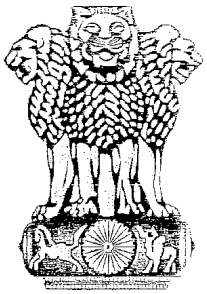
REPORT
OF THE
INTER-MINISTERIAL GROUP

Norms and Standards for Determining the Capacity of Airport Terminals



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September, 2008
(Revised January, 2009)

Ministry of Civil Aviation
Government of India

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1. Introduction:

1.1 In a meeting taken by Dy. Chairman, Planning Commission, on 23.11.2007, to review the progress of implementation of the decisions of the Committee on Infrastructure (CoI) in relation to civil aviation, it was decided that an Inter-Ministerial Group (IMG) under the chairmanship of Secretary, Ministry of Civil Aviation (MoCA) would be constituted to recommend the norms and standards for determining the terminal capacity of the airports.

1.2 Pursuant to the aforesaid decision, an IMG under the chairmanship of Secretary, Ministry of Civil Aviation was constituted, vide Ministry of Civil Aviation's Order dated 23.1.2008, with the following composition:

(i)	Secretary, Ministry of Civil Aviation	Chairman
(ii)	Secretary, Department of Economic Affairs or his representative not below the rank of Addl. Secretary	Member
(iii)	Secretary, Department of Expenditure or his representative not below the rank of Addl. Secretary	Member
(iv)	Adviser to Dy. Chairman, Planning Commission	Member
(v)	Chairman, Airports Authority of India	Member
(vi)	Director General of Civil Aviation	Member
(vii)	Joint Secretary, Ministry of Civil Aviation	Convenor

2. Discussions:

2.1 MoCA circulated a Discussion Paper for the consideration of the IMG. The IMG was apprised that:

A General -

A.1 An Airport Terminal is the most significant interface between ground access system and the aircraft. Airport terminal facilitates the transfer of passengers and baggage to and from the aircraft. A terminal has three major components.

Access Interface involving access from city, parking, circulation, kerbside loading and unloading of passengers.

Processing involving ticketing, baggage check-in, baggage claim, immigration, customs, security etc.

Flight Interface involving assembly, conveyance to and from the aircraft and loading and unloading of baggage.

A.2 General Design Objectives -

Following objectives are generally considered while designing airport terminals:

- Capacity to meet the projected demands.
- Practical, functional and financial feasibility.
- Maximizing use of existing facilities.
- Flexibility to meet requirement beyond planning horizon.
- Environmental issues.
- Adaptability to implement innovations in aviation technology.

A.3 Specific Design Objectives -

In addition to the above, a designer/planner strives to accommodate the following, while evolving conceptual design for a terminal:

Passenger Objectives -

- Responsiveness to the needs, convenience and comfort.
- Effective signage for processing.
- Operational efficiency.
- Ancillary facilities like parking, taxi services, travel requisites.

Airline Objectives -

- Operational efficiency for processing of passengers and their baggage.
- Parking space for aircraft.
- Security.

Airport Management Objectives -

- Operational efficiency of all systems.
- Minimum maintenance and operational expense.
- Maximizing revenues from Concessionaires and other sources.

Community Objectives -

- Facility for citizens
- Should be an aesthetic and integral part of city

The size and space requirements of Passenger Terminals are largely influenced by the quality of service desired by User, Promoter and Community.

B. Key issues in planning Airport Terminals -

Following issues are key to planning of Airport Terminals:

- Growth rate for Traffic Projection
- Target year for capacity creation
- Peak hour projections
- Level of service in target year
- Unit Area Norms
- Unit cost of construction

B.1 Growth Rate for Traffic Projections -

Passenger traffic is the key parameter which needs to be estimated/forecast appropriately for capacity planning.

