1. The 5-kg block is traveling with the speed of $v = 4$ m/s just before it strikes the aluminum stepped cylinder. Determine the maximum normal stress developed in the cylinder. $E_{al} = 68.9$ GPa.
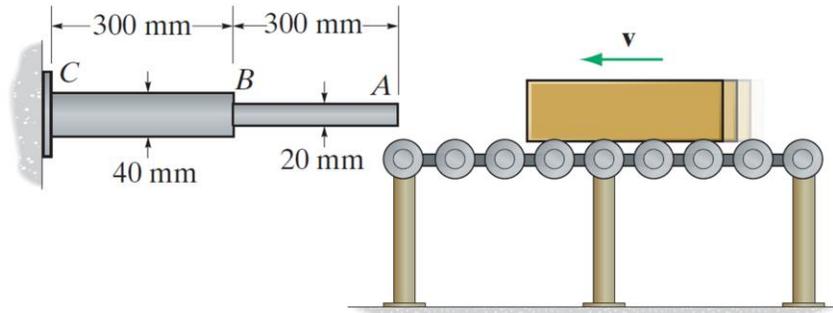

2. The car bumper is made of polycarbonate-polybutylene terephthalate. If $E = 2.0$ GPa, determine the maximum deflection and maximum stress in the bumper if it strikes the rigid post when the car is coasting at $v = 0.75$ m/s. The car has a mass of 1800 kg, and the bumper can be considered simply supported on two spring supports connected to the rigid frame of the car. For the bumper take $I = 300(10^6)$ mm^4, half thickness $c = 75$ mm, $\sigma_Y = 30$ MPa and $k = 1.5(10^6)$ N/m.
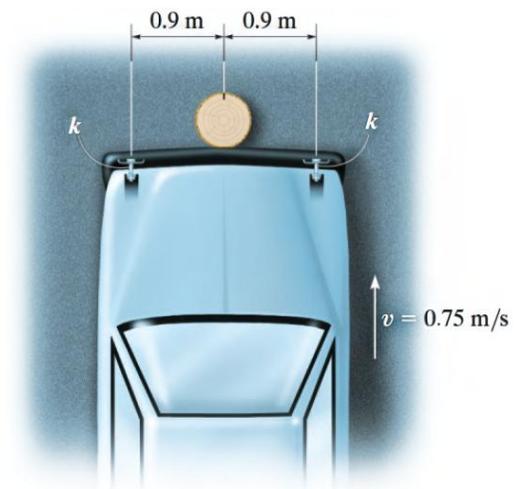
3. The composite aluminum bar is made from two segments having diameters of 5 mm and 10 mm. Determine the maximum axial stress developed in the bar if the 5-kg collar is dropped from a height of $h = 100$ mm. $E_{al} = 70$ GPa, $\sigma_Y = 410$ MPa.

5 mm

200 mm

300 mm

h

10 mm
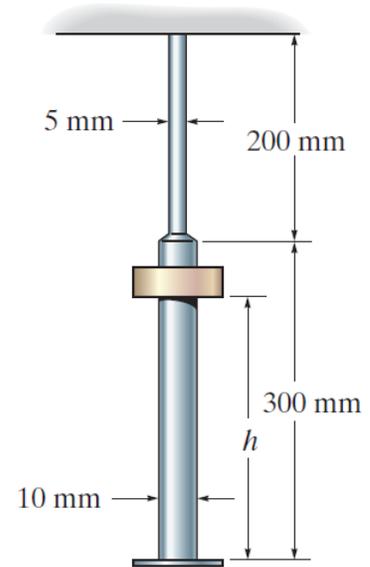
4. The wide-flange beam has a length of $2L$, a depth $2c$, and a constant EI. Determine the maximum height h at which a weight W can be dropped on its end without exceeding a maximum elastic stress σ_{max} in the beam.

W

h

2c

A

B

L

L