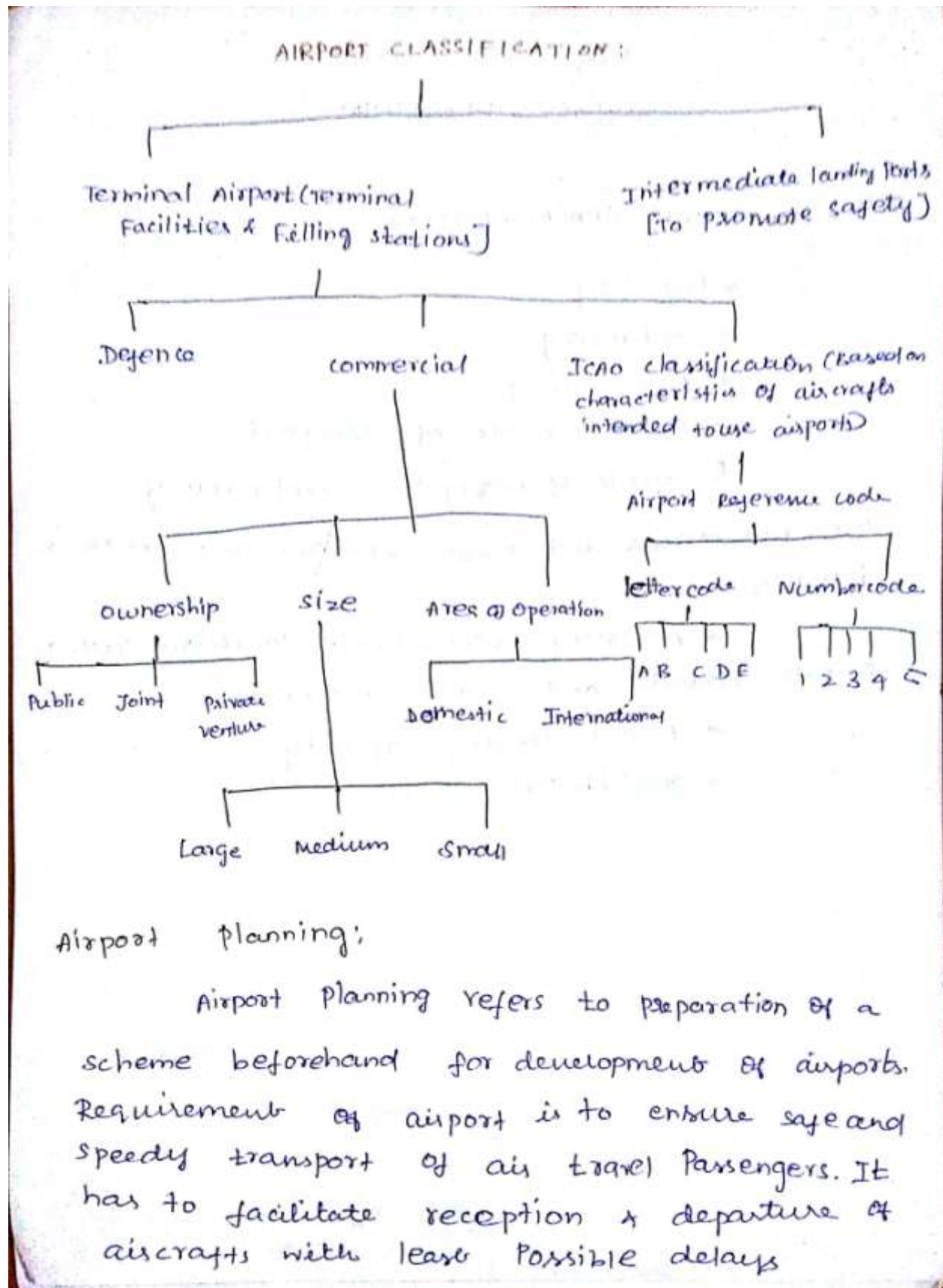


### UNIT - III

#### AIRPORT PLANNING:

##### AIR TRANSPORT CHARACTERISTICS:

- \* Rapidity
- \* continuity
- \* Accessibility
- \* Fastest mode of Transport
- \* capable of navigating continuously over mountains and oceans without any break in journey.
- \* Accessing even remote locations such as Forests, islands and snowed mountains
- \* Lesser carrying capacity
- \* prohibitive costs



### OBJECTIVES OF AIRPORT PLANNING,

- \* Justify the need for an airport
- \* Formulate a layout plan for the airport and design of runways, taxiways and airport buildings.
- \* Prepares cost estimation
- \* Propose institutional arrangements.

