Important Turning Radius Formulas PDF

Formulas
Examples
with Units

List of 19
Important Turning Radius Formulas

1) Deceleration given Sight Distance Formula

Evaluate Formula

Formula

$$d = \frac{V_{Turning\ Speed}^2}{25.5 \cdot SD}$$

Example with Units

$$32.6797\ m^2/s = \frac{50\ km/h^2}{25.5 \cdot 3\ m}$$

2) Deflection Angle of Entrance Curve Formula

Evaluate Formula

Formula

$$D_1 = \frac{180 \cdot L_1}{\pi \cdot R_{Taxiway}}$$

Example with Units

$$21.7292\ rad = \frac{180 \cdot 20.1\ m}{3.1416 \cdot 53\ m}$$

3) Deflection Angle of Entrance Curve given Deflection of Angle at Central Curve Formula

Evaluate Formula

Formula

$$D_1 = 35 - D_2$$

Example with Units

$$21\ rad = 35 - 14\ rad$$

4) Deflection of Angle at Central Curve Formula

Evaluate Formula

Formula

$$D_2 = 35 - D_1$$

Example with Units

$$14\ rad = 35 - 21\ rad$$

5) Deflection of Angle at Central Curve when Length of Central Curve is considered Formula

Evaluate Formula

Formula

$$D_2 = \frac{180 \cdot L2}{\pi \cdot R2}$$

Example with Units

$$14.0993\ rad = \frac{180 \cdot 25.1\ m}{3.1416 \cdot 102\ m}$$

6) Distance between Midway Points of Main Gears and Edge of Taxiway Pavements Formula

Evaluate Formula

Formula

$$D_{Midway} = \left(0.5 \cdot T_{Width}\right) - \left(0.388 \cdot \frac{W^2}{R_{Taxiway}}\right)$$

Example with Units

$$17.7897\,\text{m} = \left(0.5 \cdot 45.1\,\text{m}\right) - \left(0.388 \cdot \frac{25.5\,\text{m}^2}{53\,\text{m}}\right)$$

7) Horonjeff Equation for Turning Radius of Taxiway Formula

Evaluate Formula

Formula

$$R_{Taxiway} = \frac{0.388 \cdot W^2}{\left(0.5 \cdot T_{Width}\right) - D_{Midway}}$$

Example with Units

$$52.8925\,\text{m} = \frac{0.388 \cdot 25.5\,\text{m}^2}{\left(0.5 \cdot 45.1\,\text{m}\right) - 17.78\,\text{m}}$$

8) Length of Central Curve Formula

Evaluate Formula

Formula

$$L2 = \frac{\pi \cdot R2 \cdot D_2}{180}$$

Example with Units

$$24.9233\,\text{m} = \frac{3.1416 \cdot 102\,\text{m} \cdot 14\,\text{rad}}{180}$$

9) Length of Entrance Curve when Deflection Angle of Entrance Curve is considered Formula

Evaluate Formula

Formula

$$L_1 = \frac{\pi \cdot D_1 \cdot R_{Taxiway}}{180}$$

Example with Units

$$19.4255\,\text{m} = \frac{3.1416 \cdot 21\,\text{rad} \cdot 53\,\text{m}}{180}$$

10) Radius of Central Curve given Length of Central Curve Formula

Evaluate Formula

Formula

$$R2 = \frac{180 \cdot L2}{\pi \cdot D_2}$$

Example with Units

$$102.7231\,\text{m} = \frac{180 \cdot 25.1\,\text{m}}{3.1416 \cdot 14\,\text{rad}}$$

11) Radius of Curve when Velocity in Turn Formula

Evaluate Formula

Formula

$$R_{Taxiway} = \left(\frac{V_{Turning\ Speed}}{4.1120}\right)^2$$

Example with Units

$$147.8542\,\text{m} = \left(\frac{50\,\text{km/h}}{4.1120}\right)^2$$

12) Radius of Entrance Curve when Deflection Angle of Entrance Curve is considered Formula

Evaluate Formula

Formula

$$R_{Taxiway} = \frac{180 \cdot L_1}{\pi \cdot D_1}$$

Example with Units

$$54.8402\,\text{m} = \frac{180 \cdot 20.1\,\text{m}}{3.1416 \cdot 21\,\text{rad}}$$

