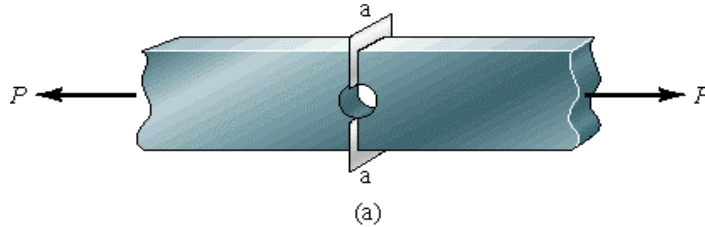


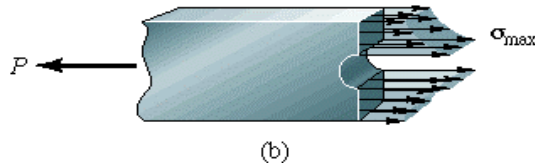
Diseño mecánico y estructural

Grado en Diseño de Producto
Guillermo Filippone

Concentración de tensiones

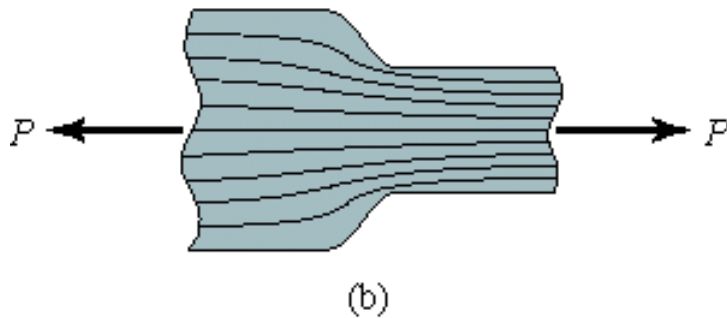
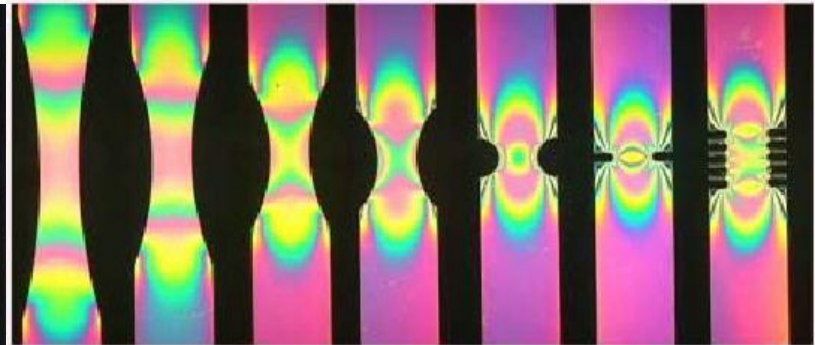


(a) Placa con sección transversal del agujero.

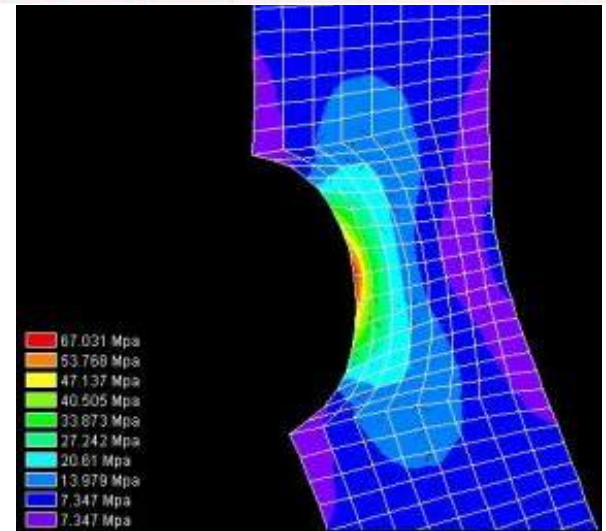


(b) Distribución de esfuerzos.

