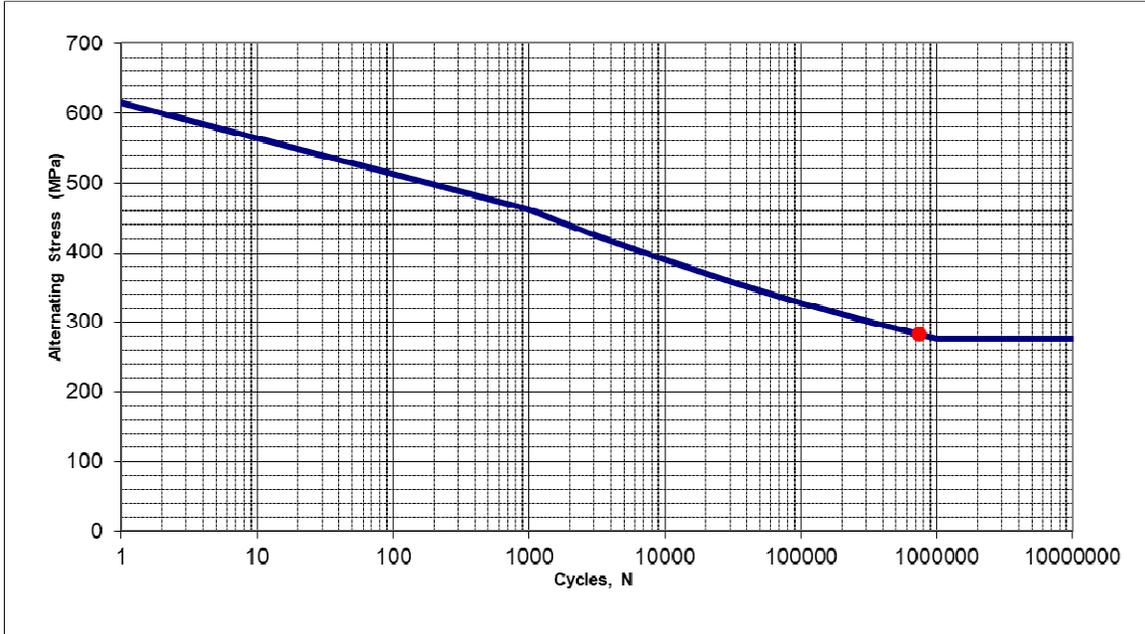


### HW5.1

The axial stress on the rod is 283 MPa.  $S_{ut}$  of the 1080 steel is 615 MPa. Using the coefficients for axial loading gives  $SL = 0.75 \cdot S_{ut} = 461$  MPa at 1000 cycles, and  $Se' = 0.45 \cdot S_{ut} = 277$  MPa at 1 million cycles on the S/N plot. The cycles to failure is 739,000.



### HW5.2

With a bending moment of 270 in.lb, the bending stress would be 22.0 ksi. The corrections for 99.9% reliability, ground surface, and half-inch diameter are 0.747, 0.95, and 0.94, respectively. This gives an adjusted  $Se$  of 19.0 ksi. The shaft should last 362,000 cycles. Dropping the load to 39 lb should make the alternating stress =  $Se$  and result in infinite life.

