

CHAPTER VI. PASSENGER TERMINAL FACILITY REQUIREMENTS

1. GATE ANALYSIS

The demand for aircraft gates and parking positions and the manner in which the gates are provided are primary factors in shaping the future passenger terminal area. The determination of requirements on a terminal-by-terminal basis commenced with an analysis of gates. The locations of the existing terminal buildings, and those under construction are shown in Figure VI-1.

A. Existing Gates

The existing (1987) gates are shown on Table VI.1. Other than parking positions for commuter aircraft, the 59 air carrier gates are distributed as follows:

Terminal 1	9 gates
Terminal 2	16 gates (prior to the 1988 renovation)
Terminal 3	34 gates

B. Forecasts of Future Gate Requirements

Table VI.2 shows the forecasts of gate requirements and mix of gates to accommodate the air carrier operations projected through 2007. The forecast assumes that gate utilization increases by 10 percent. In 1987 the air carriers were averaging 5.8 flights (11.6 operations) per gate per day. It is assumed that by the year 2007, the utilization will be 6.5 flights per gate per day. This level of increased utilization is consistent with the basic assumption that there will be relatively more "hubbing" at Phoenix and, therefore, relatively more intensive use of terminal facilities. For commuter parking position, it is assumed that utilization will increase from 5.6 to 6.2 flights per position per day.

The mix of gates by size is based on the forecast mix of aircraft. The uniformity of the 727/MD-80 gate requirements and the less than proportional growth in the smallest gate size (DC-9/737) assumes that the 727/MD-80 gates will continue to be used by DC-9 and 737 aircraft. Overall, there is a projected increase in the average gate size with the 747/DC-10 and 767/757 gates increasing from 22 percent to 40 percent of the total over the period.

This table presents the actual gates which would be needed to meet the forecasted air carrier operations. In fact, airlines planning and requesting gates typically estimate their needs in excess of these minima to allow for growth and contingencies. Then vacant or underutilized gates are subleased routinely to other carriers or commuters on a short-term basis. The subsequent planning of gates in this study will provide an additional 10 percent contingency in excess of calculated requirements to allow for this factor. The requirements with and without this planning factor are shown in Table VI.2.

Table VI.1

AIRCRAFT GATES, 1987, BY TERMINAL, BY AIRCRAFT TYPE^d

Terminal/Carrier	Gate No.	Category of Aircraft Accommodated				
		Commuter	DC-9/737	727/MD-80	757/767	D-10/747
TERMINAL 1						
Southwest ^c	1 thru 12		8			
USAir	9			1		
Pacific Commuter	10	1				
States West Commuter	10	1				
Mesa Commuter	11	1				
TERMINAL 2						
Alaska	2,4			2		
TWA	4A,6,8,10			2	2	
Midway Commuter	4A	1				
Braniff	16A,15			2		
PSA/USAir ^c	5,7,9			2	1	
United	1,1A,3,C			3	1	
Int'l Arrivals	D				1	
TERMINAL 3						
America West	3,5,7,8,9, 10,11,12, 31 thru 41		8			
American	2,4,6			2 ^a	1 ^b	
Am. Eagle Commuter	2,4,6	3				
Northwest	23,24,25,26			2	1	1
Delta	16,18,19,21			2	2	
Continental	15,17			2		
Eastern	20,22			2		
TOTAL AIRCRAFT		7	24	22	12	1

Notes: ^aOne of these gates is utilized by B-767 aircraft.

^bThis gate is utilized by DC-10 aircraft.

^cPrior to current improvement program.

^dThe allocation of gates between airlines and aircraft types is dynamic. This represents the conditions which pertained in 1987 at the time of inventory. The number of gates has not changed in the interim except as specifically noted in the text.

Source: HMB Inventory and Airport records.

Table VI.2

**TURBO-JET AIR CARRIER
FORECASTED GATE REQUIREMENTS AND MIX**

Aircraft/Gate Size	Actual 1987	1992	Forecasts		2007
			1997	2002	
747/DC-10 ^a	1	3	5	6	7
767/757	12	12	18	24	29
727/MD-80 ^b	22	22	22	22	22
DC-9/737 ^b	24	36	35	34	31
Gate Requirement	59	73	80	86	89
Gate Requirement with Planning Factor ^c	59	80	88	95	98

Notes: ^aTwo of the 747/DC-10 gates should be able to accommodate international arrivals.

^bAssumes that DC-9/737 size aircraft can use 727/MD-80 gates.

