway	L.S.	
3) Installation of PAPI for the runway	L.S. both direction	L.S. both direction
4) Installation of Aerodrome Beacon	L.S.	L.S.
5) Renewal of airfield lighting system	REDL, RTHL, TWTL, RECL, TDZL	REDL, RTHL, TWTL, RECL, TDZL
3.4 Meteorological Observation System		
1) Installation of RVR and ceilometer	L.S.	L.S.
2) Installation of thermometer, illuminated wind direction indicator, barometer, etc.	L.S.	L.S.
4. Airport Utilities		
1) Construction of new utility station	Elec. and heating supply	
2) Expansion of existing facilities	Elec., water, sewage, etc.	Elec., water, sewage, etc.
3) Installation of communication system	Expansion of telephone	Expansion of telephone
4) Replacement of sewage scooping pumps	Terminal area / lake side	
5) Installation of incinerator	for prohibited garbage	
6) Installation of an aircraft refueling pipe line	L = 1.6 km	
7) Relocation of existing fuel pipeline / pump		
5. Procurement of Equipment		
1) Rescue and Fire Fighting vehicles	total 6 nos.	total 9 nos.
2) Maintenance vehicles	total 10 nos.	total 10 nos.

Aktau	Aktyubinsk	Atyrau	Pavlodar
Airport maintenance office, storage, equipment workshop and garage, guard house	Airport maintenance office, storage, equipment workshop and garage, guard house, radar station	Airport maintenance office, storage, equipment workshop and garage, guard house	Airport maintenance office, storage, equipment workshop and garage, guard house
L.S. CAT I L.S. L.S.	L.S. CAT I or II L.S. L.S. L.S.	L.S. CAT I L.S. L.S.	L.S. CAT I L.S. L.S. L.S.
L.S. CAT I L.S. L.S. both direction L.S. REDL, RTHL, TWTL, RECL, TDZL L.S. L.S.	L.S. CAT I L.S. L.S. both direction L.S. REDL, RTHL, TWTL, RECL, TDZL L.S. L.S.	L.S. CAT I L.S. L.S. both direction L.S. REDL, RTHL, TWTL, RECL, TDZL L.S. L.S.	L.S. CAT I L.S. L.S. both direction L.S. REDL, RTHL, TWTL, RECL, TDZL L.S. L.S.
Elec., water, sewage, etc. Expansion of telephone Terminal area	Elec., water, sewage, etc. Expansion of telephone Terminal area	Elec., water, sewage, etc. Expansion of telephone Terminal area	Elec., water, sewage, etc. Expansion of telephone Terminal area L = 0.9 km
total 7 nos. total 5 nos.	total 7 nos. total 10 nos.	total 7 nos. total 7 nos.	total 7 nos. total 16 nos.

6.1.1 Akmola International Airport

Figure 6.1.1.1 shows overall airport layout.

(1) Terminal Area Layout Planning

a) Location of Terminal Area

The alternatives for the terminal area use:

- Alternative-A (new terminal area in southwest)

  A new terminal would be developed in the vacant lot to the southwest of the existing terminal. The existing facilities would continue to be operated until completion of the new facilities. After hand over, disused facilities would be demolished.

- Alternative-B (around the existing terminal area)

  This plan requires a carefully phased development program. The passenger terminal building would be constructed next to the existing building in the early stages. Then the construction of other buildings would follow progressively, so that temporary works can be minimized.

- Alternative-C (new terminal area in the northeast)

  The development of new terminal area in the vacant lot to the northeast.

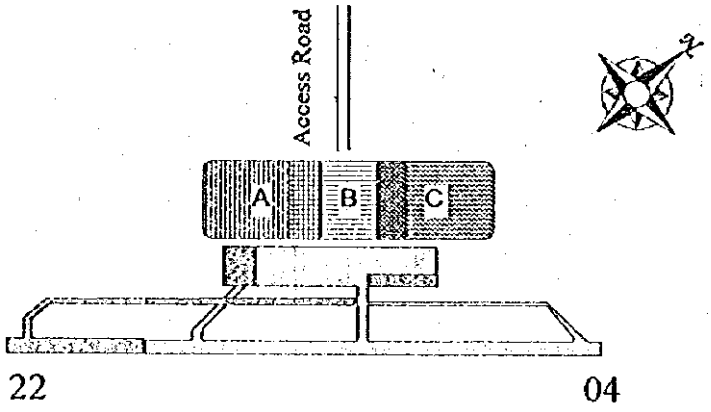


Figure 6.1.1.2 Alternative Locations for Terminal Area

Alternative-A was chosen as the most optimum to the following reasons.

- More flexible layout planning is possible than B.
- The construction term would be shorter than B because of fever temporary works and diversions of utilities.
- The construction cost would be lower than for B because of the same reason as above.
- The location is more central to the extended runway than for C.
- Geographical conditions are better than C in terms of ground height.

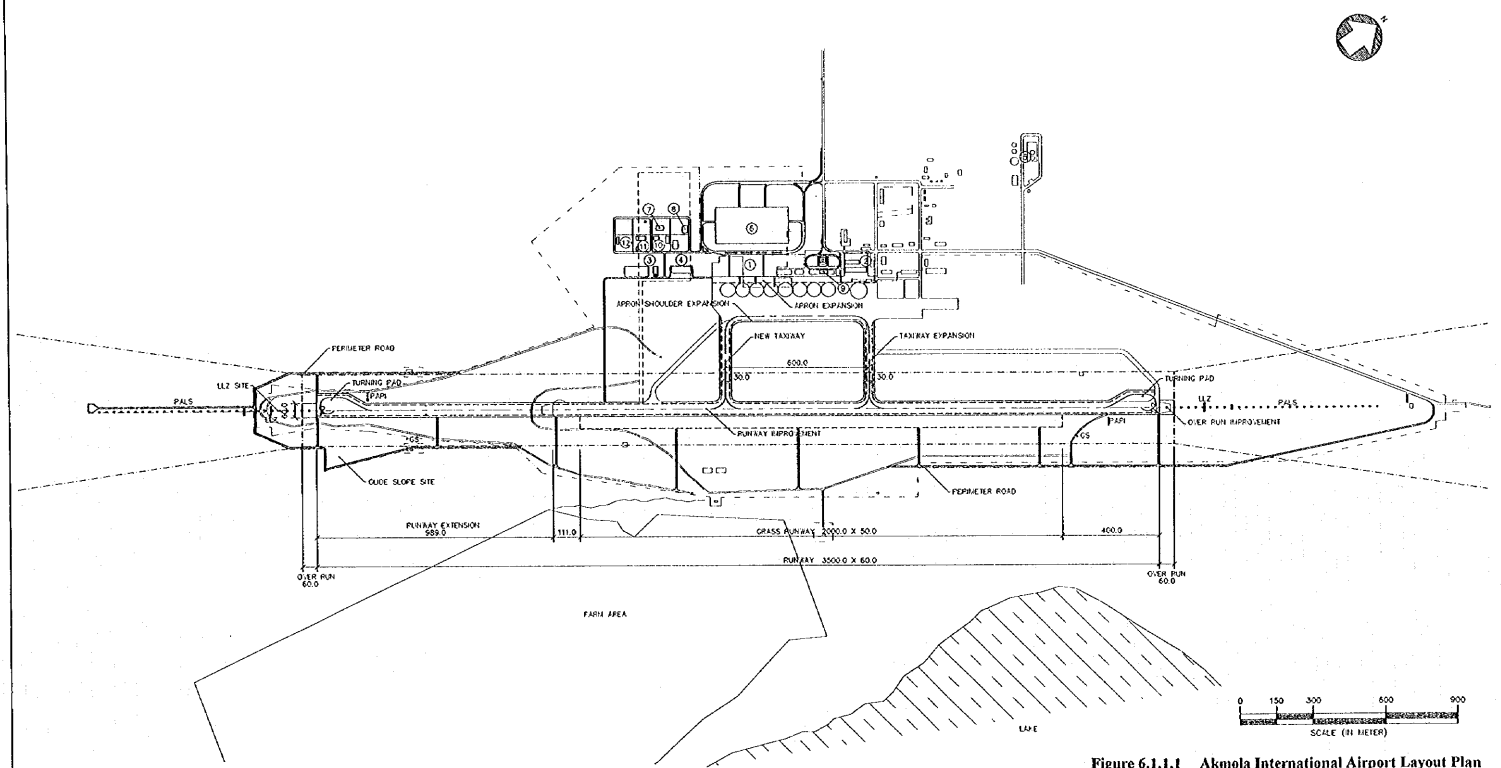


Figure 6.1.1.1 Akmola International Airport Layout Plan

BASIC DATA TABLE			
AIRPORT CLASS	PRIMARY	INSTRUMENT RUNWAY	04, 22
AIRPORT STATUS	Int. Dom	PAVEMENT STRENGTH	63/R/B/X/T
AIRPORT REF. ELEVATION	353 m		
AIRPORT REF. POINT (APP) COORDINATES	N 51°01.8' E 71°28.3'	NAV. AIDS CATEGORY	CAT-I
AIRPORT REF. TEMP	20.7 °C	DISTANCE FROM CITY	18.5 km
RUNWAY DIRECTION	04 / 22		

BUILDING AREA			
No.	NAME OF BUILDING	No.	NAME OF BUILDING
①	PASSENGER TERMINAL	⑦	POWER HOUSE
②	CARGO TERMINAL	⑧	BOILER & COOLING STATION
③	ADMINISTRATION BUILDING	⑨	VVIP TERMINAL BUILDING
④	FIRE STATION	⑩	GSE MAINTENANCE BLDG.
⑤	FUEL FARM	⑪	METEO STATION
⑥	CAR PARK	⑫	WORK SHOP

LEGEND	
	ROAD
	AIRPORT BOUNDARY
	RUNWAY STRIP
	GRASSED MOVEMENT AREA
	PERIMETER ROAD
65	BUILDINGS

THE REPUBLIC OF KAZAKHSTAN MINISTRY OF TRANSPORT AND COMMUNICATIONS	APPROVED BY :
	CHECKED BY:
AKMOLA AIRPORT	DRAWN BY:
DRAWING TITLE PRELIMINARY AIRPORT LAYOUT (Year 2005)	DRAWING No.
THE STUDY ON AIR TRANSPORT DEVELOPMENT IN THE REPUBLIC OF KAZAKHSTAN JAPAN INTERNATIONAL COOPERATION AGENCY	SCALE: 1 / 15,000 DATE: JAN. 1997

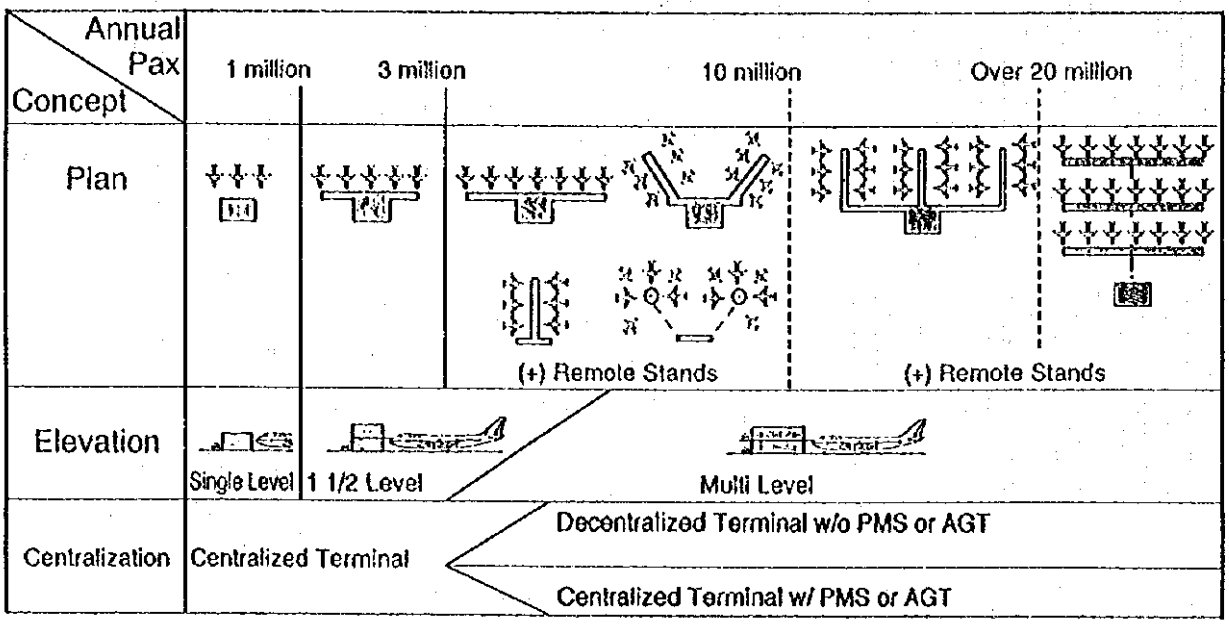
b) Terminal Concept

Apron arrangements are interrelated with the passenger terminal concepts. Various passenger terminal concepts are illustrated in **Figure 6.1.1.3** The number of annual passengers to be handled is forecast at 2.1 million in 2020. The size of the passenger terminal building is likely be about 27,000 sq.m, 250 m wide and 60 m deep. For this size of building, the linear concept is the most preferable with the following advantages:

- Short walking distance and easy guidance for passengers.
- Easy and simple maneuvering of aircraft
- Efficient utilization of apron space
- Sufficient flexibility and expandability
- Least cost for construction, operation and maintenance
- The other concepts have the following characteristics.
- Pier and satellite concepts are usually adopted when the number of annual passengers exceeds five million.
- The transporter concept does not provide a good impression of an international class airport for passengers. This concept is currently used.

Table 6.1.1.1 shows passenger handling capacity against terminal concepts.