$$K_c = \frac{\text{Tensión máxima admisible}}{\text{Tensión media}}$$

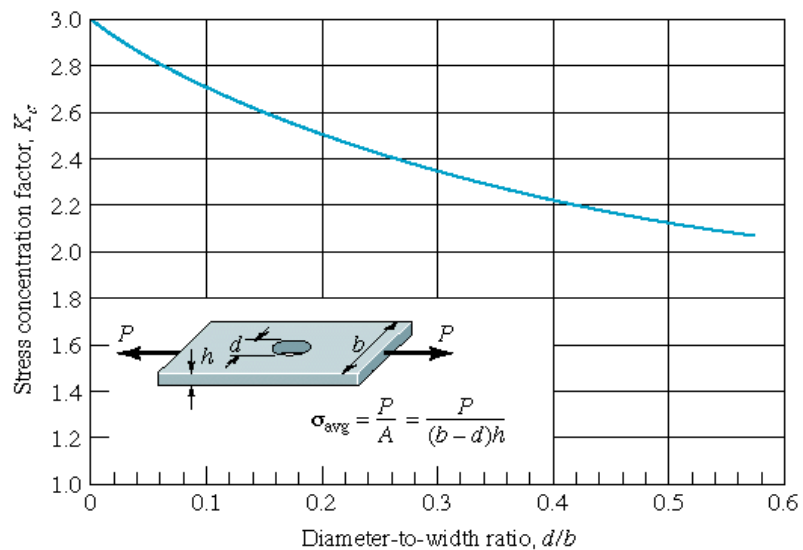


Flujo de tensión



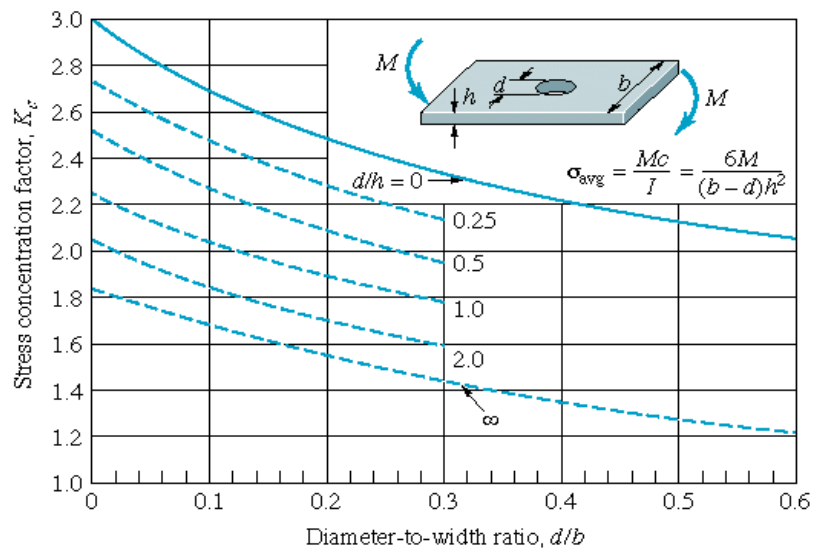
Factor de concentración de tensiones

Carga axial



(a)

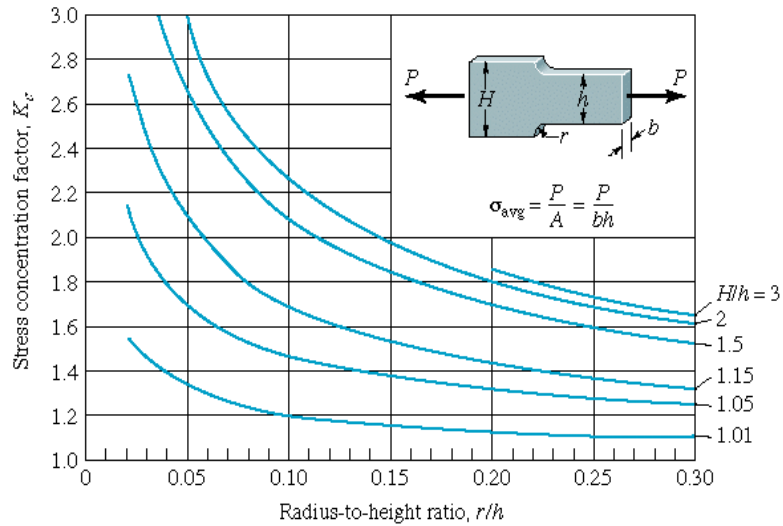
Flexión



(b)

