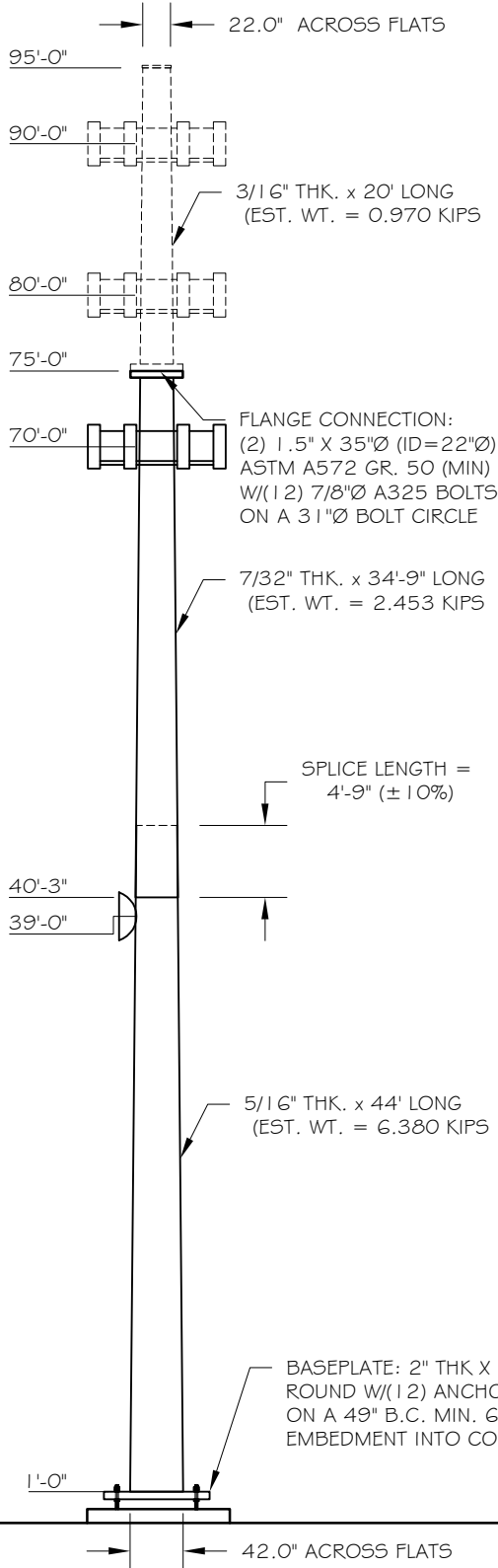


Page 1 of 1	Job Number: 23526-190
Eng: MFP	Customer Ref: TP-25701
	Date: 3/23/2026
Structure:	75-FT MONOPOLE (FUT. 95-FT)
Site:	US-CT-5052 NEW MILFORD 2 CT
Location:	LITCHFIELD CO., CT / 41°33'52.6", -73°24'58.2"
Owner:	VERTICAL BRIDGE
Revision No.:	Revision Date:



DESIGN

Building Code:	2022 CONNECTICUT BUILDING CODE		
Design Standard:	TIA-222-H		
Wind Speed Load Cases:	ASCE-7-16 WIND SPEED		
Load Case #1:	115 MPH Design Wind Speed		
Load Case #2:	50 MPH Wind with 1.00" Ice Accumulation		
Load Case #3:	60 MPH Service Wind Speed		
Structure Class Risk Category	Exposure Cat.	Topography Cat.	Crest Height
II	C	I	

STRUCTURE MEETS THE MINIMUM REQUIREMENTS OF TIA-222-I (FUT)

EQUIPMENT LIST

Elev.	Description
90	(12) ANTENNAS + MOUNTING (EPA 30,000 IN2)
90	GENERIC ANTENNA MOUNT
80	(12) ANTENNAS + MOUNTING (EPA 30,000 IN2)
80	GENERIC ANTENNA MOUNT
70	(12) ANTENNAS + MOUNTING (EPA 42,000 IN2)
70	GENERIC ANTENNA MOUNT
39	(1) 6-FT MICROWAVE
39	MICROWAVE MOUNT

