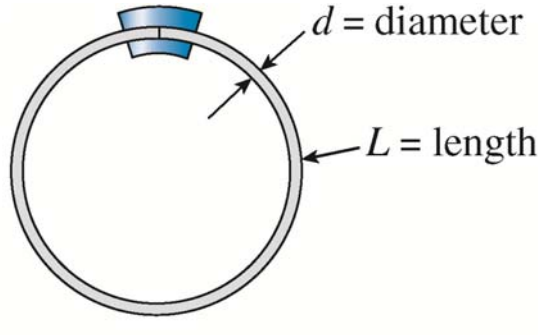
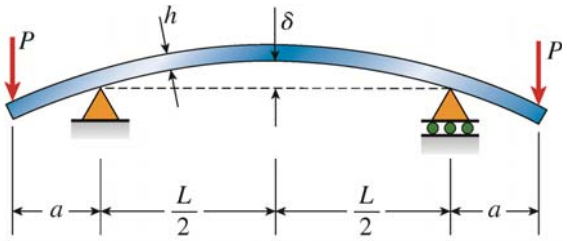
四造二甲材料力學 HW12

5.4-2 A copper wire having diameter d=3mm is bent into a circle and held with the ends just touching (see figure). If the maximum permissible strain in the copper is ϵ_{max}=0.0024 , what is the shortest length L of wire that can be used?

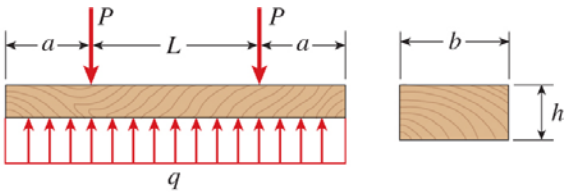


5.4-6 A bar of rectangular cross section is loaded and supported as shown in the figure. The distance between supports is L=1.5m and the height of the bar is h=120mm. The deflection at the midpoint is measured as 3.0 mm.

What is the maximum normal strain ε at the top and bottom of the bar?



5.5-10 A railroad tie (or *sleeper*) is subjected to two rail loads, each of magnitude $P = 175kN$, acting as shown in the figure. The reaction q of the ballast is assumed to be uniformly distributed over the length of the tie, which has cross-sectional dimensions $b = 300mm$ and $h = 250mm$.



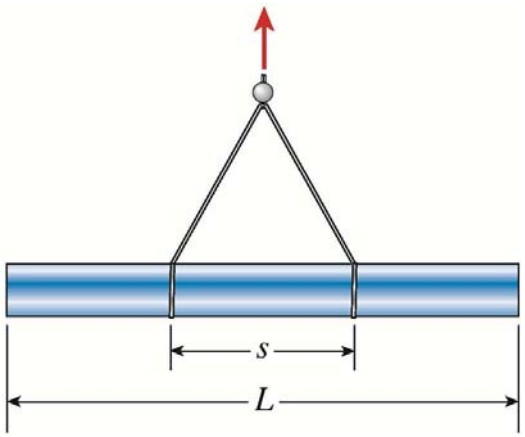
Calculate the maximum bending stress σ_{max} in the tie due to the loads P, assuming the distance $L = 1500mm$ and the overhang length $a = 500mm$.

5.5-11 A fiberglass pipe is lifted by a sling, as shown in the figure. The outer diameter of the pipe is 150 mm, its thickness is 6 mm, and its weight density is 18kN/m^3. The length of the pipe is L=13m and the distance between lifting points is s=4m.

(a) Determine the maximum bending stress in the pipe due to its own weight.

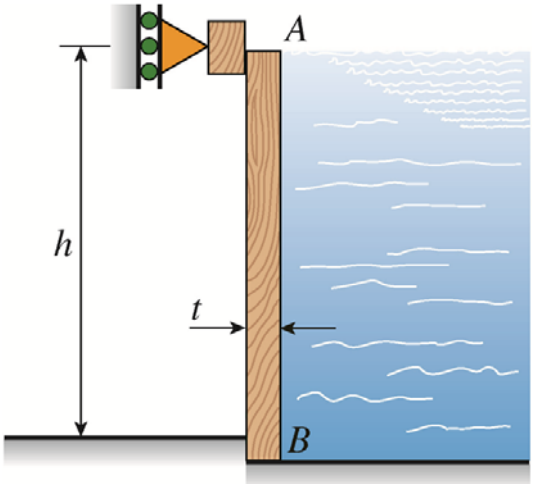
(b) Find the spacing s between lift points which will minimize the bending stress. What is the minimum bending stress?

(c) What spacing s will lead to maximum bending stress? What is that stress?

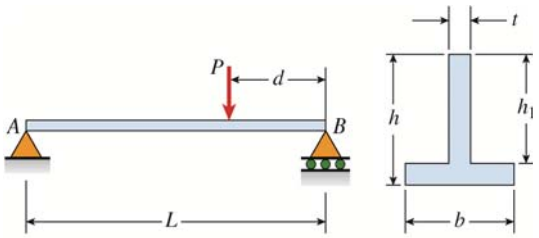


5.5-12 A small dam of height h=2.0m is constructed of vertical wood beams AB of thickness t=120mm, as shown in the figure. Consider the beams to be simply supported at the top and bottom.

Determine the maximum bending stress σ_{max} in the beams, assuming that the weight density of water is γ =9.81 kN/m^3.



5.5-16 Determine the maximum tensile stress σ_t and maximum compressive stress σ_c due to the load P acting on the simple beam AB(see figure).

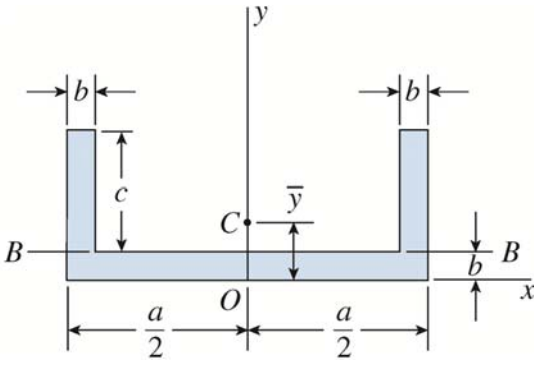


(a) Data are as follows: P =6.2 kN, L=3.2 m, d =1.25 m,
b=80 mm, t =25 mm, h=120 mm, and h_1=90 mm.

(b) Find the value of d for whith tensile and compressive stresses will be largest. What ar these stresses?

12.3-3 & 12.5-3 Calculate the distance to the centroid C of the channel section shown in the figure if a=150 mm, b=25 mm, and c=50 mm.

Calculate the moment of inertia I_{xc} with respect to an axis through the centroid C and parallel to the x axis.



12.3-7 & 12.5-7 Determine the coordinates $\bar{x}$ and $\bar{y}$ of the centroid C of the L-shaped area shown in the figure.

Calculate the centroidal moments of inertia I_{xc} and I_{yc} with respect to axes through the centroid C and parallel to the x and y axes, respectively,