

## Resumen de factores teóricos y experimentales para el análisis de la resistencia a la fatiga

**A. Cálculo de la resistencia:**

$$S_{10^3} = C_{L'} C_T S_u$$

$$S_n = C_L C_D C_S C_T S_{n'}$$

$$S_{n'} = 0,5 S_u$$

A.1 Factor de corrección por tipo de carga ( $C_L$  y  $C_{L'}$ ):

A.1.1 Para  $S_n$ :

- Flexión  $C_L = 1$
- Carga Axial  $C_L = 0.9$
- Torsión  $C_L = 0.58$

A.1.2 Para  $S_{10^3}$ :

- Flexión  $C_{L'} = 0.9$
- Carga Axial  $C_{L'} = 0.75$
- Torsión  $C_{L'} = 0.72$

A.2 Factor de corrección por tamaño de la pieza ( $C_D$ ):

- Carga Axial  $C_D = 1$  si  $d \leq 2''$
- Flexión o Torsión  $C_D = 1$  si  $d \leq 0.4''$
- Flexión o Torsión  $C_D = 0.9$  si  $0.4'' < d \leq 2''$
- Para todo tipo de carga  $C_D = 0.75$  si  $d > 2''$

A.3 Factor de corrección por acabado superficial ( $C_S$ ):

Ver Fig. 12.6

A.4 Factor de corrección por temperatura ( $C_T$ ):

$$C_T = 1 \text{ si } T \leq 450 \text{ }^\circ\text{C}$$

$$C_T = 1 - 5.8 \times 10^{-3}(T - 450 \text{ }^\circ\text{C}) \text{ si } 450 \text{ }^\circ\text{C} < T < 550 \text{ }^\circ\text{C}$$

**B. Cálculo de los esfuerzos:**  $\sigma_{\text{real}} = K_f \times \sigma_{\text{nominal}}$

B.1 Factor de concentración de esfuerzos ( $K_f$ ):

$$K_f = q (K_t - 1) + 1$$

$K_t$  = factor geométrico de concentración de esfuerzos (ver gráficos)

$q$  = factor de sensibilidad de Peterson (ver Fig. 13.21)

B.2 Factores  $K_f$  para roscas

Material	Roscas formadas	Roscas mecanizadas
Acero recocido (<200 BHN)	2.2	2.8
Acero templado y revenido (>200 BHN)	3.0	3.8

B.3 Factores  $K_f$  para chaveteros

Material	Chaveteros tipo A		Chaveteros tipo B	
	Flexión	Torsión	Flexión	Torsión
Acero recocido (<200 BHN)	1.6	1.3	1.3	1.3
Acero templado y revenido (>200 BHN)	2.0	1.6	1.6	1.6

B.4 Factores  $K_f$  para ajustes entre árboles y cubos

- Ajuste prensado  $\rightarrow K_f = 2$

- Combinación de ajuste prensado con chaveta o lengüeta  $\rightarrow K_f = 2.5$  a  $3.0$

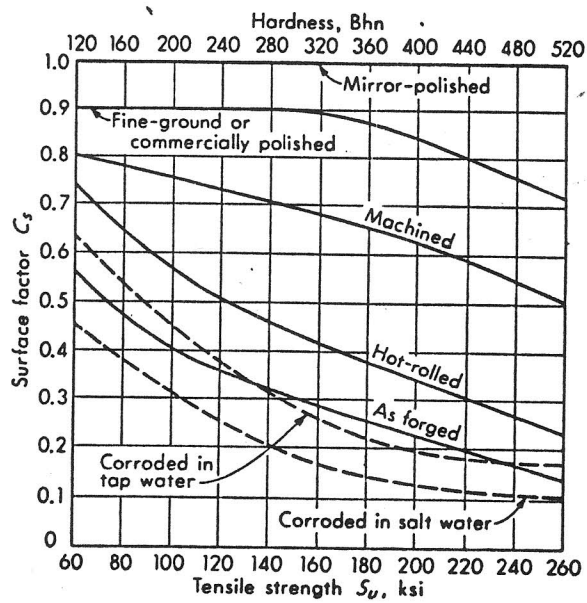


Fig. 12.6 Reduction of endurance strength due to surface finish—steel parts.

