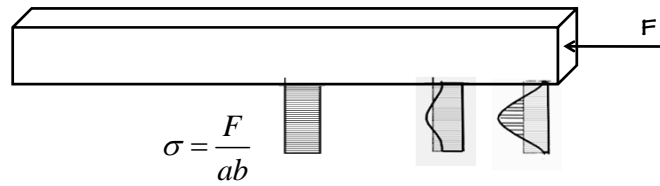




## Concentrazione delle tensioni



Trave rettilinea - principio di Saint Venant



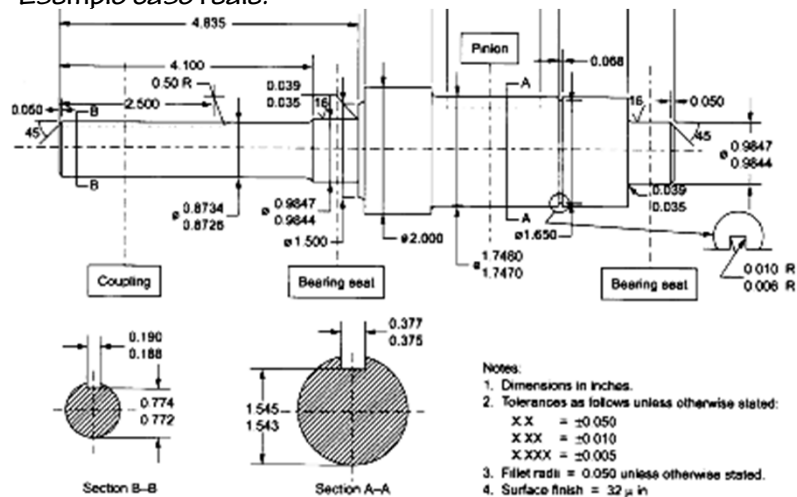
1



## Concentrazione delle tensioni



Esempio caso reale:





## Concentrazione delle tensioni



In generale per un componente reale, la forma, i vincoli e la modalità di applicazione delle forze differiscono da quelli negli schemi di calcolo nominale

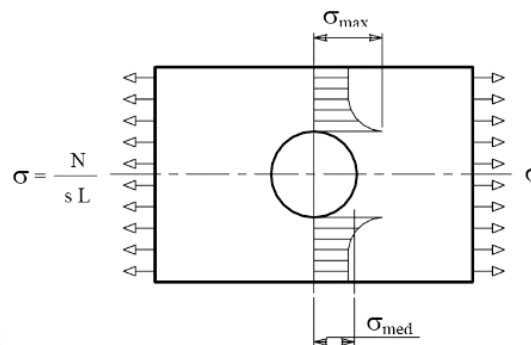
Ad esempio si possono avere:

- Fori in aste, piastre, dischi
- Saldature
- Cave per chiavette e linguette
- Dentature, filettature
- Spallamenti
- Gole
- Accoppiamenti forzati

