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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

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

[Open Calculator !\[\]\(de95854c7ee024cfadc48187bbb781b2_img.jpg\)](#)

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

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

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

[Open Calculator !\[\]\(6a9b39b98eb945faa14c645ec99e4eaa_img.jpg\)](#)

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



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

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

[Open Calculator !\[\]\(cbe80b694ebd74fcfe136a095b608235_img.jpg\)](#)

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

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

$$fx \quad S_2 = 10 \cdot V$$

[Open Calculator !\[\]\(3e2231b1ad3ca8da8658228c00dd08e0_img.jpg\)](#)

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

5) Distance required for Deceleration in normal Braking mode

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

[Open Calculator !\[\]\(0d5ec72f61334709c3fc9450209b754f_img.jpg\)](#)

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



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

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

[Open Calculator !\[\]\(e78f798d4ea5c530c9db49e7d26e6b95_img.jpg\)](#)

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

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

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

[Open Calculator !\[\]\(05be7c7a8995decd503647c99211f7c2_img.jpg\)](#)

$$ex \quad 50m = 5 \cdot (20m/s - 10)$$

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

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

[Open Calculator !\[\]\(fe3aebe81acea8d45108cd2768939da7_img.jpg\)](#)

$$ex \quad 74.14176m/s = \sqrt{((97m/s)^2) - (60m \cdot 2 \cdot 32.6m^2/s)}$$



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

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

[Open Calculator !\[\]\(e2376d476d06eb31946dc01a69a4403a_img.jpg\)](#)

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

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

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

[Open Calculator !\[\]\(0b5e7e25e8775f7e7e80906ada4f0021_img.jpg\)](#)

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

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

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

[Open Calculator !\[\]\(bd3b31712ad9bab5a241210fa6925cdd_img.jpg\)](#)

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



12) Vehicle Speed given Distance required for Transition from Main gear Touchdown

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

[Open Calculator !\[\]\(d3fb9f94af8b26d1c844efa9a98805b0_img.jpg\)](#)

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

Design of Fillets

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

$$fx \quad D_L = F - L$$

[Open Calculator !\[\]\(73002692dd5e7a64e60946be3158e719_img.jpg\)](#)

$$ex \quad 131.9m = 135m - 3.1m$$

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

$$fx \quad F = L + D_L$$

[Open Calculator !\[\]\(104fbf564e2e5a8fbd84f31656d114c7_img.jpg\)](#)

$$ex \quad 135.1m = 3.1m + 132m$$

15) Length of each Wedge-Shaped end of Fillet

$$fx \quad L = F - D_L$$

[Open Calculator !\[\]\(21226b58c700e5231ab98d27101bac58_img.jpg\)](#)

$$ex \quad 3m = 135m - 132m$$



16) Maximum Deviation permissible without Filleting

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

[Open Calculator !\[\]\(9dfdaff1d86ba3c1f8353b4d1b61b8c5_img.jpg\)](#)

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

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

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

[Open Calculator !\[\]\(2b376d1a92330ab09dad2665d2f89bf5_img.jpg\)](#)

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

18) Minimum Safety Margin given Maximum Deviation permissible without Filleting

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

[Open Calculator !\[\]\(c444627dab9fee9a1550c053ffaaaae2_img.jpg\)](#)

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




19) Minimum Safety Margin given Radius of Fillet 

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

Open Calculator 

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

20) Radius of Fillet 

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

Open Calculator 

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

21) Radius of Taxiway Centerline given Radius of Fillet 

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

Open Calculator 

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



22) Taxiway Width given Maximum Deviation permissible without Filleting



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

[Open Calculator](#)

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

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



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

[Open Calculator](#)

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

24) Track of main Undercarriage given Radius of Fillet



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

[Open Calculator](#)

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



Path followed by the main Undercarriage of Taxiing Aircraft

25) Datum Length of Aircraft given Deviation of main Undercarriage

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

[Open Calculator !\[\]\(339a16584d5da0f0a3ca4e9ec17bf6a1_img.jpg\)](#)

