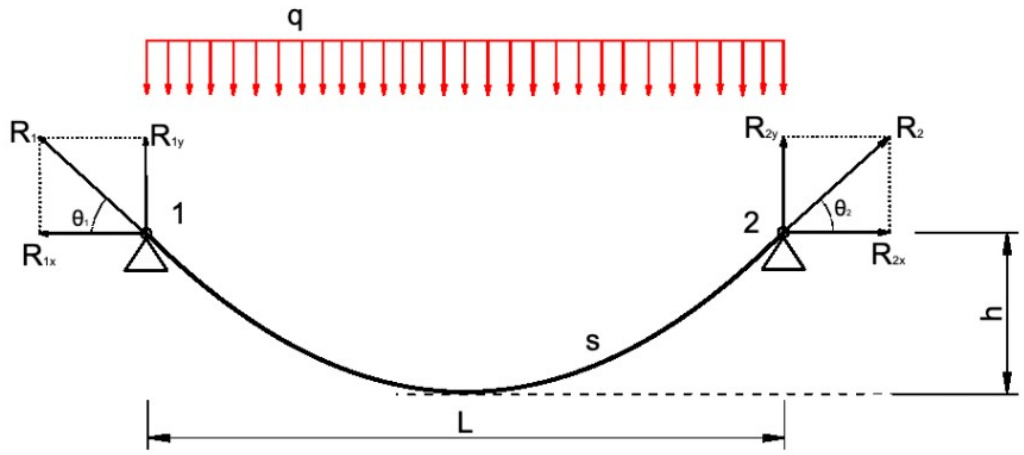
Metal Form Deck Catenary Action - Max Tension

Sagging Cable Analysis

Calculate sag length, reactions, resultant force, and angle of force for sagged cable.
(Source: Engineering Toolbox Cable Loads)



Inputs

$w := 90\ \frac{plf}{ft}$ Uniformly Distributed Load per ft of deck width

$L := 7\ ft$ Span Length

$h := 0.5\ in$ Sag Distance (Deflection)

Results (per 1 ft of deck width)

$R_y := 0.5 \cdot w \cdot L = 0.3\ \frac{kip}{ft}$ Vertical Reaction

$R_x := \frac{w \cdot L^2}{8 \cdot h} = 13.2\ \frac{kip}{ft}$ Horizontal Reaction

$R_T := \sqrt{R_y^{\ 2} + R_x^{\ 2}} = 13.2\ \frac{kip}{ft}$ Resultant Force (Max Tension)

$\theta := \operatorname{atan}\left(\frac{R_y}{R_x}\right) = 1.4\ deg$ Angle of Resultant Force from Horizontal

$s := L + \left(\frac{8 \cdot h^2}{3 \cdot L}\right) = 7\ ft$ Approximate Sagged Cable Length

Deck Screw Strength

#10 deck screw

$d := 0.182\ in$ — Screw body diameter

$A_b := \pi \cdot (0.5\ d)^2 = 0.026\ in^2$ — Screw area

$F_{allow} := 0.4 \cdot (33\ ksi) = 13.2\ ksi$ — Allowable shear stress

$R_{allow} := F_{allow} \cdot A_b = 0.343\ kip$ — Allowable shear strength

$\frac{R_{allow}}{R_T} = 0.311\ in$ — Required screw spacing for catenary tension force

Form Deck Tensile Strength

$l := 16\ \frac{in}{ft}$ — Form deck length of corrugated material for 1 ft of deck width

$t := 0.0474\ in$ — Form deck thickness (20 gage)

$A_{deck} := l \cdot t = 0.758\ \frac{in^2}{ft}$ — Form deck area per ft of width

$F_y := 50\ ksi$ — Form deck yield strength

$P_{allow} := \frac{A_{deck} \cdot F_y}{1.67} = 22.7\ \frac{kip}{ft}$ — Form deck allowable tensile strength per ft of width