### Components of airport Planning;

- \* Assessment of Traffic potential
- \* Site selection
- \* Design and drawing of airport components
- \* Cost estimation
- \* Financial resources
- \* Evaluation of economic viability, Engineering Viability & environmental impact
- \* Institutional Arrangement

### Good Airfield Layout characteristics:

- \* Landing, Takeoff and Taxiing - Independent operation
- \* Shortest Taxiway
- \* safe runway length
- \* Safe Approaches
- \* Excellent control Tower visibility

- \* Adequate landing Apron space.
- \* Adequate Terminal Building facilities
- \* Land area for future expansion
- \* Cost effective construction, maintenance and operation

Socio Economic characteristics of catchment areas:

(i) Assessment of Traffic potential;

Assessment of Traffic potential for a Proposed airport in terms of passenger and cargos is a crucial element in establishing the need for an airport. The first step in assessment of Traffic potential is to delineate catchment area of the proposed airport in the national network of airports. After demarcation of imaginary influence area, socio economic characteristics of population are studied.

ii) population:

- \* Total population
- \* Rate of growth of population.
- \* Estimation of future population.



iii) Economic characteristics:

a. Pattern of employment - Industries, Business, Government, Private, others.

b. Income group - Composition of families under high income and middle income group.

c. Average Per capita income of Persons in income groups of HIG and MIG

d. Pattern of expenditure - Proportion of expenditure for different items and more particularly for travel.

iv) Travel characteristics:

\* Frequency of air travel

\* Modal choice.

site selection for Airports:

Site selection is a critical element in airport planning. Efficiency, safety and capacity of airports to a great extent depend on suitability of sites.

### Factors influencing Size of Airport:

- \* Type of an airport i.e. domestic or international or defence. Size of an airport depends up on whether it is an international or domestic one.
- \* Traffic potential of an airport region.
- \* Aircraft characteristics such as aircraft capacity, aircraft speed, minimum circling radius, minimum turning radius, noise level and take off and landing distances.
- \* Site characteristics such as topography and land availability.

### Design and drawing of Airport Components:

Airport Planning involves the preparation of following plans

- \* Topographical plan
- \* Layout plan
- \* Design of Taxiway, runway & buildings
- \* vehicular circulation and parking area plan.

### Topographical Plan:

It includes all man made & natural features on a site, besides boundaries of the site.

Boundaries of cleared and graded area, contour lines and access roads are marked on the topographical plans. Width for which features are incorporated depends upon the type & size of airport.

Layout plan:

It is the process of laying out various elements in a system. It is the manner in which various elements are arranged. An airport layout plan shows the various positioning of components of airport.

- \* Airport landing area - Approach zone
- \* Airport Terminal area - Runway, Taxiway, Apron, Airport building, vehicular parking area, Airport road network.

Design of Runway:

- \* Runway orientation
- \* Length of runway
- \* Runway width
- \* width & length of safety area
- \* Transverse gradient
- \* Longitudinal & effective gradient
- \* Rate of change of long. gradient
- \* sight distance
- \* Design of runway Pavement



## ICAO stipulations

Federal Aviation agency (FAA) and International Civil Aviation organisation (ICAO) have stipulated norms for various parameters

### 1) Regional plan;

A region is a larger area consisting of cities, towns and villages. The ICAO stipulates a min. distance of separation b/w airports.

Regional plan is studied to ensure that the proposed airport forms part of the regional network of airports. Min. separation is essential from operational & effective potential consideration.

Minimum spacing as per FAA:

Smaller airports under VFR conditions	- 3km
Bigger airports	" " " - 6km
Airports operating piston engine aircrafts	- 25km
" " jet " "	- 160km

### 2) Types of airports:

The site suitability depends upon the type of proposed airports such as commercial, domestic, international or defence. In case of



airports for defence, special requirements are provided such as natural cover from air raids, sites with thick bushes.

