

Anemometer Tower Design Sheet [pipe/tube]

Specifications	
Height of Tower [ft]	100
Radius of Guy Anchor [ft]	50
Typical Pre-Tension on Guy Wire [lbs]	1000
Length of Gin Pole [ft]	50
Wind Survival Speed [M/s]	50
Factor Of safety Required [FOS]	1
Number of Guy Wires Around Tower	4
n [end fixidity for guyed towers Assume =2]	2
Modulus of Elasticity [Steel Assume 30M psi]	3E+07

Section 1 [Base]	
Pipe Material = 3.5" x 0.125 WLL	
Diameter of Section [In.]	3.5
Length of Section [In.]	240
X-sect. Area [In.^2]	1.23
Moment of Inertia [In.^4]	1.77
Radius of Gyration [In.]	1.2
Weight/Foot of Section [Lb/Ft]	4.51
Section 1 Calculations	
Height at top of section [ft]	20
Angle of Guy to Top of Sect. [Deg]	21.8
Vertical Load Due to Guy Tension [lbs]	37.1
Weight of Section [lbs]	90.2
Weight of All Sect [Inc this sect & abv]	433
Guy Tension Load (this Sect & abv)[lbs]	3191.5
Total Load (Weight & Guvs this sect & abv)	3624.5
Wind Load on Centroid of Section [lbs Force]	186.7
Guy Tension Load Due to Wind	402.2
Guy Anchor Load This Sect & Abv [inc FOS] Lbs	3131.6
Critical Load At Section 1 [inc all Loads] {Per}	18209.5
Critical Stress [psi] at Section 1	14804.5
Compression Stress at Section [psi]	2946.79
Allowable Load at Sect w/ FOS [lbs]	18209.5
Remaining [excess vertical] Load Capacity As Designed @ FOS [lbs]	14585.0

Gin Pole Calculations	
Guy Angle-During Gin Pole Use	21.8
Axial Load During Gin Pole Use	36.08
Tension Load on Guy Wire	97.1484
Total Axial Load on Tower	490.8
Axial Load on Gin Pole	433
Tension On Hand Down Line	654.503
Gin Pole Pipe Material = 3.0" x 0.120WLL	
X-sect. Area [In.^2]	1.02
Moment of Inertia [In.^4]	1.06
Radius of Gyration [In.]	1.02
Critical Load -Gin Pole [lbs]	1745.63
Critical Stress [psi] in Gin Pole	1711.4
Allowable Load [axial] on Gin Pole	1745.63
Remaining [Excess] Load for Gin Pole	1312.63

Section 2 [Above Sect. 1]	
Pipe Material = 3.0" x 0.188 WLL	
Diameter of Section [In.]	3
Length of Section [In.]	240
X-sect. Area [In.^2]	1.51
Moment of Inertia [In.^4]	1.55
Radius of Gyration [In.]	1
Weight/Foot of Section [Lb/Ft]	5.65
Section 2 Calculations	
Height at top of section [ft]	40
Angle of Guy to Top of Sect. [Deg]	38.7
Vertical Load Due to Guy Tension [lbs]	62.5
Weight of Section [lbs]	113
Weight of All Sect [Inc this sect & abv]	342.8
Guy Tension Load (this Sect & abv)[lbs]	3043.0
Total Load (Weight & Guvs this sect & abv)	3385.8
Wind Load on Section [lbs Force]	160.0
Guy Tension Load Due to Wind	409.9
Guy Anchor Load This Sect & Abv	2629.4
Critical Load At Section 2 [inc all Loads]	15241.1
Critical Stress [psi] at Section 2	10280.9
Compression Stress at Section [psi]	2242.25
Allowable Load at Sect w/ FOS [lbs]	15224.1
Remaining Load Capacity As Designed	12138.3

Section 3	
Pipe Material = 3.0" x 0.134 WLL	
Diameter of Section [In.]	3
Length of Section [In.]	240
X-sect. Area [In.^2]	1.33
Moment of Inertia [In.^4]	1.17
Radius of Gyration [In.]	1.02
Weight/Foot of Section [Lb/Ft]	4.11
Section 3 Calculations	
Height at top of section [ft]	60
Angle of Guy to Top of Sect. [Deg]	50.2
Vertical Load Due to Guy Tension [lbs]	76.8
Weight of Section [lbs]	82.2
Weight of All Sect [Inc this sect & abv]	229.8
Guy Tension Load (this Sect & abv)[lbs]	2793.1
Total Load (Weight & Guvs this sect & abv)	3022.9
Wind Load on Section [lbs Force]	160.0
Guy Tension Load Due to Wind	500.0
Guy Anchor Load This Sect & Abv	2119.5
Critical Load At Section 3 [inc all Loads]	12086.7
Critical Stress [psi] at Section 3	10696.2
Compression Stress at Section [psi]	2675.14
Allowable Load at Sect w/ FOS [lbs]	12086.7
Remaining Load Capacity As Designed	9063.8

