Mechanics of Materials

Lecture 14 - Transverse Shear

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schedule

- (11 Oct) - Fall Break
- 13 Oct - Transverse Shear
- 15 Oct - Homework 6 Due, Homework 5 Self-grade due
- 18 Oct - Exam 2 Review
- 20 Oct - Exam 2

outline

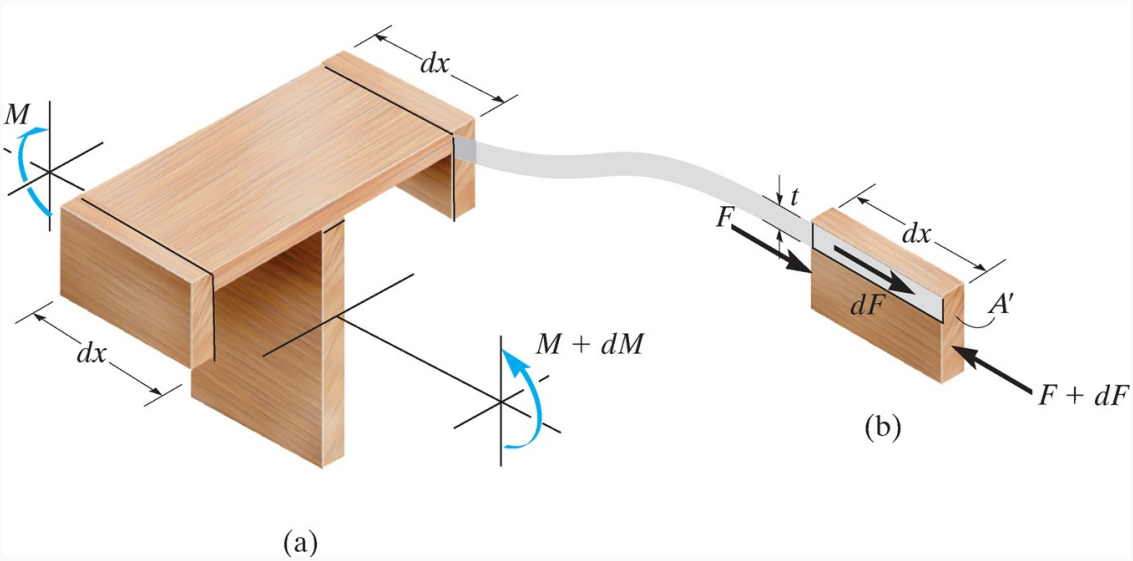
- shear flow in built-up members

shear flow in built-up members

built-up members

- Often in practice, structural members are “built-up”
- This refers to parts that are comprised of several other parts to have greater strength in certain areas
- We need to analyze the shear between these members to choose appropriate adhesives or fasteners

equilibrium



equilibrium

- From equilibrium we see that

$$dF = \frac{dM}{I} \int_{A'} y dA'$$

- We recall that this integral represents Q, we can also define the shear flow as $q = dF/dx$and recall that $dM/dx = V$ to find

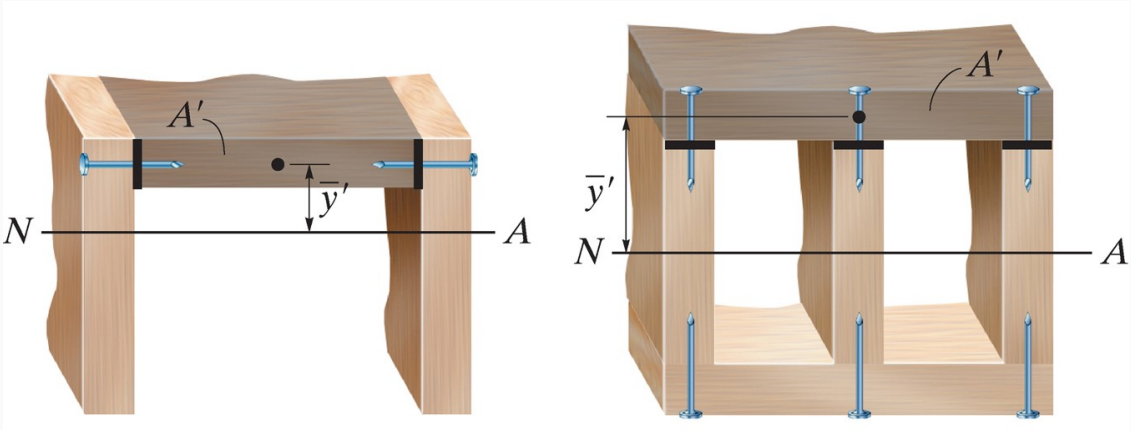
$$q = \frac{VQ}{I}$$

fastener spacing

- We can use shear flow to determine fastener spacing
- Say a fastener can support a shear force of F_0 before failure
- The shear flow (force/distance) times the spacing (distance) will give the shear force per fastener

