

### PROBLEM STATEMENT:

1. Strand Type =  $\frac{1}{2}$ "  $\emptyset$ , 270 K, 8 strands
2. Physical characteristics of strand. (Check mill certificate from supplier)  
 $A = 0.1530 \text{ in}^2$   
 $E = 28,600,000 \text{ psi}$
3. Initial tension = 3,000 lb<sub>f</sub>
4. Final tension = 28,910 lb<sub>f</sub>

### CORRECTIONS:

1. Dead End Slippage =  $\frac{1}{8}$ "
2. Bed Shortening =  $\frac{1}{8}$ " per strand
3. Live End Seating =  $\frac{3}{8}$ "
4. Temperature:  
Strands to be stressed 40 °F  
Concrete Temperature 75 °F  
Temperature difference of + 35 °F

### SOLUTION:

$$P = 28,910 \text{ lb}_f - 3,000 \text{ lb}_f = 25,910 \text{ lb}_f$$
$$L = 455' - 4'' = 5,464 \text{ inches}$$

Basic Elongation:

$$\Delta = \frac{(25,910)(5,464)}{(0.1530)(28,600,000)} = 32.35''$$

Dead End Slippage:

Add  $\frac{1}{8}$ ". No adjustment to force.

Bed Shortening

$$\text{Bed will shorten} = \frac{1}{8} \times 8 = 1''$$

$$\text{Elongation adj.} = 0.13 + 0.5 = 0.63$$

$$\text{Force/Inch} = \frac{25,910}{32.35} = 801 \text{ lb / in}$$

$$\text{Over pull} = 801 \times 0.63 = 505 \text{ lb}_f$$

Live End Seating:

$$\text{Over pull} = \frac{(0.38)(25910)}{32.35} = 304 \text{ lb}_f$$

Temperature Adjustment:

$$T_{\text{conc.}} - T_{\text{std}} = 75 \text{ °F} - 40 \text{ °F} = 35 \text{ °F}$$

No correction required. Temperature changes will affect strand and self-stressing beds the same.

SUMMARY	Gross Theo. Elong.	Net Theo. Elong.
Basic Elongation	32.35"	32.35"
Dead end slippage	0.13"	0.13"
Bed shortening	0.63"	0.63"
Live End seating	0.38"	
Total Elongation	33.49"	33.11"

Final Force:

$$28,910 + 505 + 304 = 29,719 \text{ lb}_f$$

Use Gross Theoretical Elongation to monitor stressing jack.  
Use Net Theoretical Elongation to measure elongation.