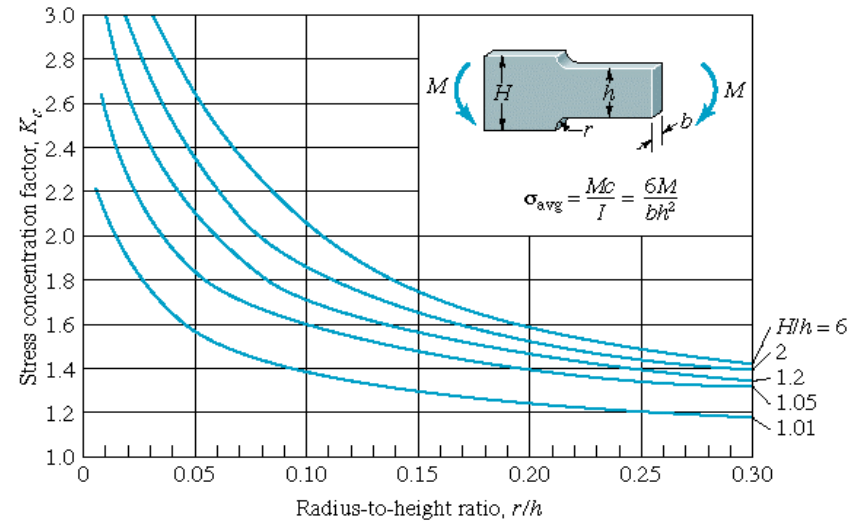
Placa rectangular con agujero

Carga axial



(a)

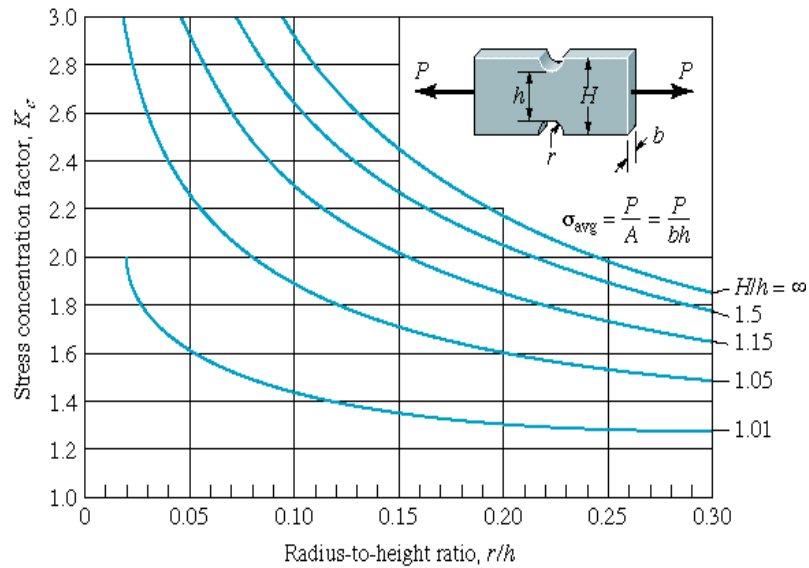
Flexión



(b)

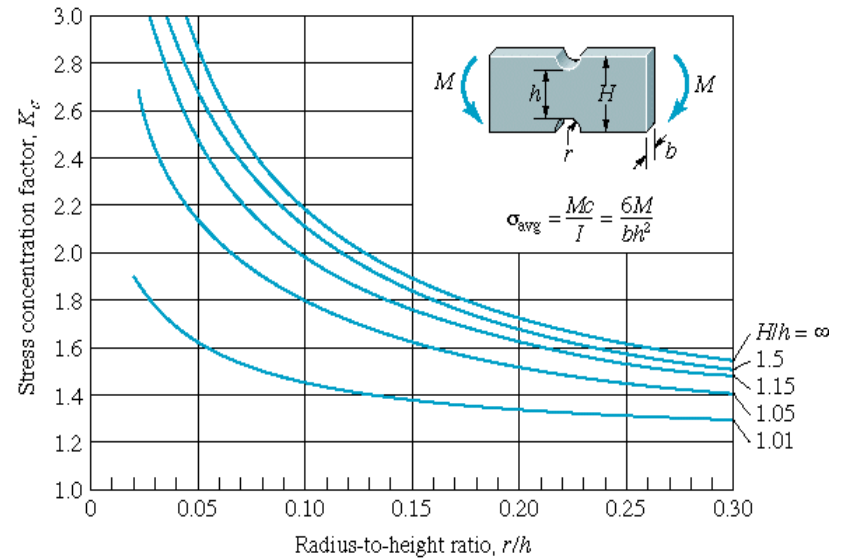
Placa rectangular con rebaje

Carga axial



(a)

