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Taxiway Design Formulas

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List of 44 Taxiway Design Formulas

Taxiway Design

Braking Distance

1) Assumed Brake Application Speed given Distance for Deceleration in Normal Braking Mode

Open Calculator

fx $$V_{ba} = \sqrt{S_3 \cdot 2 \cdot d + V_{ex}^2}$$

ex $$101.548\text{m/s} = \sqrt{60\text{m} \cdot 2 \cdot 32.6\text{m}^2/\text{s} + (80\text{m/s})^2}$$

2) Deceleration Rate when Distance for Deceleration in Normal Braking Mode

Open Calculator

fx $$d = \frac{V_{ba}^2 - V_{ex}^2}{2 \cdot S_3}$$

ex $$25.075\text{m}^2/\text{s} = \frac{(97\text{m/s})^2 - (80\text{m/s})^2}{2 \cdot 60\text{m}}$$

3) Deceleration Rate when Distance for Deceleration in Normal Braking Mode is considered

Open Calculator

fx $$d = \frac{(V_t - 15)^2 - (V_{ex}^2)}{8 \cdot S_3}$$

ex $$24.69169 m^2/s = \frac{(150.1 m/s - 15)^2 - ((80 m/s)^2)}{8 \cdot 60 m}$$

4) Distance for Transition from Main gear Touchdown to create Stabilized Braking Configuration

Open Calculator

fx $$S_2 = 10 \cdot V$$

ex $$450 m = 10 \cdot 45 m/s$$

5) Distance required for Deceleration in normal Braking mode

Open Calculator

fx $$S_3 = \frac{V_{ba}^2 - V_{ex}^2}{2 \cdot d}$$

ex $$46.15031 m = \frac{(97 m/s)^2 - (80 m/s)^2}{2 \cdot 32.6 m^2/s}$$

6) Distance required for Deceleration in Normal Braking Mode to Nominal Takeoff Speed

Open Calculator

$$S_3 = \frac{(V_t - 15)^2 - V_{ex}^2}{8 \cdot d}$$

$$45.44482\text{m} = \frac{(150.1\text{m/s} - 15)^2 - (80\text{m/s})^2}{8 \cdot 32.6\text{m}^2/\text{s}}$$

7) Distance required for Transition from Maingear Touchdown to create Stabilized Braking Configuration

Open Calculator

$$S_2 = 5 \cdot (V_{th} - 10)$$

$$50\text{m} = 5 \cdot (20\text{m/s} - 10)$$

8) Nominal Turn-Off Speed given Distance for Deceleration in Normal Braking Mode

Open Calculator

$$V_{ex} = \sqrt{(V_{ba}^2) - (S_3 \cdot 2 \cdot d)}$$

$$74.14176\text{m/s} = \sqrt{\left((97\text{m/s})^2\right) - (60\text{m} \cdot 2 \cdot 32.6\text{m}^2/\text{s})}$$

9) Nominal Turn-off Speed given Distance required for Deceleration in normal Braking mode

Open Calculator

fx $$V_{ex} = \sqrt{\left(\left(V_t - 15\right)^2\right) - \left(8 \cdot d \cdot S_3\right)}$$

ex $$51.0295\text{m/s} = \sqrt{\left(\left(150.1\text{m/s} - 15\right)^2\right) - \left(8 \cdot 32.6\text{m}^2\text{/s} \cdot 60\text{m}\right)}$$

10) Threshold Speed given Distance for Deceleration in Normal Braking Mode

Open Calculator

fx $$V_t = \left(8 \cdot S_3 \cdot d + V_{ex}^2\right)^{0.5} + 15$$

ex $$163.4857\text{m/s} = \left(8 \cdot 60\text{m} \cdot 32.6\text{m}^2\text{/s} + \left(80\text{m/s}\right)^2\right)^{0.5} + 15$$

11) Threshold Speed given Distance required for Transition from Maingear Touchdown

Open Calculator

fx $$V_{th} = \left(\frac{S_2}{5}\right) + 10$$

ex $$20.2\text{m/s} = \left(\frac{51\text{m}}{5}\right) + 10$$

12) Vehicle Speed given Distance required for Transition from Maingear Touchdown

Open Calculator

fx $$V = \frac{S_2}{10}$$

ex $$5.1\text{m/s} = \frac{51\text{m}}{10}$$

Design of Fillets

13) Aircraft Datum Length given Length of each Wedge-shaped End of Fillet

Open Calculator

fx $$D_L = F - L$$

ex $$131.9\text{m} = 135\text{m} - 3.1\text{m}$$

14) Distance along Straight Taxiway Center line given Length of each End of Fillet