Table 6.1.1.1 Passenger Handling Capacity of Passenger Terminal Concepts



Note ; PMS : Passenger Moving Sidewalk
AGT : Automated Guideway Transit

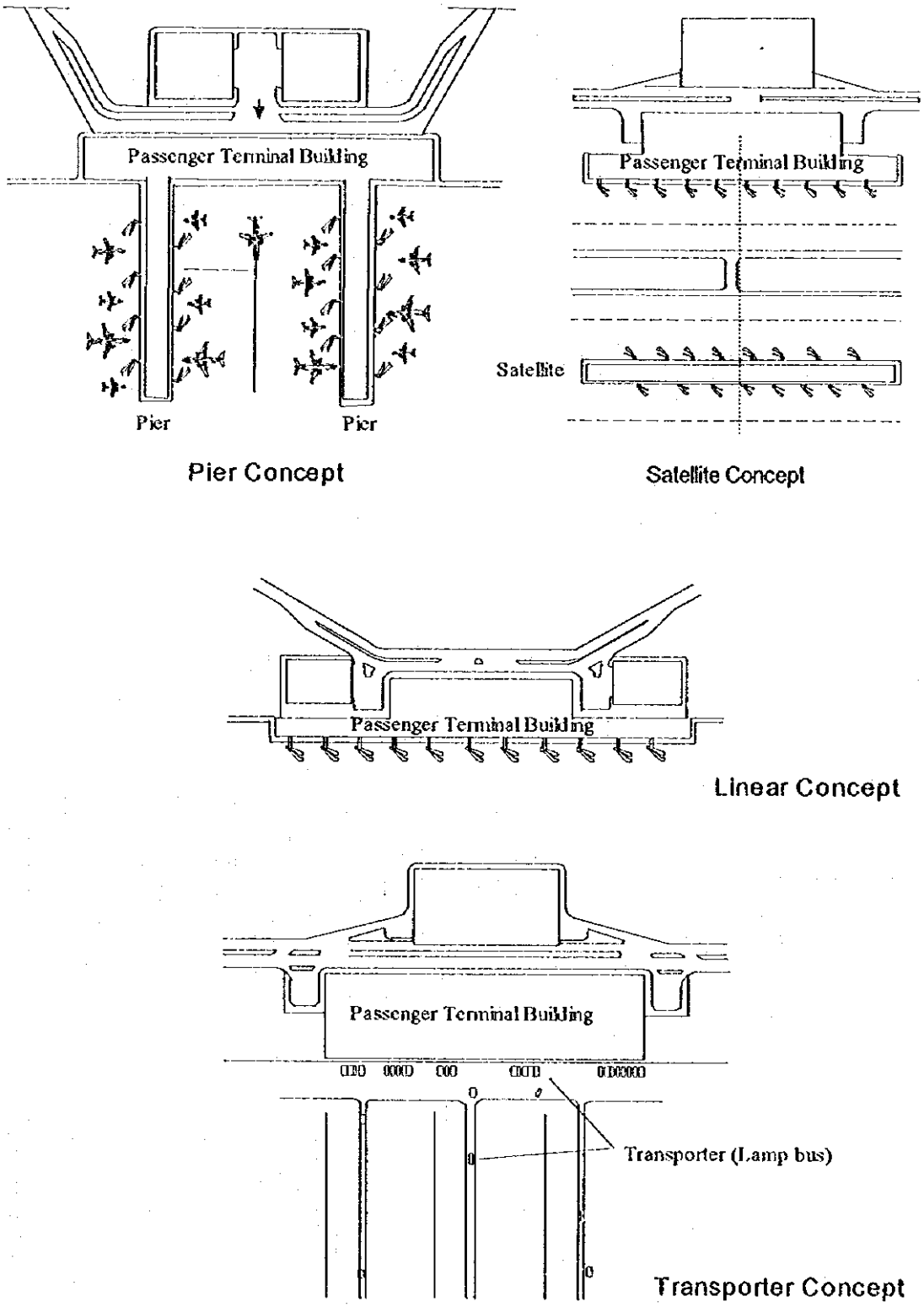


Figure 6.1.1.3 Passenger Terminal Concepts

c) Layout of Facilities

The following facilities should be located in the terminal area:

- Passenger terminal building
- Car park
- VVIP building
- Cargo terminal building
- Control tower and administration building
- Fire station
- Utility station
- Airport maintenance office
- Ground support equipment maintenance garage
- Canteen
- Airline office building

Space should be reserved for airline flight crew accommodation and pilot training facilities and for a hanger which will not be required before 2005.

In order to provide maximum flexibility for future developments and enable smooth traffic flows in the terminal area, the terminal area land use zoning and road network was studied. The following major considerations were made during the layout planning.

- The passenger terminal building and associated car park should be located in the central part of the terminal area to provide the maximum expandability on both sides. A 25m wide space, for utilities, GSE parking and apron service traffic, should be provided between the apron and terminal building.
- The VVIP building should be located at slightly apart from public facilities to divide landside vehicle flows.
- The cargo terminal building would be located in the area to the northeast of the passenger terminal, the site of the former post office building.
- The control tower should be located near to the passenger terminal building, near to the mid-point central of the runway to provide the best visibility of both runway ends. It should be located at the airside / landside boundary so as to provide access to the both sides.
- The fire station should be located facing the extended parallel taxiway so as to provide the best accessibility to the both ends of the runway. Its location should not obstruct the future expansion of the airside facilities.

(2) Civil Facilities

a) Runway Extension

The runway should be extended by 1,000 m in the 22 direction. The dimensions of the runway will be 3,500 m x 45m, with a 7.5 m shoulder on each side in accordance with ICAO Annex 14. Overruns of 60 m x 60 m should be provided.

b) Runway Strip

Its size should become 3,620 m long and 300 m wide, 150 m to each side to the runway centerline. This rectangular area should be evenly graded.

c) Taxiway

Two stub taxiways should be provided to connect the apron with runway. In order to prepare for new large aircraft, the separation distance between the centerlines of the runway and the parallel taxiway should be at least 190 m. The location of the apron taxiway satisfies this requirement. The width of taxiways should be at least 23 m with a 10.5 m shoulder on each side in accordance with Annex 14.

d) Apron

The dimensions of apron should be about 875 m in width so as to accommodate five (5) MJ class aircraft, twelve (12) SJs and one (1) TP. This is year 2020 requirement which differs little from the 2005 requirement. The depth of apron will remain 155 m.

A 20 m wide space for GSE parking and apron service traffic should be provided between the apron and passenger terminal building.

e) Terminal road and car park

The terminal road network is planned so traffic flow will be smooth and efficient. A car park for 630 vehicles should be provided in front of passenger terminal building. Typical cross sections of terminal roads are shown in **Figure 6.1.1.4**. The width of the carriage ways of the bi-directional and single directional road should be 14 m and 7 m respectively. The curb frontal road should have a dual standing lane and two passing lanes.

f) Drainage

Storm water flow would remain as is. The water from the runway strip area will be led to Maubalyk Lake. A drainage facility should be installed in the extended runway strip and connected to the existing one. Scooping pumps should be replaced in the station beside the Lake. The water from the new terminal area will discharge to the existing canal by gravity flow.

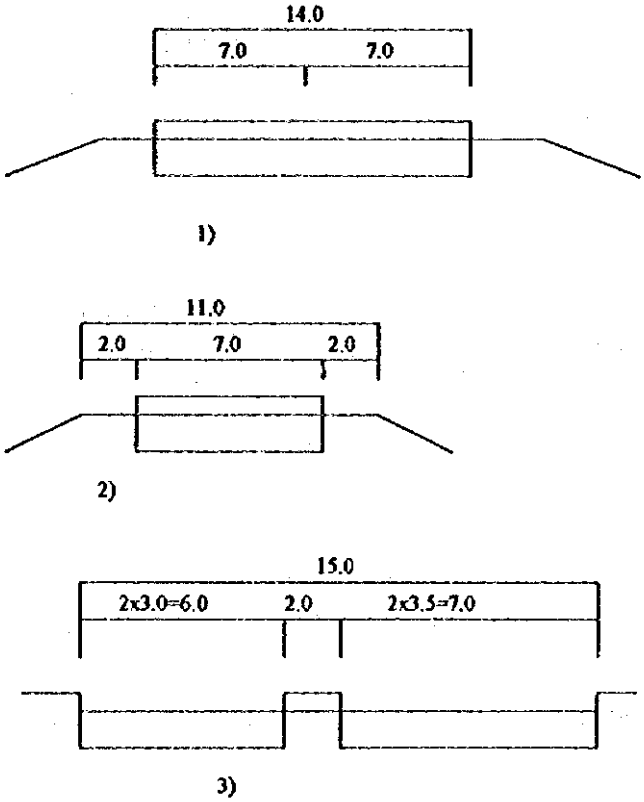


Figure 6.1.1.4 Typical Cross Section of Terminal Roads

g) Other Civil Works

Other civil works will include the following.

- Fence and Gates:

  A security fence should be installed along the airport perimeter and at the boundary of the landside and airside in the terminal area. Gates should be provided where access between the landside and airside is required.

- Landscaping:

  Landscaping will be required in the terminal area for aesthetic reasons. In addition, sodding and seeding will be required for surface protection of the graded areas.

- Marking and Signs:

  Marking will be required on the runway, taxiways, aprons, roads and car parks. Signs should also be provided along the roads and at the car parks.

(3) Passenger Terminal Building

A new passenger terminal building, which will be the gateway of the new capital to the outside world, was concerned as described below. **Figure 6.1.1.7**.shows floor plans and **Figure 6.1.1.8** shows elevations. These drawings were prepared for reference only. The actual design for implementation will be discussed between the executing agency and concerned users.

a) General Concept

The basic concept for the international passenger terminal building is a linear concept, as described in Chapter 5. Regarding processing levels, the one-and-a-half level concept was adopted in the preliminary design for the following reasons.

- Major passenger processing functions can be more centrally located with a one-and-a-half level concept than with a one level concept; therefore, the maximum walking distance can be reduced.
- The one-and-a-half level concept is more convenient and comfortable for passengers when passenger boarding bridges are installed.
- The one-and-a-half does not need double level curbs. It reduces construction costs, and allows more flexibility for future development of the terminal road network.

The passenger and baggage flow used in the preliminary design of the new passenger terminal building is based on a common practices used elsewhere in the world, although consideration was given to local conditions for passenger and baggage processing. **Figure 6.1.1.5** shows the flow of international passenger processing.

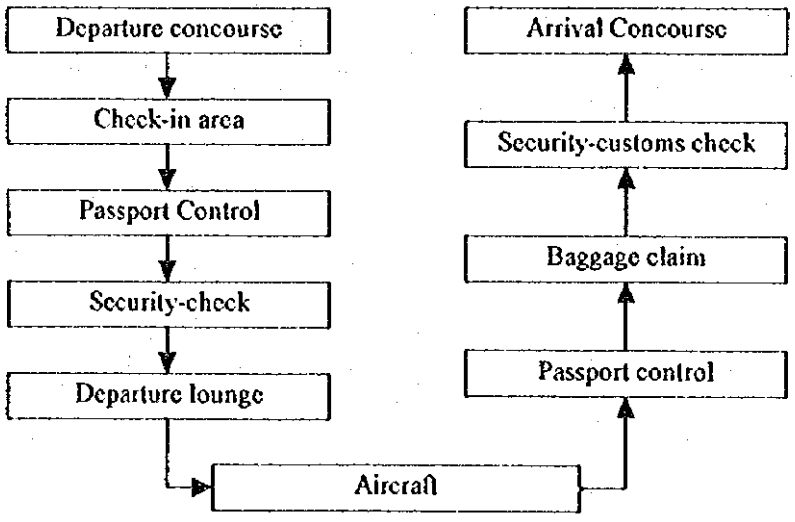


Figure 6.1.1.5 Flow of International Passenger Processing

b) Facility Requirement

The required number and sizes of major facilities were calculated based on the number of peak hour passengers in the year 2005, and the capacity calculation formulae in IATA's Airport Development Reference Manual, as shown in Table 6.1.1.1. Details of the calculation are shown in Appendix 6.1.1.1.

Table 6.1.1.1 Requirements of Major Facilities

	ROOMS OR POSITIONS	Unit	Required 2005	Required 2020	Planned
1	Curb Length Int./Dom.Combined	m2	79	94	168
2	Departure Arrival Concourse	m2	290	570	712
3	Security Check - Domestic	no.	2	2	2
4	Security Check - International	no.	1	1	1
5	Customs Control	no.	3	1	1
6	Queuing - Check-in - Domestic	m2	69	138	270
7	Queuing - Check-in - International	m2	22	80	270
8	Check-in desks - Domestic	no.	9	9	9
9	Check-in desks - International	no.	3	5	9
10	Passport Control	no.	1	2	4
11	Security Check - Domestic	no.	2	1	1
12	Security Check - International	no.	1	1	1
13	Departure Lounge - Domestic	m2	312	623	384
14	Departure Lounge - International	m2	100	362	128
15	Queuing - Passport - Arrival	m2	20	73	232
16	Passport Control - Arrival	no.	1	3	6
17	Baggage Claim Area - Domestic	m2	248	495	548
18	Baggage Claim Area - International	m2	79	287	500
19	Baggage Claim Belt - Domestic	no.	1	2	1
20	Baggage Claim Belt - International	no.	1	1	1
21	Queuing - Customs - Arrival	m2	20	73	70
22	Customs - Arrival	no.	1	3	2
23	Restaurant	seats	242	242	384

c) Zoning and Layout of Major Facilities

Allowing for the basic concepts and passenger and baggage flows described previously, the following zoning principles were adopted for the preliminary design.

- International and domestic passengers are completely separated to both sides.
- Departing passenger processing facilities, other than check-in counters, will be located on the second floor. Departing passengers will go to the second floor after check-in, by escalator, stairs or lift.
- Most of the arriving passenger processing facilities will be located on the first floor and laid-out from airside to landside in the sequence of processing so as to minimize any lateral movements of the passengers.
- Departing and arriving passengers are segregated at the dual level corridor
- Gate lounges and arrival level corridors will be located on the mezzanine floor where the passenger loading bridges will be connected.
- Baggage make-up and break-down areas will be located on the first floor nearest to the apron.