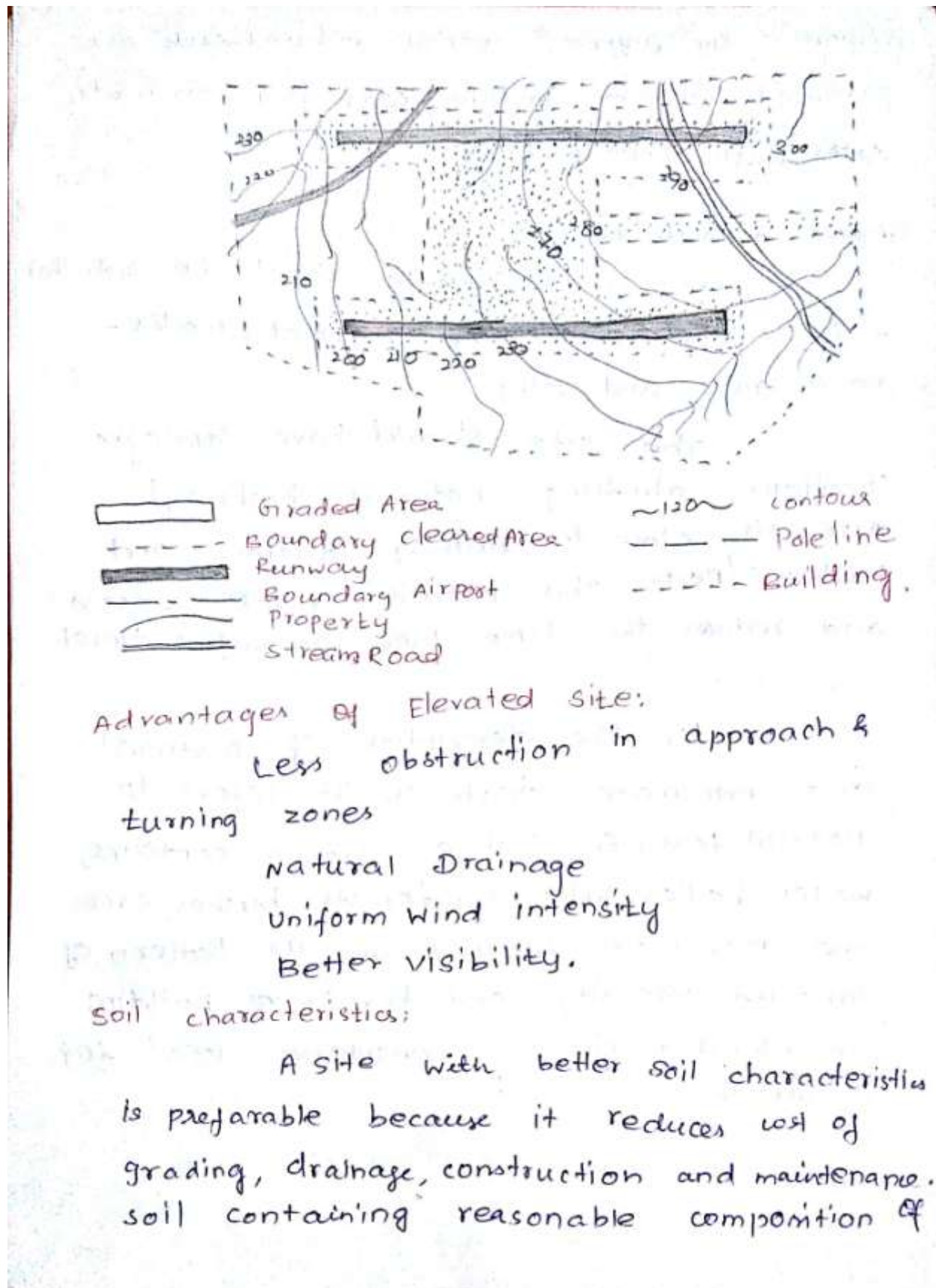
#### Ground Accessibility:

Location of a site should be such that it is easily accessible by different modes - road, rail and water.

The site should have strategic location abutting national highway/arterials, close to railway stations and harbours/ports. This provides quick access and reduces the time taken for surface travel.

#### Topography:

It is the description of natural and man made features. It refers to natural features such as ground contours, water bodies, hillocks, forests, bushes, trees and man made features such as Pattern of land use, intensity and height of building. An elevated site is considered ideal for an airport.



Pervious materials like gravel or sand with a suitable natural binder is considered desirable. A site with expansive soil like clay is considered unsuitable.

Properties of run soil as runway Material:

- \* Stability
- \* Strength
- \* Minimum change in volume & stability under adverse condition.

Index Properties

- \* Grain size distribution
- \* liquid limit
- \* Plasticity index.

Meteorological Factors:

i) Wind:

Landing & Take off operations take place in head wind.

wind data greatly influence the site selection.

wind data on direction, duration & intensity are collected atleast for 10 years for available sites and favourable place which has favourable wind has chosen



### Frost and Fog:

Any site selected should be free from fog, frost and smoke.