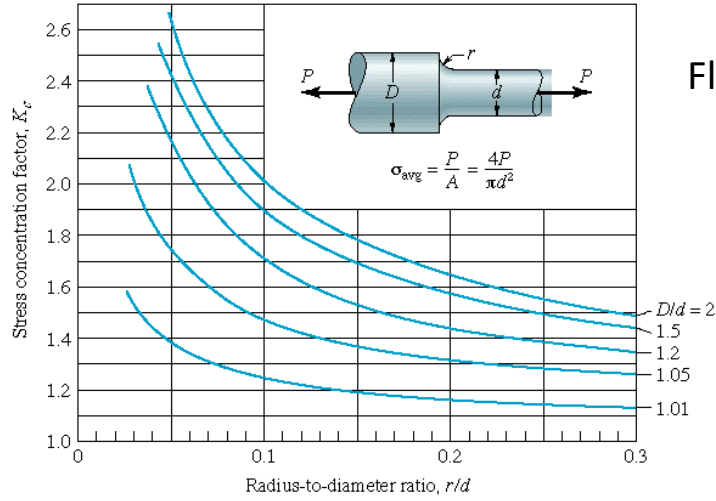
Flexión



(b)

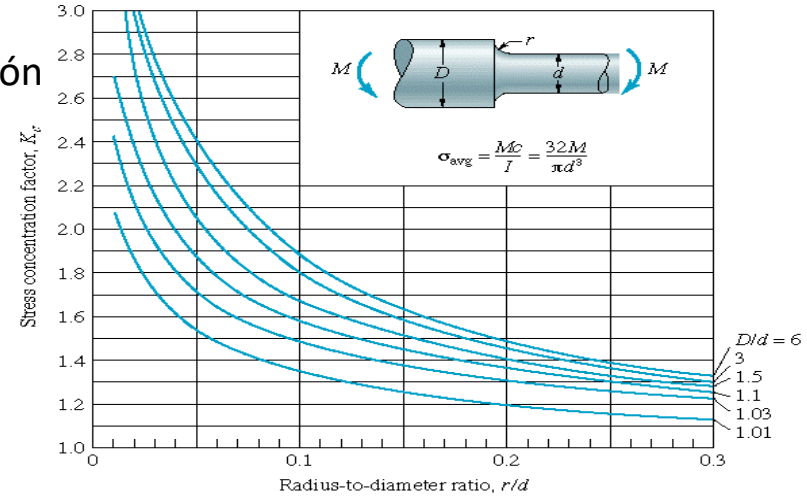
Placa rectangular con muesca

Carga axial



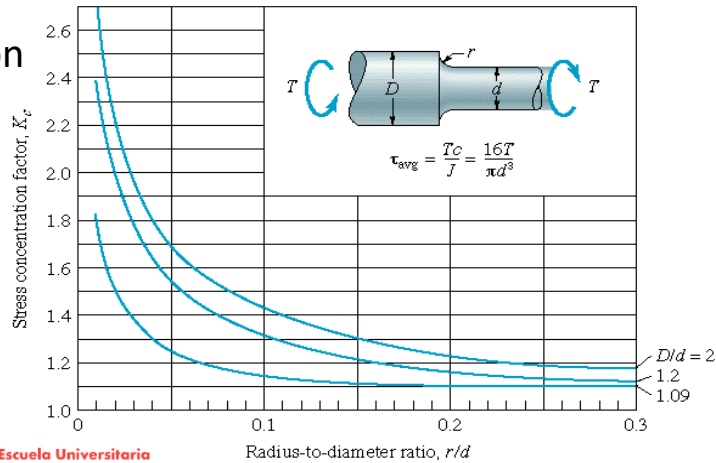
(a)