Departing passengers will usually arrive at the departure curb and enter the terminal building. There is a public concourse with a wood decor where passengers and their friends can stay together for a while before the passengers proceed to check-in. After the check-in counter, passengers will go to the second floor by escalator, stairs or lift to the departure passport control. There are CIP lounges and a restaurant at the airside of the second floor. On the second floor, the passengers will stay there or in the gate lounge on the mezzanine floor until their boarding time. Then they will proceed to the aircraft through the passenger boarding bridges. A bus gate for remote aircraft stands is located at the east corner of the main building on the first floor.

Arriving passengers will enter the terminal building on the mezzanine floor through the passenger boarding bridges. The passengers will walk along the corridor and come to the arrival passport control area. After clearing passport control, they will go down stairs to the baggage claim area on the first floor. After claiming their bags, the passengers will proceed to the customs check and then exit to the public concourse. From there the passengers and well-wishers will exit to the curb.

Figure 6.1.1.6.shows passenger and baggage flow in the building.

(4) VVIP Building

A VVIP terminal building for national guests is planned separately from the public facilities. **Figure 6.1.1.9** shows floor plans and elevation.

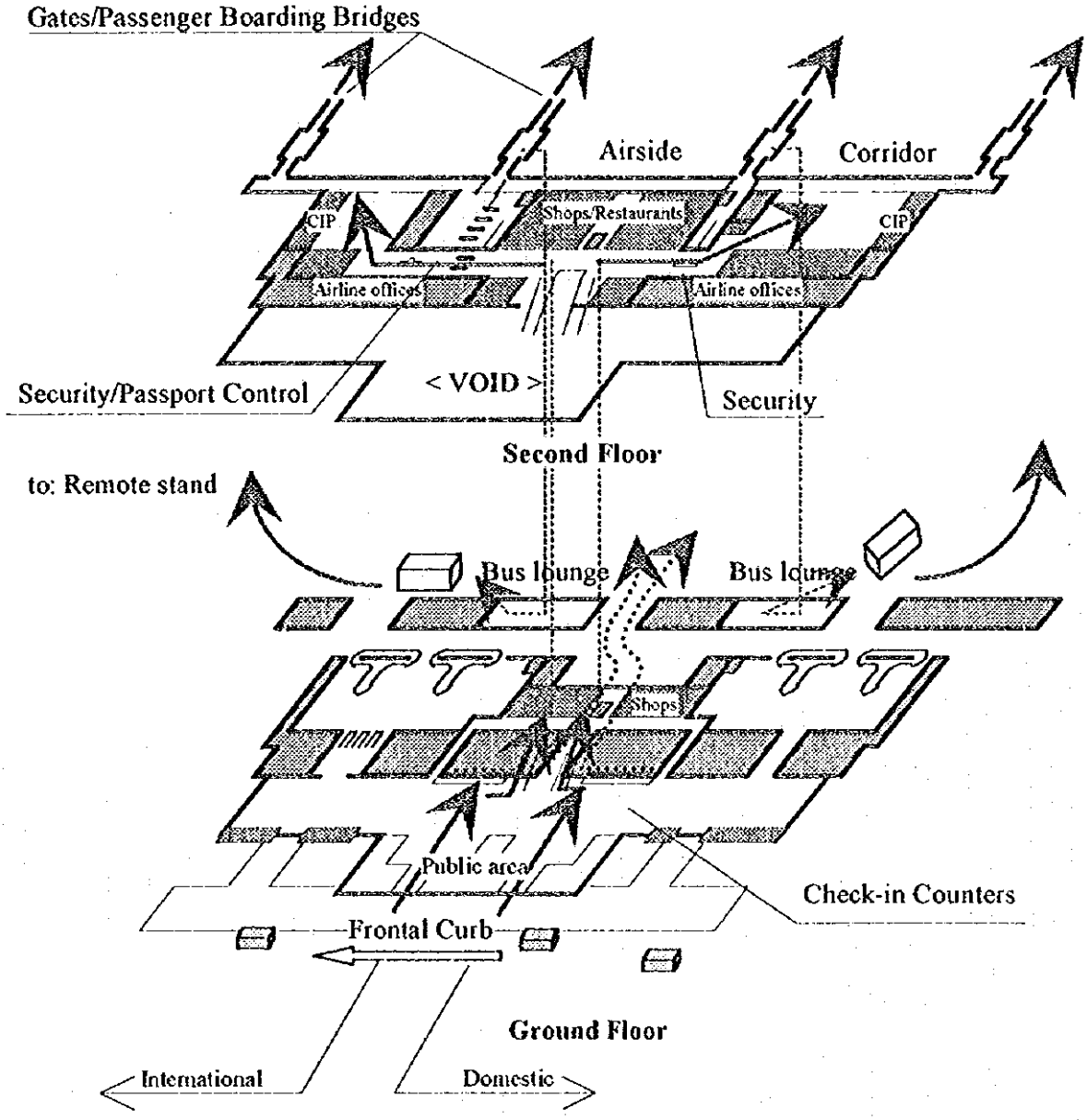


Figure 6.1.1.6 (1) Passenger and Baggage Flow (Departure)

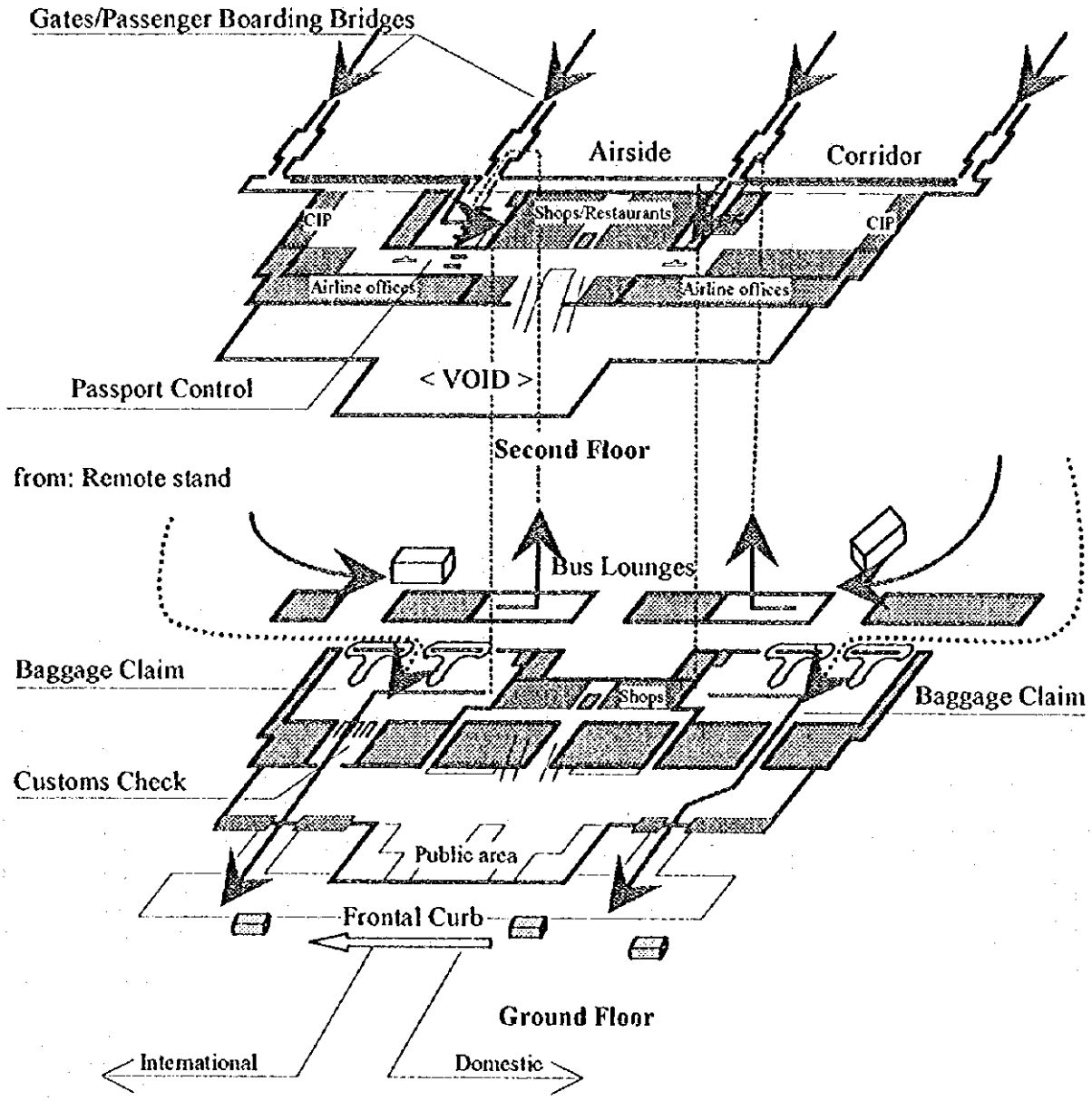
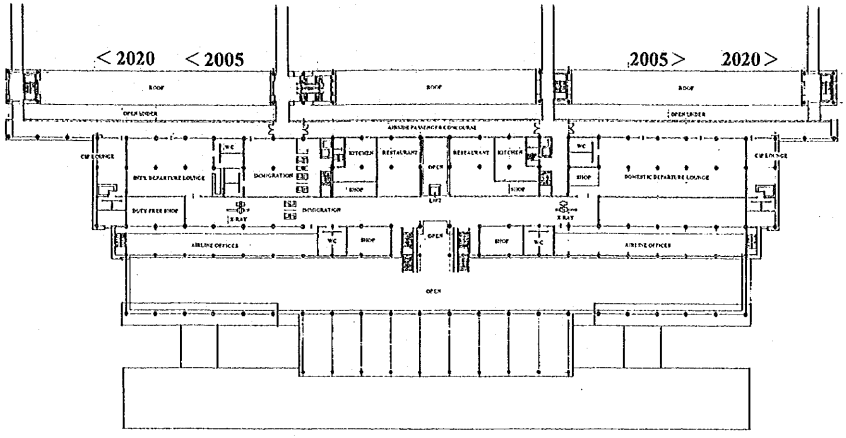


Figure 6.1.1.6 (2) Passenger and Baggage Flow (Arrival)



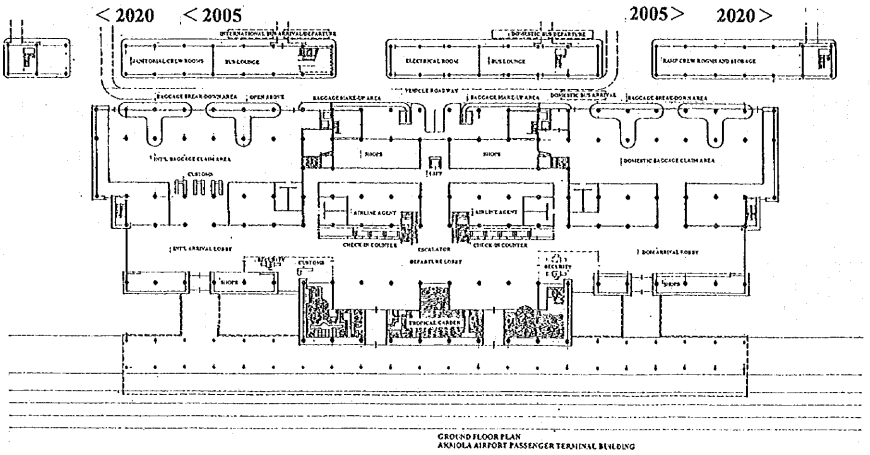
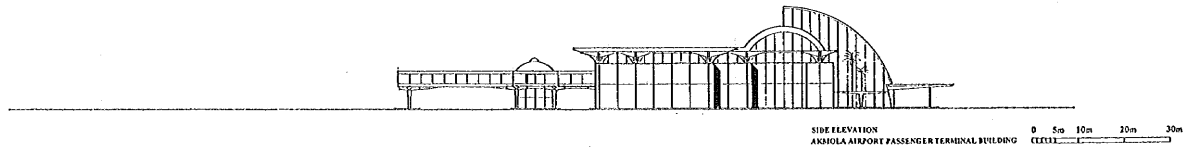


Figure 6.1.1.7 Passenger Terminal Building - Floor Plans



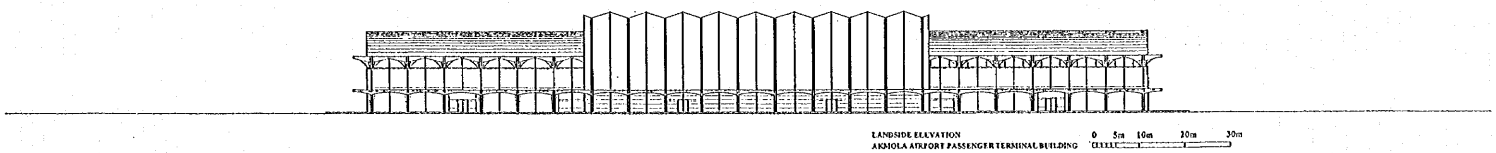
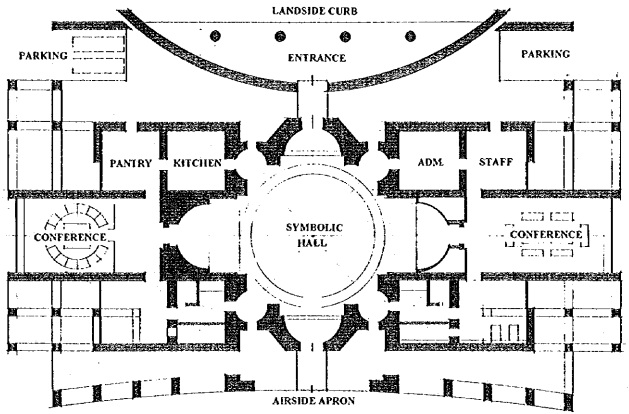
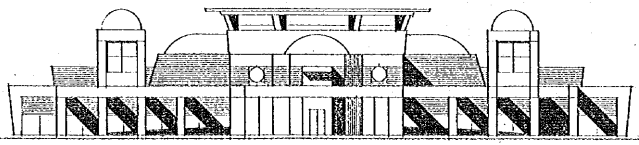


