

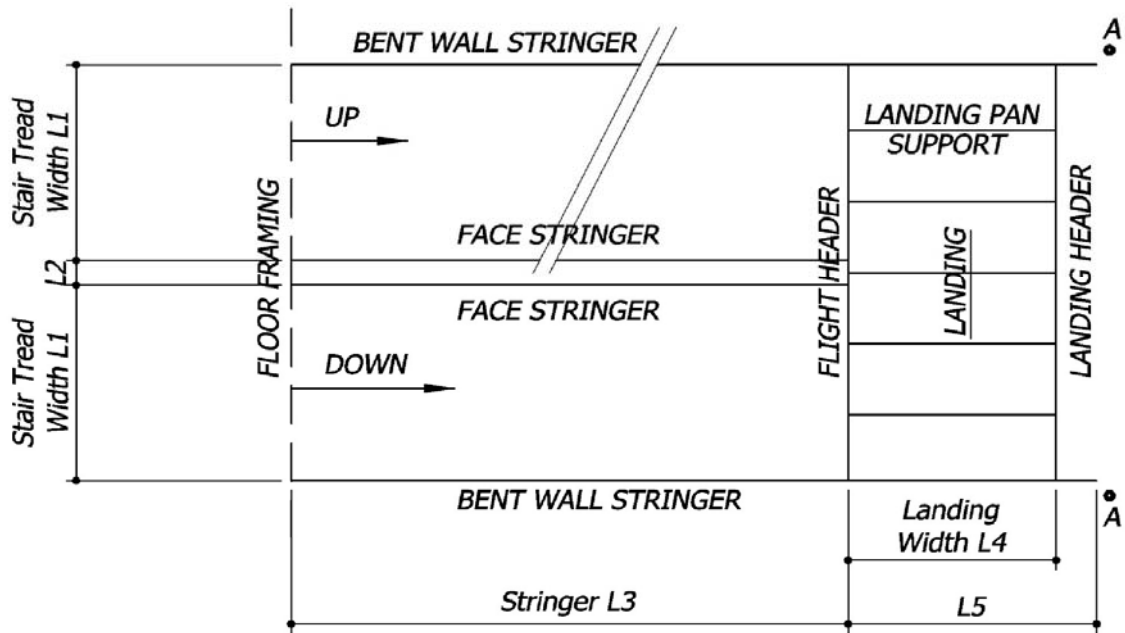
Analysis Method: **ASD**

Stair Number: _____

Bent Exterior Stringer Stair Design

Based on 2005 Specification for Structural Steel Buildings

FRAMING AT BENT WALL STRINGER STAIR



Geometry

Tread Width L1 :	3.854 ft
Stringer Spacing L2 :	8.500 in
Stringer Length L3 :	11.000 ft
Landing Width L4 :	4.580 ft
Stringer Support L5 :	5.500 ft
Landing Pan Support Spacing:	5.500 ft
Concrete Fill at Treads :	2.00 in
Concrete Fill at Landing :	3.00 in

Loads

Treads:	Concrete = 25.00 psf
	Treads & Pans = 10.00 psf
	Misc = 5.00 psf
	<hr/> Dead Load = 40.00 psf

Live Load = 100.00 psf

Stringers:	Unif. Load = 77.08 plf
	Handrails = 50.00 plf
	Dead Load = 127.08 plf

Live Load = 192.70 plf

Total Load = 319.78 plf

Landing:	Concrete = 37.50 psf
	Pans = 3.00 psf
	Misc = 4.50 psf
	<hr/> 45.00 psf

Live Load = 100.00 psf

Total Load = 145.00 psf

Does Wall Stringer have Handrails?