Open Calculator

fx $$F = L + D_L$$

ex $$135.1\text{m} = 3.1\text{m} + 132\text{m}$$

15) Length of each Wedge-Shaped end of Fillet

Open Calculator

fx $$L = F - D_L$$

ex $$3\text{m} = 135\text{m} - 132\text{m}$$

16) Maximum Deviation permissible without Filleting

Open Calculator

fx $$\lambda = \left(\frac{T_{Width}}{2}\right) - \left(M + \frac{T}{2}\right)$$

ex $$4.05 = \left(\frac{45.1m}{2}\right) - \left(15 + \frac{7}{2}\right)$$

17) Maximum value of Deviation of main Undercarriage given Radius of Fillet

Open Calculator

fx $$\gamma = -\left(r - R + M + \left(\frac{T}{2}\right)\right)$$

ex $$104 = -\left(27.5m - 150m + 15 + \left(\frac{7}{2}\right)\right)$$

18) Minimum Safety Margin given Maximum Deviation permissible without Filleting

Open Calculator

fx $$M = \left(\frac{T_{Width}}{2}\right) - \lambda - \left(\frac{T}{2}\right)$$

ex $$14.95 = \left(\frac{45.1m}{2}\right) - 4.1 - \left(\frac{7}{2}\right)$$

19) Minimum Safety Margin given Radius of Fillet

Open Calculator

fx $$M = -\left(r - R + \gamma + \left(\frac{T}{2}\right)\right)$$

ex $$24 = -\left(27.5\text{m} - 150\text{m} + 95 + \left(\frac{7}{2}\right)\right)$$

20) Radius of Fillet

Open Calculator

fx $$r = R - \left(\gamma + M + \left(\frac{T}{2}\right)\right)$$

ex $$36.5\text{m} = 150\text{m} - \left(95 + 15 + \left(\frac{7}{2}\right)\right)$$

21) Radius of Taxiway Centerline given Radius of Fillet

Open Calculator

fx $$R = r + \left(\gamma + M + \frac{T}{2}\right)$$

ex $$141\text{m} = 27.5\text{m} + \left(95 + 15 + \frac{7}{2}\right)$$

22) Taxiway Width given Maximum Deviation permissible without Filleting

Open Calculator

fx $$T_{Width} = 2 \cdot \left(\lambda + \left(M + \frac{T}{2}\right)\right)$$

ex $$45.2\text{m} = 2 \cdot \left(4.1 + \left(15 + \frac{7}{2}\right)\right)$$

23) Track of Main Undercarriage given Maximum Deviation permissible without Filleting

Open Calculator

fx $$T = 2 \cdot \left(\left(\frac{T_{Width}}{2}\right) - \lambda - M\right)$$

ex $$6.9 = 2 \cdot \left(\left(\frac{45.1\text{m}}{2}\right) - 4.1 - 15\right)$$

24) Track of main Undercarriage given Radius of Fillet

Open Calculator

fx $$T = -2 \cdot (r - R + \gamma + M)$$

ex $$25 = -2 \cdot (27.5\text{m} - 150\text{m} + 95 + 15)$$

Path followed by the main Undercarriage of Taxiing Aircraft

25) Datum Length of Aircraft given Deviation of main Undercarriage

Open Calculator

fx $$D_L = \frac{\gamma}{\sin(\beta)}$$

ex $$132.0655\text{m} = \frac{95}{\sin(46^\circ)}$$

26) Deviation of Main Undercarriage

Open Calculator

fx $$\gamma = D_L \cdot \sin(\beta)$$

ex $$94.95285 = 132\text{m} \cdot \sin(46^\circ)$$

Taxiway Width

27) Clearance between Outer Main Gear Wheel and Taxiway Edge given Taxiway Width

Open Calculator

fx $$C = \frac{T_{Width} - T_M}{2}$$

ex $$14.95\text{m} = \frac{45.1\text{m} - 15.2\text{m}}{2}$$

28) Clearance between Outer Main Gear Wheel and Taxiway Edge given Wing Tip Clearance

Open Calculator

$$C = S - WS - Z$$

ex $14\text{m} = 64\text{m} - 45\text{m} - 5\text{m}$

29) Clearance given Separation Distance between Taxiway and Object

Open Calculator

$$C = S - (0.5 \cdot W_{Span}) - Z$$

ex $16.5\text{m} = 64\text{m} - (0.5 \cdot 85\text{m}) - 5\text{m}$

30) Lateral Deviation given Separation Distance between Aircraft Stand Taxi lane-to-object

Open Calculator

$$d_L = S - (0.5 \cdot W_{Span}) - Z$$

ex $16.5 = 64\text{m} - (0.5 \cdot 85\text{m}) - 5\text{m}$

31) Maximum Outer Main Gear Wheel Span given Taxiway Width

Open Calculator

$$T_M = T_{Width} - (2 \cdot C)$$

ex $14.9\text{m} = 45.1\text{m} - (2 \cdot 15.1\text{m})$

32) Separation Distance between Aircraft Stand Taxi lane-to-object

Open Calculator

fx $$S = \left(\frac{W_{Span}}{2}\right) + d_L + Z$$

ex $$65\text{m} = \left(\frac{85\text{m}}{2}\right) + 17.5 + 5\text{m}$$

33) Separation Distance between Runway and Parallel Taxiway

Open Calculator

fx $$S = 0.5 \cdot (SW + WS)$$

ex $$64\text{m} = 0.5 \cdot (83\text{m} + 45\text{m})$$

34) Separation Distance between Taxiway and Object

Open Calculator

fx $$S = \left(\frac{W_{Span}}{2}\right) + C + Z$$

ex $$62.6\text{m} = \left(\frac{85\text{m}}{2}\right) + 15.1\text{m} + 5\text{m}$$

