SECTION D

CABLE END REACTIONS UNDER CODE REQUIRED LOADING FOR INTERMEDIATE RAILING COMPONENTS

D.1—INTRODUCTION

The 2006 *International Building Code* and 2007 *California Building Code* require intermediate rails "to withstand a horizontally applied normal load of 50 pounds on an area equal to 1 square foot, including openings and space between rails" (IBC / CBC 1607.7.1.2).

To meet this requirement, the end reactions, R_x and R_y, caused by the 50 lbs over 1 square ft load must be determined, so that they may be included in the railing frame calculations.

The equations used in these calculations are derived in Section C.

There are no pass/fail criteria for this loading; however, cable hardware shall be used whose allowable load capacities exceed the values for R'_x listed herein.

D.2—1/8" WIRE ROPE CABLE

3.08" Spacing

Diameter of Cable:	$D := 0.125 \cdot in$	Cable Spacing:	$S_o := 3.08 \cdot in$
Support Spacing:	$L := 42 \cdot in$	Prestress Force:	$F_{ps} := 325 \cdot lbf$
Code-Required Load:	$w := 50 \cdot psf$ $b := 1 \cdot ft$		
Uniform Load on Cable:	$q_{app} := w \cdot S_o$	$q_{app} = 12.833\ plf$	
Cable Deflection:	$\Delta := root(q(\Delta, D, L, b, F_{ps}) - q_{app}, \Delta)$	$\Delta = 0.205\ in$	
Axial (in-plane) Reaction:	$R'_x := R_x(D, L, F_{ps}, q_{app}, b)$	$R'_x = 329.4\ lbf$	
Out-of-Plane Reaction:	$R'_y := R_y(q_{app}, b)$	$R'_y = 6.4\ lbf$	

3.1" Spacing

Diameter of Cable:	$D := 0.125 \cdot in$	Cable Spacing:	$S_o := 3.1 \cdot in$
Support Spacing:	$L := 42 \cdot in$	Prestress Force:	$F_{ps} := 400 \cdot lbf$
Code-Required Load:	$w := 50 \cdot psf$ $b := 1 \cdot ft$		
Uniform Load on Cable:	$q_{app} := w \cdot S_o$	$q_{app} = 12.917\ plf$	
Cable Deflection:	$\Delta := root(q(\Delta, D, L, b, F_{ps}) - q_{app}, \Delta)$	$\Delta = 0.168\ in$	
Axial (in-plane) Reaction:	$R'_x := R_x(D, L, F_{ps}, q_{app}, b)$	$R'_x = 403.1\ lbf$	
Out-of-Plane Reaction:	$R'_y := R_y(q_{app}, b)$	$R'_y = 6.5\ lbf$	

3.25" Spacing

Diameter of Cable:	$D := 0.125 \cdot in$	Cable Spacing:	$S_o := 3.25 \cdot in$
Support Spacing:	$L := 42 \cdot in$	Prestress Force:	$F_{ps} := 400 \cdot lbf$
Code-Required Load:	$w := 50 \cdot psf$ $b := 1 \cdot ft$		
Uniform Load on Cable:	$q_{app} := w \cdot S_o$	$q_{app} = 13.542\ plf$	
Cable Deflection:	$\Delta := root(q(\Delta, D, L, b, F_{ps}) - q_{app}, \Delta)$	$\Delta = 0.176\ in$	
Axial (in-plane) Reaction:	$R'_x := R_x(D, L, F_{ps}, q_{app}, b)$	$R'_x = 403.4\ lbf$	
Out-of-Plane Reaction:	$R'_y := R_y(q_{app}, b)$	$R'_y = 6.8\ lbf$	