Fog generally settles in area like valley where wind blow is less.

Smoke exists at sites nearer to 'industrial areas'.

The site located on the leeward direction should be preferred than that on windward direction.

Trend of future development of industries should also be studied and sites should be chosen accordingly.

### Temperature:

Temperature influences runway length. Increase in temperature results in decrease in air density.

Aircraft requires longer runway in a particular direction.

Sites with temperature at or closed to standard temperature are preferred.

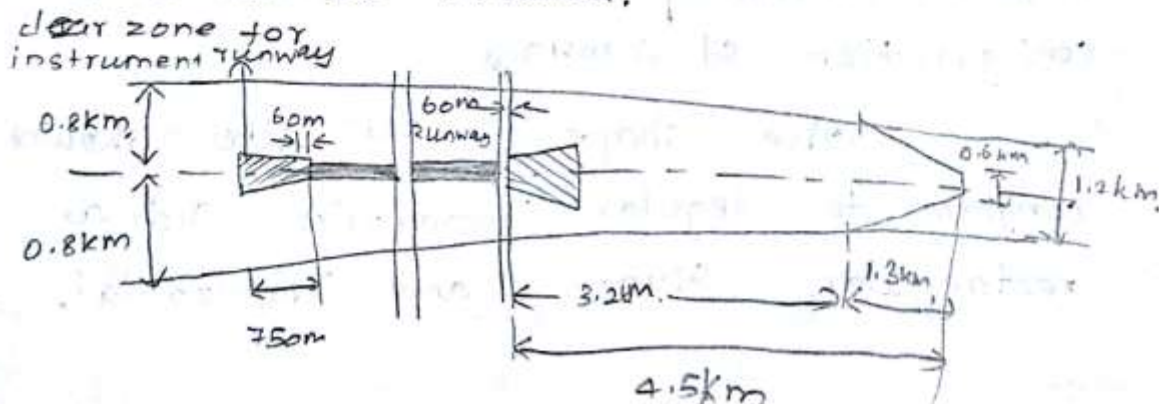
## Noise nuisance:

Proximity of airports to areas of human habitation, residential areas & institutional areas such as schools, hospitals, should be avoided.

Intensity of noise nuisance depends upon climb-out paths of aircrafts, types of engine propulsion and gross weights of aircrafts.

A site which is not marked by any developments in general and residential developments in particular is preferred.

It is practically not possible to provide a buffer zone, acoustic barriers have to be installed.



Buffer zone for noise mitigation.

Onsite and off site infrastructures

\* It refers to basic facilities such as water supply, sewer network, electricity communication and roads.

\* In case these facilities are not available onsite or off site they may have to be developed. exclusively for airports, it may add to the cost of projects

\* sites for which facilities are already available should be selected than those which are in isolation or away from existing cities.

shape and dimension of a site;

shape of an airport depends upon the type and class of an airport, prevailing wind direction and configuration of runways

The shape of the site should conform to regular geometrics such as rectangular, square and Trapezoidal.



scope for future expansion;

Area of a site selected for an airport should be more than that stipulated by ICAO.

It should be adequate not only to meet present demand but also future requirements by way of more number of runways, aprons, terminal buildings, vehicular parking and horizontal expansion to meet future air travel demand.

Comprehensive Evaluation:

A comparative analysis of alternate sites is done with reference to economic viability, environmental impact, technical feasibility, social & political acceptability.

A multi criteria technique is adopted to integrate various evaluation elements such as and arrive at a composite score.

Based on composite score, the best site among alternatives is chosen.

Typical Airport layout;

Runway is the principal element of an airport.

All other components of airports should have good correlation with runway.

Integration of all elements make efficient and effective airports

Requirements of well planned airports are

- \* optimal route from the apron to the runway, through the taxiway.

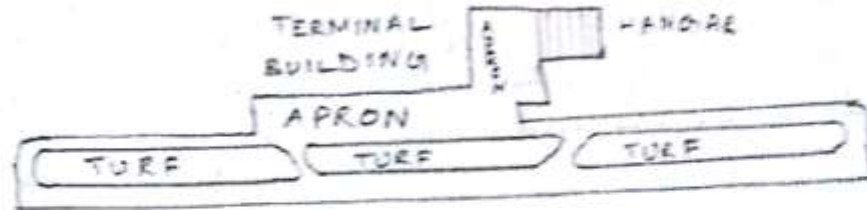
- \* control tower with a command over entire airfield.