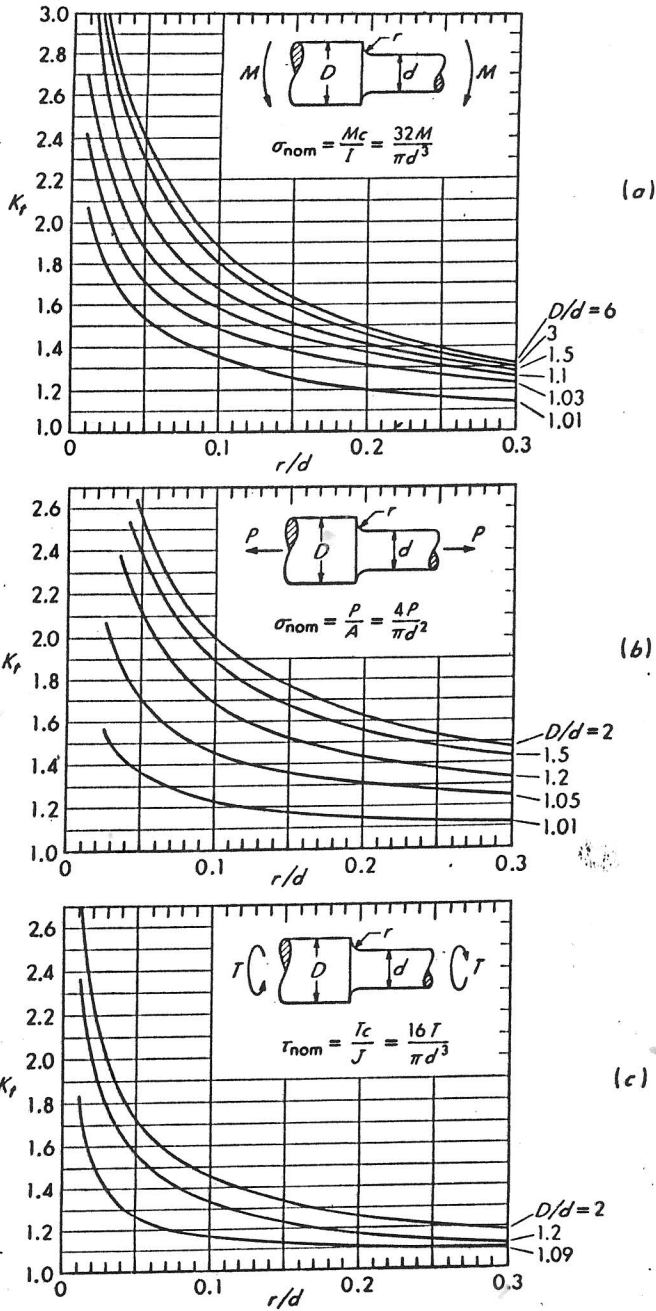


Fig. 13.7 Shaft with fillet (a) bending; (b) axial load; (c) torsion [1].