3.36" Spacing

Diameter of Cable:	$D := 0.125 \cdot in$	Cable Spacing:	$S_o := 3.36 \cdot in$
Support Spacing:	$L := 42 \cdot in$	Prestress Force:	$F_{ps} := 400 \cdot lbf$
Code-Required Load:	$w := 50 \cdot psf$ $b := 1 \cdot ft$		
Uniform Load on Cable:	$q_{app} := w \cdot S_o$	$q_{app} = 14\ plf$	
Cable Deflection:	$\Delta := root(q(\Delta, D, L, b, F_{ps}) - q_{app}, \Delta)$	$\Delta = 0.182\ in$	
Axial (in-plane) Reaction:	$R'_x := R_x(D, L, F_{ps}, q_{app}, b)$	$R'_x = 403.6\ lbf$	
Out-of-Plane Reaction:	$R'_y := R_y(q_{app}, b)$	$R'_y = 7\ lbf$	

D.3—3/16" WIRE ROPE CABLE

3.08" Spacing

Diameter of Cable:	$D := 0.1875 \cdot in$	Cable Spacing:	$S_o := 3.08 \cdot in$
Support Spacing:	$L := 42 \cdot in$	Prestress Force:	$F_{ps} := 325 \cdot lbf$
Code-Required Load:	$w := 50 \cdot psf$ $b := 1 \cdot ft$		
Uniform Load on Cable:	$q_{app} := w \cdot S_o$	$q_{app} = 12.833\ plf$	
Cable Deflection:	$\Delta := root(q(\Delta, D, L, b, F_{ps}) - q_{app}, \Delta)$	$\Delta = 0.201\ in$	
Axial (in-plane) Reaction:	$R'_x := R_x(D, L, F_{ps}, q_{app}, b)$	$R'_x = 336\ lbf$	
Out-of-Plane Reaction:	$R'_y := R_y(q_{app}, b)$	$R'_y = 6.4\ lbf$	

3.1" Spacing

Diameter of Cable:	$D := 0.1875 \cdot in$	Cable Spacing:	$S_o := 3.1 \cdot in$
Support Spacing:	$L := 42 \cdot in$	Prestress Force:	$F_{ps} := 400 \cdot lbf$
Code-Required Load:	$w := 50 \cdot psf$ $b := 1 \cdot ft$		
Uniform Load on Cable:	$q_{app} := w \cdot S_o$	$q_{app} = 12.917\ plf$	
Cable Deflection:	$\Delta := root(q(\Delta, D, L, b, F_{ps}) - q_{app}, \Delta)$	$\Delta = 0.166\ in$	
Axial (in-plane) Reaction:	$R'_x := R_x(D, L, F_{ps}, q_{app}, b)$	$R'_x = 408.4\ lbf$	
Out-of-Plane Reaction:	$R'_y := R_y(q_{app}, b)$	$R'_y = 6.5\ lbf$	

3.25" Spacing

Diameter of Cable:	$D := 0.1875 \cdot in$	Cable Spacing:	$S_o := 3.25 \cdot in$
Support Spacing:	$L := 42 \cdot in$	Prestress Force:	$F_{ps} := 400 \cdot lbf$
Code-Required Load:	$w := 50 \cdot psf$ $b := 1 \cdot ft$		
Uniform Load on Cable:	$q_{app} := w \cdot S_o$	$q_{app} = 13.542\ plf$	
Cable Deflection:	$\Delta := root(q(\Delta, D, L, b, F_{ps}) - q_{app}, \Delta)$	$\Delta = 0.174\ in$	
Axial (in-plane) Reaction:	$R'_x := R_x(D, L, F_{ps}, q_{app}, b)$	$R'_x = 408.9\ lbf$	
Out-of-Plane Reaction:	$R'_y := R_y(q_{app}, b)$	$R'_y = 6.8\ lbf$	

3.36" Spacing

Diameter of Cable:	$D := 0.1875 \cdot in$	Cable Spacing:	$S_o := 3.36 \cdot in$
Support Spacing:	$L := 42 \cdot in$	Prestress Force:	$F_{ps} := 400 \cdot lbf$
Code-Required Load:	$w := 50 \cdot psf$ $b := 1 \cdot ft$		
Uniform Load on Cable:	$q_{app} := w \cdot S_o$	$q_{app} = 14\ plf$	
Cable Deflection:	$\Delta := root(q(\Delta, D, L, b, F_{ps}) - q_{app}, \Delta)$	$\Delta = 0.18\ in$	
Axial (in-plane) Reaction:	$R'_x := R_x(D, L, F_{ps}, q_{app}, b)$	$R'_x = 409.4\ lbf$	
Out-of-Plane Reaction:	$R'_y := R_y(q_{app}, b)$	$R'_y = 7\ lbf$	

