

Architectural Engineer's Solutions Suite

Platform: Windows
Includes Mathcad Engine
Available for ground shipment



This Mathcad electronic book is a rendering of selections from *Hick's Standard Handbook of Engineering Calculations* by McGraw-Hill. Solve structural design problems with this interactive software resource which contains text, tables, graphs, and diagrams in addition to 200 formulas and equations. This fully-interactive CD-ROM supplies builders, designers, planners, and architectural engineers with all the tools they need to find the right equation and solve a problem in an instant.

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ANALYSIS OF A STEEL HANGER

A 12 1/2 in (305 12.7 mm) steel plate is to support a tensile load applied 2.2 in (55.9 mm) from its center. Determine the ultimate load.

Calculation Procedure:

1. Determine the distance x

Figure 2a is the load diagram, and Fig. 2b is the stress diagram at plastification. The latter may be replaced for convenience with the stress diagram in Fig. 2c, where $T_1 = C$; P_u = ultimate load; e = eccentricity; M_u = ultimate moment = $P_u e$; f_y = yield-point stress; d = depth of section; t = thickness of section

By using Fig. 2c,

$$P_u = T_1 = f_y t (d - 2x)$$

Also, $T_1 = f_y t x$, and $M_u = P_u e = T_1 (d - x)$, so

$$x = \frac{d}{2} + e - \left[\left(\frac{d}{2} + e \right)^2 - e d \right]^{0.5}$$

2. Find P_u

By Eq. 1, $P_u = 36,000(0.50)(12 - 3.62) = 15$

Mathcad Engine - [Architectural Eng. Solutions Suite: Struct. Equations]

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1. Determine the distance x

$t := 0.5 \text{ in}$ $e := 2.2 \text{ in}$

$d := 12 \text{ in}$ $f_y := 36000 \text{ psi}$

$$x := \frac{d}{2} + e - \sqrt{\left(\frac{d}{2} + e \right)^2 - e d}$$

$x = 1.809 \text{ in}$

2. Find P_u

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The Architectural Engineer's Solutions Suite includes topics such as plumbing and drainage systems, HVAC systems, solar heating and cooling systems, wind-stress analysis, vibration, design of connections, and column and beam design.

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