SECTION F

THERMAL BEHAVIOR OF WIRE-ROPE CABLE INTERMEDIATE RAILINGS

F.1—TEMPERATURE INCREASE VS. PRESTRESS LOAD (SUFFICIENT TO CAUSE LOSS OF 400 lbs. PRESTRESS LOAD)

F.1.1—1/8" WIRE ROPE CABLE

Prestress Force: $F_{ps} := 400 \cdot lbf$

Diameter of Wire Rope: $D := 0.125 \cdot in$ Area of Wire Rope: $A := \frac{\pi \cdot D^2}{4}$ $A = 0.012\, in^2$

Thermal Expansion Coefficient for Wire Rope Cable: $\alpha = 9.6 \times 10^{-6} \frac{in}{in \cdot °F}$

Temperature Change to Cause Loss of Prestress: $\Delta T := \frac{F_{ps}}{\alpha \cdot E_{eff} \cdot A}$ $\Delta T = 208.3\, °F$

Effective Thermal Expansion Coefficient *(See Section A)*: $\alpha_{eff} = 6.35 \times 10^{-6} \frac{in}{in \cdot °F}$

Temperature Change to Cause Loss of Prestress: $\Delta T := \frac{F_{ps}}{\alpha_{eff} \cdot E_{eff} \cdot A}$ $\Delta T = 314.9\, °F$

F.1.2—3/16" WIRE ROPE CABLE

Prestress Force: $F_{ps} := 400 \cdot lbf$

Diameter of Wire Rope: $D := 0.1875 \cdot in$ Area of Wire Rope: $A := \frac{\pi \cdot D^2}{4}$ $A = 0.028\, in^2$

Thermal Expansion Coefficient for Wire Rope Cable: $\alpha = 9.6 \times 10^{-6} \frac{in}{in \cdot °F}$

Temperature Change to Cause Loss of Prestress: $\Delta T := \frac{F_{ps}}{\alpha \cdot E_{eff} \cdot A}$ $\Delta T = 92.6\, °F$

Effective Thermal Expansion Coefficient *(See Section A)*: $\alpha_{eff} = 6.35 \times 10^{-6} \frac{in}{in \cdot °F}$

Temperature Change to Cause Loss of Prestress: $\Delta T := \frac{F_{ps}}{\alpha_{eff} \cdot E_{eff} \cdot A}$ $\Delta T = 140\, °F$

F.1.3—1/4" WIRE ROPE CABLE

Prestress Force:	$F_{ps} := 400 \cdot lbf$			
Diameter of Wire Rope:	$D := 0.25 \cdot in$	Area of Wire Rope:	$A := \frac{\pi \cdot D^2}{4}$	$A = 0.049\,in^2$
Thermal Expansion Coefficient for Wire Rope Cable:	$\alpha = 9.6 \times 10^{-6} \frac{in}{in \cdot °F}$			
Temperature Change to Cause Loss of Prestress:	$\Delta T := \frac{F_{ps}}{\alpha \cdot E_{eff} \cdot A}$	$\Delta T = 52.1\,°F$		
Effective Thermal Expansion Coefficient *(See Section A)*:	$\alpha_{eff} = 6.35 \times 10^{-6} \frac{in}{in \cdot °F}$			
Temperature Change to Cause Loss of Prestress:	$\Delta T := \frac{F_{ps}}{\alpha_{eff} \cdot E_{eff} \cdot A}$	$\Delta T = 78.7\,°F$		

F.1.4—5/16" WIRE ROPE CABLE

Prestress Force:	$F_{ps} := 400 \cdot lbf$			
Diameter of Wire Rope:	$D := 0.3125 \cdot in$	Area of Wire Rope:	$A := \frac{\pi \cdot D^2}{4}$	$A = 0.077\,in^2$
Thermal Expansion Coefficient for Wire Rope Cable:	$\alpha = 9.6 \times 10^{-6} \frac{in}{in \cdot °F}$			
Temperature Change to Cause Loss of Prestress:	$\Delta T := \frac{F_{ps}}{\alpha \cdot E_{eff} \cdot A}$	$\Delta T = 33.3\,°F$		
Effective Thermal Expansion Coefficient *(See Section A)*:	$\alpha_{eff} = 6.35 \times 10^{-6} \frac{in}{in \cdot °F}$			
Temperature Change to Cause Loss of Prestress:	$\Delta T := \frac{F_{ps}}{\alpha_{eff} \cdot E_{eff} \cdot A}$	$\Delta T = 50.4\,°F$		

F.1.5—3/8" WIRE ROPE CABLE

Prestress Force:	$F_{ps} := 400 \cdot lbf$			
Diameter of Wire Rope:	$D := 0.375 \cdot in$	Area of Wire Rope:	$A := \frac{\pi \cdot D^2}{4}$	$A = 0.11\, in^2$
Thermal Expansion Coefficient for Wire Rope Cable:	$\alpha = 9.6 \times 10^{-6} \frac{in}{in \cdot °F}$			
Temperature Change to Cause Loss of Prestress:	$\Delta T := \frac{F_{ps}}{\alpha \cdot E_{eff} \cdot A}$	$\Delta T = 23.1\, °F$		
Effective Thermal Expansion Coefficient *(See Section A)*:	$\alpha_{eff} = 6.35 \times 10^{-6} \frac{in}{in \cdot °F}$			
Temperature Change to Cause Loss of Prestress:	$\Delta T := \frac{F_{ps}}{\alpha_{eff} \cdot E_{eff} \cdot A}$	$\Delta T = 35\, °F$		