Figure 6.1.1.8 Passenger Terminal Building - Elevations



CONCEPTUAL PLAN FOR AKMOLA AIRPORT VVIP TERMINAL BUILDING SCALE:1/500 0 5m 10m 20m 30m



CONCEPTUAL ELEVATION FOR AKMOLA AIRPORT VVIP TERMINAL BUILDING SCALE:1/500 0 5m 10m 20m 30m

Figure 6.1.1.9 VVIP Terminal Building - Plans and Elevation

(5) Air Navigation System

a) Radio Navigation Aids

i. ILS

A category I Instrument Landing System (or CAT -2) should be installed for both runways. The ILS system should conform to standards and recommendations of ICAO Annex 10.

ii. VOR / DME

b) ATC Systems

i. Control Tower

"STARTs" are currently located near the ends of both runways but not used, and the aerodrome control service is provided by the control tower located on the top of a 6 story building. The tower is obsolete and a modern properly equipped control tower should be constructed.(See attached list for Aerodrome control tower equipment.)

ii. ARTS

A typical ARTS installed "Bright Display" (bring radar indicator) should be installed in the control tower and it should be readily accessible for viewing by the local controller.

iii. ASDE

An ASDE would normally be mounted on the roof of the control tower cab and the display mounted in the cab, in view or the ground control and local control positions.

c) Aeronautical Ground Lights

The following aeronautical ground lights should be installed.

i. Precision Approach CAT- II Lighting System
ii. PAPI
iii. Runway Edge Lights (REDL)
iv. Runway Threshold Lights (RTHL)
v. Taxiway Edge Lights (TWTL)
vi. Runway Center Line Lights (RECL)
vii. Runway Touchdown Zone Lights (TDZL)
viii. Aerodrome Beacon

(6) Airport Utilities

a) Aviation Fuel Supply

The capacity of the existing fuel storage tanks will satisfy the demand up to 2020. A fuel hydrant system will be required so as to improve the safety of traffic on the apron and to maintain fuel quality, to replace the refuelers in use now. The fuel hydrant system should be connected to the existing fuel farm by pipeline.

b) Public Utilities

A new utility station should be constructed in the terminal area to supply heating water and electric power for new facilities. Water supply piping will be connected to the city mains as in the past. An incinerator should be provided for solid waste disposal. Sewerage piping will lead waste water from the terminal area to the existing pumping station, and the scooping pumps there should be replaced.

6.1.2 Almaty International Airport

(1) Layout Planning for Feasibility Study

The National Airport System Development Plan in Chapter 5 describes how the new terminal area should be developed for the target year 2020.

For the feasibility study, however, development in the existing terminal area is assumed because:

- Lufthansa will still be the airport's operator in the target year 2005; and
- Their current development plans (**Table 6.1.2.1**) should be taken into account.

Table 6.1.2.1 Current Facility Development Plan by Lufthansa

Facility development plans

- Improvement of Runway

  Pavement overlay work by asphalt concrete is supposed to be completed by Spring, 1997. The average thickness is 25 to 30 cm. This will strengthen the existing runway

- Improvement of Taxiway System

  A new partial parallel taxiway will be constructed in the same place as the original.

- Improvement of Aprons

  Rehabilitation of pavement

- Expansion and renewal of passenger terminal building

  The existing domestic/CIS passenger terminal building will be expanded in depth, and the interior renewed. Four passenger boarding bridges at two new terminal fingers are included in the plan. The capacity planned is said to be as follows.

Demand forecast: 2010	International	Domestic	Total
Annual passengers	1.5 million	3.0 million	4.5 million
Peak hour passengers	500	700	1,200

Implementation of these development plans will depend on the airport's revenues. This is sound commercial practice. However, in terms of generally accepted airport standards, many facilities and equipment already need replacement or improvement. In this Study, the following assumptions were made the for planning purposes.

- The total floor area of passenger terminal building would be about 20,000 sq.m. It could handle 4.5 million passenger annually, however, this is

about 12,000 sq.m less compared with the facility requirement in Chapter 5 of the Study, whose forecast shows 4.7 million. To meet this service level, it would be desirable to construct a new passenger terminal building in the existing terminal area instead of expanding the existing building.

- The aircraft stands, whose numbers were calculated in the facility requirement, were to be laid out near to the passenger terminal building.
- There is significant shortage of car parking space in the existing terminal area. Expansion would be needed in the surrounding area.
- The runway will have enough strength for traffic demand in 2020 after completion of the current improvement work. The strength of the taxiways and aprons will also be sufficient. Hence construction of the remaining portion of parallel taxiway and rapid exit taxiways should be considered in the feasibility study.
- An administration building with control tower, navigational facilities, and any other facilities others which are not included in the current development plan should be included in the feasibility study based on the Master Plan described in Chapter 5.

Figure 6.1.2.1 shows overall airport layout.

(2) Civil Facilities

a) Taxiway expansion

A full parallel taxiway should be provided 200 m from the runway center line. About half of this will be constructed under the current development plan. The remaining 3,500 m should be included in the feasibility study. Four additional rapid exit taxiways should also be provided and located for both large and small size aircraft.

b) Airside road

Access to the new administration building should be provided.

c) Terminal road and Car park

The car park in existing terminal area should be expanded. An additional remote car park has been planned because of insufficient space near the terminal. Proper usage of these two car parks should an operational consideration. A terminal road should be developed in the terminal area.

d) Other Civil Works

Other civil works will include Landscaping, Markings and Signage.

(3) Passenger Terminal Building

The general considerations are the same as those for Akmola, except for dual level airside corridors and gate lounges, because a large number of gates will be required. This plan enables a stricter vertical separation of departure and arrival passengers. **Table 6.1.2.2** gives requirements for major facilities. See **Figure 6.1.2.2** and **6.1.2.3** for floor plans and passenger/baggage flows respectively.

These drawings were prepared for reference only. The actual design for implementation will be discussed between the executing agency and concerned users.

Table 6.1.2.2 Requirements of Major Facilities

	ROOMS OR POSITIONS	Unit	Required 2005	Required 2020	Planned
1	Curb Length Int./Dom.Combined	m2	594	542	250
2	Departure Arrival Concourse	m2	2196	2932	1008
3	Security Check - Domestic	no.	4	2	2
4	Security Check - International	no.		2	2
5	Customs Control	no.	8	6	6
6	Queuing - Check-in - Domestic	m2	143	183	336
7	Queuing - Check-in - International	m2	125	173	336
8	Check-in desks - Domestic	no.	19	12	12
9	Check-in desks - International	no.	17	12	12
10	Passport Control	no.	5	3	4
11	Security Check - Domestic	no.	3	2	2
12	Security Check - International	no.	3	2	2
13	Departure Lounge - Domestic	m2	648	829	768
14	Departure Lounge - International	m2	567	785	768
15	Queuing - Passport - Arrival	m2	114	158	224
16	Passport Control - Arrival	no.	8	6	6
17	Baggage Claim Area - Domestic	m2	515	658	1278
18	Baggage Claim Area - International	m2	451	624	1184
19	Baggage Claim Belt - Domestic	no.	1	1	2
20	Baggage Claim Belt - International	no.	1	1	2
21	Queuing - Customs - Arrival	m2	114	158	336
22	Customs - Arrival	no.	8	21	14
23	Restaurant	seats	440	440	512

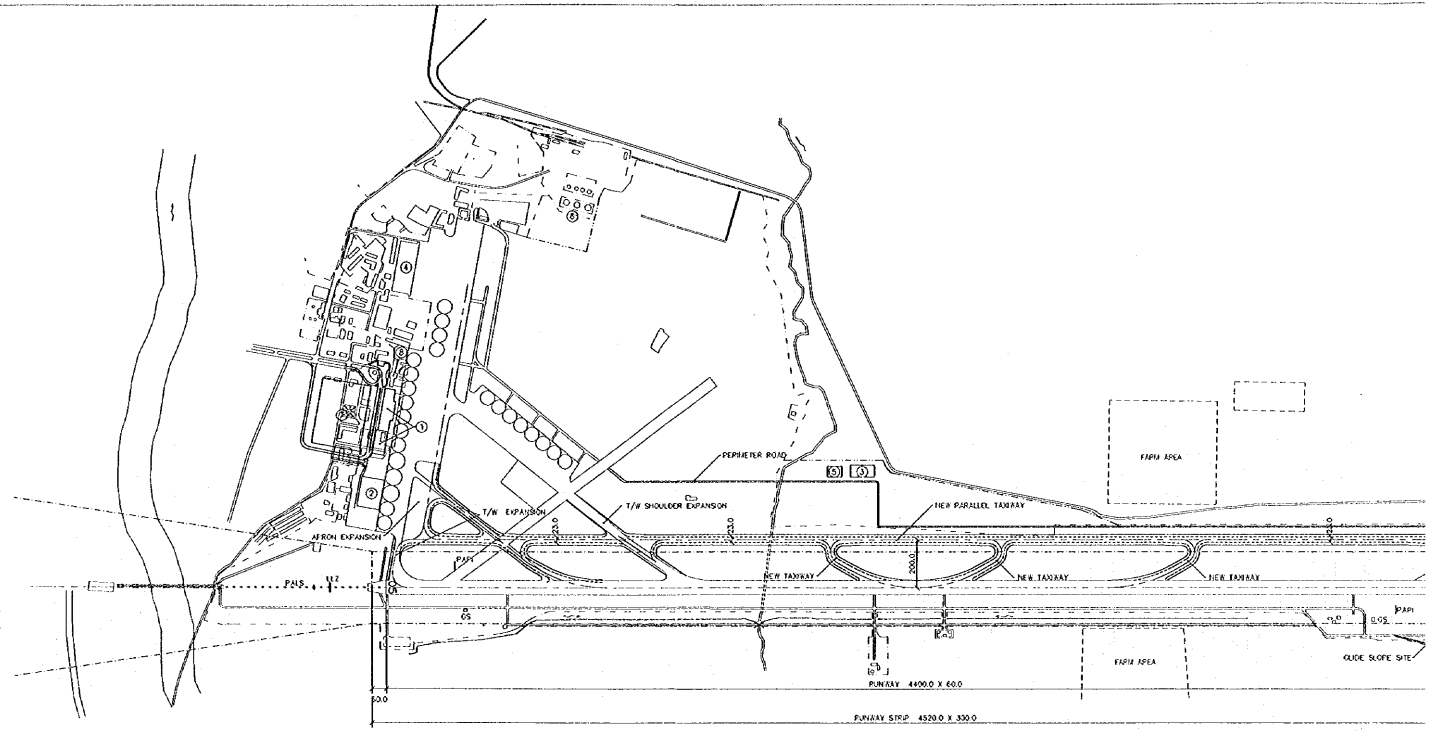


Figure 6.1.

BASIC DATA TABLE			
AIRPORT CLASS	PRIMARY	INSTRUMENT RUNWAY	05, 23
AIRPORT STATUS	Int. Dom	PAVEMENT STRENGTH	
AIRPORT REF. ELEVATION	681 m		
AIRPORT REF. POINT (ARP) COORDINATES	N 43°21.1' E 77°02.3'	NAV. AIDS CATEGORY	CAT-II
AIRPORT REF. TEMP	30.6°C	DISTANCE FROM CITY	10 km
RUNWAY DIRECTION	05 / 23		

BUILDING AREA			
No.	NAME OF BUILDING	No.	NAME OF BUILDING
1	PASSENGER TERMINAL	7	CAR PARK
2	CARGO TERMINAL	8	VIP TERMINAL BUILDING
3	ADMINISTRATION BUILDING		
4	HANGAR/MAINTENANCE		
5	FIRE STATION		
6	FUEL FARM		

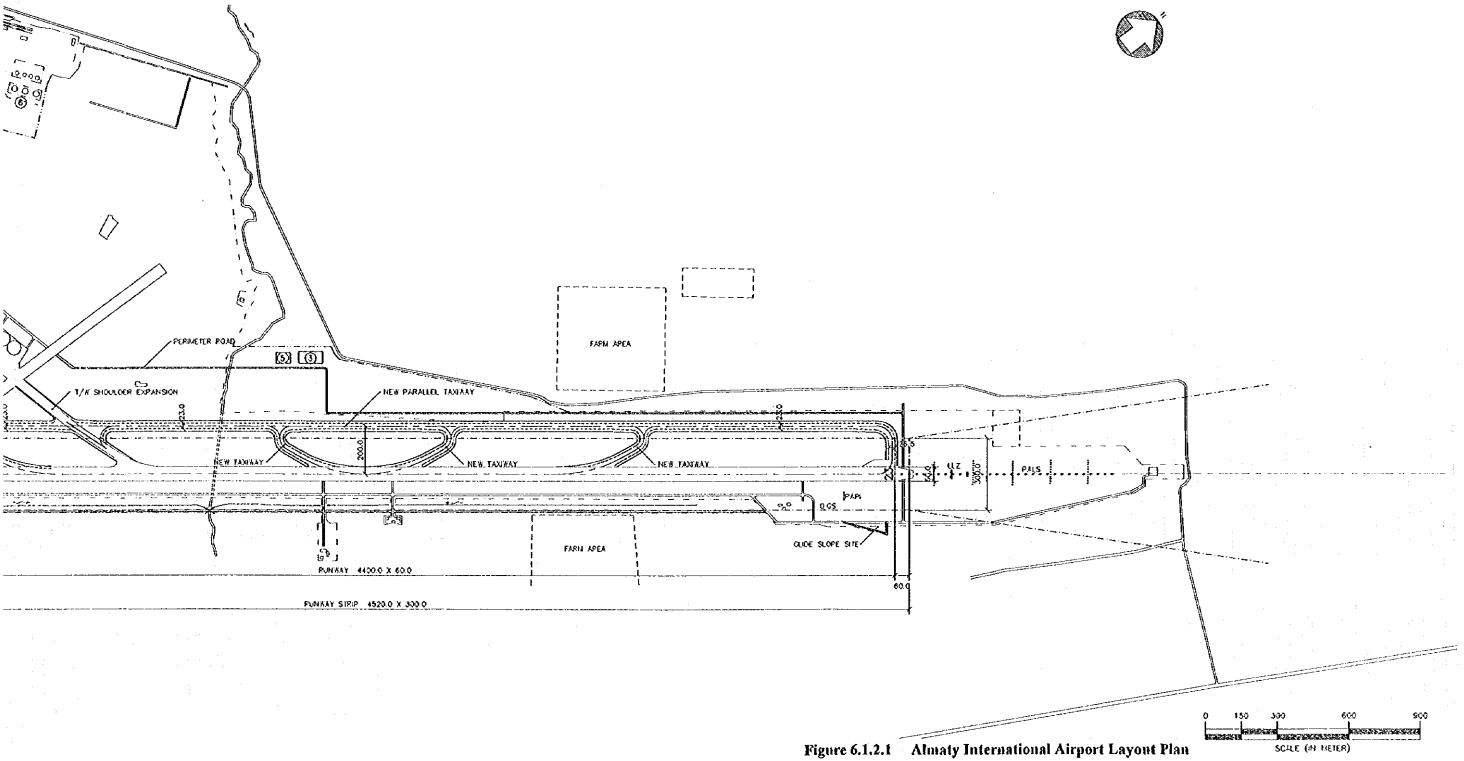


Figure 6.1.2.1 Almaty International Airport Layout Plan

BASIC DATA TABLE			
AIRPORT CLASS	PRIMARY	INSTRUMENT RUNWAY	05, 23
AIRPORT STATUS	Int. Dom	PAVEMENT STRENGTH	
AIRPORT REF. ELEVATION	681 m		
AIRPORT REF. POINT (ARP) COORDINATES	N 43°21.1' E 77°02.3'	NAV. AIDS CATEGORY	CAT-II
AIRPORT REF. TEMP	30.8°C	DISTANCE FROM CITY	10 km
RUNWAY DIRECTION	05 / 23		