Flexión



(b)

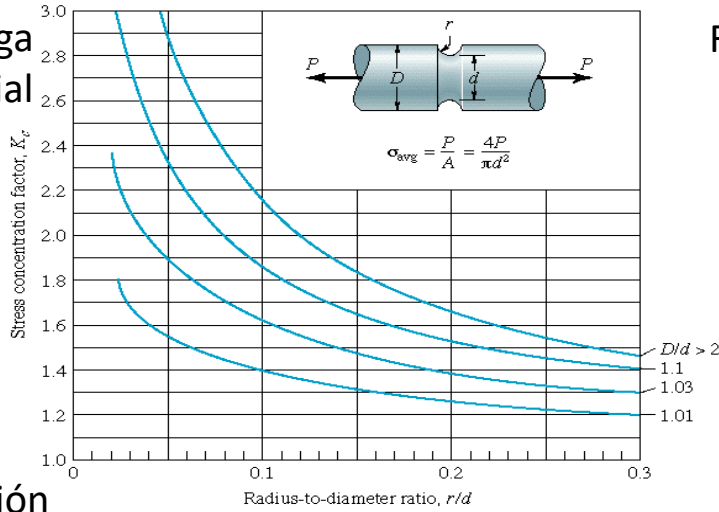
Torsión



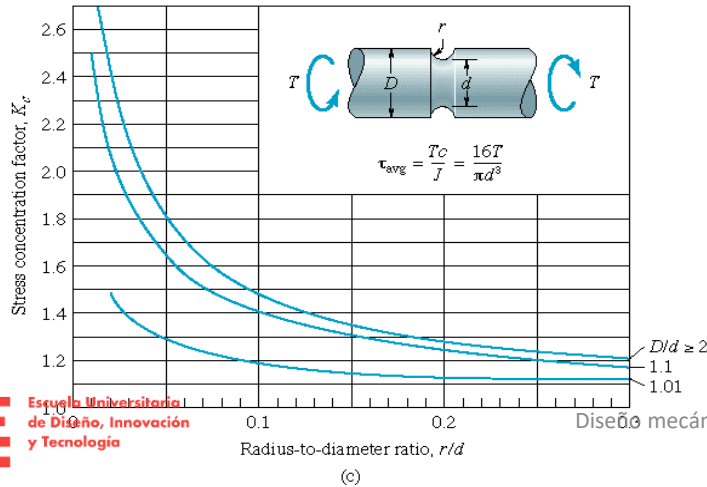
(c)