- \* optimal service to air passengers.

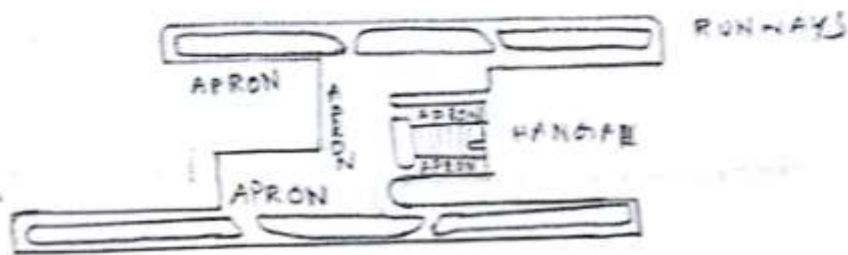
- \* cost effective construction & maintenance.

- \* Scope for future expansion

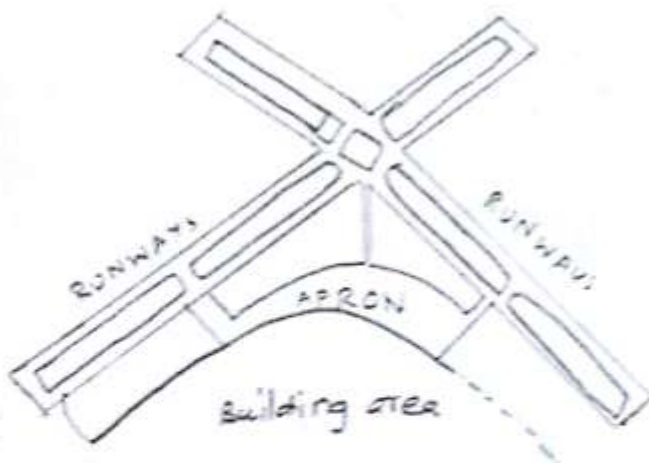
a) single Runway layout.



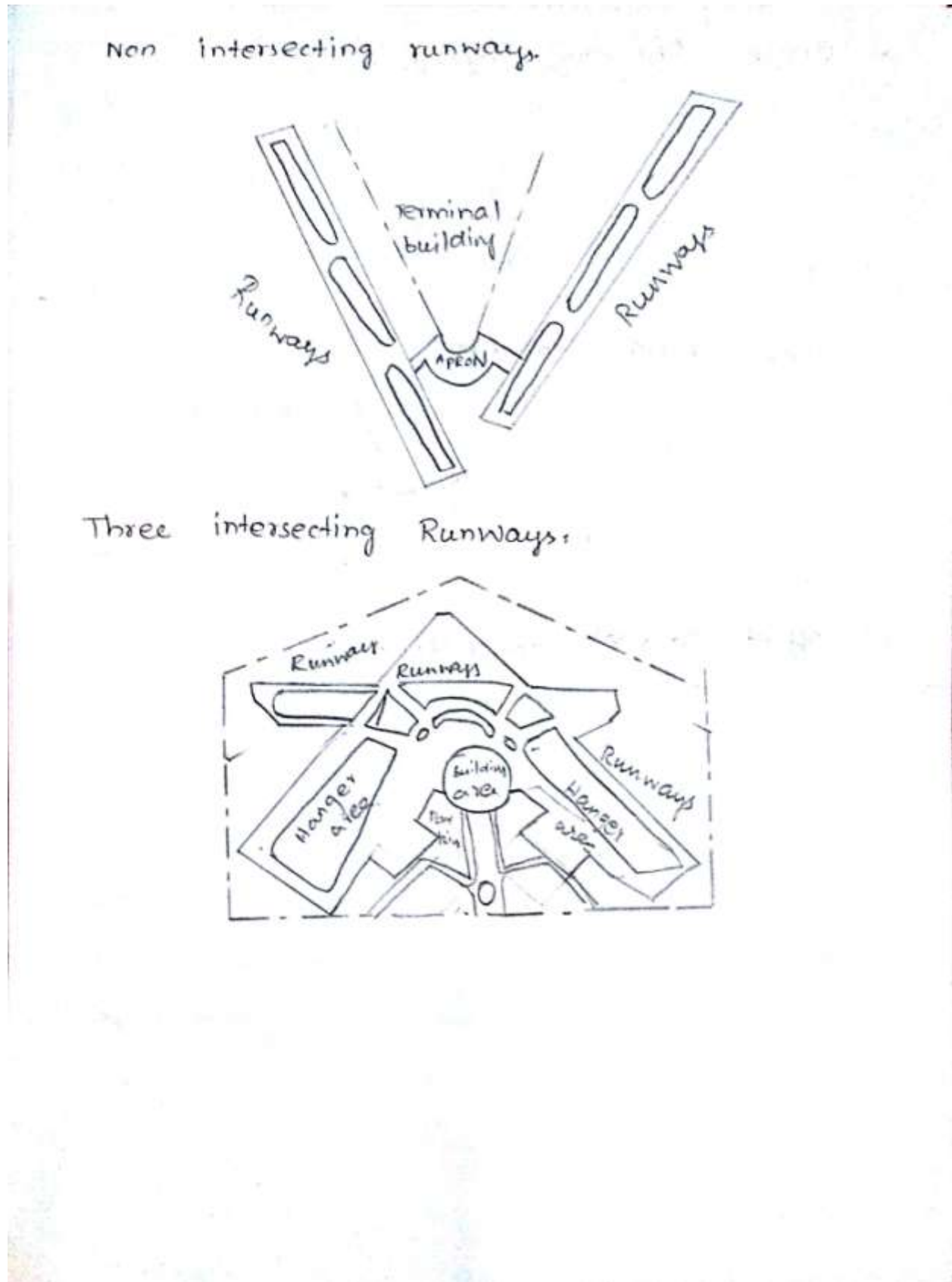
b) open runway concept.