BUILDING AREA			
No.	NAME OF BUILDING	No.	NAME OF BUILDING
①	PASSENGER TERMINAL	⑦	CAR PARK
②	CARGO TERMINAL	⑧	VIP TERMINAL BUILDING
③	ADMINISTRATION BUILDING		
④	HANGAR/MAINTENANCE		
⑤	FIRE STATION		
⑥	FUEL FARM		

LEGEND	
	AIRPORT FENCE
05	BUILDINGS
	PERIMETER ROAD
	RAILWAY
	RIVER
	ROAD
	RUNWAY STRIP

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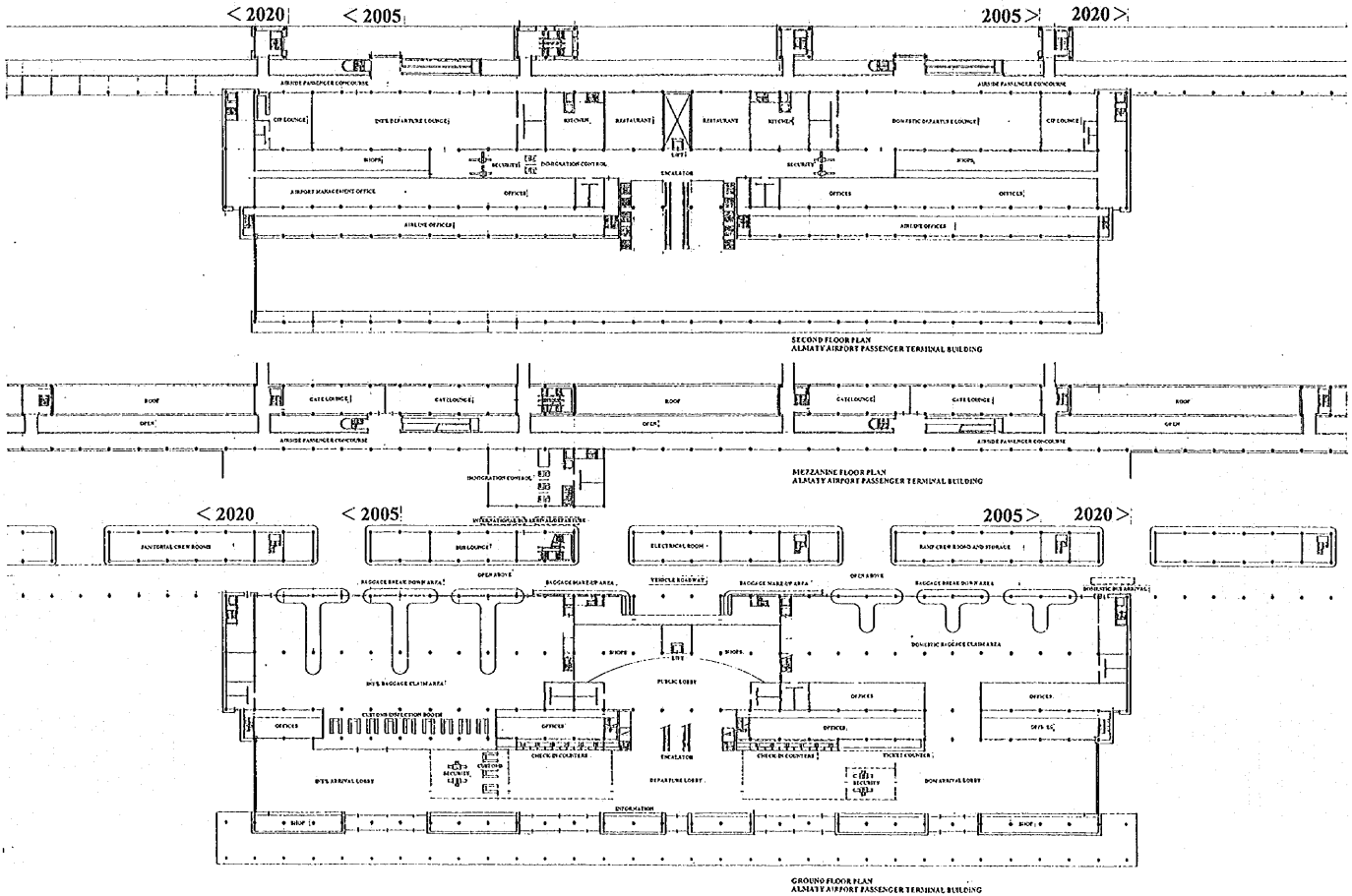

Figure 6.1.2.2 Passenger Terminal Building - Floor Plans

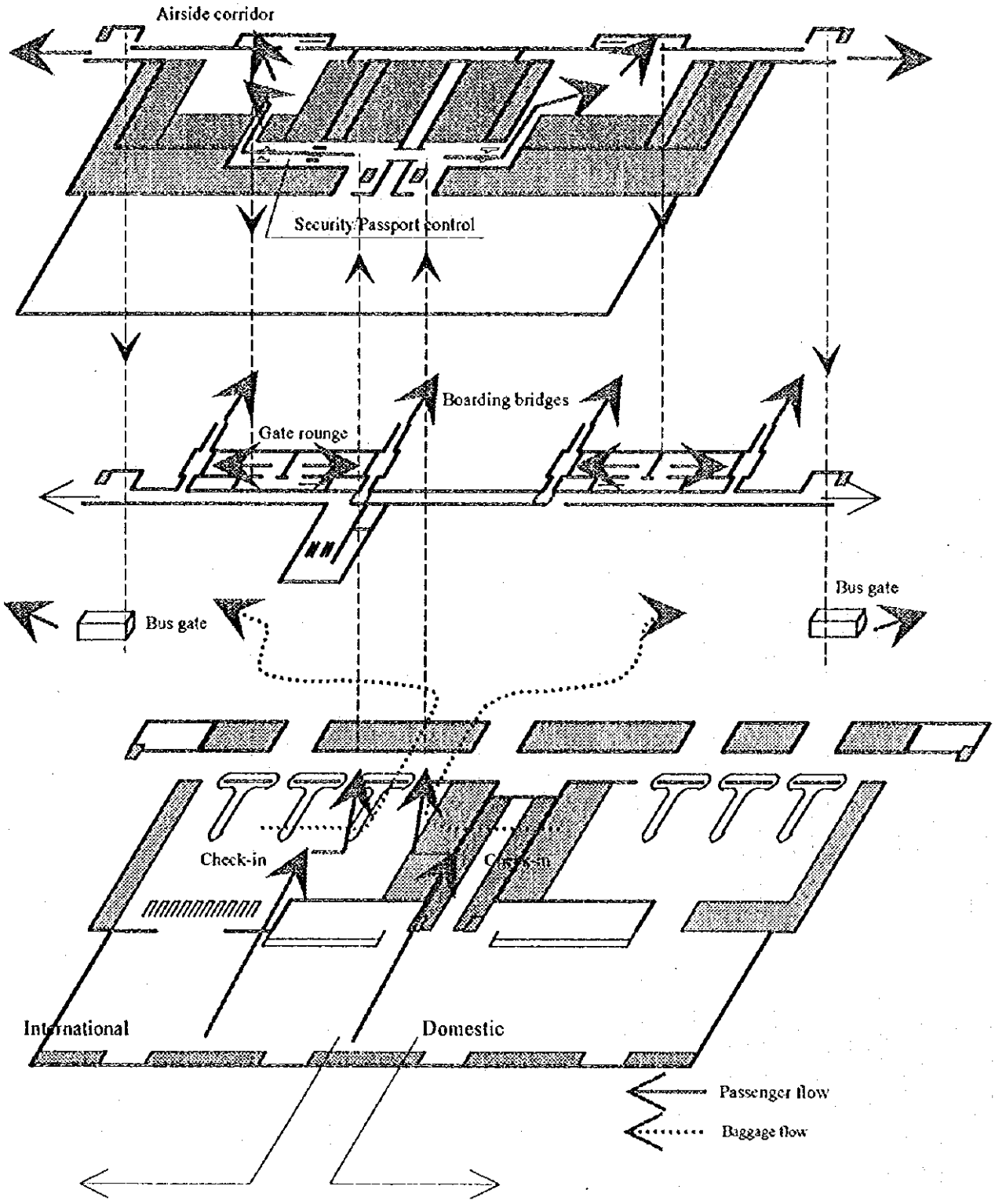

Figure 6.1.2.3 (1) Passenger and Baggage Flow (Departure)

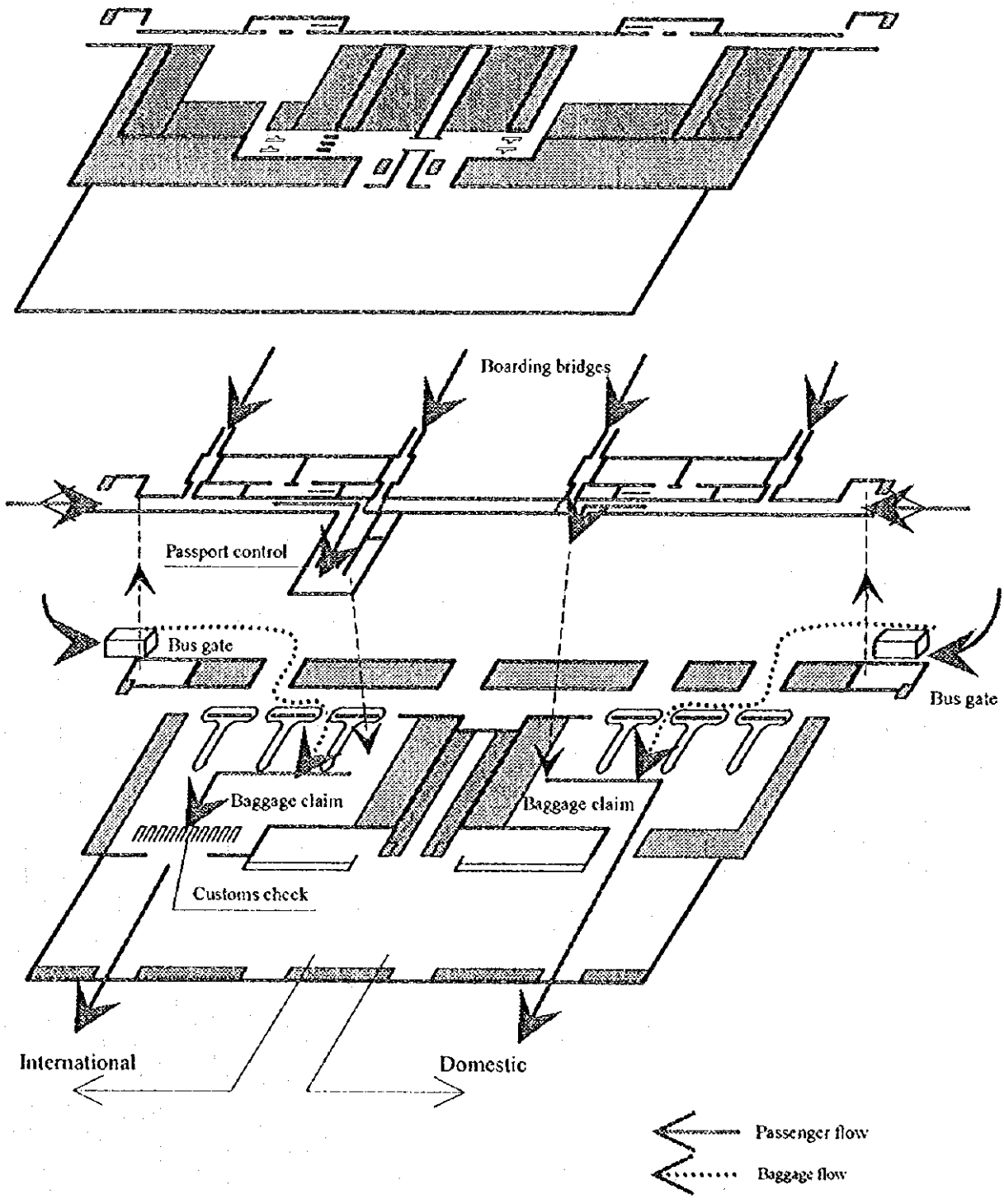

Figure 6.1.2.3 (2) Passenger and Baggage Flow (Arrival)

(4) Air Navigation Systems

a) Radio Navigation Aids

i. ILS

A Category-2 Instrument Landing System should be installed. The ILS system should conform to standards and recommendations of ICAO Annex-10.

b) ATC Systems

i. Control Tower

An old control tower is on top of the ACC building but it is no longer in use. START cabs are located near both ends of the runways and for aerodrome control (local control). Apron and ground control are done from the ground control tower located on top of the Kazaeronavigation, Almaty Branch, building. To maintain safe and efficient operation of aerodrome control, the START and ground control functions should be combined in a new properly equipped control tower. (See attached list for aerodrome control tower equipment.)

i. ARTS

ii. ASDE

c) Aeronautical Ground Lights

The following aeronautical ground lights should be installed. The airport lighting system of Almaty must be supplemented by "runway center line lights" and "touchdown zone lights" for CAT-2 operations.

i. Precision Approach CAT-2 Lighting System

ii. PAPI

iii. Runway Edge Lights

iv. Runway Threshold Lights

v. Taxiway Edge Lights

vi. Runway Center Line Lights

vii. Runway Touchdown Zone Lights

viii. Aerodrome Beacon

(5) Airport Utilities

Utility cabling and piping are would be connected to the existing city supplies as at present.