35) Separation Distance given Wing Tip Clearance

Open Calculator

fx $$S = WS + C + Z$$

ex $$65.1\text{m} = 45\text{m} + 15.1\text{m} + 5\text{m}$$

36) Strip Width given Separation Distance between Runway and Parallel Taxiway

Open Calculator

fx $$SW = \left(\frac{S}{0.5}\right) - WS$$

ex $$83\text{m} = \left(\frac{64\text{m}}{0.5}\right) - 45\text{m}$$

37) Taxiway Width

Open Calculator

fx $$T_{Width} = T_M + 2 \cdot C$$

ex $$45.4\text{m} = 15.2\text{m} + 2 \cdot 15.1\text{m}$$

38) Wing Span given Separation Distance between Aircraft Stand Taxi lane-to-object

Open Calculator

fx $$W_{Span} = 2 \cdot (S - d_L - Z)$$

ex $$83\text{m} = 2 \cdot (64\text{m} - 17.5 - 5\text{m})$$

39) Wing Span given Separation Distance between Runway and Parallel Taxiway

Open Calculator

fx $$WS = \left(\frac{S}{0.5}\right) - SW$$

ex $$45\text{m} = \left(\frac{64\text{m}}{0.5}\right) - 83\text{m}$$

40) Wing Span given Separation Distance between Taxiway and Object

Open Calculator

fx $$W_{Span} = \frac{S - C - Z}{0.5}$$

ex $$87.8\text{m} = \frac{64\text{m} - 15.1\text{m} - 5\text{m}}{0.5}$$

41) Wing Span given Wing Tip Clearance

Open Calculator

fx $$WS = S - C - Z$$

ex $$43.9\text{m} = 64\text{m} - 15.1\text{m} - 5\text{m}$$

42) Wing Tip Clearance given Separation Distance between Aircraft Stand Taxi lane-to-object

Open Calculator

fx $$Z = S - (0.5 \cdot W_{Span}) - d_L$$

ex $$4\text{m} = 64\text{m} - (0.5 \cdot 85\text{m}) - 17.5$$

43) Wing Tip Clearance given Separation Distance between Runway and parallel Taxiway

Open Calculator

fx $$Z = S - WS - C$$

ex $$3.9\text{m} = 64\text{m} - 45\text{m} - 15.1\text{m}$$

44) Wing Tip Clearance given Separation Distance between Taxiway and Object

Open Calculator

fx $$Z = S - (0.5 \cdot W_{Span}) - C$$

ex $$6.4\text{m} = 64\text{m} - (0.5 \cdot 85\text{m}) - 15.1\text{m}$$

Variables Used

- **C** Clearance Distance *(Meter)*
- **d** Deceleration *(Square Meter per Second)*
- d_L Lateral Deviation
- D_L Datum Length of Aircraft *(Meter)*
- **F** Distance along Straight Taxiway Centerline *(Meter)*
- **L** Length of each Wedge-shaped end of Fillet *(Meter)*
- **M** Minimum Safety Margin
- **r** Radius of Fillet *(Meter)*
- **R** Radius of Taxiway Centerline *(Meter)*
- **S** Separation Distance *(Meter)*
- S_2 Distance for Transition from Main gear Touchdown *(Meter)*
- S_3 Distance for Deceleration in Normal Breaking Mode *(Meter)*
- **SW** Strip Width *(Meter)*
- **T** Track of Main Undercarriage
- T_M Maximum Outer Main Gear Wheel Span *(Meter)*
- T_{Width} Taxiway Width *(Meter)*
- **V** Vehicle Speed *(Meter per Second)*
- V_{ba} Assumed Speed Brake Application Speed *(Meter per Second)*
- V_{ex} Nominal Turn-off Speed *(Meter per Second)*
- V_t Threshold Speed for Transition *(Meter per Second)*
- V_{th} Threshold Speed under Normal Braking Mode *(Meter per Second)*
- W_{Span} Span of Wing *(Meter)*

- **WS** Wing Span *(Meter)*
- **Z** Wing Tip Clearance *(Meter)*
- **β** Steering Angle *(Degree)*
- **γ** Deviation of Main Undercarriage
- **λ** Maximum Deviation without Filleting

Constants, Functions, Measurements used

- Function: **sin**, sin(Angle)
  Trigonometric sine function
- Function: **sqrt**, sqrt(Number)
  Square root function
- Measurement: **Length** in Meter (m)
  Length Unit Conversion
- Measurement: **Speed** in Meter per Second (m/s)
  Speed Unit Conversion
- Measurement: **Angle** in Degree (°)
  Angle Unit Conversion
- Measurement: **Kinematic Viscosity** in Square Meter per Second (m²/s)
  Kinematic Viscosity Unit Conversion

Check other formula lists

- **Taxiway Design Formulas**
- **Turning Radius Formulas**

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