3



## Concentrazione delle tensioni



$$\sigma_{\max} = K_t \frac{N}{s(L-d)}$$

tensione massima

$$K_t = \frac{\sigma_{\max}}{\sigma_{\text{med}}}$$

coeff. di concentrazione  
delle tensioni teorico

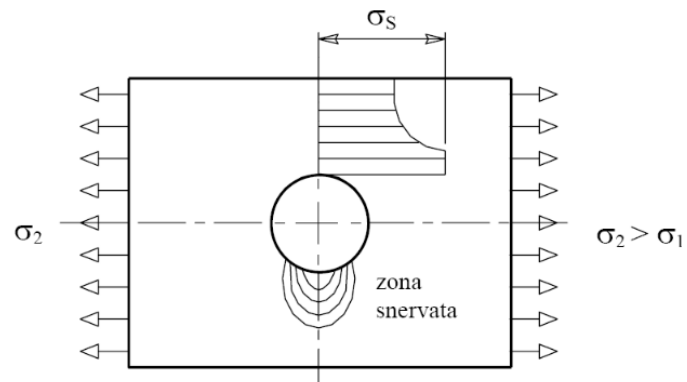
4



### Concentrazione delle tensioni



Materiale duttile



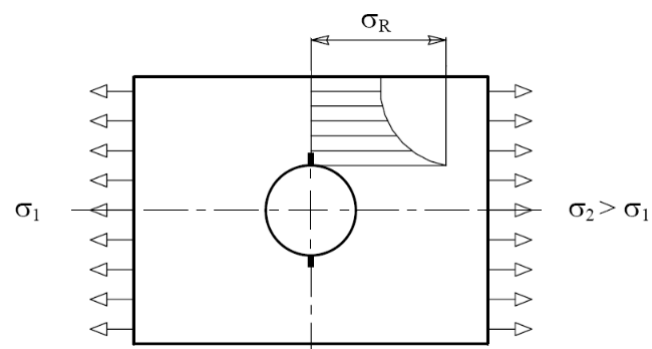
5



### Concentrazione delle tensioni



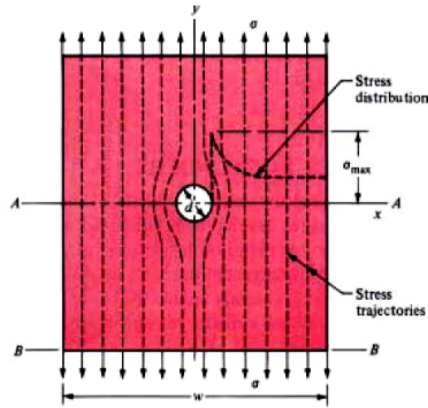
Materiale fragile



6



### Concentrazione delle tensioni



$$K_t = \frac{\sigma_{\max}}{\sigma_{\text{nom}}}$$

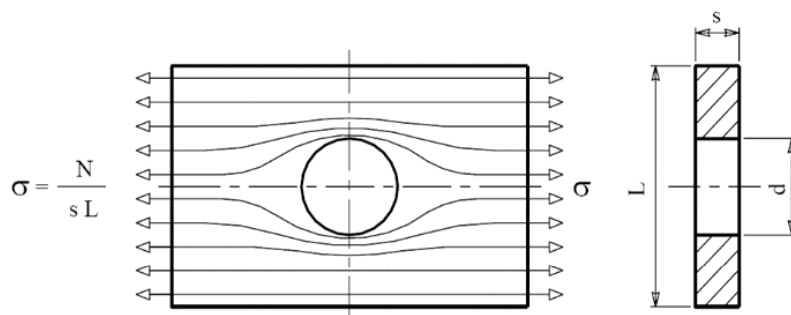
$$\sigma_{\text{nom}} = \frac{F}{A_0}$$

$$A_0 = (w - d)t$$

7



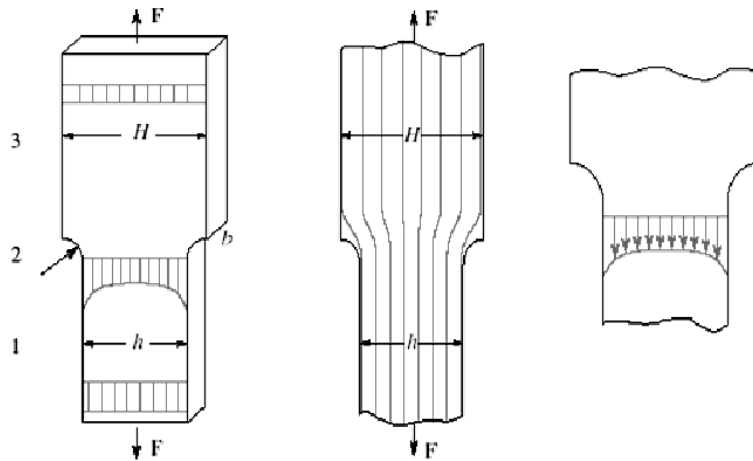