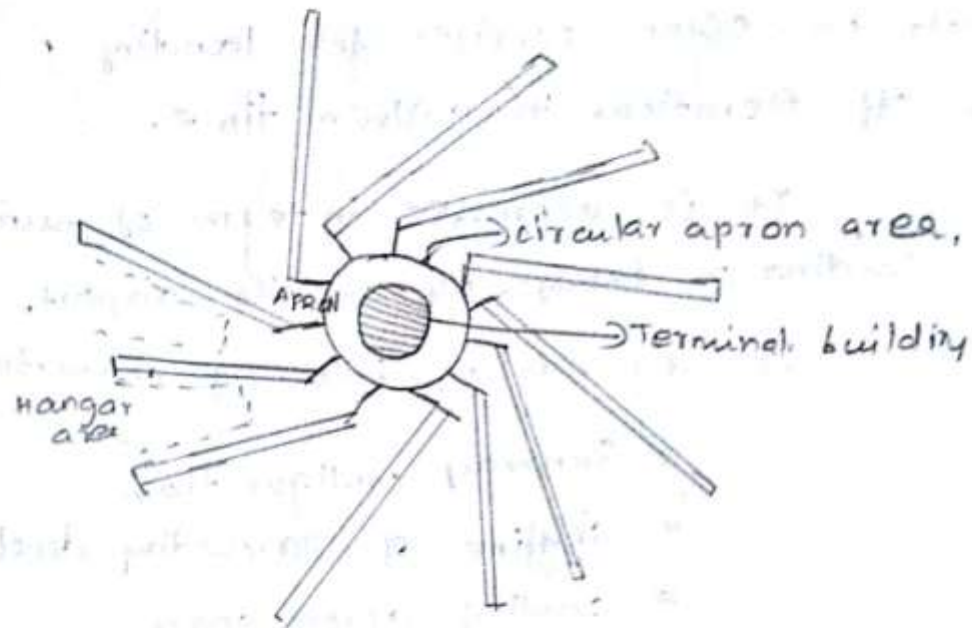
c) offset parallel concept:







### Tangential Runway layout:



### Conceptual layout pattern:

Pattern of airport layouts is determined by configuration of runways

Secondary elements such as apron, taxiway, Terminal building are positioned ~~and~~ based on orientation of runway.

### Airport capacity:

It refers the ability of an airport to offer services for landing / Take off operations in a given time.

It is expressed in terms of number of landing or taking off in the airport.