6.1.3 Aktau Airport

Figure 6.1.3.1 shows overall airport layout.

(1) Terminal Area Layout Planning

A new passenger terminal would be located in the vacant space between the existing air technical base building and Kazairnavigation building, in front of the apron. Aircraft stands on the apron should be reassigned to allow a nose-in parking configuration in front of the new passenger terminal building. The size of the apron is enough for the demand in 2005. At terminal road network and car park should be developed around new terminal. An administration area would be at the existing terminal area, and the cargo building located in-between. .

(2) Civil Facilities

a) Runway/ Taxiway Shoulder Improvement

The runway and tawiways should be provided with a 7.5 m shoulder on each side in accordance with ICAO Annex 14.

b) Airfield Pavement Overlay

Pavement overlay work with a minimum thickness of 5 cm asphaltic concrete should be undertaken to even the surface.

c) Apron Service Road

A 20 m wide apron service road should be provided along the edge of apron.

d) Terminal Road and Car Park

A car park to accommodate 160 passenger cars should be provided in the terminal area. A terminal road network should be constructed as shown in the terminal area layout plan for smooth traffic flow around the whole terminal area.

e) Other Civil Works

Expansion of security road at airside, expansion of drainage system, landscaping works at the new terminal, cable duct, traffic sign, marking and other civil works will be included.

(3) Passenger Terminal Building

The general design concept of this building is scale down version of Akmola's design. The difference is in processing flow as there is no mezzanine floor for Aktau. Flexible operations will be required so as not to mix departing and arriving passengers, at international and domestic passengers in the single level airside corridor. **Table 6.1.3.1** gives the requirements for major facilities.

See **Figure 6.1.3.2** for floor plans.

Table 6.1.3.1 Requirements of Major Facilities

	ROOMS OR POSITIONS	Unit	Required 2005	Required 2020	Planned
1	Curb Length Int./Dom.Combined	m2	160	157	165
2	Departure Arrival Concourse	m2	641	924	507
3	Security Check - Domestic	no.	1	1	1
4	Security Check - International	no.	1	1	1
5	Customs Control	no.	1	1	0
6	Queuing - Check-in - Domestic	m2	39	61	108
7	Queuing - Check-in - International	m2	17	25	81
8	Check-in desks - Domestic	no.	5	4	7
9	Check-in desks - International	no.	2	2	3
10	Passport Control	no.	1	1	2
11	Security Check - Domestic	no.	1	1	1
12	Security Check - International	no.	1	1	1
13	Departure Lounge - Domestic	m2	175	274	360
14	Departure Lounge - International	m2	75	112	256
15	Queuing - Passport - Arrival	m2	15	23	132
16	Passport Control - Arrival	no.	1	1	3
17	Baggage Claim Area - Domestic	m2	139	218	316
18	Baggage Claim Area - International	m2	59	89	298
19	Baggage Claim Belt - Domestic	no.	1	1	1
20	Baggage Claim Belt - International	no.	1	1	1
21	Queuing - Customs - Arrival	m2	15	23	64
22	Customs - Arrival	no.	1	3	3
23	Restaurant	seats	143	242	360

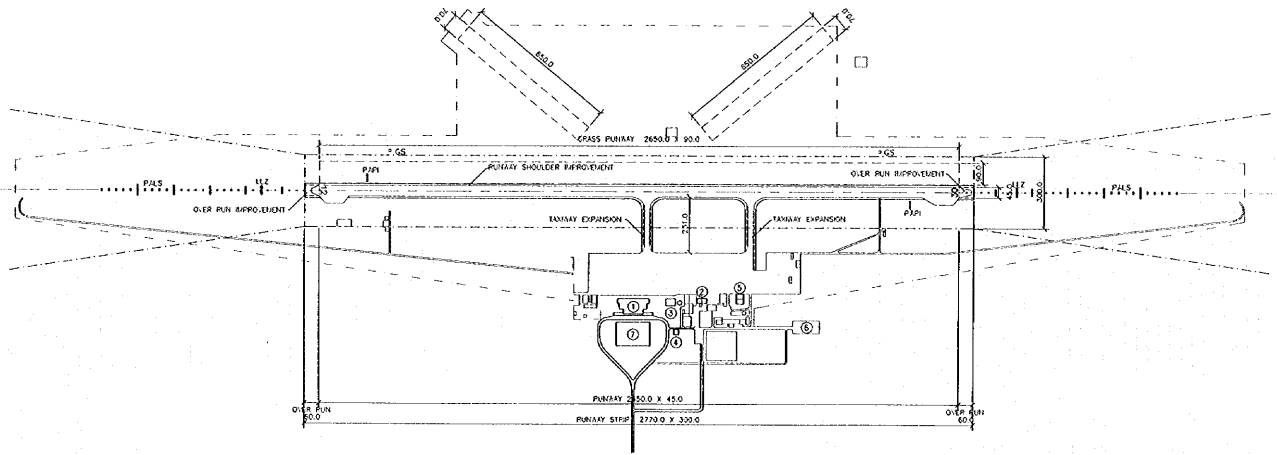

Figure 6.1.3.1 Aktau Airport Layout Plan

BASIC DATA TABLE			
AIRPORT CLASS	SECONDARY	INSTRUMENT RUNWAY	12, 30
AIRPORT STATUS	Int / Dom	PAVEMENT STRENGTH	
AIRPORT REF. ELEVATION	22 m		
AIRPORT REF. POINT (APP) COORDINATES	N 43°51.6' E 51°05.5'	NAV. AIDS CATEGORY	CAT-1
AIRPORT REF. TEMP		DISTANCE FROM CITY	10 km
RUNWAY DIRECTION	12/30, 16/34, 08/26		

BUILDING AREA			
No.	NAME OF BUILDING	No.	NAME OF BUILDING
①	PASSENGER TERMINAL	⑦	CAR PARK
②	CARGO TERMINAL		
③	ADMINISTRATION BUILDING		
④	POWER HOUSE		
⑤	FIRE STATION		
⑥	FUEL FARM		

LEGEND	
	ROAD
	AIRPORT BOUNDARY
	RUNWAY STRIP
	GRASSED MOVEMENT AREA
65	BUILDINGS

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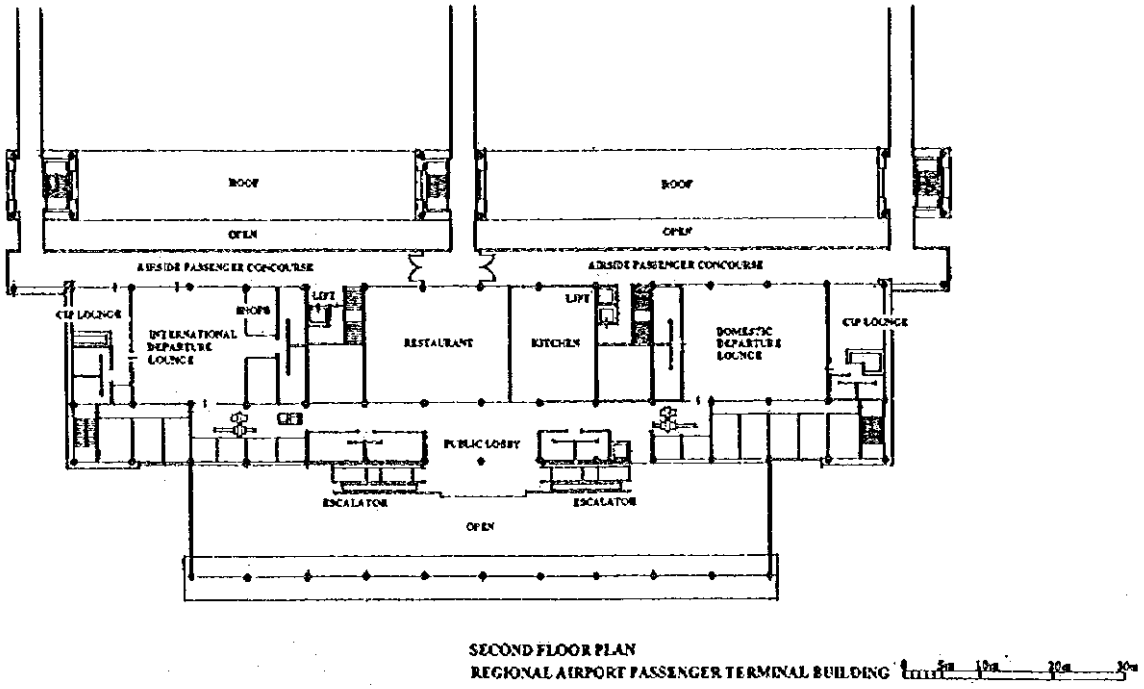
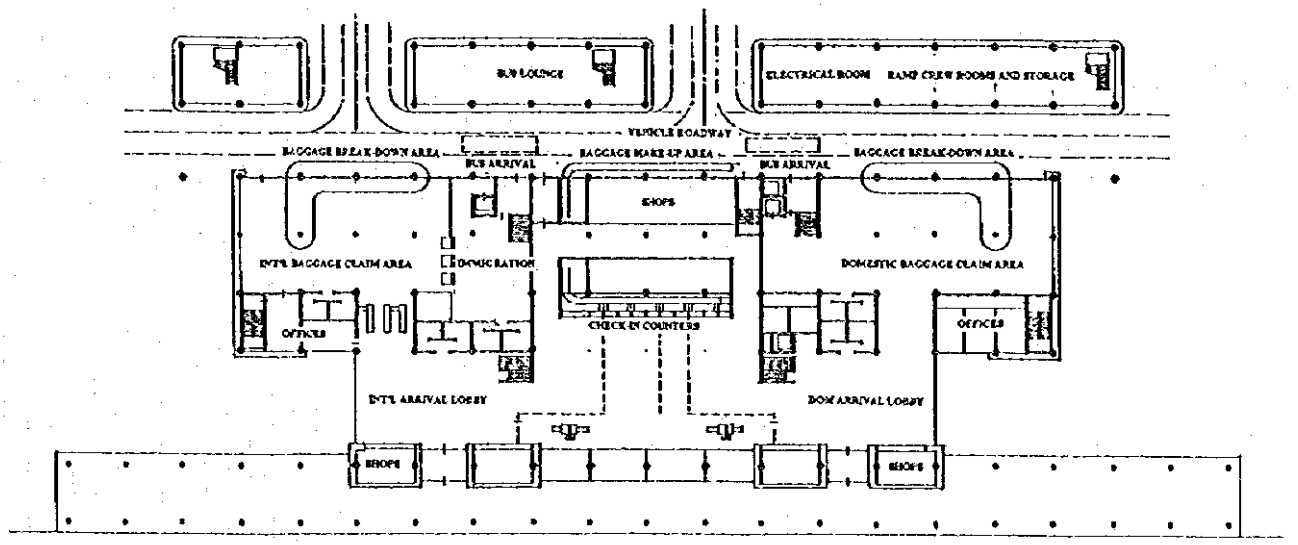
	DATE: JAN. 1997



SECOND FLOOR PLAN
REGIONAL AIRPORT PASSENGER TERMINAL BUILDING



GROUND FLOOR PLAN
REGIONAL AIRPORT PASSENGER TERMINAL BUILDING

Figure 6.1.3.2 Passenger Terminal Building - Floor Plans

(4) Air Navigation System

a) Radio Navigation Aids

i. ILS

A category I Instrument Landing System should be installed for both runways. The ILS system should conform to the standards and recommendations of ICAO Annex 10

b) ATC Systems

i. Control Tower

START cabs are located near the ends of both runways but not used and the aerodrome control service is provided by the control tower. A modern properly equipped control tower should be constructed. (See attached list for aerodrome control tower equipment)

c) Aeronautical Ground Lights

The following aeronautical ground lights should be installed.

i. Precision Approach CAT- I Lighting System
ii. PAPI
iii. Runway Edge Lights (REDL)
iv. Runway Threshold Lights (RTHL)
v. Taxiway Edge Lights (TWYL)
vi. Runway Centre Line Lights (RWCL)
vii. Runway Touchdown Zone Lights (TDZL)
viii. Aerodrome Beacon

(5) Airport Utilities

It is assumed that the power, water and kerosene supply can still be used in the future with minor repair and maintenance. However, the condition of the water supply system from the City is getting worse. An improved water supply is planned by City, including development of new water source. The airport should , however, have its own contingency plans in the event that the water supply system from the city is not imported.

6.1.4 Aktyubinsk Airport

Figure 6.1.4.1 shows overall airport layout.

(1) Terminal Area Layout Planning

The vacant space next to existing passenger terminal building will be used for a new passenger terminal. The apron edge line was located so that LJ class aircraft can park in a nose-in configuration on the apron. A terminal road network and car park should be developed around the new terminal. More space is available for further expansion of the passenger terminal in the runway 31 direction. Other facilities, including an ACC, will be located this area.

(2) Civil Facilities

a) Airfield Pavement Overlay

Pavement overlay work with a minimum thickness 5 cm asphaltic concrete should be undertaken for to even the surface.

b) Apron Expansion

The apron should by expanded by an area of 170 m x XX m near the south end of the existing apron so that aircraft can park in front of the new passenger terminal building in a nose-in parking configuration.

c) Terminal Road and Car Park

A car park to accommodate 270 passenger cars should be provided in the terminal area. The terminal road network should be constructed as shown in the terminal area layout plan for smooth traffic flow around the whole terminal area.

d) Other Civil Works

Expansion of drainage system, landscaping works at the new terminal, cable duct, traffic sign, marking and other civil works will be included.