### Concentrazione delle tensioni



8



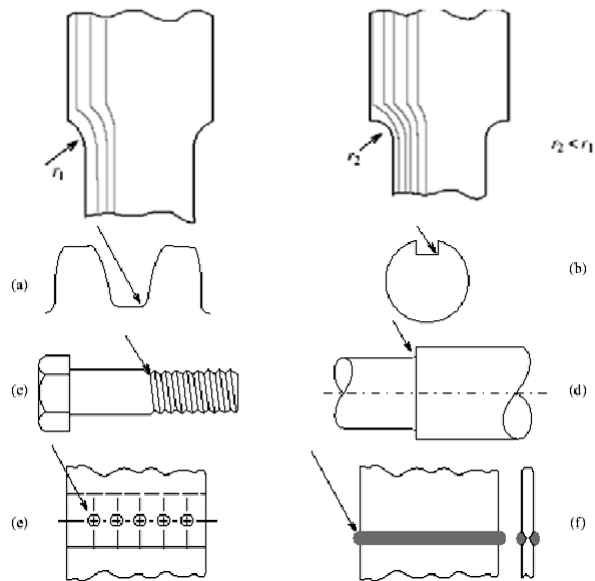
### Concentrazione delle tensioni



9



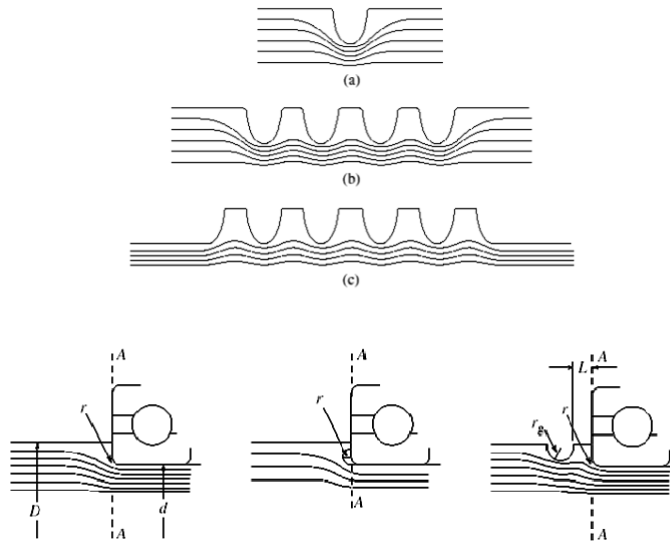
### Concentrazione delle tensioni



10



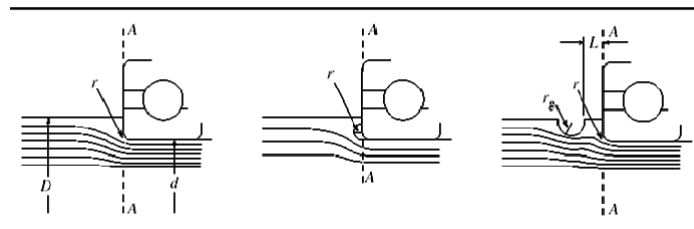
### Concentrazione delle tensioni



11



### Concentrazione delle tensioni



12



## Concentrazione delle tensioni



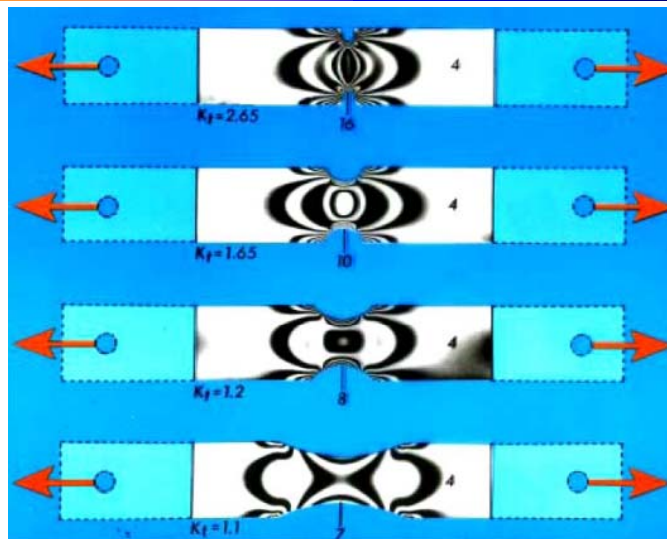
### Metodologie di determinazione

- Calcolo nominale e coefficienti correttivi: grafici
- Analisi sperimentale: misure con strain gauges, metodi ottici, altro.
- Calcoli teorico-analitici dove possibile
- Simulazioni con codici di calcolo numerici agli elementi finiti (CODICI FEM).

