

2.2 GEOMETRIC DESIGN OF RUNWAY AND TAXIWAYS

ELEMENTS OF TAXIWAY DESIGN

Taxiway

A taxiway is a path for aircraft at an airport connecting runways with aprons hangars terminals and other facilities.

Geometric Design Standards

- Turning radius
- Sight distance
- Rate of change of longitudinal gradient
- Transverse gradient
- Longitudinal gradient
- Width of safety area
- Width of taxiway
- Length of taxiway

Length of Taxiway

The speed of an aircraft on a taxiway is also less than the runway.

Width of taxiway is lower than the runway width.

No specifications are recommended by any organisation. Width of taxiway

It should be as short as practicable.

Longitudinal Gradient

ICAO recommends that the longitudinal gradient should not exceed 1.5% for A and B types and 3% for C D and E types.

A width of 7.5 m of shoulders adjacent to the pavement edges should be paved with light strength material.

Width of safety area

This area includes taxiway pavement on either side that may be partially paved plus the area that is graded and drained.

Rate of change of longitudinal gradient

ICAO recommends that the rate of change of slope in longitudinal direction should not exceed 1% per 30 m length of vertical curve for A,B and C types and 1.2% for D and E types of airports.

ICAO has recommended that the transverse gradient should not exceed 1.5% for A,B and C and C types and 2% for D and E types of airports.

Transverse Gradient

This is essential for quick drainage of water.

Sight distance

The radius of horizontal curve is obtained by : $R = \frac{V^2}{125f}$ V =speed in kmph
coefficient of friction $f = .13$

Whenever there is a change in the direction of taxiway a horizontal curve is provided

ICAO has recommended that the surface of taxiway must be visible from 3m height for a distance of 300m for A,B and C types and distance of 250 m be visible for 2.1m height for D and E types of airports.

TURNING RADIUS**Horonjeff equation**

$$R = \frac{.388W^2}{T/2 - S}$$

W=wheel base of taxiway in metre

T=width of taxiway pavement in metre

S =distance between midway point of main gears and the edge of the taxiway pavement in metre for super sonic planes it is taken as 180m and for sub sonic it is taken as 120m.

Taxiway design and geometrical design of taxiway

The speed of an aircraft on taxiway is much lower than its speed on a runway during the landing or take-off.} A taxiway is a path for aircraft at an airport connecting runways with aprons, hangars, terminals.

Factors controlling taxiway layout

Turning radius Sight

distance Transverse

gradient Longitudinal

gradient Width of

safety area Width of

taxiway Length of

taxiway Bypass

taxiway Holding

apron Separation

clearance Fillets

Exit taxiways

Factors controlling exit taxiway Aircraft

leaves runway quicker Intersection of

taxiway and runway avoid Taxiway-short

distance

No interfere taxiway

Fillets

Distance between two parallel taxiway

Icao-recommends radius of fillet should not less than width of taxiway

Provide at junction of two runways, taxiway.

