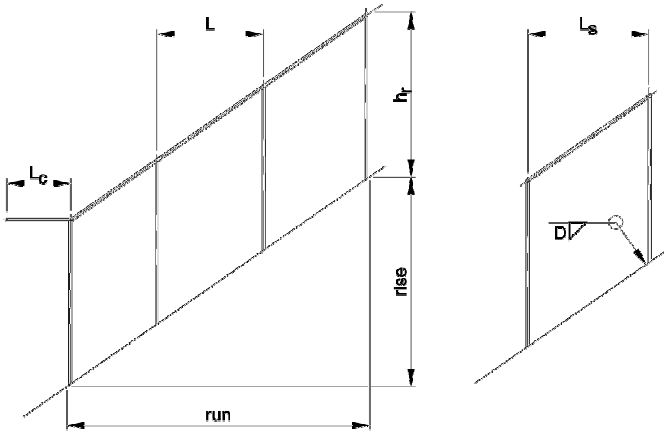
Summary:



Material Property Factor

Steel	$\varphi_s = 0.90$
Weld	$\varphi_w = 0.67$
Dead Load Factor	$\alpha_D = 1.25$
Live Load Factor	$\alpha_L = 1.50$

$Check\left(\alpha_D \geq 1.25\right) = "...OK"$

$Check\left(\alpha_L \geq 1.5\right) = "...OK"$

Steel

Steel Designation Imperial (Rail)	$desI_1 = "G40.21\text{-}350W"$	
Steel Yield Strength (Rail)	$f_{y1} = 50\ ksi$	$f_{y1} = 345\ MPa$
Steel Ultimate Strength (Rail)	$F_{u1} = 65\ ksi$	$F_{u1} = 448\ MPa$
Steel Designation Imperial (Anchor Plate)	$desI_2 = "G40.21\text{-}350W"$	
Steel Yield Strength (Anchor Plate)	$f_{y2} = 50\ ksi$	$f_{y2} = 345\ MPa$
Steel Ultimate Strength (Anchor Plate)	$F_{u2} = 65\ ksi$	$F_{u2} = 448\ MPa$

Rail Section

Depth	$d = 2\ in$	$d = 50.8\ mm$
Thickness	$t = 0.5\ in$	$t = 12.7\ mm$
Area	$A = 1\ in^2$	$A = 645.2\ mm^2$
Plastic Modulus	$Zx = 0.5\ in^3$	$Zx = 8193.5\ mm^3$

Span Information

Continuous Span of Guardrail	$L = 7.000\ ft$	$L = 2.134\ m$
Simple Span of Guardrail	$L_s = 0.000\ ft$	$L_s = 0.000$
Cantilever Span of Guardrail	$L_c = 0.000\ ft$	$L_c = 0.000$
Height of Guardrail	$h_r = 3.500\ ft$	$h_r = 1.067\ m$
Rise	$rise = 0\ in$	$rise = 0$
Run	$run = 77\ in$	$run = 1.956\ m$
Guardrail Angle	$\phi = 0\ °$	
Amplification Factor	$\alpha_1 = 1$	

Weld

Electrode Designation (Imperial)	$desI_w = "E80xx"$	
Electrode Designation (Metric)	$desM_w = "E55xx\text{-}x"$	
Weld Metal Strength	$X_u = 80.00\ Ksi$	
Base Metal Strength	$F_{u2} = 65.00\ Ksi$	
Weld Size	$D = 0.38\ in$	$D = 9.53\ mm$

Design Loads

Dead Load $q_D = 3.00\ \text{plf}$ $q_D = 0.04\ \text{kNpm}$

Live Load (Hor on Top of Rail) $q_L = 51.00\ \text{plf}$ $q_L = 0.74\ \text{kNpm}$

Live Load (Vert on Top of Rail) $q_{L1} = 103.00\ \text{plf}$ $q_L = 0.74\ \text{kNpm}$

Live Load (Load P on Top of Rail) $p_L = 225.00\ \text{lb}$ $p_L = 1.00\ \text{kN}$

Design of Rail

Resistance of Rail Section $M_{rr} = 1.88\ \text{K\_ft}$ $M_{rr} = 2.54\ \text{kN\_m}$

Max Rail Reaction $R_{fr\_max} = 0.59\ \text{K}$ $R_{fr\_max} = 2.62\ \text{kN}$

Max Rail Moment $M_{fr\_max} = 0.86\ \text{K\_ft}$ $M_{fr\_max} = 1.17\ \text{kN\_m}$

$\text{Check}\left(M_{rr} \geq M_{fr\_max}\right) = \text{"...OK"}$ $\text{Check}\left(\frac{M_{rr}}{\varphi_s} \geq M_{fr\_max}\right) = \text{"...OK"}$ Allow for Overload

Design of Post

Resistance of Post Section $M_{rp} = 1.88\ \text{K\_ft}$ $M_{rp} = 2.54\ \text{kN\_m}$

Max Post Moment (Penultimate) $M_{fpp} = 2.06\ \text{K\_ft}$ $M_{fpp} = 2.80\ \text{kN\_m}$

$\text{Check}\left(M_{rp} \geq M_{fpp}\right) = \text{"...NG"}$ $\text{Check}\left(\frac{M_{rp}}{\varphi_s} \geq M_{fpp}\right) = \text{"...OK"}$ Allow for Overload

Max Post Moment (Continuous) $M_{fp} = 2.06\ \text{K\_ft}$ $M_{fp} = 2.80\ \text{kN\_m}$

$\text{Check}\left(M_{rp} \geq M_{fp}\right) = \text{"...NG"}$ $\text{Check}\left(\frac{M_{rp}}{\varphi_s} \geq M_{fp}\right) = \text{"...OK"}$ Allow for Overload

Design of Weld

Section Modulus of Weld (All Around) $Sx_w = 1.54\ \text{in}^3$ $Sx_w = 25295\ \text{mm}^3$

Moment Resistance (weld) $M_{rw} = 3.27\ \text{K\_ft}$ $M_{rw} = 4.43\ \text{kN\_m}$

$\text{Check}\left(M_{rw} \geq \max\left(\left[\begin{array}{cc} M_{fpp} & M_{fp} \end{array}\right]\right)\right) = \text{"...OK"}$ $\text{Check}\left(\frac{M_{rw}}{\varphi_s} \geq \max\left(\left[\begin{array}{cc} M_{fpp} & M_{fp} \end{array}\right]\right)\right) = \text{"...OK"}$ Allow for Overload