Barra circular con
reducción de sección

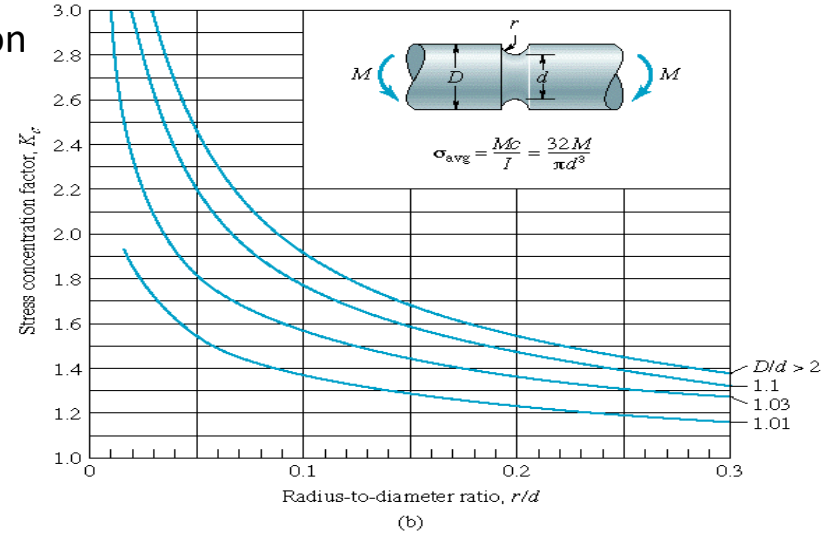
Carga axial



Torsión



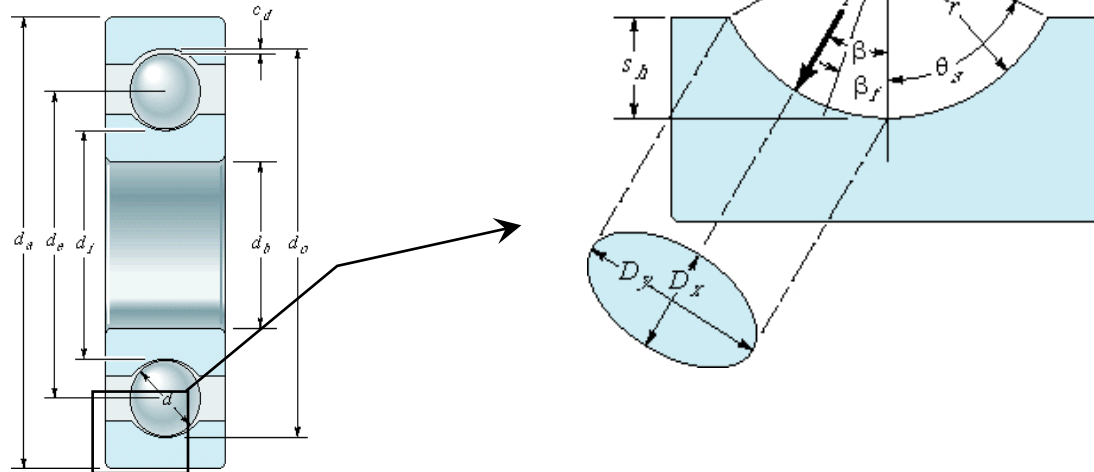
Flexión



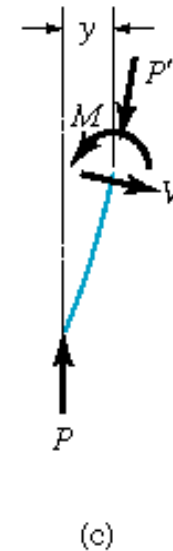
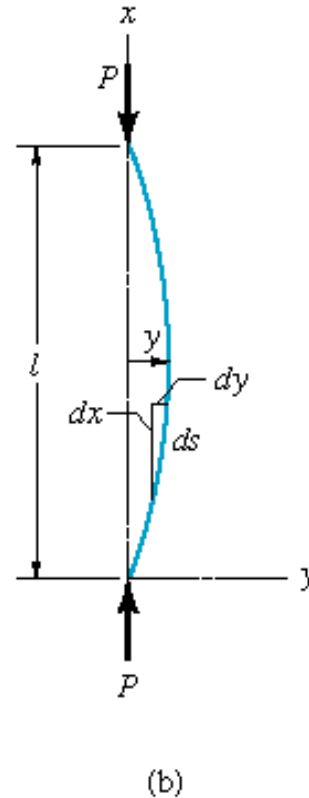
Barra circular acanalada

Otras sollicitaciones

Tensiones de contacto (Hertzianas)



Alabeo de columnas: Pandeo



$$M = -Py$$

$$M = -EI \frac{d^2 y}{dx^2}$$

$$\frac{d^2 y}{dx^2} + \frac{P}{EI} y = 0$$

Tensiones térmicas

Efecto inducido por dilataciones térmicas.

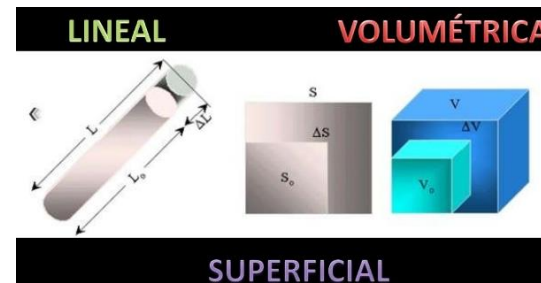
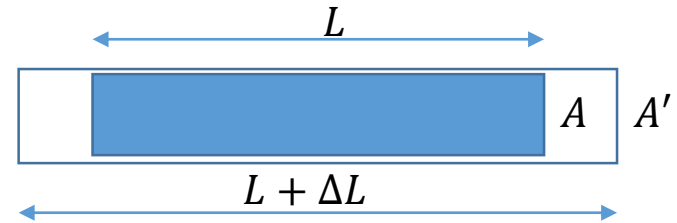
$$\Delta L = \Delta t \alpha L$$