Fillets(radius) separation clearance

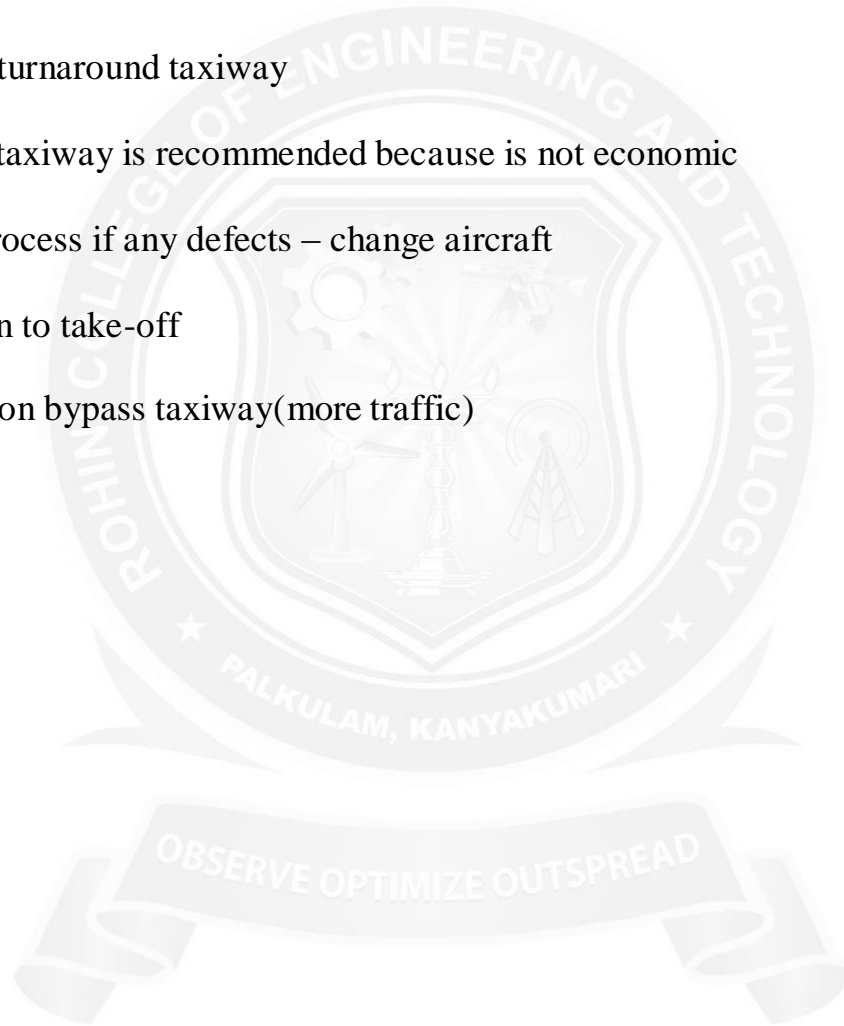
Also called turnaround taxiway

No parallel taxiway is recommended because is not economic

Checking process if any defects – change aircraft

Wait for turn to take-off

Holding apron bypass taxiway(more traffic)



GEOMETRIC DESIGN OF RUNWAY

Length

Longitudinal and Effective gradient

Safety Area Sight

Distance Transverse

Gradient Width

Length of Runway

The Basic runway length is given by ICAO in accordance with the classification of airports.

The actual runway length is computed after applying corrections in length for: –

Elevation

Temperature, and

Gradient

Longitudinal and Effective gradient

The longitudinal gradient increases the runway length

Fuel consumption of aircraft increases on uphill slope climbing during takeoff.

Safety Area

It includes runway, shoulders on either side of runway, and additional length

The shoulders are generally unpaved

They are only used in case of emergency

They are generally turfed or made of stabilized soil

Shoulders provide a sense of openness and vastness to pilot

The length of safety area should extend by 60m on either side beyond runway ends

The total length of safety area is = Runway Length +120

Stopway

A stopway is an area beyond the runway to decelerating an aircraft in case of an aborted takeoff.

It must be at least as wide as the runway and must be capable of supporting an airplane without causing structural damage to it.

Clearway

A clearway is a defined area connected to the end of a runway

It increases the allowable airplane operating takeoff weight without increasing runway length.

Runway:

Design Criteria

It should be designed keeping in view the characteristics of critical aircraft.

The major design guidelines:

Length, width, and orientation (direction),

configuration (multiple runways),

Slope (Longitudinal and cross)

Pavement thickness of runways

Immediate airfield area surrounding the runways obstructions

Function of Taxiways

They connect runways with other areas, like terminal building, cargo, and parking areas. Taxiways gives access for aircraft to and from the runways

Types of taxiways

Parallel taxiway

Provided parallel to an adjacent runway, It facilitates aircrafts to reach the apron area from runway after landing and from apron area to runway for take-off.

Entrance taxiway

Located near the runway threshold. It facilitates entry of an aircraft to runway for take-off operation.

Exit taxiways

Located at various points along the runway to allow landing aircraft to efficiently exit the runway after landing.

Bypass taxiways

Provided to give way to aircraft, Located at areas of congestion at busy airports.

Taxiways:

Design Criteria

Provide each runway with a parallel taxiway

Design taxiways of optimum length

Provide bypass capability or multiple accesses to runway ends

Minimize crossing runways

Provide large curves and fillet radii for easier maneuvering of aircrafts.

Provide airport traffic control tower line-of-sight