ANTENNA FEED LINES ROUTED ON THE INSIDE OF THE POLE

STRUCTURE PROPERTIES

Cross-Section:	18-Sided	Taper:	0.21742 in/ft		
Shaft Steel:	ASTM A572 GR 65	Baseplate Steel:	ASTM A572 GR 55		
Anchor Rods:	2.25 in. A615 GR. 75 X 7'-0"				
Sect.	Length (ft)	Thickness (in)	Splice (ft)	Top Dia. (in)	Bot Dia. (in)
1	20.00	0.1875	0.00	22.00	26.35
2	34.75	0.2188	4.75	26.35	33.90
3	44.00	0.3125	0.00	32.43	42.00



BASE REACTIONS FOR FOUNDATION DESIGN

Moment: 2316 ft-kip
Shear: 32 kip
Axial: 29 kip

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Tower Input Data

The tower is a monopole.

This tower is designed using the TIA-222-H standard.

The following design criteria apply:

Tower base elevation above sea level: 294.00 ft.

Basic wind speed of 115 mph.

Risk Category II.

Exposure Category C.

Simplified Topographic Factor Procedure for wind speed-up calculations is used.

Topographic Category: 1.

Crest Height: 0.00 ft.

Nominal ice thickness of 1.0000 in.

Ice thickness is considered to increase with height.

Ice density of 56 pcf.

A wind speed of 50 mph is used in combination with ice.

Temperature drop of 50 °F.

Deflections calculated using a wind speed of 60 mph.

Non-linear (P-delta) analysis was used.

Pressures are calculated at each section.

Stress ratio used in pole design is 1.

Local bending stresses due to climbing loads, feed line supports, and appurtenance mounts are not considered.

Tapered Pole Section Geometry

Section	Elevation ft	Section Length ft	Splice Length ft	Number of Sides	Top Diameter in	Bottom Diameter in	Wall Thickness in	Bend Radius in	Pole Grade
L1	95.00-75.00	20.00	0.00	18	22.0000	26.3484	0.1875	0.7500	A572-65 (65 ksi)
L2	75.00-40.25	34.75	4.75	18	26.3484	33.9038	0.2188	0.8750	A572-65 (65 ksi)
L3	40.25-1.00	44.00		18	32.4335	42.0000	0.3125	1.2500	A572-65 (65 ksi)

Tapered Pole Properties

Section	Tip Dia. in	Area in ²	I in ⁴	r in	C in	I/C in ³	J in ⁴	It/Q in ²	w in	w/t
L1	22.3105	12.9812	780.3007	7.7434	11.1760	69.8193	1561.6281	6.4918	3.5420	18.891
	26.7259	15.5690	1346.1823	9.2871	13.3850	100.5740	2694.1360	7.7860	4.3073	22.972
L2	26.7211	18.1421	1564.9246	9.2760	13.3850	116.9164	3131.9083	9.0728	4.2523	19.439
	34.3930	23.3879	3352.7592	11.9582	17.2231	194.6663	6709.9300	11.6962	5.5821	25.518
L3	33.9343	31.8600	4153.0008	11.4030	16.4762	252.0602	8311.4662	15.9330	5.1583	16.507
	42.5997	41.3488	9078.4551	14.7991	21.3360	425.4994	18168.8558	20.6783	6.8420	21.894

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Tower Elevation	Gusset Area (per face)	Gusset Thickness	Gusset Grade	Adjust. Factor A_f	Adjust. Factor A_r	Weight Mult.	Double Angle Stitch Bolt Spacing Diagonals	Double Angle Stitch Bolt Spacing Horizontals	Double Angle Stitch Bolt Spacing Redundants
ft	ft ²	in					in	in	in
L1 95.00-75.00				1	1	1			
L2 75.00-40.25				1	1	1			
L3 40.25-1.00				1	1	1			

Feed Line/Linear Appurtenances - Entered As Area

Description	Face or Leg	Allow Shield	Exclude From Torque Calculation	Component Type	Placement	Total Number	$C_A A_A$	Weight	
					ft		ft ² /ft	plf	
Safety Climb & Step Bolts Exposed	C	No	Yes	CaAa (Out Of Face)	95.00 - 1.00	1	No Ice	0.06	0.09
							1/2" Ice	0.14	0.63
							1" Ice	0.24	1.77
**									
1 5/8"	C	No	Yes	Inside Pole	90.00 - 1.00	12	No Ice	0.00	0.92
							1/2" Ice	0.00	0.92
							1" Ice	0.00	0.92
1 5/8"	C	No	Yes	Inside Pole	80.00 - 1.00	12	No Ice	0.00	0.92
							1/2" Ice	0.00	0.92
							1" Ice	0.00	0.92
1 5/8"	C	No	Yes	Inside Pole	70.00 - 1.00	18	No Ice	0.00	0.92
							1/2" Ice	0.00	0.92
							1" Ice	0.00	0.92
1 5/8"	C	No	Yes	Inside Pole	39.00 - 1.00	2	No Ice	0.00	0.92
							1/2" Ice	0.00	0.92
							1" Ice	0.00	0.92