$F = qs$

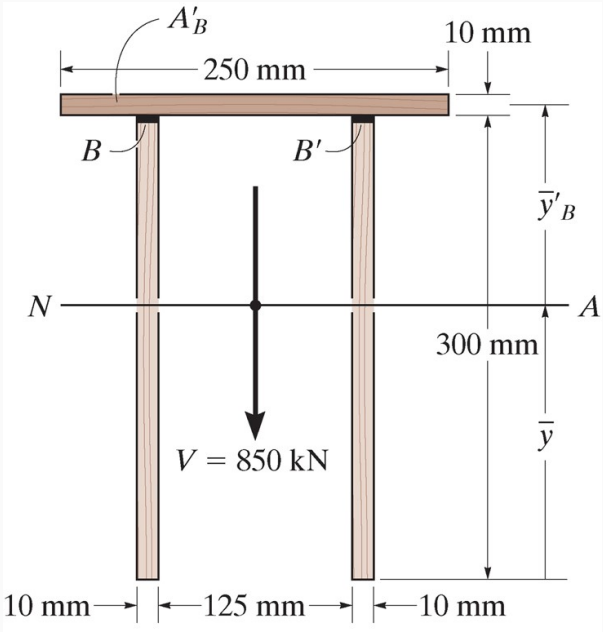
multiple fasteners



multiple fasteners

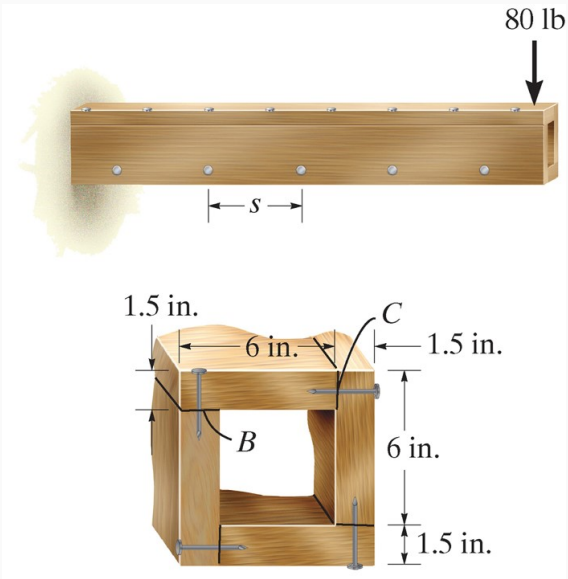
- When multiple arms are connecting the same area (as shown in the previous slide)
- The shear flow "seen" by each fastener is q/n where n is the number of fasteners per area

example 7.4



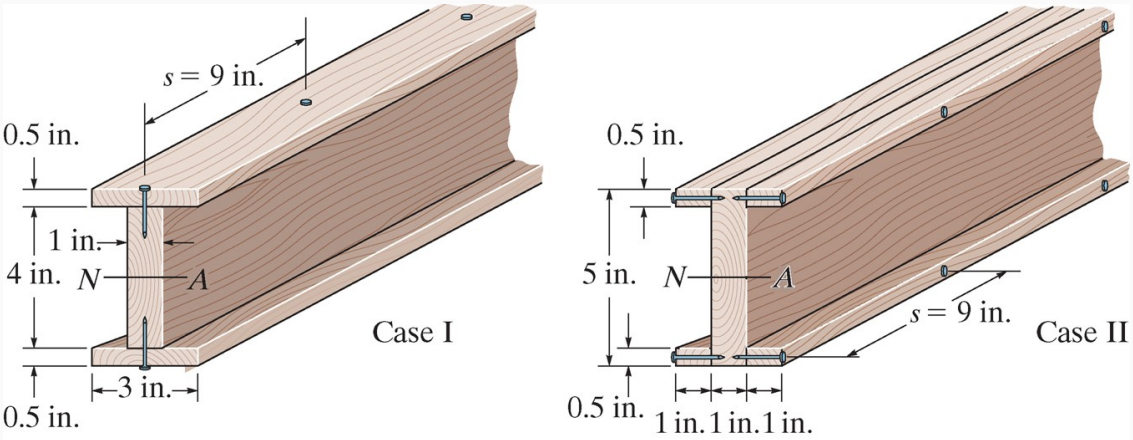
Determine the shear flow at B and B' that must be resisted by glue to bond the boards together.

example 7.5



If each nail can support a maximum shear force of 30 lb, determine the maximum spacing of the nails at B and at C so that the beam can support the force of 80 lb.

example 7.6



Nails with a shear strength of 40 lb are used in a beam that can be constructed as shown in Case I or Case II. If the nails are spaced at 9 in determine the largest vertical shear that can be supported.