D.4—1/4" WIRE ROPE CABLE

3.08" Spacing

Diameter of Cable:	$D := 0.25 \cdot in$	Cable Spacing:	$S_o := 3.08 \cdot in$
Support Spacing:	$L := 42 \cdot in$	Prestress Force:	$F_{ps} := 325 \cdot lbf$
Code-Required Load:	$w := 50 \cdot psf$ $b := 1 \cdot ft$		
Uniform Load on Cable:	$q_{app} := w \cdot S_o$	$q_{app} = 12.833\ plf$	
Cable Deflection:	$\Delta := root(q(\Delta, D, L, b, F_{ps}) - q_{app}, \Delta)$	$\Delta = 0.194\ in$	
Axial (in-plane) Reaction:	$R'_x := R_x(D, L, F_{ps}, q_{app}, b)$	$R'_x = 347.3\ lbf$	
Out-of-Plane Reaction:	$R'_y := R_y(q_{app}, b)$	$R'_y = 6.4\ lbf$	

3.1" Spacing

Diameter of Cable:	$D := 0.25 \cdot in$	Cable Spacing:	$S_o := 3.1 \cdot in$
Support Spacing:	$L := 42 \cdot in$	Prestress Force:	$F_{ps} := 400 \cdot lbf$
Code-Required Load:	$w := 50 \cdot psf$ $b := 1 \cdot ft$		
Uniform Load on Cable:	$q_{app} := w \cdot S_o$	$q_{app} = 12.917\ plf$	
Cable Deflection:	$\Delta := root(q(\Delta, D, L, b, F_{ps}) - q_{app}, \Delta)$	$\Delta = 0.162\ in$	
Axial (in-plane) Reaction:	$R'_x := R_x(D, L, F_{ps}, q_{app}, b)$	$R'_x = 418.1\ lbf$	
Out-of-Plane Reaction:	$R'_y := R_y(q_{app}, b)$	$R'_y = 6.5\ lbf$	

3.25" Spacing

Diameter of Cable:	$D := 0.25 \cdot in$	Cable Spacing:	$S_o := 3.25 \cdot in$
Support Spacing:	$L := 42 \cdot in$	Prestress Force:	$F_{ps} := 400 \cdot lbf$
Code-Required Load:	$w := 50 \cdot psf$ $b := 1 \cdot ft$		
Uniform Load on Cable:	$q_{app} := w \cdot S_o$	$q_{app} = 13.542\ plf$	
Cable Deflection:	$\Delta := root(q(\Delta, D, L, b, F_{ps}) - q_{app}, \Delta)$	$\Delta = 0.17\ in$	
Axial (in-plane) Reaction:	$R'_x := R_x(D, L, F_{ps}, q_{app}, b)$	$R'_x = 419\ lbf$	
Out-of-Plane Reaction:	$R'_y := R_y(q_{app}, b)$	$R'_y = 6.8\ lbf$	

3.36" Spacing

Diameter of Cable:	$D := 0.25 \cdot in$	Cable Spacing:	$S_o := 3.36 \cdot in$
Support Spacing:	$L := 42 \cdot in$	Prestress Force:	$F_{ps} := 400 \cdot lbf$
Code-Required Load:	$w := 50 \cdot psf$ $b := 1 \cdot ft$		
Uniform Load on Cable:	$q_{app} := w \cdot S_o$	$q_{app} = 14\ plf$	
Cable Deflection:	$\Delta := root(q(\Delta, D, L, b, F_{ps}) - q_{app}, \Delta)$	$\Delta = 0.175\ in$	
Axial (in-plane) Reaction:	$R'_x := R_x(D, L, F_{ps}, q_{app}, b)$	$R'_x = 419.7\ lbf$	
Out-of-Plane Reaction:	$R'_y := R_y(q_{app}, b)$	$R'_y = 7\ lbf$	