Feed Line/Linear Appurtenances Section Areas

Tower Section	Tower Elevation	Face	A_R	A_F	$C_A A_A$ In Face	$C_A A_A$ Out Face	Weight
	ft		ft ²	ft ²	ft ²	ft ²	K
L1	95.00-75.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	1.100	0.22
L2	75.00-40.25	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	1.911	1.26
L3	40.25-1.00	A	0.000	0.000	0.000	0.000	0.00
		B	0.000	0.000	0.000	0.000	0.00
		C	0.000	0.000	0.000	2.159	1.58

Feed Line/Linear Appurtenances Section Areas - With Ice

Tower Section	Tower Elevation	Face or Leg	Ice Thickness	A_R	A_F	$C_A A_A$ In Face	$C_A A_A$ Out Face	Weight
	ft		in	ft ²	ft ²	ft ²	ft ²	K

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Tower Section	Tower Elevation ft	Face or Leg	Ice Thickness in	A _R ft ²	A _F ft ²	C _{AA} In Face ft ²	C _{AA} Out Face ft ²	Weight K
L1	95.00-75.00	A	1.099	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	5.145	0.26
L2	75.00-40.25	A	1.056	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	8.646	1.33
L3	40.25-1.00	A	0.954	0.000	0.000	0.000	0.000	0.00
		B		0.000	0.000	0.000	0.000	0.00
		C		0.000	0.000	0.000	9.766	1.66

Discrete Tower Loads

Description	Face or Leg	Offset Type	Offsets: Horz Lateral Vert ft ft ft	Azimuth Adjustment °	Placement ft	C _{AA} Front ft ²	C _{AA} Side ft ²	Weight K	
Antennas + Mount (EPA 30,000 in2)	C	None		0.0000	90.00	No Ice	209.00	209.00	4.00
						1/2" Ice	219.00	219.00	5.00
						1" Ice	229.00	229.00	6.00
Antennas + Mount (EPA 30,000 in2)	C	None		0.0000	80.00	No Ice	209.00	209.00	4.00
						1/2" Ice	219.00	219.00	5.00
						1" Ice	229.00	229.00	6.00
Antennas + Mount (EPA 42,000 in2)	C	None		0.0000	70.00	No Ice	291.67	291.67	4.00
						1/2" Ice	350.00	350.00	5.00
						1" Ice	408.33	408.33	6.00

Dishes

Description	Face or Leg	Dish Type	Offset Type	Offsets: Horz Lateral Vert ft	Azimuth Adjustment °	3 dB Beam Width °	Elevation ft	Outside Diameter ft	Aperture Area ft ²	Weight K	
6 ft standard	C	Paraboloid w/o Radome	From Face	1.00	0.0000		39.00	6.00	No Ice	28.27	0.14
				0.00					1/2" Ice	29.07	0.29
				0.00					1" Ice	29.86	0.45

Load Combinations

Comb. No.	Description
1	Dead Only
2	1.2 Dead+1.0 Wind 0 deg - No Ice
3	0.9 Dead+1.0 Wind 0 deg - No Ice
4	1.2 Dead+1.0 Wind 90 deg - No Ice

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Comb. No.	Description
5	0.9 Dead+1.0 Wind 90 deg - No Ice
6	1.2 Dead+1.0 Wind 180 deg - No Ice
7	0.9 Dead+1.0 Wind 180 deg - No Ice
8	1.2 Dead+1.0 Ice+1.0 Temp
9	1.2 Dead+1.0 Wind 0 deg+1.0 Ice+1.0 Temp
10	1.2 Dead+1.0 Wind 90 deg+1.0 Ice+1.0 Temp
11	1.2 Dead+1.0 Wind 180 deg+1.0 Ice+1.0 Temp
12	Dead+Wind 0 deg - Service
13	Dead+Wind 90 deg - Service
14	Dead+Wind 180 deg - Service