13



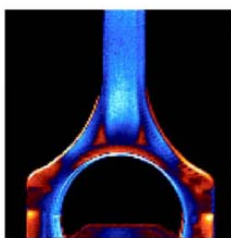
## Concentrazione delle tensioni



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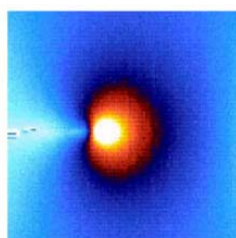
## Concentrazione delle tensioni



Automobile  
Connecting Rod



Hook and Clevis

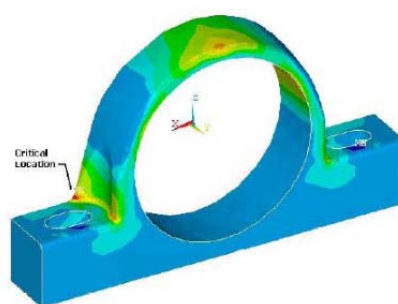
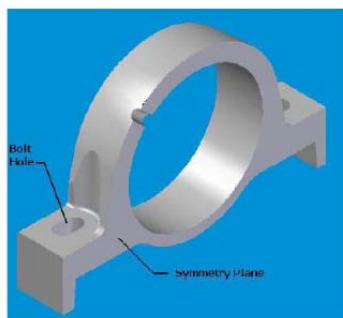


Crack Tip

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## Concentrazione delle tensioni



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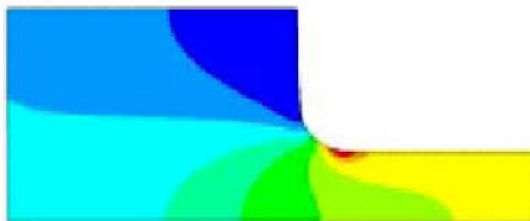




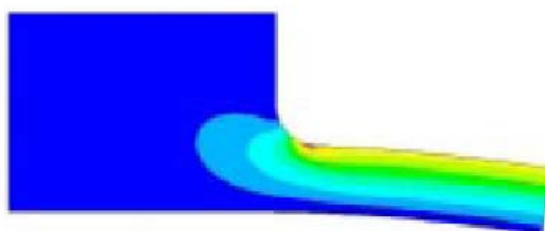
### Concentrazione delle tensioni



Barra rettangolare  
In trazione



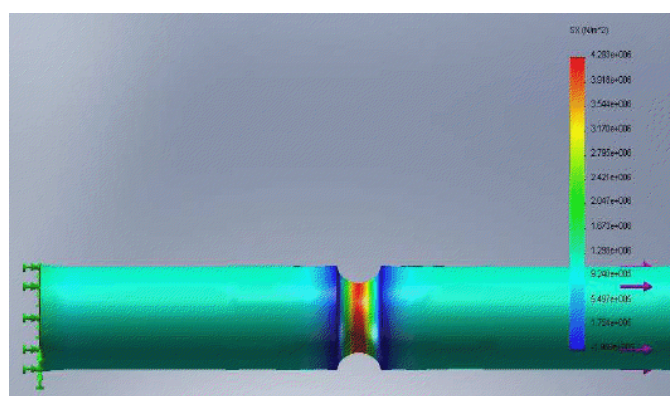
Barra rettangolare  
In flessione



17



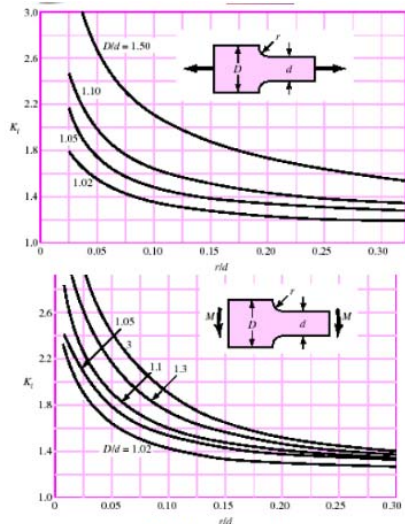
### Concentrazione delle tensioni



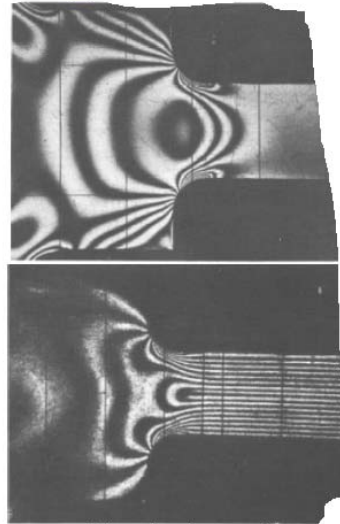
18



### Concentrazione delle tensioni



(Shigley et. al)

