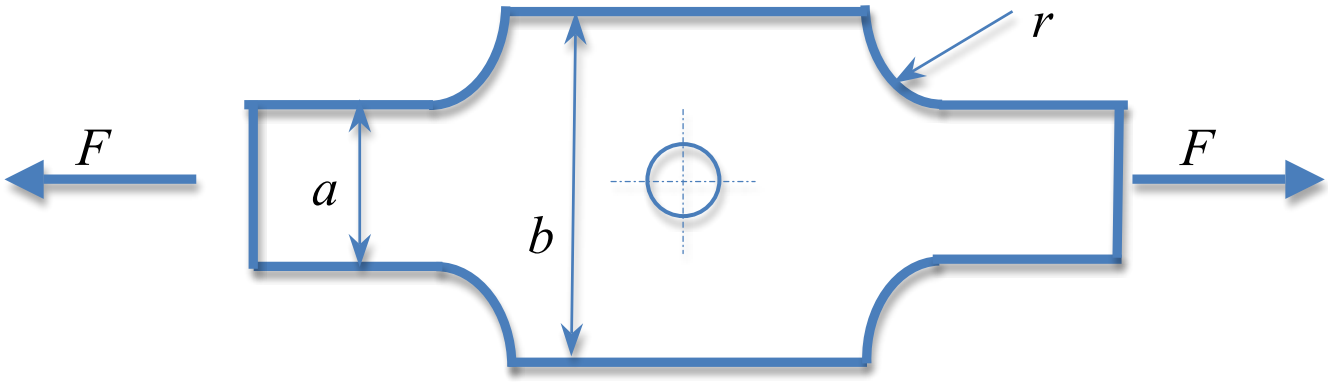
Tutorial 2
ME-351, 2013-14 2nd Semester

January 23, 2014

Problem 1:



The connecting-link shown above is subject to an axial force F. It has a thickness h and the other dimensions are: $a = 60\text{mm}$, $b = 100\text{mm}$, $r = 6\text{mm}$, hole diameter $= 20\text{mm}$. The material of the link is cold-drawn AISI 1018 steel. The link is subject to a completely reversible load of magnitude 80kN.

(a) Determine the critical location of the link.
(b) Determine the thickness of the link to have a factor of safety of at least 3 against yielding. Choose a standard value for the thickness.
(c) Recalculate the thickness such that the connecting-link has infinite life with a fatigue factor of safety of at least 2.5. Choose a standard value for the thickness.
(d) For the thickness calculated in (c), determine the new load level if you want to have a finite life of 10,000 cycles.
(e) Determine the fatigue factor of safety if the load changes from completely reversible one and fluctuates between a tension of 80kN and compression of 20kN. Use modified Goodman failure criteria (ignore column buckling).

Problem 2: A cantilever beam with circular cross section of diameter d and length 250mm is subject to a load of 5kN at the tip and a torque of 2kN-m. Determine the diameter d if you want the beam to have a factor of safety of 2.5 against yielding using

(a) Tresca failure criteria
(b) Von Mises failure criteria and
(c) Mohr-Coulomb failure criteria.

Finally choose a standard size for the beam. Use AISI 1020 hot-rolled steel as beam material.