ICAO Manual on Air Traffic Forecasting DOC 8991/AT/722/3 (2006) gives forecasting methods for air passengers, aircraft movement etc. In general, the methods can be divided into three broad categories:

- Quantitative or mathematical
- Qualitative or judgmental
- Decision Analysis

Air Traffic Forecasting is mainly done following the Quantitative Approach i.e., Trend Analysis and Econometric Modelling to assess the growth rate. In case of smaller airports and Greenfield airports, Origin Destination (O-D) Surveys and Market Surveys are conducted to arrive at forecast. Market Survey methods include survey of industries/trade associates and tourist/hotel industry associations in the region and survey of experts' opinion. Forecast/ growth rate is arrived using judgment analysis in the light of results obtained through Trend Analysis & Econometric Modeling and O-D Surveys & Market Surveys.

B.2 Target year for Capacity Creation -

Forecasts are made for short, intermediate and long term horizons. There are different authorities in this regard.

Horonjeff & Mc Kelvey

Short Term	-	5 years
Inter mediate	-	10 years
Long Term	-	20 years

As the range of forecast increases, it becomes less precise.

IATA

In 'Airport Development Reference Manual' (9th edition – 2004), Traffic Forecasts are presented for following projected periods:

- Short Term (> 1 year < 5 years)
- Long Term (> 5 year< 30 year)

ICAO

In 'Manual on Air Traffic Forecasting' DOC 8991/AT/722/3, (3rd edition – 2006) following time horizons are given:

Short Term	-	Upto 1 year
Medium Term	-	1 to 5 year
Long Term	-	> 5 year

AAI has been adopting following norms:

Short Term	-	1 year for preparation of Annual Plan
Medium Term	-	1 to 5 years for preparation of 5 Year Plan
Long Term	-	10 years for Capital Projects.

B.3 Peak Hour Projections -

An Airport Terminal and facilities therein have to be sufficient to cater to peak hour passenger traffic at the airport.

As per ICAO Manual, *Peak hour is defined as the thirtieth or fortieth busy hour in a year, or traffic in a typical peak hour measured as an average over a specified period such as peak month.*

ICAO guidelines state that forecasts of peak period passengers can be obtained directly from annual forecasts by applying ratios of busy period traffic to annual traffic derived from recent studies conducted at various airports.

Capacity Measurement Survey/Normative Planning Survey were conducted, from time to time, at Indian airports with varying traffic levels. Based on the results of such surveys, ratios of Average Day (AD) to Peak Day (PD) traffic and Peak Day to Peak Hour (PH) traffic for different annual passenger volumes, have been estimated/determined.

The ratios of Peak Day (PD) to Average Day (AD) traffic and Peak Hour (PH) to Peak Day (PD) traffic as deduced from Traffic surveys are given in *Table – 1.*

TABLE 1: TRAFFIC RATIOS AT INTERNATIONAL & DOMESTIC AIRPORTS IN INDIA

Sl. No	Traffic (in million passengers per annum)	Ratios for International Terminal		Ratios for Domestic Terminal	
		PD/AD	PH/PD	PD/AD	PH/PD
1	10.0 and above	1.15	0.15	1.10	0.10
2	5.0-10.0	1.20	0.20	1.15	0.15
3	1.0 -5.0	1.30	0.30	1.25	0.25
4	0.50 - 1.0	1.35	0.35	1.35	0.35
5	Less than 0.5	1.45	0.45	1.45	0.45

B.4 Level of Services in Target Year -

Level of Service Standards and associated criteria to evaluate the level of service is a rather complex issue.

Passengers are concerned with completion of air journey at a reasonable cost, with minimum delay, and inconvenience.

Airlines are concerned with on-time schedules, minimum operating costs and profitability.

Airport Operator is interested to provide modern facilities which meet the expectations of passengers, airlines and community (where airport is located), with suitable returns on investment.

IATA has evolved a framework for different levels of service (*Table 2*)

TABLE 2: LEVEL OF SERVICE FRAME WORK.

LEVEL	SERVICE CRITERIA
A	An Excellent lever of service. Conditions for free flow, no delays and excellent levels of comfort.
B	High level of service. Conditions of stable flow, very few delays and high level of comfort.
C	Good level of service. Conditions of stable flow, acceptable delays and good levels of comfort.

