Student in-class exercise 1

An axially loaded straight cylindrical bar of diameter d = 12.5mm is to be made of 2024-T4 aluminum with ultimate strength of S_u = 469MPa, yield strength S_y = 331MPa, and fatigue properties shown in Figure. The bar is to be subjected to a completely reversed axial force of 27kN, and must last for at least 10^7 cycles.

a. What is the governing failure mode?

b. Is failure predicted to occur?

Note: $\frac{\text{ksi}}{\mathbf{0.145}} = \text{MPa}$