^cIncludes planning factor for temporary underutilization of gates by individual airlines.

Source: HNTB analysis.

The total number of air carrier gates required in the year 2007 will be 89, or some 30 gates more than the existing inventory of gates. Planning will be conducted to allow for up to 98 gates if these are required.

C. Assumptions - Passenger Terminal Changes

The allocations of gates through the 20-year planning period is based on the following assumptions:

1. Terminal 1 (T-1) will be removed in the 1991 time-frame following the opening of the first phase of Terminal 4 (T-4). Any additional aircraft parking positions added to T-1 by Southwest under current plans would be available to the airline only until the demolition of this old terminal building.

2. The temporary America West Concourse on Terminal 3 (T-3)(Gates 31-41) will be removed in 1991 with the opening of T-4. These gates consist of eight B-737 gates and three B-757 gates.

3. In the 1997-2002 time-frame, gates at the southern extremity of Terminal 2 (T-2) and T-3 will be removed to permit full two-way taxiing capability on Taxiway CC. There will be three B-727 gates (14-16) from T-2 and three B-737 gates (10-12) lost from T-3. If T-2 is eliminated prior to enhancement of Taxiway CC, there will be a loss of gates on T-3 only.

4. With recent improvements to T-2, this terminal has 18-19 gates , including Gates B and C. T-2 will be removed around the year 2000.

5. When T-4 opens in 1990, it will have four concourses; two on the north side occupied by America West (with 28 gates) and two on the south side occupied by Southwest (with 16 gates).

2. ALTERNATIVES

A. Two Scenarios

Facility requirements must be calculated on a terminal-by-terminal basis for the four terminals, since they each operate largely independently of each other. A surplus of one particular functional area, say ticket counters, in one terminal cannot be offset against a deficiency in this factor in another terminal. The allocation of passenger enplanements by terminal determines facility requirements by terminal.

Two basic options are identified for use in calculation of terminal facility needs. These two options are:

Scenario 1. Keep T-3 as a two-concourse terminal. After removal of the temporary America West Concourse in 1991, do not construct a permanent third replacement concourse. The additional gates would be provided at T-4, through an acceleration of the second phase of development of that building.

Scenario 2. Replace the temporary concourse on T-3 with a permanent third concourse. The additional gates needed to meet demand would again be provided at T-4, but there would be fewer than for Scenario 1.

Facility requirements for T-3 and T-4 for the two basic options are addressed below.

B. Summary of Gate Requirements

Table VI.3 shows gate requirements by terminal for 1992, 1997, 2002, and 2007 for the two scenarios.

3. TERMINAL FACILITY REQUIREMENTS

Terminal facility requirements have been calculated by terminal for this scenario for the 5, 10, 15 and 20-year planning horizons. Total requirements are then compared with existing facilities to identify current and anticipated deficiencies.

Terminal building facility requirements have been analyzed using HNTB's terminal facilities computer program, reflecting local service characteristics, industry planning guidelines¹, and planning data based on similar levels of service at airports comparable to PHX.

Requirements for the terminals have been divided into six main categories of space, the first three of which are generally revenue producing in nature. Each category is divided into specific functional areas.

Airline Support Functions: This category includes ticket counters, airline offices, inbound and outbound baggage service areas, baggage claim, operations space, and passenger holdrooms.

Food Service Concessions: The food service category includes areas required for food preparation (kitchens, storage areas, offices, delivery areas and employee facilities) public food serving, dining and snack bar areas and cocktail lounges and bars.

¹ FAA documents, "Planning and Design Guidelines for Airport Terminal Facilities" (AC 150/5360-13) and "The Apron and Terminal Building Planning Manual" (FAA-RD-75-191).

