Anemometer Tower Design Sheet [pipe/tube]

Specifications

Specification	Value
Height of Tower [ft]	100
Radius of Guy Anchor [ft]	50
Typical Pre-Tension on Guy Wire [lbs]	100
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
Modulous of Elasticity [Steel Assume 30M psi]	3E+07

Sections 1–6

	Section 1 [Base]	Section 2 [Above Sect. 1]	Section 3	Section 4	Section 5	Section 6
Pipe Material	3.5" x 0.125 WLL	3.0" x 0.188 WLL	3.0" x 0.134 WLL	3.0" x 0.120 WLL	3.0" x 0.120 WLL	3.5" x 0.125 WLL
Diameter of Section [In.]	3.5	3	3	3	3	3
Length of Section [In.]	240	240	240	240	240	0
X-sect. Area [In.^2]	1.23	1.51	1.13	1.02	1.02	1.02
Moment of Inertia [In.^4]	1.77	1.55	1.17	1.06	1.06	1.06
Radius of Gyration [In.]	1.2	1	1.02	1.02	1.02	1.02
Weight/Foot of Section [Lb/Ft]	4.51	5.65	4.11	3.69	3.69	3.69

Section Calculations

	Section 1 Calculations	Section 2 Calculations	Section 3 Calculations	Section 4 Calculations	Section 5 Calculations	Section 6 Calculations
Height at top of section [ft]	20	40	60	80	100	100
Angle of Guy to Top of Sect. [Deg]	21.8	38.7	50.2	58.0	63.4	63.4
Vertical Load Due to Guy Tension [lbs]	37.1	62.5	76.8	84.8	89.4	89.4
Weight of Section [lbs]	90.2	113	82.2	73.8	73.8	0
Weight of All Sect [this sect & abv]	433	342.8	229.8	147.6	73.8	0
Guy Tension Load (this Sect & abv)[lbs]	3191.5	3043.0	2793.1	2485.8	2146.6	1788.9
Total Load (Weight & Guys this sect & abv)	3624.5	3385.8	3022.9	2633.4	2220.4	1788.9
Wind Load on Centroid of Section [lbs Force]	186.7	160.0	160.0	160.0	160.0	0.0
Guy Tension Load Due to Wind	402.2	409.9	500.0	603.9	715.7	0.0
Guy Anchor Load This Sect & Abv {inc FOS} Lbs	3131.6	2629.4	2119.5	1519.6	815.7	0.0
Critical Load At Section [inc all Loads] {Pcr}	18209.5	15524.1	12086.7	10910.2	10910.2	#DIV/0!
Critical Stress [psi] at Section	14804.5	10280.9	10696.2	10696.2	10696.2	#DIV/0!
Compression Stress at Section [psi]	2946.79	2242.25	2675.14	2581.79	2176.89	1753.78
Allowable Load at Sect w/ FOS [lbs]	18209.5	15524.1	12086.7	10910.2	10910.2	#DIV/0!
Remaining [excess vertical] Load Capacity As Designed @ FOS [lbs]	14585.0	12138.3	9063.8	8276.7	8689.7	#DIV/0!

Note (Section 1 row): "Remaining [excess vertical] Load Capacity As Designed @ FOS [lbs]"; Sections 2–6: "Remaining Load Capacity As Designed".

Gin Pole Calculations

	Section 1	Section 2	Section 3	Section 4	Section 5	Section 6
Guy Angle-During Gin Pole Use	21.8	38.7	50.2	58.0	63.4	63.4
Axial Load During Gin Pole Use	36.08	90.4	98.64	118.08	147.6	0
Tension Load on Guy Wire	97.1484	144.711	128.401	139.246	165.022	0

Gin Pole Calculations	Value
Total Axial Load on Tower	490.8
Axial Load on Gin Pole	433
Tension On Haul 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