# Autodesk Inventor Engineer s Handbook

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Engineer s Handbook

# Plate Calculator

[ قابل توجه خوانندگان عزیز: کلیه مطالب این هندبوک از سایت شرکت Autodesk کپی برداری شده است.]

# Circular flat plates

Cross section size

$A = \pi R^2$

*Edge supported around the circumference, load distributed uniformly over the surface*

*Maximum stress*

$$\sigma = \frac{0.39F}{t^2}$$

*Deflection*

$$d = \frac{0.221FR^2}{Et^3}$$

*Rotation at support position*

$$\varphi = \frac{FR}{\pi Et^3}$$

*Edge fixed around circumference, load distributed uniformly over the surface*

*Maximum stress*

$$\sigma = \frac{0.24F}{t^2}$$

*Deflection*

$$d = \frac{0.0543FR^2}{Et^3}$$

*Edge supported around the circumference, load concentrated at the center*

*Maximum stress*

$$\sigma = \frac{0.48F}{t^2}\left[1 + 1.3\log_e\frac{R}{0.325\,t} - 0.0185\frac{t^2}{R^2}\right]$$

*Deflection*

$$d = \frac{0.55FR^2}{Et^3}$$

*Rotation at support position*

$$\varphi = \frac{0.667FR}{Et^3}$$

*Edge fixed around circumference, load concentrated at the center*

*Maximum stress*

$$\sigma = \frac{0.62F}{t^2}\left[\log_e\frac{R}{0.325\,t} + 0.0264\frac{t^2}{R^2}\right]$$

*Deflection*

$$d = \frac{0.22FR^2}{Et^3}$$

*Strength check*

$\sigma_{max} \leq S_y / k_s$

$k_s \leq k$

# Square flat plates

Cross section size

$A = L^2$

*Square flat plate supported at all four edges and a load distributed uniformly over the surface of the plate.*

*Max. stress*

$$\sigma = \frac{0.29F}{t^2}$$

*Deflection*

$$d = \frac{0.0443FL^2}{Et^3}$$

*Square flat plate with all edges firmly fixed and a load distributed uniformly over the surface of the plate.*

*Max. stress*

$$\sigma = \frac{0.31F}{t^2}$$

*Deflection*

$$d = \frac{0.0138FL^2}{Et^3}$$

*Square flat plate with all edges firmly fixed and a uniform load over small circular area at the center.*

*Max. stress*

$$\sigma = \frac{0.62F}{t^2}\log_e\left(\frac{L}{2r_0}\right)$$

where:

$r_0$ = radius of area to which load is applied. If $r_0 < 1.7t$, use $r_s$ where $r_s = \sqrt{(1.6r_0^2 + t^2)} - 0.675t$.

*Deflection*

$$d = \frac{0.0568 F L^2}{E t^3}$$

*Square flat plate with all edges supported above and below, or below only, and a concentrated load at the center.*

*Max. stress*

$$\sigma = \frac{0.62F}{t^2}\left[\log_e\left(\frac{L}{2r_0}\right) + 0.577\right]$$

*Deflection*

$$d = \frac{0.1266 F L^2}{E t^3}$$

*Strength check*

$\sigma_{max} \leq S_y / k_s$

$k_s \leq k$

# Rectangular flat plates

Cross section size

A = L 1

*Rectangular plate with all edges supported at top and bottom and a load distributed uniformly over the surface of the plate.*

*Max. stress*

$$\sigma = \frac{0.75F}{t^2\left(\frac{L}{l} + 1.61\frac{l^2}{L^2}\right)}$$

*Deflection*

$$d = \frac{0.1422F}{E\,t^3\left(\frac{L}{l^3} + \frac{2.21}{L^2}\right)}$$

*Rectangular plate with all edges fixed and a load distributed uniformly over the surface of the plate.*

*Max. stress*

$$\sigma = \frac{0.5F}{t^2\left(\frac{L}{l} + \frac{0.623\,l^5}{L^5}\right)}$$

*Deflection*

$$d = \frac{0.0284\,F}{E\,t^3\left(\frac{L}{l^3} + \frac{1.056\,l^2}{L^4}\right)}$$

*Strength check*

$\sigma_{max} \leq S_y / k_s$

$k_s \leq k$

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