No

Tread Design

Tread Gage =	12 GA
I =	23.00
S =	3.56
Max Imposed Load =	0.54 k
Max Tread Capacity =	11.08 k OK
Deflection =	0.021 in = L/2161

Face Stringer

max. deflection = 0.3667 in

Face Stringer Size = **MC12x14.3**

Span = 11.000 ft

w = 334.08 plf

R = 1.84 k

Z_x = 15.24 in³

M = 5.05 k-ft

Mark

Wt = 14.30 plf

M_r/Ω = **27.38 k-ft** **OK****S154S1**I_x = 76.30 in⁴Channel F_y: **36.00 ksi**

deflection = 0.0497 in = L/2654

F_u: 58.00 ksi

Max Span for Strength = 25.60 ft

Max Span for Deflection = 18.13 ft

Bent Stringer

max. deflection = 0.3667 in

Face Stringer Size = **C12x20.7**

Span = 16.500 ft

w₁ = 290.48 plf

R = 3.58 k

Z_x = 25.60 in³w₂ = 401.45 plf

R at A = 6.29 k

Mark

Wt = 20.70 plf

M = 21.83 k-ft

S154S1I_x = 129.00 in⁴Channel F_y: **36.00 ksi**M_r/Ω = **45.99 k-ft** **OK**F_u: 58.00 ksi

deflection = 0.0256 in = L/5161

Max Span for Strength = 35.59 ft

Max Span for Deflection = 21.40 ft

Landing Pan SupportHeader Size = **C4X5.4**

Span = 4.580 ft

w = 802.90 plf

R = 1.84 k

Z_x = 2.29

Mark

W = 5.4

M = 2.11 k-ft

I_x = 3.85M_r/Ω = **4.11 k-ft** **OK**F_y: **36.00 ksi**F_u: 58.00 ksi

deflection = 0.0712 in = L/772

Flight HeaderHeader Size = **HSS7X4X3/8**

Span = 8.416 ft

w = 356.90 plf

R = 3.34 k

Z_x = 15.1

Mark

W = 24.8537

P = 3.67 k

M = 10.89 k-ft

S163M5I_x = 41.8M_r/Ω = **44.65 k-ft** **OK**F_y: **36.00 ksi**F_u: 58.00 ksi

deflection = 0.0983 in = L/1027

Guard & Handrails

Posts : **HSS2X2X3/16**
 Zx 0.80 in3
 A 1.19 in3
 Ix 0.64 in3
 Post F_y: **46.00 ksi**
 F_u: 58.00 ksi

Guard Rails : **HSS2X2X3/16**
 Zx 0.80 in3
 A 1.19 in3
 Ix 0.64 in3
 Rail F_y: **46.00 ksi**
 F_u: 58.00 ksi

Rail Height : **3'-6"**
 End Post Spacing : **3'-8"**
 Middle Post Spacing : **3'-9"**
 Concentrated Load : **200 lbs**
 Uniform Load : **50 lbs/ft**

C_{post} = 0.01526
 C_{rail} = 0.01457
 C_R = 0.95

Per NAAMM *Pipe Railing Systems Manual* Page 15, in lieu of looking up P_f,

At End posts 2-span Rail 0.85
 3 or more spans 0.82

At Intermediate posts 2-span Rail 0.65
 3 or more spans 0.60

End Post

Spans = **3**
 M = 0.43 k-ft **OK**
 M_r/Ω = 1.83 k-ft
 P_f = 0.82
 Weld size req'd = 0.08 in
 Minimum Weld Required = **3/16 Fillet** Post to Channel Flange

Middle Posts

Spans = **3**
 M = 0.32 k-ft **OK**
 M_r/Ω = 1.83 k-ft
 P_f = 0.6
 Weld size req'd = 0.06 in
 Minimum Weld Required = **3/16 Fillet** Post to Channel Flange

Grab Rails

Guard Rails : **Pipe1-1/4STD**
 Zx 0.31 in3
 A 0.62 in3
 Ix 0.18 in3
 Rail F_y: **35.00 ksi**
 F_u: 60.00 ksi
 M = 0.05 k-ft **OK**
 M_r/Ω = 1.83 k-ft

P_f = 0.6