

Lecture # 5.3

Cotter Joints - Sleeve Type

2/4/2026

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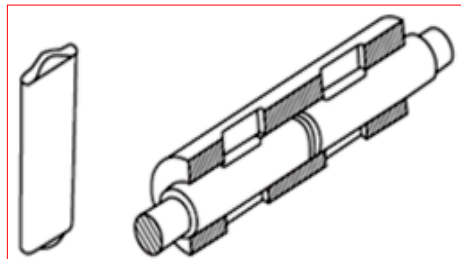
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Cotter Joints

Cotter Joint With Sleeve:

The rod ends are enlarged to take care of the weakening effect caused by the slots.



The slots in the rods and sleeve are made slightly wider than the width of cotter.

The relative positions of the slots are such, that when a cotter is driven into its position, it permits wedging action and pulls the rod into the sleeve.

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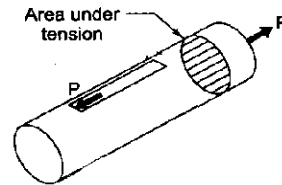
Cotter Joints

Design of Sleeve and cotter joint

If the allowable stresses in tension, compression and shear for the sleeve, rod and cotter be σ_t , σ_c and τ respectively, assuming that they are all made of the same material, we may write the following failure criteria:

1. Tension Failure of rod at diameter d

$$\frac{\pi}{4} d^2 \sigma_t = P$$



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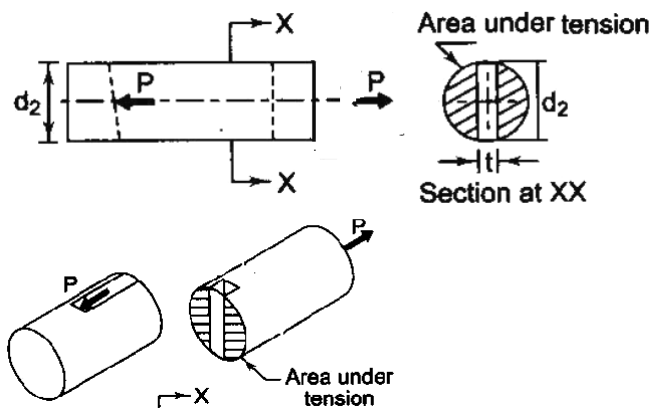
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2. Tension Failure of rod across slot

$$\left(\frac{\pi}{4} d_2^2 - d_2 t\right) \sigma_t = P$$



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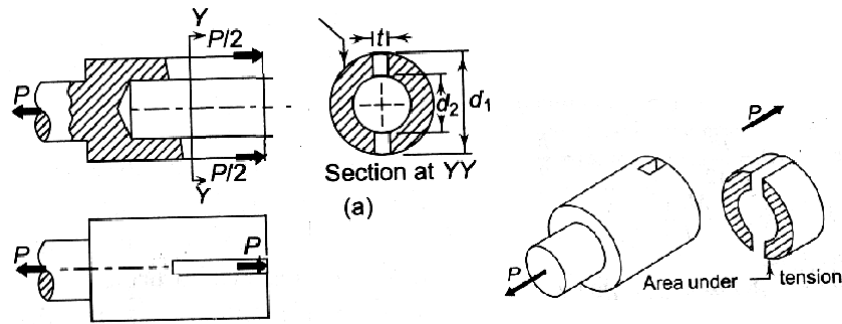
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3. Tension Failure of Sleeve across slot