D	Adequate level of service. Conditions of unstable flow, acceptable delays for short periods of time and adequate levels of comfort.
E	Inadequate level of service. Conditions of unstable flow, unacceptable delays and inadequate levels of comfort.
F	Unacceptable level of service. Conditions of cross-flows, system breakdowns and unacceptable delays; an unacceptable level of comfort.

The traffic demand at an airport is dynamic and is dependent upon schedule, flight sector, aircraft size and local factor. The nature of traffic demand plays a crucial role in affecting the level of service experienced by a passenger.

On the supply side there are services and systems which airport provides. Level of service can be considered as a range of values or as an assessment of the ability of supply to meet the demand. It combines both qualitative and quantitative measures of relative comfort and convenience.

B.5 Unit Area Norms -

An airport terminal should be capable of handling peak hour passenger traffic at the target level of service standard in the design year. The terminals should be sufficient not only for passengers processing but should be able to meet other requirements like travelers requisites, commercial activities, food courts, bank, post office etc. Different bodies/ authors have suggested different values for Unit Area per php.

Horonjeff, McKelvey

Gross area	-	Sqm /php
Domestic	-	25

IATA

Domestic	-	25
Charter	-	30

AAI is generally adopting following norms:

Domestic	:	22-23 sqm per peak hour pax
International	:	27-28 sqm per peak hour pax
Integrated	:	24-25 sqm per peak hour pax

B.6 Unit Cost of Construction -

The design and approach towards Airport Terminals has undergone a radical change. Earlier, a terminal was a building where a passenger commenced and concluded an air journey. In the present times, a lot more is expected from Terminal- not only it should be functionally efficient, it should also be aesthetically and architecturally appealing. It encompasses a wide variety of activities related to aviation, leisure, comfort, shopping and business apart from Customs, Immigration, Security etc. Comparison with a 'World Class' airport in neighbouring countries is also a crucial factor in planning Airport Terminals.

Construction cost is mainly driven by the target Level of Service Standards. The location is another important factor. The cost of construction generally increases by about 10% in difficult and remote areas.

3. Recommendations:

IMG has deliberated in detail on various key issues and makes following recommendations:

A Growth Rate for Traffic Projections -

- The IMG adopted the following recommendations contained in the Manual on Air Traffic Forecasting (Doc. 8991, Part I), which reads as follows:

  "Forecasting techniques that start with historical data and develop a forecast based on a set of rules fall into the category of quantitative methods. Situations in which such data are not readily available or applicable and in which experience and judgement have to be used are generally best suited for the application of quantitative forecasting methods. Numerous methods exist for analyzing time-series data. The methods, which are possible in particular circumstances, may be limited by a lack of data or resources. In general, however, a more reliable forecast may be obtained by employing more than one approach and consolidating differing results through judgement and knowledge of the markets concerned."

- Keeping in view the trend in air traffic in last few years, a span of five years be adopted for the projects planned during the current five year plan period, i.e., upto 2011-12. Thereafter, as the growth rate stabilizes, the span for making projections should be increased to 7 years for a more realistic assessment.

B Target year for Capacity Creation (Design Year) -

Infrastructure projects are capital intensive in nature with long gestation periods. Therefore, these have to be planned in a long term perspective. At the same time, it is to be observed that an airport terminal is designed to cater to peak hour passenger traffic in the design year. Therefore, for some years (specially during the initial years after commissioning), the terminal may handle passengers much below its capacity. Redundancy in capacity would obviously decrease the returns from the project. Balancing these factors is, as such, critical for creation of a viable infrastructure. It is felt that the Design Year could generally be 10th year from the Planning year. In the case of bigger projects, the project approval, pre-qualification and preparatory work generally takes upto 2-3 years. Thus, following norms could be adopted for capacity creation:

- Smaller airports (< 5.0 mppa) – 10th year from Planning year
- Bigger airports (> 5.0 mppa) – 7th year from Planning year.
  (mppa – Million passengers per annum)