13) Sight Distance Formula

Evaluate Formula

Formula

$$SD = \frac{V_{Turning\ Speed}^2}{25.5 \cdot d}$$

Example with Units

$$3.0073\,\text{m} = \frac{50\,\text{km/h}^2}{25.5 \cdot 32.6\,\text{m}^2/\text{s}}$$

14) Taxiway Width given Turning Radius Formula

Evaluate Formula

Formula

$$T_{Width} = \frac{\left(\frac{0.388 \cdot W^2}{R_{Taxiway}}\right) + D_{Midway}}{0.5}$$

Example with Units

$$45.0806\,\text{m} = \frac{\left(\frac{0.388 \cdot 25.5\,\text{m}^2}{53\,\text{m}}\right) + 17.78\,\text{m}}{0.5}$$

15) Turning Radius Formula

Evaluate Formula

Formula

$$R_{Taxiway} = \frac{V_{Turning\ Speed}^2}{125 \cdot \mu_{Friction}}$$

Example with Units

$$7.716\,\text{m} = \frac{50\,\text{km/h}^2}{125 \cdot 0.2}$$

16) Turning Speed of Aircraft given Radius of Curve Formula

Evaluate Formula

Formula

$$V_{Turning\ Speed} = \sqrt{R_{Taxiway} \cdot \mu_{Friction} \cdot 125}$$

Example with Units

$$36.4005\,\text{km/h} = \sqrt{53\,\text{m} \cdot 0.2 \cdot 125}$$

17) Turning Speed of Aircraft given Sight Distance Formula

Evaluate Formula

Formula

$$V_{Turning\ Speed} = \sqrt{25.5 \cdot d \cdot SD}$$

Example with Units

$$49.939\,\text{km/h} = \sqrt{25.5 \cdot 32.6\,\text{m}^2/\text{s} \cdot 3\,\text{m}}$$

18) Velocity in Turn Formula

Evaluate Formula

Formula

$$V_{Turning\ Speed} = 4.1120 \cdot R_{Taxiway}^{0.5}$$

Example with Units

$$107.7689\,\text{km/h} = 4.1120 \cdot 53\,\text{m}^{0.5}$$

19) Wheelbase given Turning Radius Formula

Evaluate Formula

Formula

$$W = \sqrt{\frac{\left(R_{Taxiway} \cdot \left(0.5 \cdot T_{Width}\right)\right) - D_{Midway}}{0.388}}$$

Example with Units

$$55.0859\,\text{m} = \sqrt{\frac{\left(53\,\text{m} \cdot \left(0.5 \cdot 45.1\,\text{m}\right)\right) - 17.78\,\text{m}}{0.388}}$$

Variables used in list of Turning Radius Formulas above

- **d** Deceleration *(Square Meter per Second)*
- D_1 Deflection Angle of Entrance Curve *(Radian)*
- D_2 Deflection Angle of Central Curve *(Radian)*
- D_{Midway} Distance between Midway Points *(Meter)*
- L_1 Length of Entrance Curve *(Meter)*
- **L2** Length of Central Curve *(Meter)*
- $R_{Taxiway}$ Radius of Curve for Taxiway *(Meter)*
- **R2** Radius of Central Curve *(Meter)*
- **SD** Sight Distance *(Meter)*
- T_{Width} Taxiway Width *(Meter)*
- $V_{Turning\ Speed}$ Turning Speed of Aircraft *(Kilometer per Hour)*
- **W** Wheelbase *(Meter)*
- $\mu_{Friction}$ Coefficient of Friction

Constants, Functions, Measurements used in list of Turning Radius Formulas above

- constant(s): **pi**, 3.14159265358979323846264338327950288 *Archimedes' constant*
- Functions: **sqrt**, sqrt(Number) *A square root function is a function that takes a non-negative number as an input and returns the square root of the given input number.*
- Measurement: **Length** in Meter (m) *Length Unit Conversion*
- Measurement: **Speed** in Kilometer per Hour (km/h) *Speed Unit Conversion*
- Measurement: **Angle** in Radian (rad) *Angle Unit Conversion*
- Measurement: **Kinematic Viscosity** in Square Meter per Second (m²/s) *Kinematic Viscosity Unit Conversion*

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