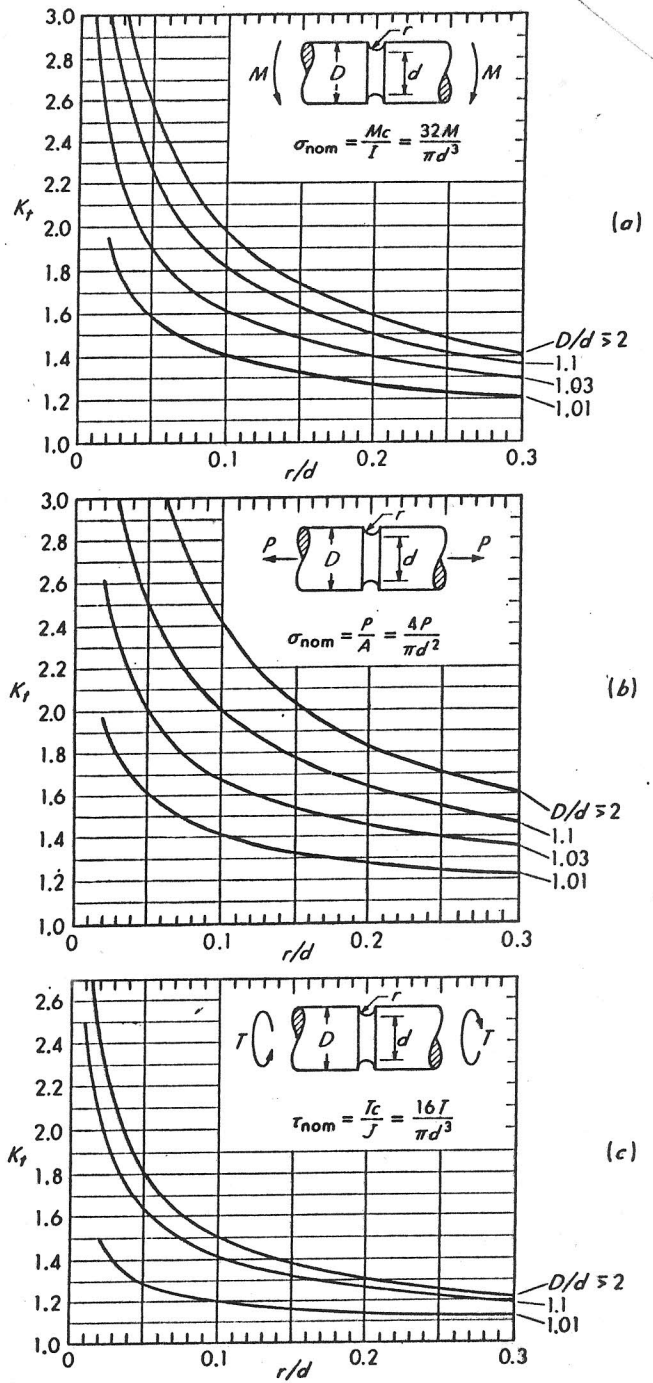


Fig. 13.8 Grooved shaft (a) bending; (b) axial load; (c) torsion [1].

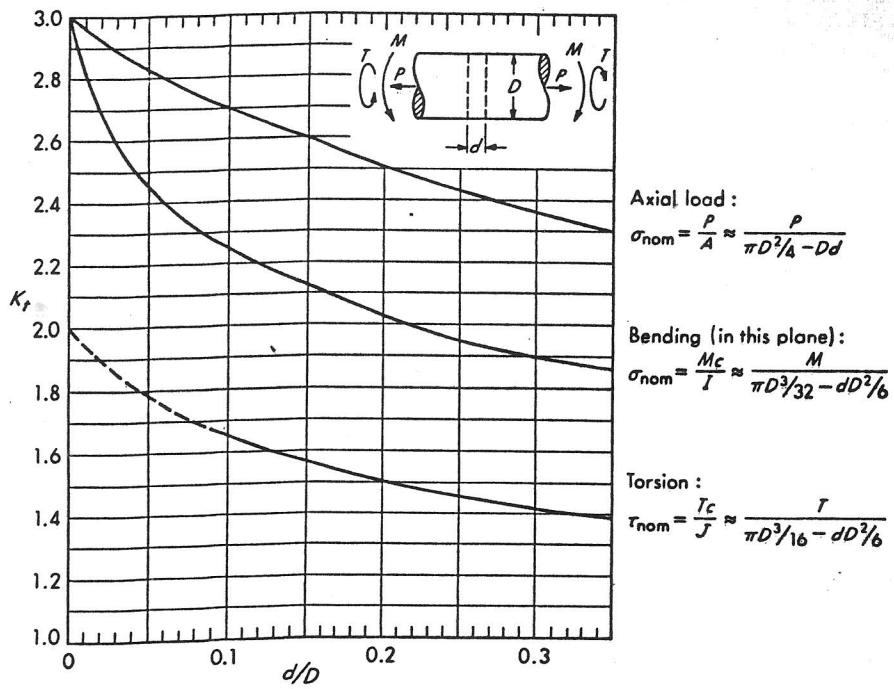


Fig. 13.9 Shaft with radial hole [11].