D.5—5/16" WIRE ROPE CABLE

3.08" Spacing

Diameter of Cable:	$D := 0.3125 \cdot in$	Cable Spacing:	$S_o := 3.08 \cdot in$
Support Spacing:	$L := 42 \cdot in$	Prestress Force:	$F_{ps} := 325 \cdot lbf$
Code-Required Load:	$w := 50 \cdot psf$ $b := 1 \cdot ft$		
Uniform Load on Cable:	$q_{app} := w \cdot S_o$	$q_{app} = 12.833\ plf$	
Cable Deflection:	$\Delta := root(q(\Delta, D, L, b, F_{ps}) - q_{app}, \Delta)$	$\Delta = 0.185\ in$	
Axial (in-plane) Reaction:	$R'_x := R_x(D, L, F_{ps}, q_{app}, b)$	$R'_x = 365\ lbf$	
Out-of-Plane Reaction:	$R'_y := R_y(q_{app}, b)$	$R'_y = 6.4\ lbf$	

3.1" Spacing

Diameter of Cable:	$D := 0.3125 \cdot in$	Cable Spacing:	$S_o := 3.1 \cdot in$
Support Spacing:	$L := 42 \cdot in$	Prestress Force:	$F_{ps} := 400 \cdot lbf$
Code-Required Load:	$w := 50 \cdot psf$ $b := 1 \cdot ft$		
Uniform Load on Cable:	$q_{app} := w \cdot S_o$	$q_{app} = 12.917\ plf$	
Cable Deflection:	$\Delta := root(q(\Delta, D, L, b, F_{ps}) - q_{app}, \Delta)$	$\Delta = 0.156\ in$	
Axial (in-plane) Reaction:	$R'_x := R_x(D, L, F_{ps}, q_{app}, b)$	$R'_x = 434.4\ lbf$	
Out-of-Plane Reaction:	$R'_y := R_y(q_{app}, b)$	$R'_y = 6.5\ lbf$	

3.25" Spacing

Diameter of Cable:	$D := 0.3125 \cdot in$	Cable Spacing:	$S_o := 3.25 \cdot in$
Support Spacing:	$L := 42 \cdot in$	Prestress Force:	$F_{ps} := 400 \cdot lbf$
Code-Required Load:	$w := 50 \cdot psf$ $b := 1 \cdot ft$		
Uniform Load on Cable:	$q_{app} := w \cdot S_o$	$q_{app} = 13.542\ plf$	
Cable Deflection:	$\Delta := root(q(\Delta, D, L, b, F_{ps}) - q_{app}, \Delta)$	$\Delta = 0.163\ in$	
Axial (in-plane) Reaction:	$R'_x := R_x(D, L, F_{ps}, q_{app}, b)$	$R'_x = 435.7\ lbf$	
Out-of-Plane Reaction:	$R'_y := R_y(q_{app}, b)$	$R'_y = 6.8\ lbf$	

3.36" Spacing

Diameter of Cable:	$D := 0.3125 \cdot in$	Cable Spacing:	$S_o := 3.36 \cdot in$
Support Spacing:	$L := 42 \cdot in$	Prestress Force:	$F_{ps} := 400 \cdot lbf$
Code-Required Load:	$w := 50 \cdot psf$ $b := 1 \cdot ft$		
Uniform Load on Cable:	$q_{app} := w \cdot S_o$	$q_{app} = 14\ plf$	
Cable Deflection:	$\Delta := root(q(\Delta, D, L, b, F_{ps}) - q_{app}, \Delta)$	$\Delta = 0.168\ in$	
Axial (in-plane) Reaction:	$R'_x := R_x(D, L, F_{ps}, q_{app}, b)$	$R'_x = 436.7\ lbf$	
Out-of-Plane Reaction:	$R'_y := R_y(q_{app}, b)$	$R'_y = 7\ lbf$	

