



AM-FM Antenna Towers

RCA can make a wide selection of towers available for all AM and FM applications . . . including standard self-supporting, guyed and custom designs.

Guyed Towers

Where land area permits, towers are usually guyed and the usual cross sectional shape is triangular so that three point guying can be used. Guyed tower costs are usually lower than for self-supporting structures because less steel is used. A useful method for estimating the land required for a guyed structure is to consider the distance to the farthest guy anchorage as being about 80 percent the tower height.

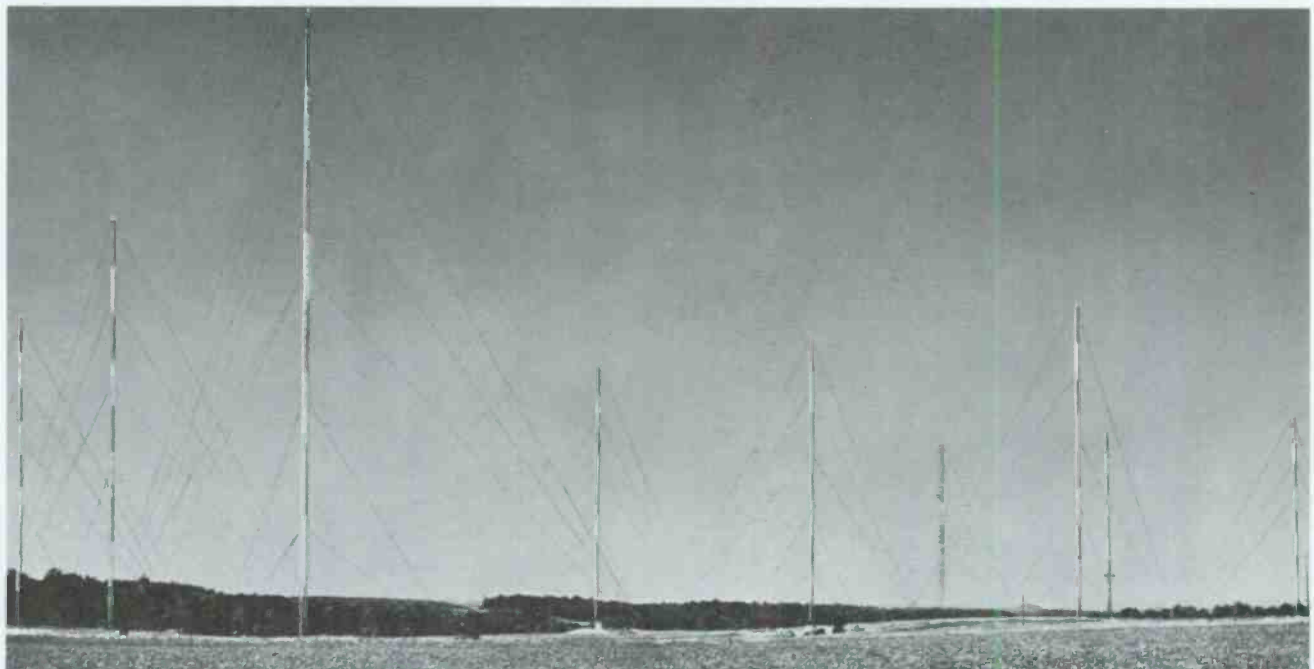
Self-Supporting Towers

Self-supporting towers are especially advantageous in city and congested districts where land is expensive. For estimating required space for a self-supporting tower, the distance between tower legs can normally be considered as 10 percent the height of the structure.

Wind Load

Towers must be designed and installed to safely withstand the maximum wind velocities that may be encountered. Experienced tower builders rarely design for less than a 30/20-pound loading. This means that the tower members are de-

- Wide selection of AM or FM antenna towers
- Complete line of tower accessories
- Self-supporting or guyed types
- Standard or custom designs



Frequency to wavelength conversion chart (Rounded to one decimal place)