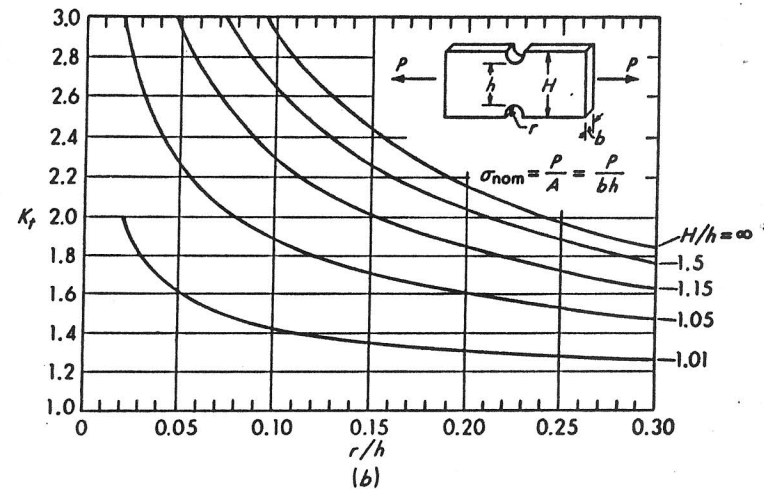
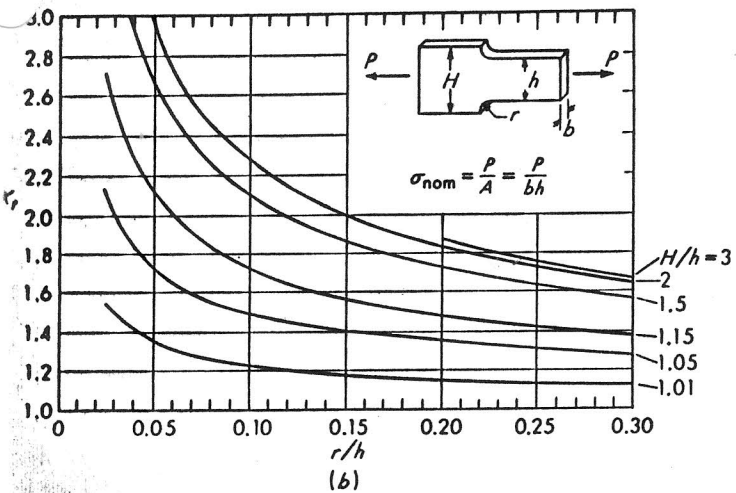
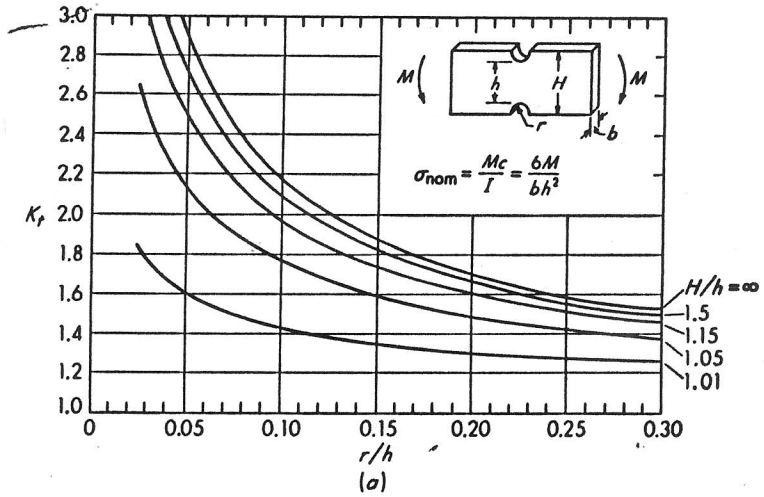
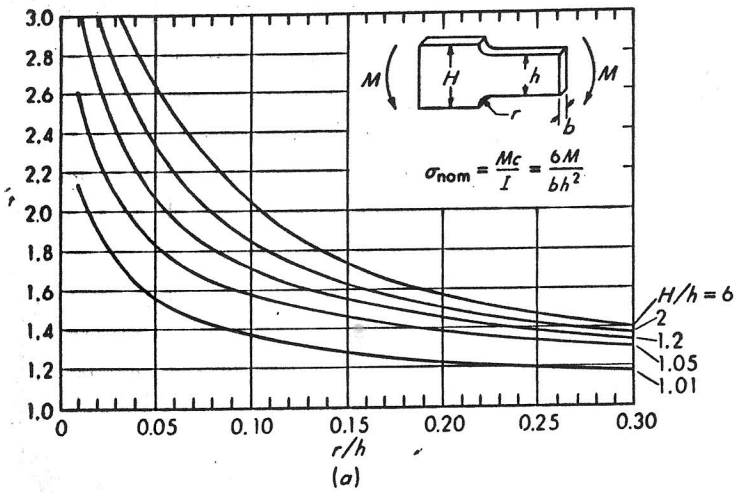


Fig. 13.10 Bar with shoulder fillet (a) bending; (b) axial load [11].

Fig. 13.11 Notched flat bar (a) bending; (b) tension [11].