Maximum Member Forces

Section No.	Elevation ft	Component Type	Condition	Gov. Load Comb.	Axial K	Major Axis Moment kip-ft	Minor Axis Moment kip-ft
L1	95 - 75	Pole	Max Tension	2	0.00	0.00	-0.00
			Max. Compression	8	-16.16	0.00	-0.00
			Max. Mx	4	-9.63	-167.81	-0.01
			Max. My	2	-9.62	0.00	167.87
			Max. Vy	4	16.71	-167.81	-0.01
			Max. Vx	2	-16.71	0.00	167.87
			Max. Torque	4			0.00
L2	75 - 40.25	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	8	-28.19	0.00	-0.00
			Max. Mx	4	-18.14	-950.12	-0.07
			Max. My	2	-18.12	0.00	950.46
			Max. Vy	4	28.59	-950.12	-0.07
			Max. Vx	2	-28.60	0.00	950.46
			Max. Torque	4			0.00
L3	40.25 - 1	Pole	Max Tension	1	0.00	0.00	0.00
			Max. Compression	8	-40.09	0.00	-1.16
			Max. Mx	4	-28.90	-2268.64	-0.88
			Max. My	2	-28.89	0.00	2316.09
			Max. Vy	4	30.89	-2268.64	-0.88
			Max. Vx	2	-32.13	0.00	2316.09
			Max. Torque	5			-1.65

Maximum Tower Deflections - Service Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	95 - 75	15.049	12	1.2576	0.0009
L2	75 - 40.25	9.847	12	1.1963	0.0009
L3	45 - 1	3.559	12	0.7311	0.0009

Critical Deflections and Radius of Curvature - Service Wind

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Elevation	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
90.00	Antennas + Mount (EPA 30,000 in2)	12	13.724	1.2544	0.0009	30620
80.00	Antennas + Mount (EPA 30,000 in2)	12	11.113	1.2286	0.0009	10206
70.00	Antennas + Mount (EPA 42,000 in2)	12	8.620	1.1458	0.0009	5664
39.00	6 ft standard	12	2.727	0.6234	0.0008	2836

Maximum Tower Deflections - Design Wind

Section No.	Elevation ft	Horz. Deflection in	Gov. Load Comb.	Tilt °	Twist °
L1	95 - 75	62.085	2	5.1932	0.0036
L2	75 - 40.25	40.628	2	4.9399	0.0036
L3	45 - 1	14.689	2	3.0188	0.0036

Critical Deflections and Radius of Curvature - Design Wind

Elevation	Appurtenance	Gov. Load Comb.	Deflection in	Tilt °	Twist °	Radius of Curvature ft
90.00	Antennas + Mount (EPA 30,000 in2)	2	56.621	5.1802	0.0036	7527
80.00	Antennas + Mount (EPA 30,000 in2)	2	45.852	5.0737	0.0035	2507
70.00	Antennas + Mount (EPA 42,000 in2)	2	35.568	4.7314	0.0036	1388
39.00	6 ft standard	2	11.254	2.5740	0.0033	689

Compression Checks

Pole Design Data

Section No.	Elevation ft	Size	L ft	L _u ft	KI/r	A in ²	P _u K	φP _n K	Ratio $\frac{P_u}{\phi P_n}$
L1	95 - 75 (1)	TP26.3484x22x0.1875	20.00	0.00	0.0	15.5690	-9.62	910.79	0.011
L2	75 - 40.25 (2)	TP33.9038x26.3484x0.2188	34.75	0.00	0.0	22.6709	-18.12	1326.25	0.014
L3	40.25 - 1 (3)	TP42x32.4335x0.3125	44.00	0.00	0.0	41.3488	-28.89	2418.90	0.012

Pole Bending Design Data

Section No.	Elevation ft	Size	M _{ux} kip-ft	φM _{ux} kip-ft	Ratio $\frac{M_{ux}}{\phi M_{ux}}$	M _{uy} kip-ft	φM _{uy} kip-ft	Ratio $\frac{M_{uy}}{\phi M_{uy}}$
L1	95 - 75 (1)	TP26.3484x22x0.1875	167.87	553.25	0.303	0.00	553.25	0.000