Frequency		One Wavelength		Half Wavelength		Quarter Wavelength		Frequency		One Wavelength		Half Wavelength		Quarter Wavelength	
kHz	Meters	Feet	Meters	Feet	Meters	Feet	kHz	Meters	Feet	Meters	Feet	Meters	Feet	Meters	Feet
550	545.5	1789.2	272.8	895.0	136.4	447.5	1100	272.7	894.7	136.4	447.5	68.2	223.8		
560	535.7	1757.1	267.9	878.9	133.9	439.3	1110	270.3	886.8	135.2	443.6	67.6	221.8		
570	526.3	1726.3	263.2	863.5	131.6	431.8	1120	267.9	878.9	133.4	437.7	67.0	219.8		
580	517.2	1696.9	258.6	848.4	129.3	424.2	1130	265.5	871.1	132.8	435.7	66.4	217.8		
590	508.5	1668.3	254.3	834.3	127.1	417.0	1140	263.2	863.5	131.6	431.8	65.8	215.9		
600	500.0	1640.4	250.0	820.2	125.0	410.1	1150	260.9	856.1	130.5	428.1	65.2	213.9		
610	491.8	1613.5	245.9	806.8	123.0	403.5	1160	258.9	849.4	129.5	424.7	64.7	212.4		
620	483.9	1587.6	242.0	794.0	121.0	397.0	1170	256.4	841.2	128.2	420.6	64.1	210.3		
630	476.1	1562.0	238.1	781.2	119.0	390.4	1180	254.2	834.0	127.1	417.0	63.6	208.5		
640	468.8	1538.1	234.4	769.0	117.2	384.5	1190	252.1	827.1	126.0	413.6	63.0	206.7		
650	461.5	1514.1	230.8	757.2	115.4	378.6	1200	250.0	820.2	125.0	410.1	62.5	205.1		
660	454.5	1491.1	227.3	745.7	113.6	372.7	1210	247.9	813.3	124.8	406.7	62.4	203.3		
670	447.8	1469.2	223.9	734.6	112.0	367.5	1220	245.9	806.8	123.0	403.4	61.5	201.7		
680	441.2	1447.5	220.6	723.8	110.3	361.9	1230	243.9	800.2	122.1	400.1	61.0	200.1		
690	434.8	1426.5	217.4	713.3	108.7	356.6	1240	241.9	793.7	121.0	396.9	60.5	198.4		
700	428.6	1406.2	214.3	703.1	107.2	351.7	1250	240.0	787.4	120.0	393.7	60.0	196.9		
710	422.5	1386.2	211.3	693.2	105.6	346.5	1260	238.0	780.8	119.0	390.4	59.5	195.2		
720	416.7	1367.1	208.4	683.7	104.2	341.9	1270	236.2	774.9	118.1	387.4	59.1	193.7		
730	411.0	1348.4	205.5	674.2	102.8	337.3	1280	234.4	769.0	117.2	384.5	58.6	192.3		
740	405.4	1330.1	202.7	665.0	101.4	332.7	1290	232.6	763.1	116.3	381.6	58.2	190.8		
750	400.0	1312.3	200.0	656.2	100.0	328.1	1300	230.8	757.2	115.4	378.6	57.7	189.3		
760	394.7	1294.9	197.4	647.6	98.7	323.8	1310	229.0	751.3	114.5	375.6	57.3	187.8		
770	389.6	1278.2	194.8	639.1	97.4	320.0	1320	227.3	745.7	113.7	372.9	56.8	186.4		
780	384.6	1261.8	192.3	630.9	96.2	315.6	1330	225.6	740.2	112.8	370.1	56.4	185.1		
790	379.7	1245.7	189.9	623.0	94.9	311.4	1340	223.9	734.6	112.0	367.3	56.0	183.7		
800	375.0	1230.3	187.5	615.2	93.8	307.7	1350	222.2	729.0	111.1	364.5	55.5	182.3		
810	370.4	1215.2	185.2	607.6	92.6	303.8	1360	220.6	723.8	110.3	361.9	55.1	181.0		
820	365.9	1200.4	183.0	600.4	91.5	300.2	1370	219.0	718.5	109.5	359.3	54.8	179.6		
830	361.4	1185.7	180.7	592.8	90.4	296.6	1380	217.4	713.3	108.7	356.7	54.4	178.3		
840	357.1	1171.6	178.6	586.0	89.3	293.0	1390	215.8	708.0	107.9	354.0	54.0	177.0		
850	352.9	1157.8	176.5	579.1	88.2	289.4	1400	214.3	703.1	107.2	351.6	53.6	175.8		
860	348.8	1144.4	174.4	572.2	87.2	286.1	1410	212.8	698.2	106.4	349.1	53.2	174.6		
870	344.8	1131.2	172.4	565.6	86.2	282.8	1420	211.3	693.2	105.7	346.6	52.8	173.3		
880	340.9	1118.4	170.5	559.4	85.2	279.5	1430	209.8	688.3	104.9	344.2	52.5	172.1		
890	337.1	1106.0	168.6	553.1	84.3	276.6	1440	208.3	683.4	104.2	341.7	52.1	170.9		
900	333.3	1093.5	166.7	546.9	83.3	273.3	1450	206.9	678.8	103.4	339.4	51.8	169.7		
910	329.7	1081.7	164.9	541.0	82.4	270.3	1460	205.0	674.2	102.8	337.1	51.0	168.6		
920	326.1	1069.9	163.1	535.1	81.5	267.4	1470	204.1	669.6	102.1	335.0	51.0	167.4		
930	322.6	1058.4	161.3	529.2	80.7	264.8	1480	202.7	665.0	101.4	332.7	50.7	166.3		
940	319.1	1046.9	159.6	523.6	79.8	261.9	1490	201.3	660.4	100.7	330.4	50.3	165.0		
950	315.8	1036.1	157.9	518.0	79.0	269.2	1500	200.0	656.1	100.0	328.1	50.0	164.0		
960	312.5	1025.3	156.3	512.8	78.1	256.2	1510	198.7	651.9	99.4	326.1	49.7	163.1		
970	309.3	1014.8	154.7	507.5	77.3	253.6	1520	197.4	647.6	98.7	323.8	49.4	162.1		
980	306.1	1004.3	153.1	502.3	76.5	251.1	1530	196.1	643.4	98.1	321.9	49.0	160.8		
990	303.0	994.1	151.5	497.0	75.8	248.7	1540	194.8	639.1	97.4	319.6	48.7	159.8		
1000	300.0	984.3	150.0	492.1	75.0	246.1	1550	193.5	634.8	96.8	317.6	48.4	158.8		
1010	297.0	974.5	148.5	487.2	74.3	243.8	1560	192.3	630.9	96.2	315.6	48.1	157.8		
1020	294.1	964.9	147.7	482.6	73.5	241.1	1570	191.1	627.0	95.5	313.6	47.8	156.8		
1030	291.1	955.1	145.6	477.7	72.8	238.8	1580	189.9	623.0	94.9	311.7	47.4	155.8		
1040	288.5	946.5	144.3	473.4	72.1	236.5	1590	188.7	619.1	94.3	309.7	47.2	154.9		
1050	285.7	937.3	142.3	466.8	71.4	234.3	1600	187.5	615.2	93.8	307.7	46.9	153.8		
1060	283.0	928.5	141.5	464.2	70.8	232.3	Wavelength in meters = $\frac{300000}{f \text{ kHz}}$ Wavelength in feet = $\frac{300000 \times 3.2808398}{f \text{ kHz}}$								
1070	280.4	919.9	140.2	460.0	70.1	230.0									
1080	277.8	911.4	138.9	455.7	69.5	228.0									
1090	275.2	902.9	137.6	451.4	68.8	225.7									

