2. RUNWAY DESIGN

ORIENTATION

- Runway is usually oriented in the direction of prevailing winds.
- The head wind i.e. the direction of wind opposite to the direction of landing and take off, provides greater lift on the wings of the aircraft when it is taking off.
- Cross wind component = V sin θ where θ = Angle of wind direction to runway centreline
- Normal component of the wind is called Cross wind component.
- The maximum permissible cross wind component depends upon the size of aircraft and the wing configuration.

Airports Serving	Max. limit of C.W.C.
1. For small aircrafts.	15 kmph
– for mixed traffic	25 kmph
2. For big Aircrafts	35 kmph

BASIC RUNWAY LENGTH

It is the length of runway under the following assumed conditions at the airport:

1. Airport altitude is at sea level
2. Temperature at the airport is standard (15°C)
3. Runway is levelled in the longitudinal direction.
4. No wind is blowing on runway.
5. Aircraft is loaded to its full loading capacity.
6. There is no wind blowing enroute to the destination.
7. Enroute temperature is standard.

CORRECTIONS FOR ELEVATION, TEMPERATURE AND GRADIENT

(a) **Correction of Elevation:** Basic runway length is increased at the rate of 7% per 300 m rise in elevation above the mean sea level.

(b) Correction for Temperature

$$\text{Airport reference temperature} = T_a + \frac{T_m - T_a}{3}$$

where T_a = monthly mean of average daily temperature

T_m = monthly mean of the max daily temperature for the same month of the year.

Total correction for elevation plus temp. ⇒ 35% of basic runway length.

(c) **Correction for Gradient**

- Steeper gradient results in greater consumption of energy and as such longer length of runway is required to attain the desired ground speed.
- After having been corrected for elevation and temperature should be further increased at the rate of 20% for every 1% of effective gradient.
- Effective gradient is defined as the maximum difference in elevation between the highest and lowest points of runway divided by the total length of runway.

RUNWAY GEOMETRIC DESIGN

- **Runway Width:** ICAD recommends the percent with varying from 45 m to 18 m for different types of airport.
- **Safety Area:** Consists of the runway, which is paved area plus the shoulder on either side of runway plus the area that is cleared, graded and drained.

  For non-instrumental runway, the width of safety area should be at least 150 m for A, B, C and 78 m for D and E types and for instrumental runway, it should be minimum 300 m

  The length of safety area is equal to the length of runway plus 120 m
- **Transverse Gradient:** Essential for quick drainage of surface water.

  For A, B, C types of Airports ⇑ 1.5%

  For D and E types of Airports ⇑ 2%

  Transverse gradient ⇔ 0.5%
- **Longitudinal Gradient**

  Max. limit

  A, B, C types of Airports = 1.5%

  D and E types of Airports = 2.0%

For effective gradient: Max limit

A, B and C type of airports = 1.0%

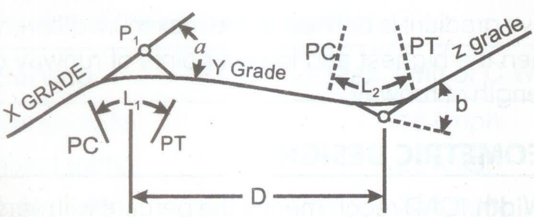
D and E types of airports = 2.0%

- **Rate of Change of Gradient:** Should be limited to a maximum of 0.1% per 30 m length of vertical curve for A and B types, 0.2% for C type and 0.4% for D and E types of airports.

  Vertical curves are generally not necessary if the change in slope is not more than 0.4%.

- **Sight Distance:** For A, B, C types of airports, any two points 3 m above the surface of runway should be mutually visible from a distance equal to half the runway length.

  For D and E types of runway there should be unobstructed line of sight from any point 3 m above runway and to all other point 2.1 m above runway within a distance of at least one half the length of runway.



	Description	Small airport	Large airport
1.	Maximum grade change such as (a) or (b) should not exceed	2 percent	1.5 percent
2.	Length of vertical curve (L_1 or L_2) for each one percent grade change	90 m	300 m
3.	Distance between points of intersection of grade lines (D)	75(a +b)m	300(a +b)m

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