(3) Building Facilities

New passenger terminal building should be constructed to replace the old existing building. The building design designs for Aktyubinsk, Atyrau and Pavlodar airports are identifical. The floor plans appear in **Figure 6.1.4.2**. **(Table 6.1.4.1** gives requirement of major facilities.)

Table 6.1.4.1 Requirements of Major Facilities

	ROOMS OR POSITIONS	Unit	Required 2005	Required 2020	Planned
1	Curb Length Int./Dom.Combined	m2	88	78	165
2	Departure Arrival Concourse	m2	314	379	620
3	Security Check - Domestic	no.	1	1	5
4	Security Check - International	no.	0	1	1
5	Customs Control	no.	0	1	1
6	Queuing - Check-in - Domestic	m2	26	30	189
7	Queuing - Check-in - International	m2	0	11	31
8	Check-in desks - Domestic	no.	3	2	5
9	Check-in desks - International	no.	0	1	2
10	Passport Control	no.	0	1	2
11	Security Check - Domestic	no.	1	1	1
12	Security Check - International	no.	0	1	1
13	Departure Lounge - Domestic	m2	118	137	320
14	Departure Lounge - International	m2	0	50	256
15	Queuing - Passport - Arrival	m2	0	10	110
16	Passport Control - Arrival	no.	0	1	3
17	Baggage Claim Area - Domestic	m2	94	109	376
18	Baggage Claim Area - International	m2	0	40	270
19	Baggage Claim Belt - Domestic	no.	1	1	1
20	Baggage Claim Belt - International	no.	0	1	1
21	Queuing - Customs - Arrival	m2	0	10	64
22	Customs - Arrival	no.	0	1	3
23	Restaurant	seats	143	242	328

(4) Air Navigation System

a) Radio Navigation Aids

i. ILS

A category I or II Instrument Landing System should be installed for both runways. The ILS system should conform to standards and recommendations of ICAO Annex 10.

b) ATC Systems

i. Control tower

Aerodrome control service is currently provided from START cabs. To maintain safe and efficient operation of the aerodrome control, a modern properly equipped control tower should be constructed.(See attached list for aerodrome control tower equipment)

ii. ARTS

The ARTS displays should be in the locations:

- A / N display in an IFR room (APP)
- Bright display equipment in the control tower for use by the local controler.

c) Aeronautical Ground Lights

The following aeronautical ground lights should be installed:

i. Precision Approach CAT - I (or CAT - 2) Lighting System
ii. PAPI
iii. Runway Edge Lights (REDL)
iv. Runway Threshold Lights (RTHL)
v. Taxiway Edge Lights (TWYL)
vi. Runway Center Line Lights (RWCL)
vii. Runway Touchdown Zone Lights (TDZL)
viii. Aerodrome Beacon

(5) Airport Utilities

Utility cabling and piping would be connected to the existing city supplies as at present.

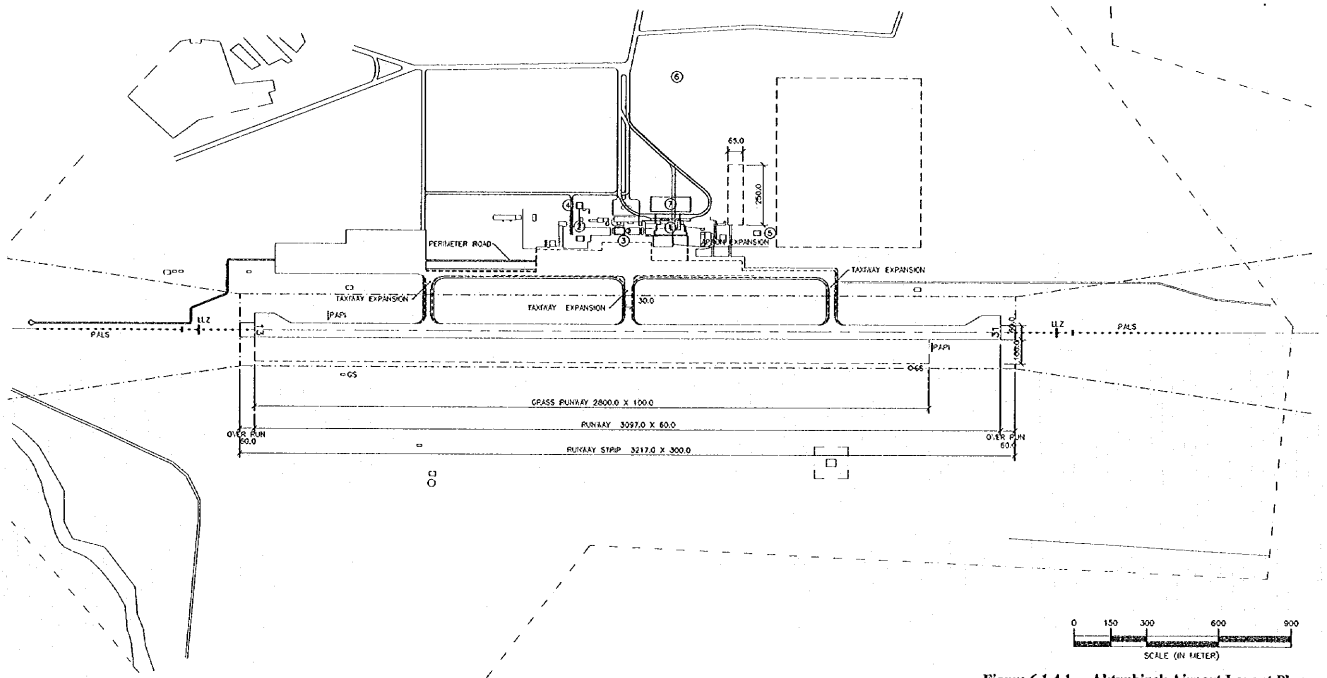


Figure 6.1.4.1 Aktyubinsk Airport Layout Plan

BASIC DATA TABLE			
AIRPORT CLASS	SECONDARY	INSTRUMENT RUNWAY	13, 31
AIRPORT STATUS	Int. Dom	PAVEMENT STRENGTH	
AIRPORT REF. ELEVATION	220 m		
AIRPORT REF. POINT (ARP) COORDINATES	N 50°14'7" E 57°12'2"	NAV. AIDS CATEGORY	CAT-I
AIRPORT REF. TEMP	28.0°C	DISTANCE FROM CITY	5 km
RUNWAY DIRECTION	13 / 31		

BUILDING AREA			
No.	NAME OF BUILDING	No.	NAME OF BUILDING
①	PASSENGER TERMINAL	⑦	CAR PARK
②	CARGO TERMINAL		
③	ADMINISTRATION BUILDING		
④	POWER HOUSE		
⑤	FIRE STATION		
⑥	FUEL FARM		

LEGEND	
	ROAD
	AIRPORT BOUNDARY
	RUNWAY STRIP
	GRASSED MOVEMENT AREA
	PIER
05	BUILDINGS

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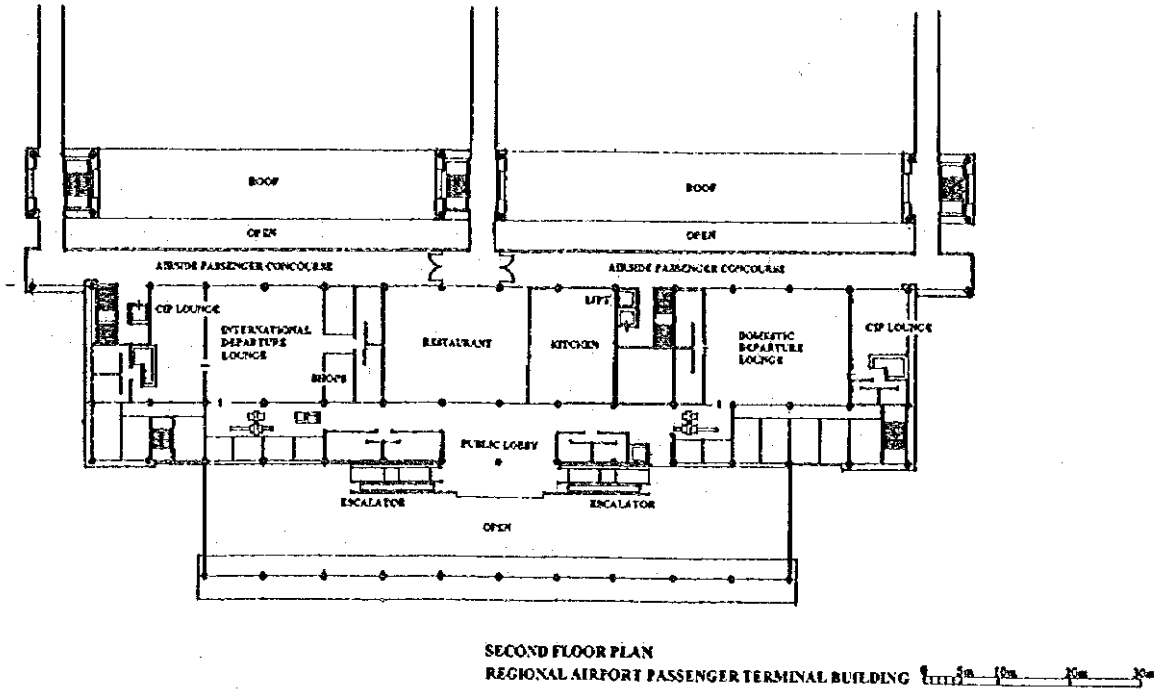
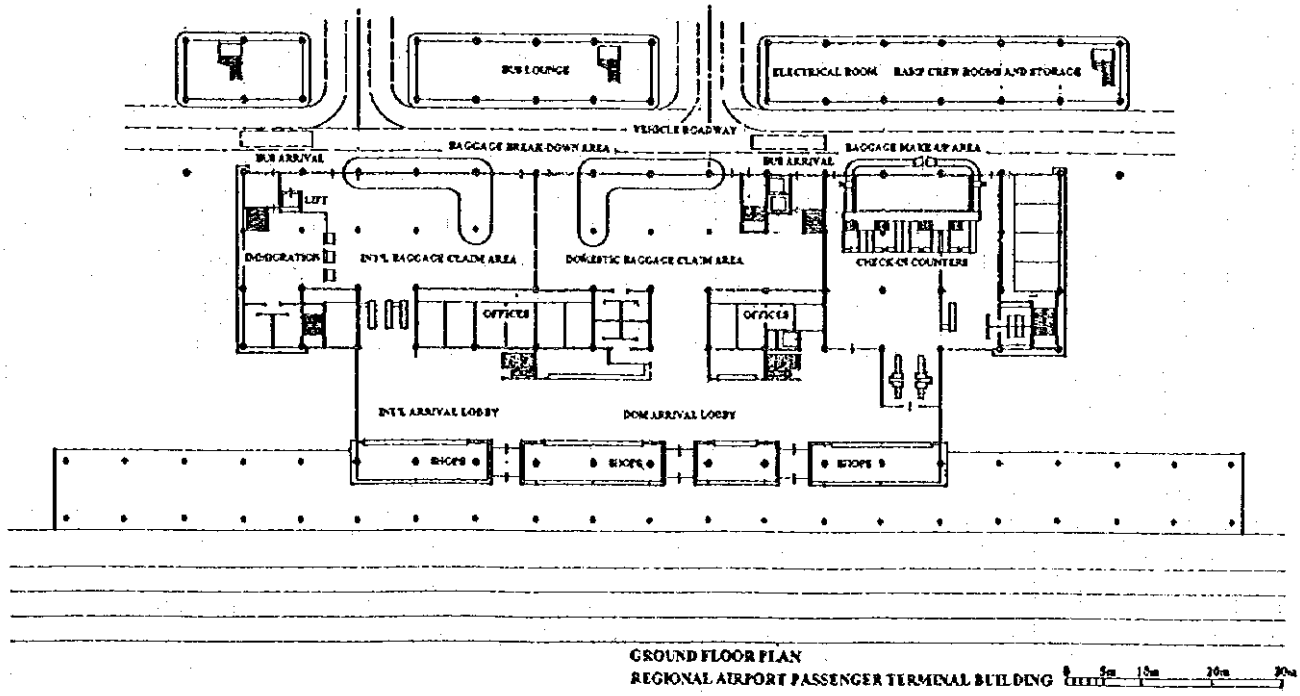


SECOND FLOOR PLAN
REGIONAL AIRPORT PASSENGER TERMINAL BUILDING



GROUND FLOOR PLAN
REGIONAL AIRPORT PASSENGER TERMINAL BUILDING

Figure 6.1.4.2 Passenger Terminal Building - Floor Plans

6.1.5 Atyrau Airport

Figure 6.1.5.1 shows overall airport layout.

(1) Terminal Area Layout Planning

A new passenger terminal would be located to the south adjacent to the existing terminal building, where a restaurant and a few small buildings are presently located. Aircraft stands on the apron should be reassigned to allow nose-in parking configurations in front of the new passenger terminal building. The apron would be expanded in front of passenger terminal building. A terminal road network and car park should be developed around the new terminal.

(2) Civil Facilities

a) Runway Width Expansion

The runway should be widened by 1 m to a total width of 45 m in accordance with ICAO Annex-14.

b) Runway/ Taxiway Shoulder Improvement

The runway and tawiways should be provided with a 7.5 m shoulder on each side in accordance with ICAO Annex 14.

c) Airfield Pavement Overlay

Pavement overlay work a minimum 5 cm thickness asphaltic concrete should be undertaken to even the surface.

d) Apron Expansion

The apron should be expanded by an area of 170 m x XX m near the south end of the existing apron so that aircraft can park in front of new passenger terminal building in a nose-in parking configuration.

e) Terminal Road and Car Park

A car park which accommodates 250 passenger cars should be provided in the terminal area. The terminal road network should be constructed as shown in the terminal area layout plan for smooth traffic flow in the whole terminal area.

f) Other Civil Works

Expansion of drainage system, landscaping works at the new terminal, cable duct, traffic sign, marking and other civil works will be included.