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Section No.	Elevation ft	Size	M_{ux} kip-ft	ϕM_{rx} kip-ft	Ratio $\frac{M_{ux}}{\phi M_{rx}}$	M_{uy} kip-ft	ϕM_{ry} kip-ft	Ratio $\frac{M_{uy}}{\phi M_{ry}}$
L2	75 - 40.25 (2)	TP33.9038x26.3484x0.2188	950.46	978.33	0.972	0.00	978.33	0.000
L3	40.25 - 1 (3)	TP42x32.4335x0.3125	2316.09	2381.12	0.973	0.00	2381.12	0.000

Pole Shear Design Data

Section No.	Elevation ft	Size	Actual V_u K	ϕV_n K	Ratio $\frac{V_u}{\phi V_n}$	Actual T_u kip-ft	ϕT_n kip-ft	Ratio $\frac{T_u}{\phi T_n}$
L1	95 - 75 (1)	TP26.3484x22x0.1875	16.71	273.24	0.061	0.00	626.00	0.000
L2	75 - 40.25 (2)	TP33.9038x26.3484x0.2188	28.60	397.87	0.072	0.00	1137.72	0.000
L3	40.25 - 1 (3)	TP42x32.4335x0.3125	32.13	725.67	0.044	0.00	2649.27	0.000

Pole Interaction Design Data

Section No.	Elevation ft	Ratio P_u	Ratio M_{ux}	Ratio M_{uy}	Ratio V_u	Ratio T_u	Comb. Stress Ratio	Allow. Stress Ratio	Criteria
L1	95 - 75 (1)	0.011	0.303	0.000	0.061	0.000	0.318	1.000	✓
L2	75 - 40.25 (2)	0.014	0.972	0.000	0.072	0.000	0.990	1.000	✓
L3	40.25 - 1 (3)	0.012	0.973	0.000	0.044	0.000	0.987	1.000	✓

Section Capacity Table

Section No.	Elevation ft	Component Type	Size	Critical Element	P K	ϕP_{allow} K	% Capacity	Pass Fail
L1	95 - 75	Pole	TP26.3484x22x0.1875	1	-9.62	910.79	31.8	Pass
L2	75 - 40.25	Pole	TP33.9038x26.3484x0.2188	2	-18.12	1326.25	99.0	Pass
L3	40.25 - 1	Pole	TP42x32.4335x0.3125	3	-28.89	2418.90	98.7	Pass
Summary								
Pole (L2)							99.0	Pass
RATING =							99.0	Pass

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Anchor Rod and Base Plate Calculation

TIA-222-H

<i>Factored Base Reactions:</i>	<i>Pole Shape:</i>	<i>Anchor Rods:</i>	<i>Base Plate:</i>
Moment: 2316 ft-kips	18-Sided	(12) 2.25 in. A615 GR. 75	2 in. x 55 in. Round
Shear: 32 kips	Pole Dia. (D_f):	Anchor Rods Evenly Spaced	$f_y = 55$ ksi
Axial: 29 kips	42.00 in	On a 49 in Bolt Circle	

Anchor Rod Calculation According to TIA-222-H

$\phi_t, \phi_v =$	0.75	TIA 4.9.6
$I_{bolts} =$	3601.50	in ² Momet of Inertia
$P_u =$	187	kips Tension Force
$V_u =$	2.7	kips Shear Force
$R_{nt} =$	325.00	kips Nominal Tensile Strength
$R_{nv} =$	198.80	kips (0.5 x f_u x a_g)
Stress Rating =	76.6%	Satisfies TIA-H 4.9.9

Base Plate Calculation According to TIA-222-H

$\phi =$	0.90	TIA 4.7
$M_{PL} =$	429.7	in-kip Plate Moment
$L =$	11.0	in Section Length
$Z =$	11.0	Plastic Section Modulus
$M_P =$	604.8	in-kip Plastic Moment
$\phi M_n =$	544.3	in-kip Factored Resistance
<i>Calculated Moment vs Factored Resistance</i>		
	429.70 in-kip	\leq 544 in-kip
Stress Rating =	78.9%	

Anchor Rods Are Adequate	76.6%	<input checked="" type="checkbox"/>
Base Plate is Adequate	78.9%	<input checked="" type="checkbox"/>