Given: fastener $\frac{5}{16}$-18UNC-2A

$S_{yt} = 120$ ksi

$K_{n,max} = 0.265$ inch $\quad D_{s,min} = 0.3026$ inch

$E_{s,min} = 0.2712$ inch $\quad E_{n,max} = 0.2817$ inch

Find: Tensile stress area, shear stress area, minimum length of engagement.

Solution:

$$A_t = \frac{\pi}{4}\left(d_b - \frac{0.9328}{n}\right)^2 = \frac{\pi}{4}\left(\frac{5}{16} - \frac{0.9328}{18}\right)^2$$

$$\boxed{A_t = 0.0534 \text{ in}^2}$$

$$A_{s,e} = \pi n K_{n,max}\left[\frac{1}{2n} + \frac{1}{\sqrt{3}}\left(E_{s,min} - K_{n,max}\right)\right]$$

$$\boxed{A_{s,e} = 0.470 \text{ in}^2/\text{in}}$$

$$A_{s,i} = \pi D_{s,min} n\left[\frac{1}{2n} + \frac{1}{\sqrt{3}}\left(D_{s,min} - E_{n,max}\right)\right]$$

$$\boxed{A_{s,i} = 0.682 \text{ in}^2/\text{in}}$$

$$L_e = \frac{2A_t}{A_{s,i}} = \frac{2(0.0534 \text{ in}^2)}{(0.682 \text{ in}^2/\text{in})} = 0.157 \text{ in}$$

$$\boxed{L_e = 0.157 \text{ in}}$$