(3) Building Facilities

A new passenger terminal building should be constructed to replace the old existing building. The building design for Atyrau, Aktyubinsk and Pavlodar airports are identical. The floor plans appears in Figure 6.1.4.2. (**Table 6.1.5.1** gives requirement of major facilities.)

Table 6.1.5.1 Requirements of Major Facilities

	ROOMS OR POSITIONS	Unit	Required 2005	Required 2020	Planned
1	Curb Length Int./Dom.Combined	m2	94	121	165
2	Departure Arrival Concourse	m2	512	693	620
3	Security Check - Domestic	no.	1	1	5
4	Security Check - International	no.	1	1	1
5	Customs Control	no.	1	1	1
6	Queuing - Check-in - Domestic	m2	30	43	189
7	Queuing - Check-in - International	m2	12	15	31
8	Check-in desks - Domestic	no.	4	3	5
9	Check-in desks - International	no.	2	1	2
10	Passport Control	no.	1	1	2
11	Security Check - Domestic	no.	1	1	1
12	Security Check - International	no.	1	1	1
13	Departure Lounge - Domestic	m2	137	193	320
14	Departure Lounge - International	m2	56	69	256
15	Queuing - Passport - Arrival	m2	11	14	110
16	Passport Control - Arrival	no.	1	1	3
17	Baggage Claim Area - Domestic	m2	109	153	376
18	Baggage Claim Area - International	m2	45	54	270
19	Baggage Claim Belt - Domestic	no.	1	1	1
20	Baggage Claim Belt - International	no.	1	1	1
21	Queuing - Customs - Arrival	m2	11	14	64
22	Customs - Arrival	no.	1	2	3
23	Restaurant	seats	143	242	328

(4) Air Navigation System

a) Radio Navigation Aids

i. ILS

Category I Instrument Landing System should be installed for both runways. The ILS system should conform to standards and recommendations of ICAO Annex 10.

ii. VOR/DME: Installed and ready for commissioning

b) ATC Systems

i. Control Tower

Aerodrome control service is provided from START cabs. To maintain safe and efficient operations, a new aerodrome control tower should be constructed. (See attached list for aerodrome control tower equipment.)

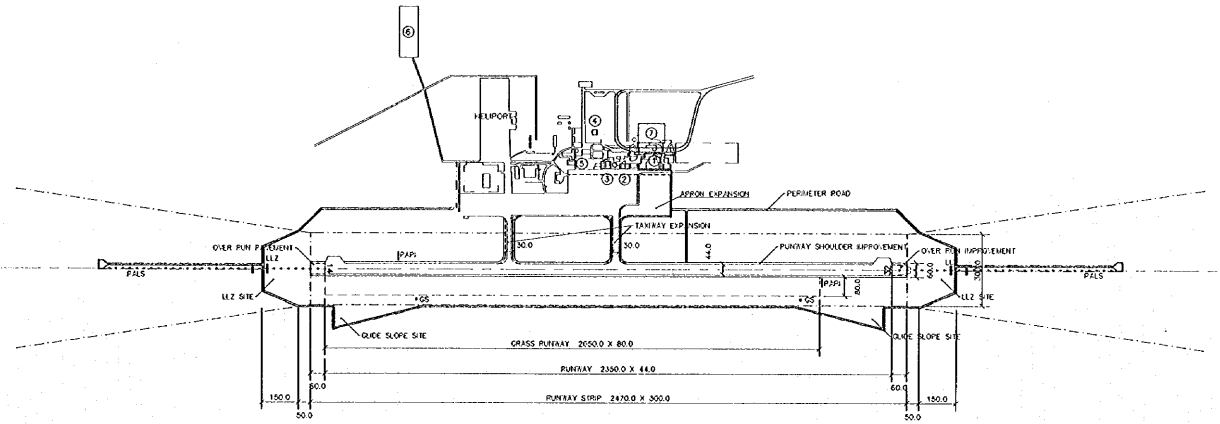
c) Aeronautical Ground Lights

The following aeronautical ground lights should be installed.

i. Precision Approach CAT-1 Lighting System
ii. PAPI
iii. Runway Edge Lights (REDL)
iv. Runway Threshold Lights (RTHL)
v. Taxiway Edge Lights (TWYL)
vi. Runway Center Line Lights (RWCL)
vii. Runway Touchdown Zone Lights (TDZL)
viii. Aerodrome Beacon

(5) Airport Utilities

Utility cabling and piping would connect to the existing city supplies as at present. For sewerage treatment, a new facility to treat waste water from the airport should be provided.



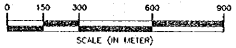


Figure 6.1.5.1 Atyrau Airport Layout Plan

BASIC DATA TABLE			
AIRPORT CLASS	SECONDARY	INSTRUMENT RUNWAY	14, 32
AIRPORT STATUS	Int, Dom	PAVEMENT STRENGTH	
AIRPORT REF. ELEVATION	23 m		
AIRPORT REF. POINT (ARP) COORDINATES	N 47°07'2" E 51°49.5'	NAV. AIDS CATEGORY	CAT-I
AIRPORT REF. TEMP		DISTANCE FROM CITY	5 km
RUNWAY DIRECTION	14 / 32		

BUILDING AREA			
No.	NAME OF BUILDING	No.	NAME OF BUILDING
①	PASSENGER TERMINAL	⑦	CAR PARK
②	CARGO TERMINAL		
③	ADMINISTRATION BUILDING		
④	POWER HOUSE		
⑤	FIRE STATION		
⑥	FUEL FARM		

LEGEND	
	ROAD
	AIRPORT BOUNDARY FENCE
	RUNWAY STRIP
	GRASSED MOVEMENT AREA
	PERIMETER ROAD
BS	BUILDINGS

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6.1.6 Pavlodar Airport

Figure 6.1.6.1 shows the overall airport layout.

(1) Terminal Area Layout Planning

In the terminal area, the vacant space between the passenger terminal building and Kazairnavigation building will be used for the new passenger terminal. The fuel pumps there should be relocated. The new administration building will be located at a vacant lot southwest of the existing passenger building so as to come closer to the mid-point of the extended runway. Other buildings will be sited around this area after demolishing old facilities. The apron edge line was located so that LJ class aircraft can park in a nose-in configuration on the apron in the future. A terminal road network and car park should be developed around new terminal.

(2) Civil Facilities

a) Runway Extension

The runway should be extended by 200 m in the 035 direction. The dimensions of the runway will be 2,800 m x 45 m, with a 7.5 m shoulder on each side in accordance with ICAO Annex 14. Overruns of 60 m x 60 m should be provided.

b) Runway/Taxiway Shoulder Improvement

The runway and taxiways should be provided with a 7.5 m shoulder on each side in accordance with ICAO Annex 14.

c) Apron Expansion

The apron should be expanded by an area of 170 m x XX m near the north end of the existing apron so that aircraft can park in front of new passenger terminal building in a nose-in parking configuration.

d) Airfield Pavement Overlay

Pavement overlay work with a minimum thickness of 5 cm asphaltic concrete should be undertaken for to even the surface.

e) New Stub Taxiway

A stub taxiway, connecting the south part of the apron to the runway, should be constructed at the location of the existing unpaved taxiway-2.

f) Terminal Road and Carpark

A car park to accommodate 270 passenger cars should be provided in the terminal area. The terminal road network should be constructed as shown in the terminal area layout plan for smooth traffic flow around the terminal area.

g) Other Civil Works

Security fence and gate in the runway extension area, expansion of drainage system, landscaping works at the new terminal, cable duct, traffic sign, marking and other civil works will be included.

(3) Building Facilities

New passenger terminal building should be constructed to replace the old existing building. The buildings designs for Aktyubinsk, Aktau and Pavlodar airports are identical. The Floor Plans appear in Figure 6.1.4.2. (**Table 6.1.6.1** gives requirement of major facilities.)

Table 6.1.6.1 Requirements of Major Facilities

	ROOMS OR POSITIONS	Unit	Required 2005	Required 2020	Planned
1	Curb Length Int./Dom.Combined	m2	137	138	165
2	Departure Arrival Concourse	m2	545	808	620
3	Security Check - Domestic	no.	1	1	5
4	Security Check - International	no.	1	1	1
5	Customs Control	no.	1	1	1
6	Queuing - Check-in - Domestic	m2	32	52	189
7	Queuing - Check-in - International	m2	14	15	31
8	Check-in desks - Domestic	no.	4	3	5
9	Check-in desks - International	no.	2	1	2
10	Passport Control	no.	1	1	2
11	Security Check - Domestic	no.	1	1	1
12	Security Check - International	no.	1	1	1
13	Departure Lounge - Domestic	m2	143	237	320
14	Departure Lounge - International	m2	62	69	256
15	Queuing - Passport - Arrival	m2	13	14	110
16	Passport Control - Arrival	no.	2	1	3
17	Baggage Claim Area - Domestic	m2	114	188	376
18	Baggage Claim Area - International	m2	50	54	270
19	Baggage Claim Belt - Domestic	no.	1	1	1
20	Baggage Claim Belt - International	no.	1	1	1
21	Queuing - Customs - Arrival	m2	13	14	64
22	Customs - Arrival	no.	1	2	3
23	Restaurant	seats	143	242	328

(4) Air Navigation System

a) Radio Navigation Aids

i. ILS

A category I Instrument Landing System should be installed. The ILS system should conform to standards and recommendations of ICAO Annex 10.

ii. VOR/DME: The present RSBN should be replaced by VOR/DME

b) ATC Systems

i. Control Tower

Aerodrome control service is provided from START cabs. To maintain safe and efficient operation of the aerodrome control a new properly equipped control tower should be constructed.(See attached list for aerodrome control tower equipment)

c) Aeronautical Ground Lights

The following aeronautical ground lights should be installed.

i. Precision Approach CAT-I
ii. Lighting System
iii. PAPI
iv. Runway Edge Lights (REDL)
v. Runway Threshold Lights (RTHL)
vi. Taxiway Edge Lights (TWYL)
vii. Runway Center Line Lights (RWCL)
viii. Runway Touchdown Zone Lights (TDZL)
ix. Aerodrome Beacon

(5) Airport Utilities

Utility cabling and piping are would be connected to the existing city supplies as at present. Regarding the aviation fuel supply system, the pumps should be relocated and the pipeline from the fuel farm should be detoured.

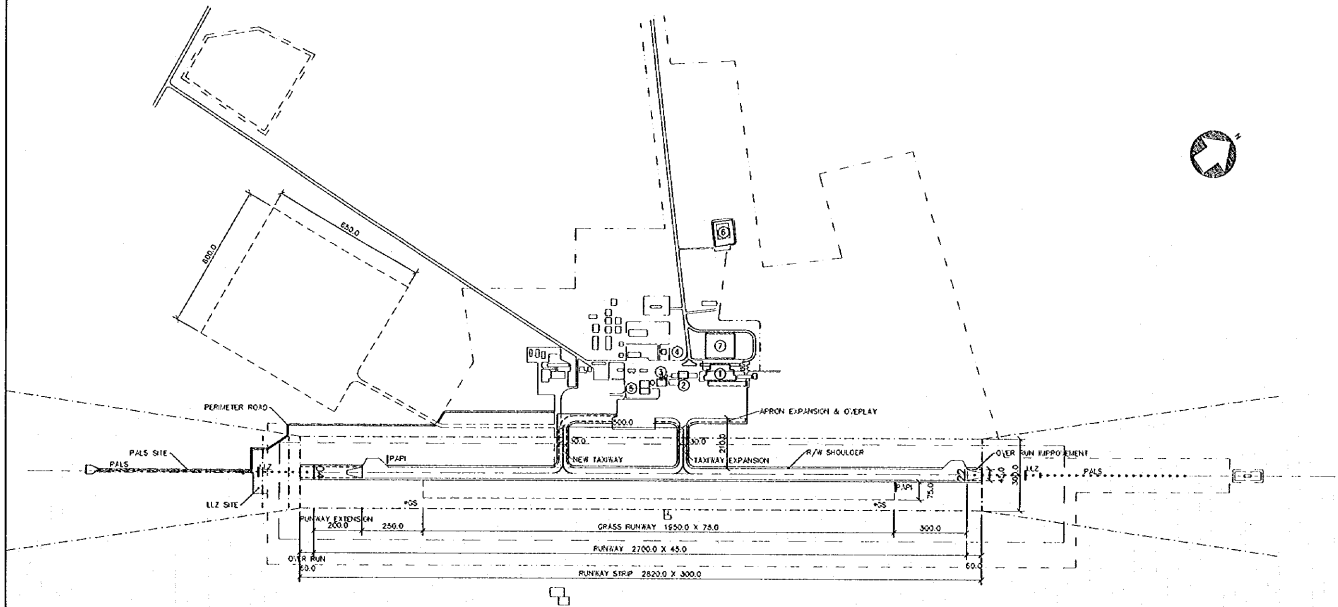

Figure 6.1.6.1 Pavlodar Airport Layout Plan

BASIC DATA TABLE			
AIRPORT CLASS	SECONDARY	INSTRUMENT RUNWAY	04, 22
AIRPORT STATUS	Int. Dom	PAVEMENT STRENGTH	
AIRPORT REF. ELEVATION	125 m		
AIRPORT REF. POINT (ARP) COORDINATES	N 52°11.6' E 77°04.4'	NAV. AIDS CATEGORY	CAT-I
AIRPORT REF. TEMP		DISTANCE FROM CITY	12.8 km
RUNWAY DIRECTION	04 / 22		

BUILDING AREA			
No.	NAME OF BUILDING	No.	NAME OF BUILDING
①	PASSENGER TERMINAL	⑦	CAR PARK
②	CARGO TERMINAL		
③	ADMINISTRATION BUILDING		
④	POWER HOUSE		
⑤	FIRE STATION		
⑥	FUEL FARM		

LEGEND	
	ROAD
	AIRPORT BOUNDARY
	AIRPORT BOUNDARY FENCE
	RUNWAY STRIP
	PERIMETER ROAD
	GRASSED MOVEMENT AREA
05	BUILDINGS

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