(b) $N = 10^4$

$$a = \frac{(0.9\,S_{ut})^2}{(0.5\,S_{ut})} = \frac{[(0.9)(95)]^2}{47.5} = \underline{153.9\,\text{kpsi}}$$

$$b = \frac{1}{3}\log_{10}\left(\frac{0.5}{0.9}\right) = -0.0851$$

$$S_f = aN^b = (153.9)(10^4)^{-0.0851}$$

$$= 70.3\,\text{kpsi}$$

(c) $S_f = aN^b$

$$\log_{10} S_f = \log_{10} a + b\log_{10} N$$

$$\log_{10} N = \frac{\log_{10}(S_f) - \log_{10}(a)}{b}$$

$\log_{10} N = x \Leftrightarrow 10^x = N$

$$N = 10^{\left(\frac{\log_{10}(S_f) - \log_{10}(a)}{b}\right)}$$

$$N = 10^{\left(\frac{\log_{10}(55) - \log_{10}(153.9)}{-0.0851}\right)}$$

$$\underline{N = 1.78 \times 10^5 \text{ cycles}}$$

$S_f = aN^b$ $\quad N \uparrow \quad S_f \downarrow$

a: kpsi