Table VI-3

PHOENIX SKY HARBOR INTERNATIONAL AIRPORT

SUMMARY OF GATE REQUIREMENTS

	EXISTING 1987	1992 Scenario 1	1992 Scenario 2	1997 Scenario 1	1997 Scenario 2	2002 Scenario 1	2002 Scenario 2	2007 Scenario 1	2007 Scenario 2
TOTAL GATE REQUIREMENTS	1 DC-10/747 12 757/767 22 727/MD-80 24 DC-9/737 (59) Total	80	80	88	88	95	95	98	98
TERMINAL 1 * ASSUME REMOVED 1991	0 DC-10/747 0 757/767 1 727/MD-80 8 DC-9/737 (9) Total								
TERMINAL 2 * ASSUME REMOVED 2000	0 DC-10/747 5 757/767 11 727/MD-80 0 DC-9/737 (16) Total	0 DC-10/747 5 757/767 11 727/MD-80 0 DC-9/737 (16) Total	0 DC-10/747 5 757/767 11 727/MD-80 0 DC-9/737 (16) Total	0 DC-10/747 5 757/767 11 727/MD-80 0 DC-9/737 (16) Total	0 DC-10/747 5 757/767 11 727/MD-80 0 DC-9/737 (16) Total				
TERMINAL 3 * ASSUME TEMP. CONCOURSE REMOVED 1991 (2) * ASSUME GATES REMOVED 2000 FOR TAXIWAY "CC"(1)	1 DC-10/747 7 757/767 10 727/MD-80 16 DC-9/737 (34) Total	1 DC-10/747 4 757/767 10 727/MD-80 8 DC-9/737 (23) Total	3 DC-10/747 8 757/767 14 727/MD-80 8 DC-9/737 (33) Total	3 DC-10/747 4 757/767 10 727/MD-80 4 DC-9/737 (21) Total	3 DC-10/747 8 757/767 14 727/MD-80 8 DC-9/737 (33) Total	3 DC-10/747 4 757/767 7 727/MD-80 4 DC-9/737 (18) Total	3 DC-10/747 8 757/767 11 727/MD-80 8 DC-9/737 (30) Total	3 DC-10/747 4 757/767 7 727/MD-80 4 DC-9/737 (18) Total	3 DC-10/747 8 757/767 11 727/MD-80 8 DC-9/737 (30) Total
TERMINAL 4 * ACCOMMODATES RESIDUAL GATES		42 ⁽⁴⁾	42 ⁽⁴⁾	51	42 ⁽⁴⁾	77	65	80	68

- (1) Remove Gates 10, 11, 12 (737's) for New Taxiway "CC".
 (2) Remove Gates 14, 15, 16 (727's) Rotunda, and USAir addition
 for New Taxiway "CC".
 (3) Remove T-3 South Temp Concourse American West Gates 31-41
 (3-757, 8-737).
 (4) Programmed Gates, 1988.

Scenario 1:
No New Concourse Dev. on T-3

Scenario 2:
New 12 Gate Concourse Dev. on T-3
4-757, 4-727, 4-737 Type Aircraft

Other Concessions: This category includes news and tobacco shops, gift and apparel stores, barber shops rental car counters and offices; and miscellaneous concessions such as flight insurance, lockers and shoe shine stands.

Secured Public Area: This category includes the security check area, public concourse circulation area, and restrooms beyond the security checkpoint.

Non-Secured Public Area: Public circulation and restrooms prior to the passenger screening security check points comprise this functional category. General, non-secure public circulation areas include waiting areas, building entrances, and circulation areas contiguous to concessions. The total required circulation area generally is proportional to the number of passengers and visitors flowing through the terminal during peak hour activity, and each area of the terminal must be sized to accommodate its share of the total flow.

Non-Public/Non-Rentable: This category includes administration space, non-public circulation area that is not leased, mechanical/building maintenance space, and other non-rentable space such as building structure and inaccessible space. While the size of the administration space will remain fairly constant, the other areas under this category will grow as terminal activity levels increase.

The projected terminal facility requirements represent minimum functional area requirements to satisfy each scenario. Actual building areas may exceed the projected requirements somewhat due to architectural geometry, physical site constraints requiring additional circulation components, or any miscellaneous services or facilities not related to airline support or passenger service.

The detailed calculations of deficiencies are shown in Appendix B. In summary, they are:

Scenario 1 - Terminal 3 remains a two-concourse terminal.

Terminal 1 - Serious deficiencies in outbound and inbound baggage handling facilities baggage claim concessions, and circulation areas. It will continue to function through 1990, but at a moderate-to-low level of service.

Terminal 2 - Improvements to baggage claim recently have been constructed. Deficiencies in ticketing and baggage claim circulation areas exist but with minor renovations, the terminal will function at a moderate level of service through 2000.

Terminal 3 - Will function well through 2007. A shortage of restaurant concession space may be offset by converting "other concession" space for this use. Baggage claim circulation and restroom areas have projected deficiencies.

Terminal 4 - Will absorb the balance of gates and enplaned passengers not accommodated in other terminals at each phase of development. The deficiencies are, in effect, the additional facilities which must be constructed at T-4 to meet the demand which the terminal will be required to absorb in each phase of the program.

Scenario 2 - Terminal 3 becomes a (permanent) three-concourse terminal

Terminal 1 - Same as Scenario 1.