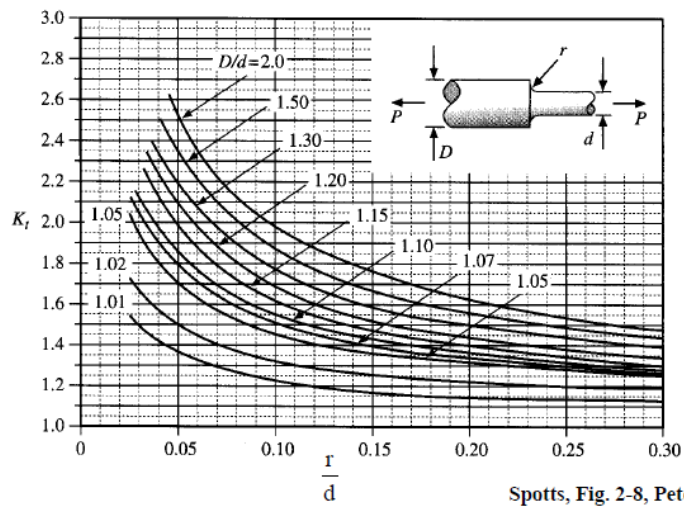


(Timoshenko et. al.)

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### Concentrazione delle tensioni

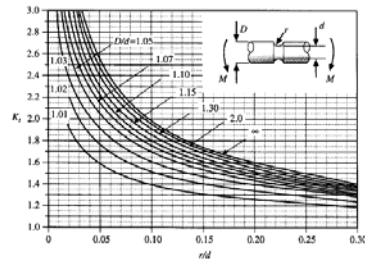
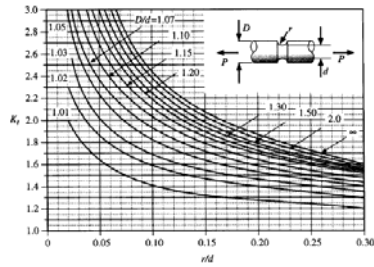
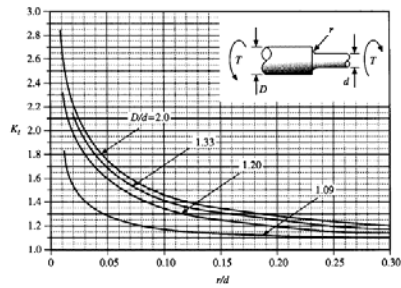
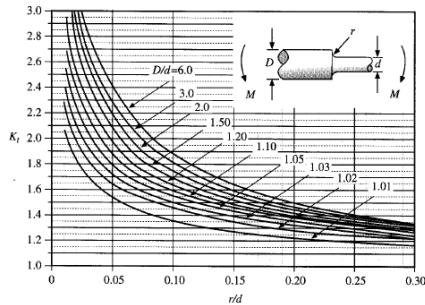