$$\left\{ \frac{\pi}{4} (d_1^2 - d_2^2) - (d_1 - d_2)t \right\} \sigma_t = P$$



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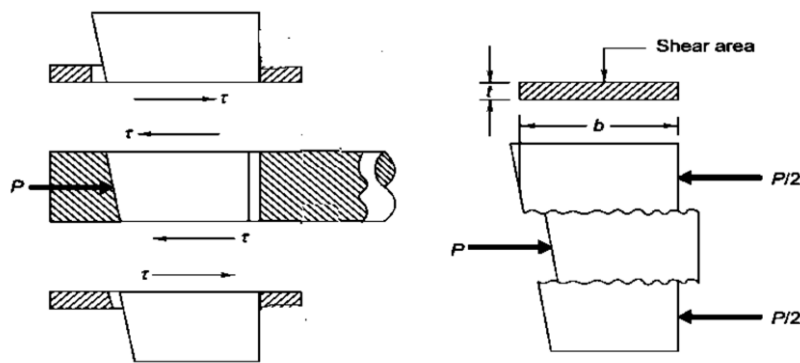
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4. Shear Failure of Cotter



$$2bt\tau = P$$

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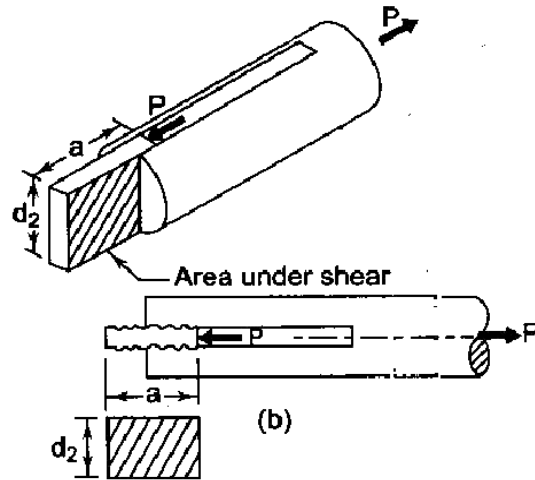
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5. Shear Failure of rod end

$$2ad_2\tau = P$$



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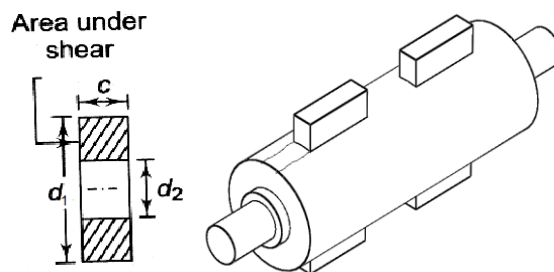
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6. Shear Failure of Sleeve end

$$2(d_1 - d_2)c\tau = P$$



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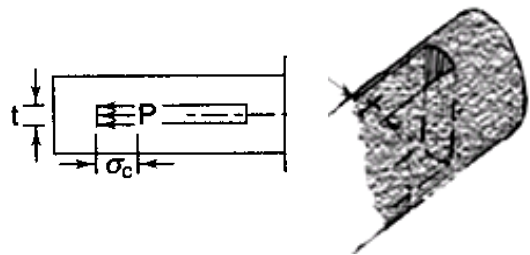
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7. Crushing Failure of rod or cotter

$$d_2 t \sigma_c = P$$



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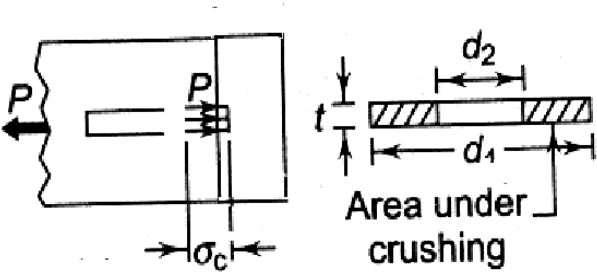
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8. Crushing Failure of Sleeve or cotter

$$(d_1 - d_2) t \sigma_c = P$$



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9. Bending Failure of cotter

$$\sigma_b = \frac{P \left[\frac{d_2}{4} + \frac{d_1}{2} \right]}{tb^2}$$

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Cotter Joints

Problem 2

Design a sleeve type cotter joint which may be subjected to a pull or push of 40 kN. All the parts of the joint are made of the same material.

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References

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