C Peak Hour Projections -

- Methodology given in ICAO Manual on Air Traffic Forecasting by finding ratios from historical data and recent studies be adopted. As per ICAO Manual, forecasts of peak period passengers are to be obtained from annual forecasts by applying ratios of busy period traffic to annual traffic derived from actual data at various airports.
- Actual data for the past five years should be analysed to determine the Peak Hour Traffic and the trend growth thereof. Projections for the Design Year should be made based on the trend growth in the past. AAI should make arrangements for data collection of Peak Hour Traffic in respect of all non- metro Airports, so that same is available at the time of planning expansion of these Airports.
- In absence of actual data the Peak Hour Traffic may be estimated based on ratios given in *Table 3* below.

Table 3: NORMATIVE TRAFFIC RATIOS FOR AIRPORTS IN INDIA

Sl. No	Traffic (in mppa)	Ratios for International Terminal	Ratios for Domestic Terminal
		PH/AD	PH/AD
1	1.0 -5.0	0.3000	0.2500
2	0.50 - 1.0	0.3500	0.3500

3	Less than 0.5	0.4500	0.4500

PH : Peak Hour Traffic
AD : Average Day Traffic i.e. Annual Traffic / 365 days
Note:
In the event that requisite data is not available for airports with traffic above 5 million passengers per annum, the above ratio-based norms may be considered in the interim. AAI would, however, initiate data collection for all airports so that planning can be undertaken on the basis of actual data.

D Level of Services in Target Year -

Level of Services 'C' as per IATA Airport Development Reference Manual (Jan 2004) denotes good service at a reasonable cost. Therefore, this level could be used for design for target demand in the design year. The unit area specified in paragraph E below represents Level of Service 'C'. Net impact of this norm would be that in the initial years, the passengers may experience LOS 'A' or 'B' and as the traffic increases LOS 'C' would be achieved.

E Unit Area Norms -

Overall space /area norm should be such as to provide a reasonable level of service for all components required in a Terminal Building. Commercial or Retail area providing amenities like food & beverages, book shops, counters for car rental, vending machines, public rest rooms etc normally require 8-12% of the overall area, and should be planned and provided accordingly. In bigger airports, i.e., with annual passenger traffic exceeding 10 million, commercial area could be upto 20% of overall area.

It is also to be observed that a number of airports in the country handle about 2 flights a day with smaller (ATR type) or midsized aircraft (A320/B737 type). In case of such airports the terminal facilities are, therefore, unutilized for about 18 hours/day. As such, tighter unit area norms for smaller airports are an economic imperative.

Keeping in view the IATA norms and discussion above, the norms as given in Table (Table 4) below, are considered appropriate for Indian Airports

Table 4: Unit Area Norms

S. No	Terminal	Area Norm – Sqm/ php
1	Domestic Terminals a) Up to 100 php	12

	b) 100 – 150 php c) 150 – 1000 php d) > 1000 php	15 18 20
2	Integrated terminal for handling both domestic and international	25
3	International Terminals	27.5

F. Unit Cost of Construction

In an airport terminal, the cost of construction is 'facilities' and 'finishes' driven. It is, therefore, imperative for planners to achieve a judicious balance between design specifications and cost associated with each element. 'Value for the Money should be the motto'. Since the architects, project engineers and contractors of a project may have the tendency to over-design and use expensive finishes, there should be some institutional check and balance for specifying an indicative/benchmark unit cost within which an airport should be designed and constructed.

The cost of construction is, however, dependent upon various variables. It is easily impacted by locational factors. Therefore, it may not be possible to lay down any general norms in this regard. It is, at the same time, important to benchmark the cost of construction across projects being implemented with similar planning horizon.

IMG is of the opinion that for appropriate benchmarking, an in-house appraisal mechanism could be established in the Ministry of Civil Aviation. The Appraisal Committee established by MoCA should assess the reasonableness of the proposed unit cost of Airport Terminals costing more than Rs. 150 crore. The Appraisal Committee should specify the ceiling unit cost and the architects/engineers of AAI should plan and implement the project within the ceiling, subject to revision on account of increase in WPI.