Section 4	
Pipe Material = 3.0" x 0.120 WLL	
Diameter of Section [In.]	3
Length of Section [In.]	240
X-sect. Area [In.^2]	1.02
Moment of Inertia [In.^4]	1.06
Radius of Gyration [In.]	1.02
Weight/Foot of Section [Lb/Ft]	3.69
Section 4 Calculations	
Height at top of section [ft]	80
Angle of Guy to Top of Sect. [Deg]	58.0
Vertical Load Due to Guy Tension [lbs]	84.8
Weight of Section [lbs]	73.8
Weight of All Sect [Inc this sect & abv]	147.6
Guy Tension Load (this Sect & abv)[lbs]	2485.8
Total Load (Weight & Guvs this sect & abv)	2633.4
Wind Load on Section [lbs Force]	160.0
Guy Tension Load Due to Wind	603.9
Guy Anchor Load This Sect & Abv	1519.6
Critical Load At Section 4 [inc all Loads]	10910.2
Critical Stress [psi] at Section 4	10696.2
Compression Stress at Section [psi]	2581.79
Allowable Load at Sect w/ FOS [lbs]	10910.2
Remaining Load Capacity As Designed	8276.7

Section 5	
Pipe Material = 3.0" x 0.120 WLL	
Diameter of Section [In.]	3
Length of Section [In.]	240
X-sect. Area [In.^2]	1.02
Moment of Inertia [In.^4]	1.06
Radius of Gyration [In.]	1.02
Weight/Foot of Section [Lb/Ft]	3.69
Section 5 Calculations	
Height at top of section [ft]	100
Angle of Guy to Top of Sect. [Deg]	63.4
Vertical Load Due to Guy Tension [lbs]	89.4
Weight of Section [lbs]	0
Weight of All Sect [Inc this sect & abv]	73.8
Guy Tension Load (this Sect & abv)[lbs]	2146.6
Total Load (Weight & Guvs this sect & abv)	2220.4
Wind Load on Section [lbs Force]	160.0
Guy Tension Load Due to Wind	715.7
Guy Anchor Load This Sect & Abv	815.7
Critical Load At Section 5 [inc all Loads]	10910.2
Critical Stress [psi] at Section 5	10696.2
Compression Stress at Section [psi]	2176.89
Allowable Load at Sect w/ FOS [lbs]	10910.2
Remaining Load Capacity As Designed	8689.7

Section 6	
Pipe Material = 3.5" x 0.125 WLL	
Diameter of Section [In.]	3
Length of Section [In.]	0
X-sect. Area [In.^2]	1.02
Moment of Inertia [In.^4]	1.06
Radius of Gyration [In.]	1.02
Weight/Foot of Section [Lb/Ft]	3.69
Section 6 Calculations	
Height at top of section [ft]	100
Angle of Guy to Top of Sect. [Deg]	63.4
Vertical Load Due to Guy Tension [lbs]	89.4
Weight of Section [lbs]	0
Weight of All Sect [Inc this sect & abv]	0
Guy Tension Load (this Sect & abv)[lbs]	1788.9
Total Load (Weight & Guvs this sect & abv)	1788.9
Wind Load on Section [lbs Force]	0.0
Guy Tension Load Due to Wind	0.0
Guy Anchor Load This Sect & Abv	0.0
Critical Load At Section 6 [inc all Loads]	#DIV/0!
Critical Stress [psi] at Section 6	#DIV/0!
Compression Stress at Section [psi]	1753.78
Allowable Load at Sect w/ FOS [lbs]	#DIV/0!
Remaining Load Capacity As Designed	#DIV/0!

Guy Angle-During Gin Pole Use	38.7
Axial Load During Gin Pole Use	90.4
Tension Load on Guy Wire	144.711

Guy Angle-During Gin Pole Use	50.2
Axial Load During Gin Pole Use	98.64
Tension Load on Guy Wire	128.401

Guy Angle-During Gin Pole Use	58.0
Axial Load During Gin Pole Use	118.08
Tension Load on Guy Wire	139.246

Guy Angle-During Gin Pole Use	63.4
Axial Load During Gin Pole Use	147.6
Tension Load on Guy Wire	165.022

Guy Angle-During Gin Pole Use	63.4
Axial Load During Gin Pole Use	0
Tension Load on Guy Wire	0