Terminal 2 - Same as Scenario 2.

Terminal 3 - Additional facilities will be required to meet the higher level of enplanements, assuming that the tenants are not conducting hubbing operations out of these concourses. Primary deficiencies.....

- airline operations space
- ticket counters
- ticket queuing
- baggage claim
- food service
- car rental space
- public circulation areas.

Terminal 4 - The additional facilities will be less than those identified for Scenario 1.

Details of facility requirements are shown in Appendix B.

4. INTERNATIONAL PASSENGER FACILITIES

The previous facility requirements calculations are for domestic passengers only. In addition to the identified space requirements, provision must be made for international arrivals, primarily the Federal Inspection Services (FIS) of Customs and Immigration.

The current facilities at Gate D in Terminal 2 are inadequate to handle the anticipated growth in international activity. Current activity levels (1986) are about 25,000 enplanements annually on 363 scheduled international flights (all to Mexico). Some additional passengers on non-reporting airlines are not included in this total. The aircraft involved are B-737s. Forecasts are that this traffic will increase to 262,000 annual enplanements (or deplanements) and 2,190 annual departures by the year 2007. The FIS facilities should be sized to process an arriving B-747 aircraft, and the gates and other terminal facilities should be designed such that they can accommodate two B-747 aircraft in any one

hour.

International arrival gates will not be used exclusively for this purpose. They will service domestic flights when not required for international arrivals. The international arrival gates and FIS facilities will, therefore, be incorporated into a domestic concourse. Alternatives for locating international arrivals are addressed in Chapter X; the basic options are limited to T-3 and T-4. The FIS facilities identified in Table VI.4 should be added to the domestic requirements for T-3 and T-4 identified in Sections 3 and 4 of this chapter.

Facility requirements have been developed using current 1988 FIS Facility design guidelines, and are based on a passenger processing rate of 400 passengers per hour to accommodate one arriving B-747 aircraft. Utilizing these criteria, a proposed FIS facility would require 35,500 square feet.

5. COMMUTER PASSENGER FACILITIES

The commuter airline service is volatile. In December 1988, there were nine airlines offering service with commuter-type aircraft. These provide 53 departures per average day.¹ Of these flights, 23 are by America West (DH-8 aircraft) and Skywest (Metroliner aircraft) with the latter being a codesharing partner of Delta Airlines. Operations by these two carriers are integrated with those of the parent airlines in Terminal 3. The remaining 30 departures per day were by seven other commuter carriers operating out of parking positions at various locations at Terminal 2, Terminal 1, and Executive Terminal.

The commuter operations which interconnect with the operations of a major carrier or are flown by a carrier aligned with a major carrier, will continue to be located on the concourses occupied by the major carrier. Favored are gates offering ramp access from second-level holdrooms. The parking positions for these aircraft are provided for in the average gate utilization factors used in the calculation of turbo-jet aircraft gate requirements. The terminal facilities (ticketing, baggage-handling) to support these passengers are insignificant. No separate allocation of space or aircraft parking positions will be provided for commuter operations on the air carrier concourses.

The remaining seven, non-affiliated commuters will locate wherever they can negotiate the most cost-effective arrangement. This may be in the form of short-term sub-leases for vacant gates belonging to the major airlines, or use of a specific commuter ramp such as that adjacent to Terminal 1. The long-term demand for a separate facility is uncertain, but it is recommended that a small commuter terminal be identified. It should be a minimum of 5,000 square feet in size, with six to eight aircraft parking positions. It should be located where access to air carrier terminals is convenient.

¹ I.P. Sharpe data, December 1988 schedule.

Table VI.4

FEDERAL INSPECTION SERVICE FACILITIES REQUIRED
TO SERVICE 400 DEPLANING PASSENGERS PER HOUR

ELEMENT	SQUARE FOOTAGE
Sterile Corridor from Aircraft to FIS	2,000
Immigration and Naturalization Primary Inspection	6,000
Immigration and Naturalization Offices	2,500
Immigration and Naturalization Secondary Inspection	2,000
U.S. Customs Service Baggage Claim	8,000
U.S. Customs Service Primary Inspection	6,000
U.S. Customs Service Offices	2,250
U.S. Customs Services Secondary Offices	3,000
U.S. Public Health Service	450
Animal and Plant Health Inspection Service	800
Public Circulation	<u>2,500</u>
TOTAL SQUARE FOOTAGE	35,500

Source: HNTB analysis.