## Anemometer Tower Design Sheet [pipe/tube]

### Specifications

| | |
|---|---|
| Number of Sections | 5 |
| Height of Tower [ft] | 100 |
| Radius of Guy Anchor [ft] | 50 |
| Typical Pre-Tension on Guy Wire [lbs] | 100 |
| Length of Gin Pole [ft] | 30 |
| Factor Of safety Required   [FOS] | 4 |
| 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 |

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

| | 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 | Height at top of section [ft] | 40 | Height at top of section [ft] | 60 | Height at top of section [ft] | 80 | Height at top of section [ft] | 100 | Height at top of section [ft] | 100 |
| Angle of Guy to Top of Sect. [Deg] | 21.8 | Angle of Guy to Top of Sect. [Deg] | 38.7 | Angle of Guy to Top of Sect. [Deg] | 50.2 | Angle of Guy to Top of Sect. [Deg] | 58.0 | Angle of Guy to Top of Sect. [Deg] | 63.4 | Angle of Guy to Top of Sect. [Deg] | 63.4 |
| Vertical Load Due to Guy Tension [lbs] | 37.1 | Vertical Load Due to Guy Tension [lbs] | 62.5 | Vertical Load Due to Guy Tension [lbs] | 76.8 | Vertical Load Due to Guy Tension [lbs] | 84.8 | Vertical Load Due to Guy Tension [lbs] | 89.4 | Vertical Load Due to Guy Tension [lbs] | 89.4 |
| Weight of Section [lbs] | 90.2 | Weight of Section [lbs] | 113 | Weight of Section [lbs] | 82.2 | Weight of Section [lbs] | 73.8 | Weight of Section [lbs] | 73.8 | Weight of Section [lbs] | 0 |
| Weight of All Sect [this sect & abv] | 433 | Weight of All Sect [Inc this sect & abv] | 342.8 | Weight of All Sect [Inc this sect & abv] | 229.8 | Weight of All Sect [Inc this sect & abv] | 147.6 | Weight of All Sect [Inc this sect & abv] | 73.8 | Weight of All Sect [Inc this sect & abv] | 0 |
| Guy Tension Load (this Sect & abv)[lbs] | 3191.5 | Guy Tension Load (this Sect & abv)[lbs] | 3043.0 | Guy Tension Load (this Sect & abv)[lbs] | 2793.1 | Guy Tension Load (this Sect & abv)[lbs] | 2485.8 | Guy Tension Load (this Sect & abv)[lbs] | 2146.6 | Guy Tension Load (this Sect & abv)[lbs] | 1788.9 |
| Total Load (Weight & Guys this sect & abv) | 3624.5 | Total Load (Weight & Guys this sect & abv) | 3385.8 | Total Load (Weight & Guys this sect & abv) | 3022.9 | Total Load (Weight & Guys this sect & abv) | 2633.4 | Total Load (Weight & Guys this sect & abv) | 2220.4 | Total Load (Weight & Guys this sect & abv) | 1788.9 |
| Critical Load At Section 1 [inc all Loads] {Pcr} | 18209.5 | Critical Load At Section 2 [inc all Loads] | 15524 | Critical Load At Section 3 [inc all Loads] | 12087 | Critical Load At Section 4 [inc all Loads] | 10910 | Critical Load At Section 5 [inc all Loads] | 10910 | Critical Load At Section 6 [inc all Loads] | ##### |
| Critical Stress [psi] at Section 1 | 14804.5 | Critical Stress [psi] at Section 2 | 10281 | Critical Stress [psi] at Section 3 | 10696 | Critical Stress [psi] at Section 4 | 10696 | Critical Stress [psi] at Section 5 | 10696 | Critical Stress [psi] at Section 6 | ##### |
| Compression Stress at Section [psi] | 2946.79 | Compression Stress at Section [psi] | 2242 | Compression Stress at Section [psi] | 2675 | Compression Stress at Section [psi] | 2582 | Compression Stress at Section [psi] | 2177 | Compression Stress at Section [psi] | 1754 |
| Allowable Load at Sect w/ FOS [lbs] | 4552.38 | Allowable Load at Sect w/ FOS [lbs] | 3881 | Allowable Load at Sect w/ FOS [lbs] | 3022 | Allowable Load at Sect w/ FOS [lbs] | 2728 | Allowable Load at Sect w/ FOS [lbs] | 2728 | Allowable Load at Sect w/ FOS [lbs] | ##### |
| Remaining [excess vertical] Load Capacity As Designed @ FOS [lbs] | 927.8 | Remaining Load Capacity As Designed | 495.2 | Remaining Load Capacity As Designed | -1.2 | Remaining Load Capacity As Designed | 94.1 | Remaining Load Capacity As Designed | 507.1 | 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 | 33.7 | Guy Angle-During Gin Pole Use | 53.1 | Guy Angle-During Gin Pole Use | 63.4 | Guy Angle-During Gin Pole Use | 69.4 | Guy Angle-During Gin Pole Use | 73.3 | Guy Angle-During Gin Pole Use | 73.3 |
| Axial Load During Gin Pole Use | 60.1333 | Axial Load During Gin Pole Use | 150.7 | Axial Load During Gin Pole Use | 164.4 | Axial Load During Gin Pole Use | 196.8 | Axial Load During Gin Pole Use | 246 | Axial Load During Gin Pole Use | 0 |
| Tension Load on Guy Wire | 108.407 | Tension Load on Guy Wire | 188.3 | Tension Load on Guy Wire | 183.8 | Tension Load on Guy Wire | 210.2 | Tension Load on Guy Wire | 256.8 | Tension Load on Guy Wire | 0 |
| Total Axial Load on Tower | 818 | | | | | | | | | | |
| Axial Load on Gin Pole | 433 | | | | | | | | | | |
| Tension On Haul Down Line | 925.534 | | | | | | | | | | |
| 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] | 4848.96 | | | | | | | | | | |
| Critical Stress [psi] in Gin Pole | 4753.88 | | | | | | | | | | |
| Allowable Load [axial] on Gin Pole | 1212.24 | | | | | | | | | | |
| Remaining [Excess] Load for Gin Pole | 779.24 | | | | | | | | | | |