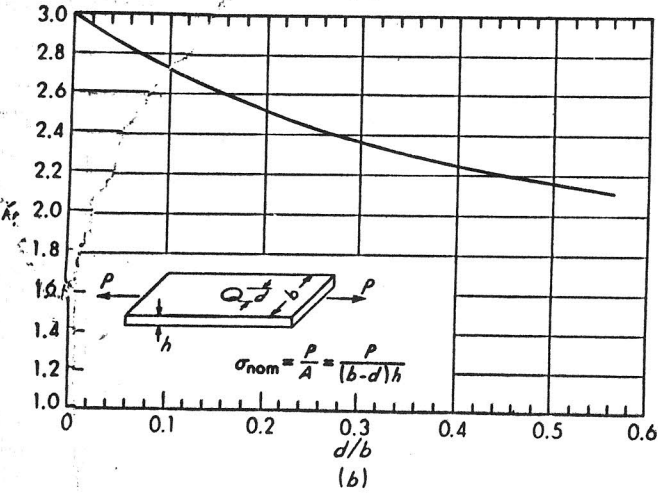
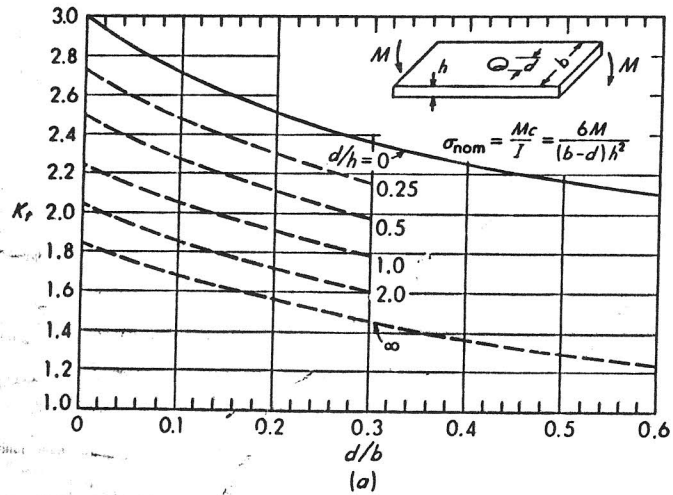


Fig. 13.12 Plate with central hole (a) bending; (b) axial load [11].

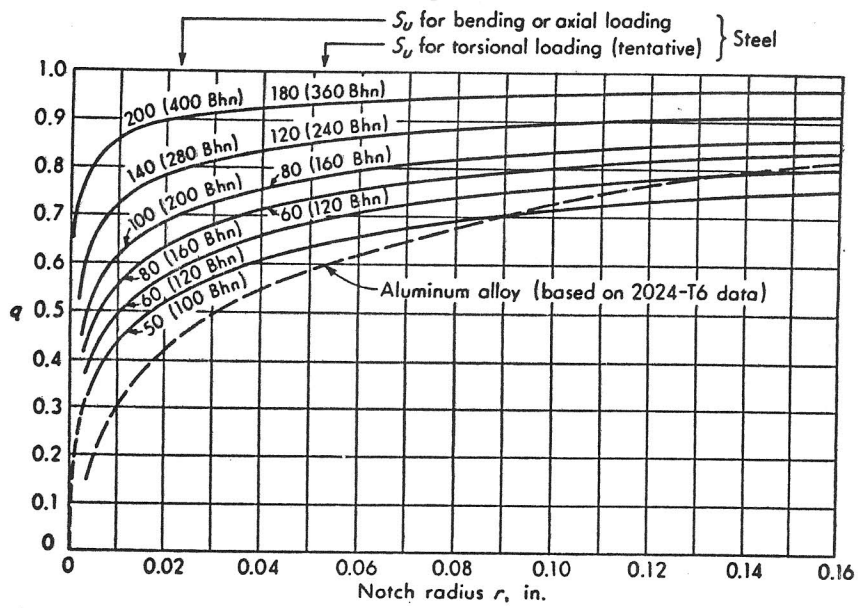


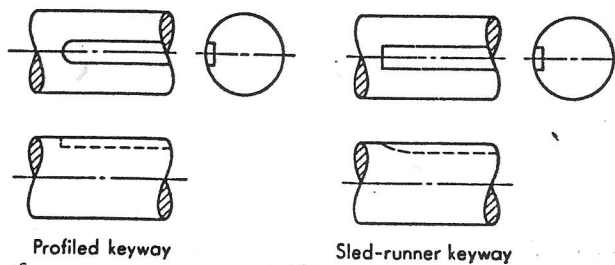
Fig. 13.21 Notch-sensitivity curves for use with theoretical factors  $K_t$ . (After [14].)

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Table 13.2 Fatigue-stress-concentration factors  $K_f$ ; typical values for keyways in solid round steel shafts\*

Steel	Profiled keyway		Sled-runner keyway	
	Bending	Torsion	Bending	Torsion
Annealed (less than 200 Bhn)	1.6	1.3	1.3	1.3
Quenched and drawn (over 200 Bhn)	2.0	1.6	1.6	1.6

Note: Nominal stresses should be based on the section modulus for the total shaft section.



\* From Charles Lipson, G. C. Noll, and L. S. Clock, "Stress and Strength of Manufactured Parts," McGraw-Hill Book Company, New York, 1950; see also [5a].