α : Coef. Dilat. térmica ($^{\circ}\text{C}^{-1}$)

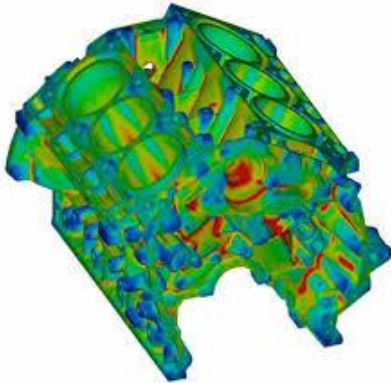
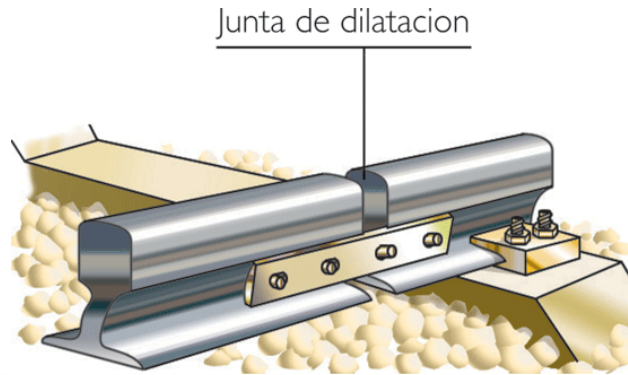
$$F = A E \Delta t \alpha$$

A: Sección (m^2)

E: Módulo de elasticidad (Young) (N/m^2)



Control de las dilataciones



Impacto

IMPACTO mecánico:

se refiere a fuerzas causadas por una brusca aceleración:

- Choque
- Caídas
- Explosión
- Terremotos

Definición analítica

t_L : tiempo de aplicación de la carga

f_N : frecuencia natural

$$t_L \leq \frac{f_N}{2} \quad ; \text{ Impacto (golpe)}$$
$$t_L > 3f_N \quad ; \text{ Carga estática (fuerza)}$$

Impacto

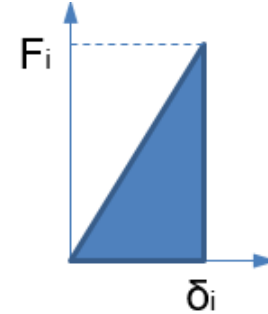
Cuando un sólido elástico es golpeado, se produce una deformación δ_i :



$$E = \frac{1}{2} F_i \delta_i$$

$$k = \frac{F_i}{\delta_i} \Rightarrow \delta_i = F_i / k$$

$$E = \frac{1}{2} F_i^2 / k$$

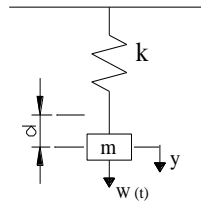


$$E_c = \eta \frac{1}{2} m_L v_i^2$$

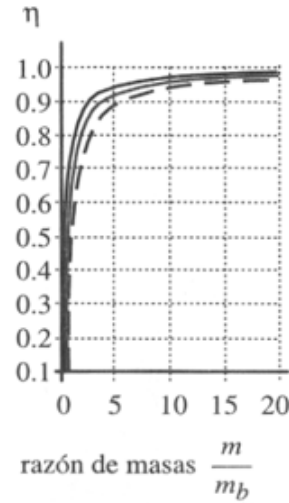
; η : disipación $\Rightarrow \frac{1}{2} \eta m_L v_i^2 = \frac{1}{2} \frac{F_i^2}{k} \Rightarrow$

$$F_i = v_i \sqrt{\eta m_L k}$$

Deformación
estática elástica



$$\frac{F_i}{W} = \frac{\delta_i}{\delta_{st}} \Rightarrow \delta_i = \delta_{st} v_i \sqrt{\frac{\eta}{g \delta_{st}}}$$



Muchas gracias

ESNE

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y Tecnología**