D.6—3/8" WIRE ROPE CABLE

3.08" Spacing

Diameter of Cable:	$D := 0.375 \cdot in$	Cable Spacing:	$S_o := 3.08 \cdot in$
Support Spacing:	$L := 42 \cdot in$	Prestress Force:	$F_{ps} := 325 \cdot lbf$
Code-Required Load:	$w := 50 \cdot psf$ $b := 1 \cdot ft$		
Uniform Load on Cable:	$q_{app} := w \cdot S_o$	$q_{app} = 12.833\ plf$	
Cable Deflection:	$\Delta := root(q(\Delta, D, L, b, F_{ps}) - q_{app}, \Delta)$	$\Delta = 0.172\ in$	
Axial (in-plane) Reaction:	$R'_x := R_x(D, L, F_{ps}, q_{app}, b)$	$R'_x = 391.7\ lbf$	
Out-of-Plane Reaction:	$R'_y := R_y(q_{app}, b)$	$R'_y = 6.4\ lbf$	

3.1" Spacing

Diameter of Cable:	$D := 0.375 \cdot in$	Cable Spacing:	$S_o := 3.1 \cdot in$
Support Spacing:	$L := 42 \cdot in$	Prestress Force:	$F_{ps} := 400 \cdot lbf$
Code-Required Load:	$w := 50 \cdot psf$ $b := 1 \cdot ft$		
Uniform Load on Cable:	$q_{app} := w \cdot S_o$	$q_{app} = 12.917\ plf$	
Cable Deflection:	$\Delta := root(q(\Delta, D, L, b, F_{ps}) - q_{app}, \Delta)$	$\Delta = 0.147\ in$	
Axial (in-plane) Reaction:	$R'_x := R_x(D, L, F_{ps}, q_{app}, b)$	$R'_x = 460.1\ lbf$	
Out-of-Plane Reaction:	$R'_y := R_y(q_{app}, b)$	$R'_y = 6.5\ lbf$	

3.25" Spacing

Diameter of Cable:	$D := 0.375 \cdot in$	Cable Spacing:	$S_o := 3.25 \cdot in$
Support Spacing:	$L := 42 \cdot in$	Prestress Force:	$F_{ps} := 400 \cdot lbf$
Code-Required Load:	$w := 50 \cdot psf$ $b := 1 \cdot ft$		
Uniform Load on Cable:	$q_{app} := w \cdot S_o$	$q_{app} = 13.542\ plf$	
Cable Deflection:	$\Delta := root(q(\Delta, D, L, b, F_{ps}) - q_{app}, \Delta)$	$\Delta = 0.154\ in$	
Axial (in-plane) Reaction:	$R'_x := R_x(D, L, F_{ps}, q_{app}, b)$	$R'_x = 461.8\ lbf$	
Out-of-Plane Reaction:	$R'_y := R_y(q_{app}, b)$	$R'_y = 6.8\ lbf$	

3.36" Spacing

Diameter of Cable:	$D := 0.375 \cdot in$	Cable Spacing:	$S_o := 3.36 \cdot in$
Support Spacing:	$L := 42 \cdot in$	Prestress Force:	$F_{ps} := 400 \cdot lbf$
Code-Required Load:	$w := 50 \cdot psf$ $b := 1 \cdot ft$		
Uniform Load on Cable:	$q_{app} := w \cdot S_o$	$q_{app} = 14\ plf$	
Cable Deflection:	$\Delta := root(q(\Delta, D, L, b, F_{ps}) - q_{app}, \Delta)$	$\Delta = 0.159\ in$	
Axial (in-plane) Reaction:	$R'_x := R_x(D, L, F_{ps}, q_{app}, b)$	$R'_x = 463\ lbf$	
Out-of-Plane Reaction:	$R'_y := R_y(q_{app}, b)$	$R'_y = 7\ lbf$	

— END OF SECTION D —