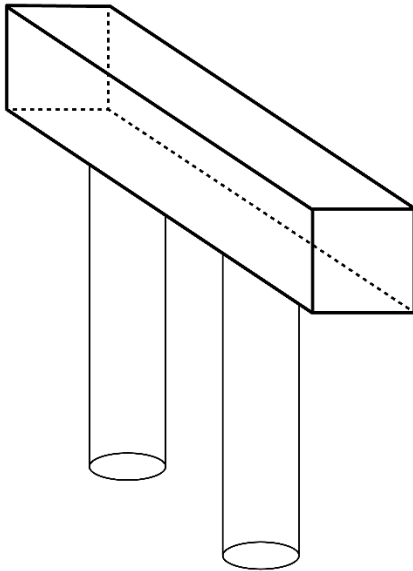


ENGINEERING THE BRIDGE CAP



The design of the pier cap has the dimensions of 5' x 5' x 20'. The design also requires a special emblem to be placed on the face of the pier cap.

It was discovered that the mold for the emblem is larger than the original design of the face of the pier cap. The contractor wants to increase the size of the pier cap to match the size of the emblem mold. The field engineer is concerned that the extra concrete needed to match the emblem mold would exceed the design weight allowed for the pier and require a redesign of the bridge pier cap.

If we adjust the pier cap face to fit the emblem mold, will the whole pier cap need a redesign? What do we need to determine to answer this?

Part A

If the weight of the new bridge pier cap exceeds 110% of the original weight, a redesign is required. If $Weight = (Volume) \cdot (Density)$, and the density of concrete is 150 lb./ft.^3 , determine the maximum allowable weight of the bridge pier cap before it needs to be redesigned.

Part B

The face of the pier cap needs to remain a square to feature the circular emblem. To allow for the emblem and to keep the bridge pier cap at a length of 20 feet, what is the maximum side length of the face that we can allow without a redesign of the bridge pier cap? *Hint: Use your results from Part A.*