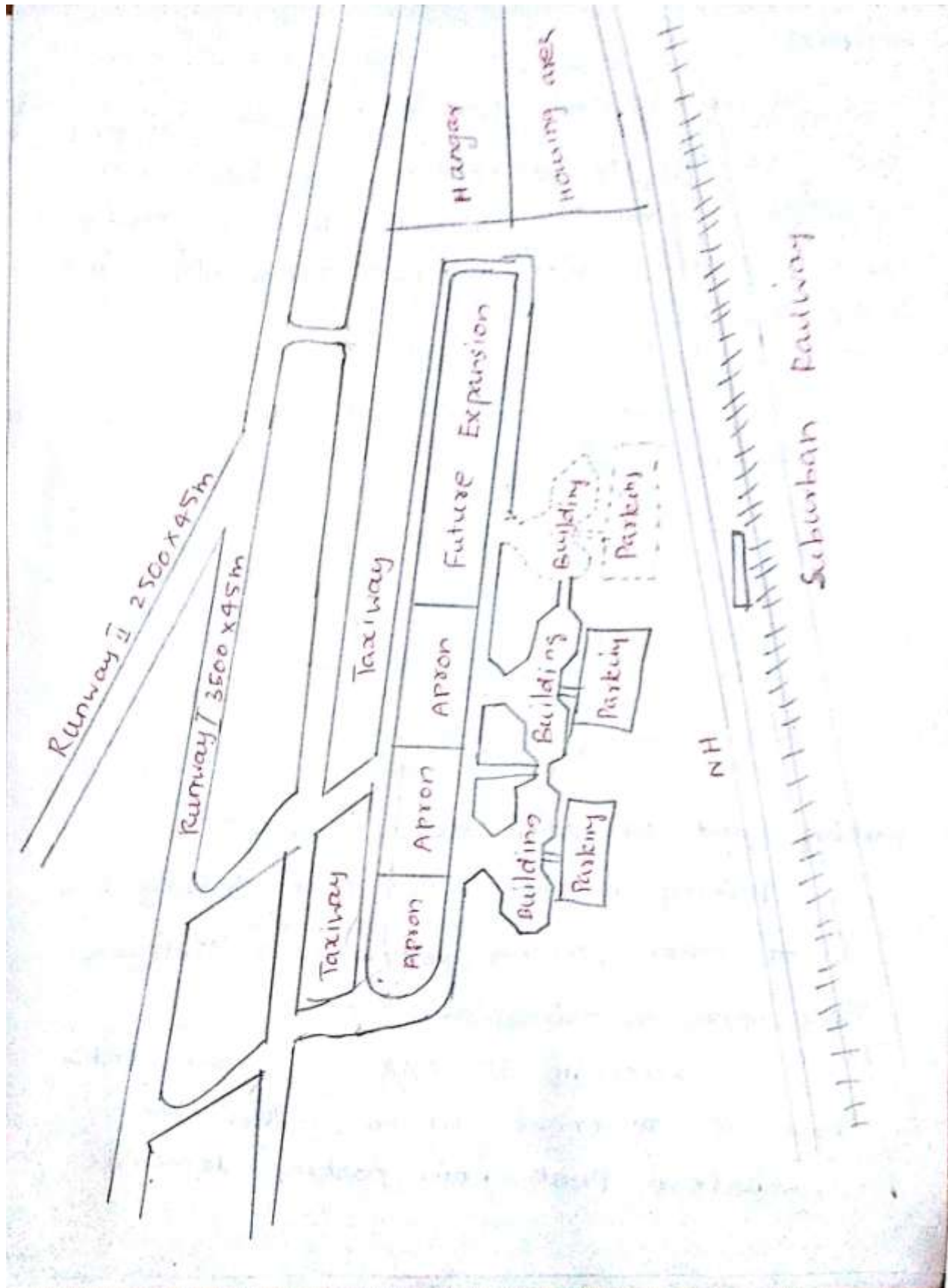
It depends on following characters

- \* Runway configuration
- \* Skyline & surrounding development
- \* Loading apron space
- \* Type of Instrument - landing system.

### Layout of Airport.

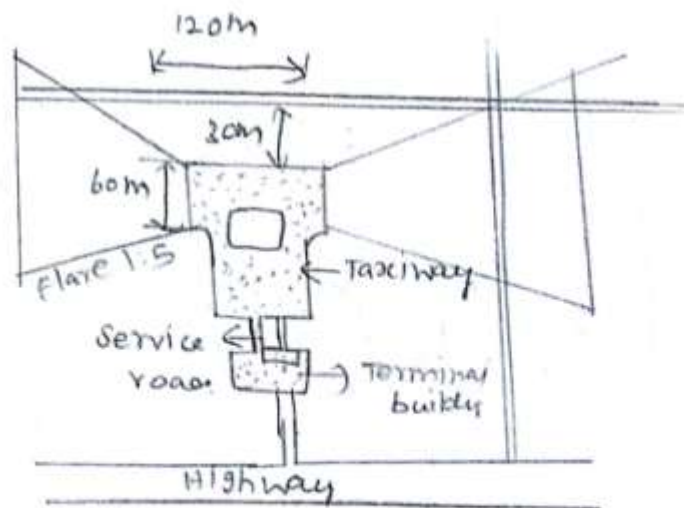
chennai Airport handled around 120 landings a day. The breakup was 95 on st. Thomas mount end of the main runway and 25 on pallavaram side based on wind conditions. With the installation of ILS on pallavaram ~~road~~ <sup>End</sup>, 48 landings could be handled.





