1. A pipe support must be designed for a static load of 200-lbs plus water hammer loads of ±80-lbs as shown below. If the bracket is made from 1010 CD steel, determine the thickness, \( t \), for an infinite design life with a factor of safety of 3. The surface is machined, assume \( K_f = K_t \), and use a 99% reliability. Use \( t = 0.75 \) inch for calculations of \( K_t \) and \( k_b \). State and use an appropriate failure theory. Show all work. (40 pts.)
2. If the pipe support of problem 1 is made from aluminum 6061-T6 (Sy=40ksi, Sut=45ksi), calculate the infinite life safety factor for t=0.75-inches, assuming all fatigue strength modification factors multiply to yield $k_\alpha k_b k_c k_d k_e = 0.76$, and $K_f = 2.0$. (20 pts.)

3. For the aluminum pipe support of problem 2, determine a factor of safety considering static failure theory? State the failure theory you are applying. (15 pts.)
4. Determine the factors of safety (bolt stress and joint separation) for bolting a 500-pound light fixture vertically with an aluminum base plate to an aluminum ceiling plate. The load is shared equally by four #10-24 x 0.75”, Grade 2, steel bolts. A typical bolt is shown below. Note: this bolt is threaded over its entire length and has a pre-load of 150 pounds per bolt. (25 pts)