Spotts, Fig. 2-8, Peterson

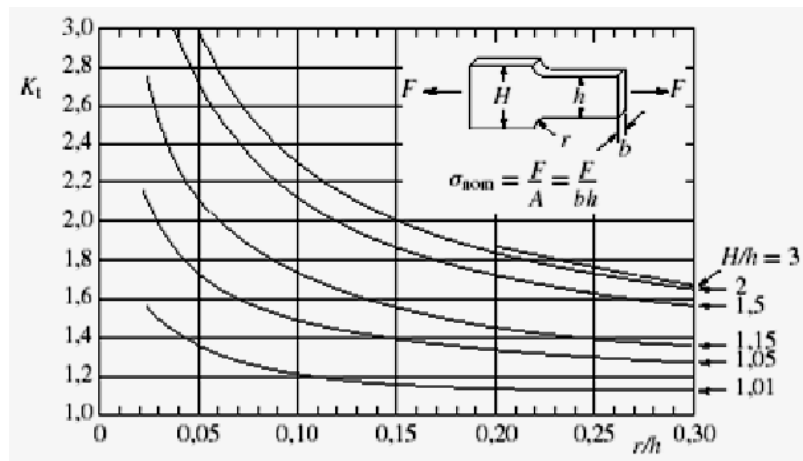
20



### Concentrazione delle tensioni

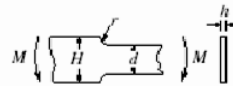
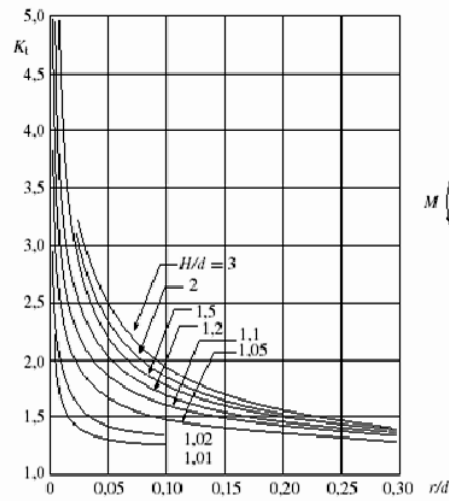


### Concentrazione delle tensioni





## Concentrazione delle tensioni



$$K_t = \frac{\sigma_{\max}}{\sigma_{\text{nom}}}$$
$$\sigma_{\text{nom}} = \frac{6M}{hd^2}$$

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## Concentrazione delle tensioni



The screenshot shows the 'Stress Concentration Factors' software window. It includes a menu bar (File, Edit, Module, Window, Help), a toolbar, and the ETB logo. The main area is divided into several sections:

- Solution Type:** A tree view showing 'Circular Members' selected, with sub-options for 'Shoulder With Fillet', 'Axial Tension', 'Bending', 'Torsion', 'Notches', 'Holes', 'Rectangular Members', and 'Infinite Plates'.
- Input Parameters:** Fields for 'Fillet Radius, r', 'Large Diameter, D', 'Small Diameter, d', and 'Axial Force, P'. The 'Fillet Radius, r' field is currently empty.
- Results:** A table showing calculated values:

Value	Parameter
3.71655E+00	Stress K Factor
2.54647E+01	Nominal Stress
9.34107E+01	Maximum Stress
- Buttons:** 'CALCULATE', 'SHOW DATA', and 'HELP'.

At the bottom, there is a small diagram of a circular member with a fillet and a cross-section view.

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## Concentrazione delle tensioni



Valore del coefficiente teorico di concentrazione delle tensioni

1. è funzione della geometria o/e della forma del componente ma non della dimensione o del materiale;
2. è funzione del tipo di carico applicato al componente;
3. è funzione della specifica variazione di forma del componente: esempio foro o intaglio o spallamento...;
4. è sempre definito rispetto ad un carico nominale;
5. di solito si considera il materiale come lineare elastico, omogeneo ed isotropo.

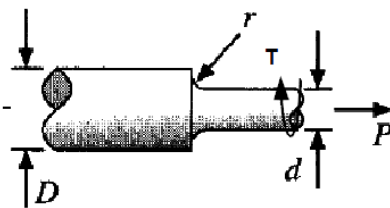
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## Concentrazione delle tensioni



Esempio



$$D = 20 \text{ mm}, r = 1 \text{ mm}, d = 10 \text{ mm}$$

$$T = 40000 \text{ Nmm}$$

$$P = 7500 \text{ N}$$

determinare la sezione critica

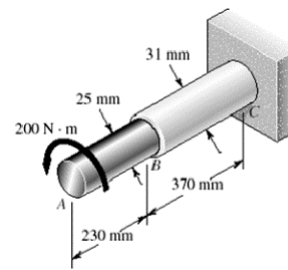
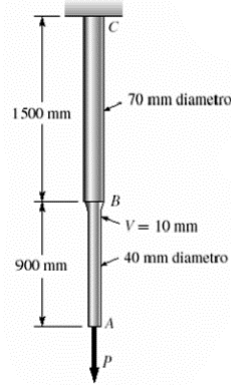
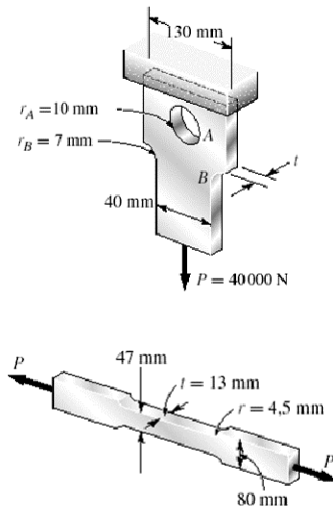
determinare gli sforzi nella sezione critica

trovare le tensioni principali e disegnare i cerchi di Mohr per lo stato tensionale

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## Concentrazione delle tensioni



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