## Heliport:

It is prepared ground used for landing and take off of helicopters. It have all facilities to that of airports but to smaller scale. landing area maybe range b/w 0.5 to 0.75 hectares.



## Parking and circulation area:

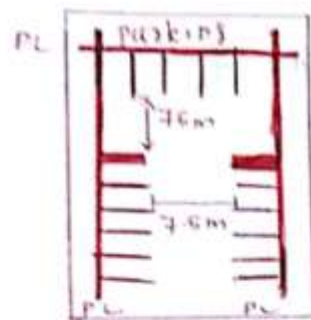
Parking may be defined as leaving of a car or other personal vehicle in a Particular Place for certain place time.

According to FAA for each peak hour air passenger 1.5 to 2 Cars are assumed as peak hour parking demand.

ii) Access and circulation standards,

- \* An important consideration is parking lot should be easily accessible.

- \* Should ensure least possible delay during entry and exit.



PL - parking lot

Driveway standards:

- \* oneway driveway for parking spaces shall have a min. width of 3.75m

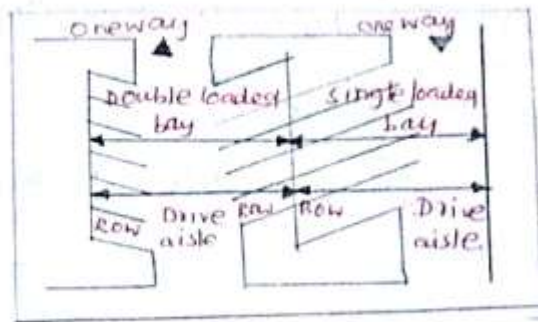
- \* Twoway driveways for a small width of 6.25m.

- \* Driveways or turnaround aisles shall not be dead - end.

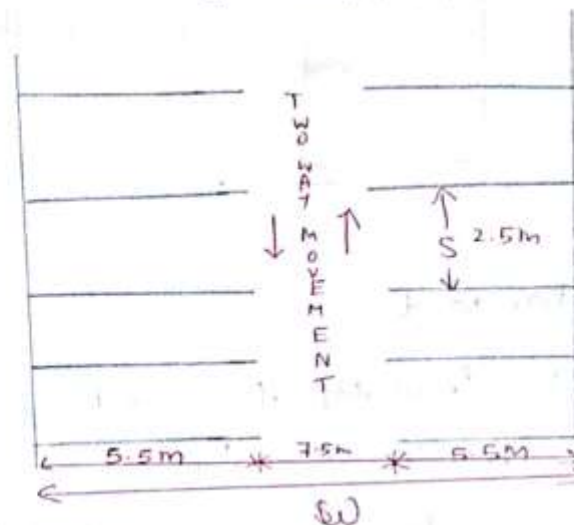
- \* Parking lots must be located close to arrival and departure halls.



## Parking slots and Drive aisle:



## Standards for parking bays



W - width  
S - space

## Maximum Aisle length:

Maximum length of aisle should not exceed 100m. without a break in circulation.

An aisle width should be sufficient to allow a driver to couple parking and unparking manoeuvres in a single, convenient and smooth turn.

### Employees Parking :

It is desirable to segregate employee's Parking from that of Passengers' Parking.

Employees' Parking are normally long term Parking. Based on Size and Shape of Parking lots, the best parking angle is decided.

- \* Parallel parking
- \* 30° angular parking
- \* 45° " "
- \* 60° " "
- \* Right angle parking.

surface parking lots are provided close to airport buildings. If sufficient spaces are not available, multi storeyed car parking is provided.

\* vehicles parked parallel to kerb is Parallel Parking

\* If vehicles are parked making angles with a kerb is called angular parking

operations of parking and unparking is difficult in Parallel parking.

Parking with 60° is practicable while 45° parking yields best results

Right angled Parking is adopted only under exceptional conditions

At airports parking for 3 hours or less is termed as short term parking

Short term parking accounts to 80% parkers at airports.