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

26) Deviation of Main Undercarriage

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

[Open Calculator !\[\]\(6059a5aa8b4ca7bb793408023d6c6e42_img.jpg\)](#)

$$ex \quad 94.95285 = 132m \cdot \sin(46^\circ)$$

Taxiway Width

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

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

[Open Calculator !\[\]\(f60b7a900783ac3fd531bfd9c111be6d_img.jpg\)](#)

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



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

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

[Open Calculator !\[\]\(cbe80b694ebd74fcfe136a095b608235_img.jpg\)](#)

$$ex \quad 14m = 64m - 45m - 5m$$

29) Clearance given Separation Distance between Taxiway and Object

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

[Open Calculator !\[\]\(3e2231b1ad3ca8da8658228c00dd08e0_img.jpg\)](#)

$$ex \quad 16.5m = 64m - (0.5 \cdot 85m) - 5m$$

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

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

[Open Calculator !\[\]\(0d5ec72f61334709c3fc9450209b754f_img.jpg\)](#)

$$ex \quad 16.5 = 64m - (0.5 \cdot 85m) - 5m$$

31) Maximum Outer Main Gear Wheel Span given Taxiway Width

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

[Open Calculator !\[\]\(b64b40baaee5acddc1eab8538ba84754_img.jpg\)](#)

$$ex \quad 14.9m = 45.1m - (2 \cdot 15.1m)$$



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

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

[Open Calculator !\[\]\(e78f798d4ea5c530c9db49e7d26e6b95_img.jpg\)](#)

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

33) Separation Distance between Runway and Parallel Taxiway

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

[Open Calculator !\[\]\(05be7c7a8995decd503647c99211f7c2_img.jpg\)](#)

$$ex \quad 64m = 0.5 \cdot (83m + 45m)$$

34) Separation Distance between Taxiway and Object

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

[Open Calculator !\[\]\(fe3aebe81acea8d45108cd2768939da7_img.jpg\)](#)

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

35) Separation Distance given Wing Tip Clearance

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

[Open Calculator !\[\]\(899d8b7697d64725bf017d3296cfcf1b_img.jpg\)](#)

$$ex \quad 65.1m = 45m + 15.1m + 5m$$



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

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

[Open Calculator !\[\]\(e2376d476d06eb31946dc01a69a4403a_img.jpg\)](#)

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

37) Taxiway Width

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

[Open Calculator !\[\]\(0b5e7e25e8775f7e7e80906ada4f0021_img.jpg\)](#)

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

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

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

[Open Calculator !\[\]\(bd3b31712ad9bab5a241210fa6925cdd_img.jpg\)](#)

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

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

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

[Open Calculator !\[\]\(7bc43b319a082987e20f7bf78f4bab80_img.jpg\)](#)

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



40) Wing Span given Separation Distance between Taxiway and Object

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

[Open Calculator !\[\]\(d3fb9f94af8b26d1c844efa9a98805b0_img.jpg\)](#)

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

41) Wing Span given Wing Tip Clearance

$$\text{fx } WS = S - C - Z$$

[Open Calculator !\[\]\(e1d6102fe77919492c04879c8450f1f5_img.jpg\)](#)

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

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

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

[Open Calculator !\[\]\(ab4e2b3fc7e7887b7a72f548aa6f5e60_img.jpg\)](#)

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

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

$$\text{fx } Z = S - WS - C$$

[Open Calculator !\[\]\(5abce1a84a655b073239ab33e1199487_img.jpg\)](#)

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



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

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

[Open Calculator !\[\]\(9dfdaff1d86ba3c1f8353b4d1b61b8c5_img.jpg\)](#)

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



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)
- **S₂** Distance for Transition from Main gear Touchdown (Meter)
- **S₃** Distance for Deceleration in Normal Braking 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**, $\sin(\text{Angle})$
Trigonometric sine function
- **Function:** **sqrt**, $\sqrt{\text{Number}}$
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 ($^{\circ}$)
Angle Unit Conversion 
- **Measurement:** **Kinematic Viscosity** in Square Meter per Second (m^2/s)
Kinematic Viscosity Unit Conversion 



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