signed to resist a horizontal wind pressure of 30 pounds per square foot of projected area on all flat surfaces and 20 pounds on round surfaces. This is the equivalent of an actual wind velocity of 86.6 mi/h (139 km/h). Towers with higher wind-load ratings are, of course, available. Towers are designed in accordance with EIA specifications RS-222B.

Tower Accessory Equipment

A number of accessories to complete various AM and FM broadcast towers are available. Most of them are fully described in specialized catalogs for these products. They include: FM antennas; FM transmission line, hangers and dehydrators; FM/AM isolation unit; material for ground systems; AM transmission line and hangers; antenna tuners; AM phasing systems (including power dividing networks, phase sampling loops, phase sampling lines and isolation coils); and tower lighting equipment (including tower lighting kits and photo electric control, lighting chokes and air core lighting transformers).

FM Antenna Equipment

RCA has a complete line of FM antennas and accessories. Coaxial transmission line which may be either of the rigid or flexible type is used to conduct power from the transmitter to the antenna. Lines which use air as a dielectric will require pressurization using nitrogen or dry air to prevent condensation from accumulating inside the line. Various sized dehydrators and gassing hardware kits are available.

If the tower upon which the antenna is mounted is an insulated AM radiator, some means of isolating the effect of grounded transmission line where it crosses the base insulator must be provided. Using insulated hangers, a quarter wave balun at the AM frequency may be constructed or, under some circumstances, a Type BAF-15 or -16 FM/AM Isolation Unit, may be used.

Material for AM Ground Systems

In order to obtain reasonable radiation efficiency and, in the case of directional arrays, to stabilize the radiation pattern a system of buried radial copper wires extending outward from the tower base must be installed. RCA can supply the wire, copper strap, and ground mats required to meet the consultant's ground system specifications. Ground system installation may be included with the tower contract.

Antenna Tuners

In most cases the impedance of the transmission line and the base impedance

of the tower are not alike and it is necessary to install an antenna tuner at the base of the tower to transform the antenna impedance to the transmission line impedance. RCA markets a standard group of antenna tuners for low and medium power use. In the higher power range antenna tuning units are custom built.

AM Phasing Equipment

Multiple tower AM arrays are used to achieve specific horizontal and vertical radiation patterns as required by allocation or economic factors related to coverage. Varying amounts of power at various phase angles are fed to the various towers. RCA is in a position to supply all of the elements of phasing, power dividing, and antenna tuning units. In these multi-tower arrays, methods for sampling the phase

and amplitude of the RF voltage in each tower and conveying this sample to the phase measuring equipment located in the transmitter house are required. Accessory phase sampling loops, which are normally mounted on the individual towers, phase sampling lines to connect the loops to the measuring device, and means for isolating the grounded sampling lines where they cross the tower base insulator are also available.

Antenna Feed Bus

The antenna tuning unit output should be connected to the tower by means of copper tubing which is not normally supplied with the antenna or transmitting equipment. The tubing may be obtained from local sources and should be flattened and drilled at the ends so that it may

WIND VELOCITY AND CORRESPONDING WIND PRESSURE ON TOWERS—EIA STANDARD SPECIFICATION

Actual Wind Velocity mi/hr (km/hr)		Wind Pressure On Flat Surfaces ($P = 0.004 V^2$) lbs/ft ² (kg/m ²)		Wind Pressure On Round Surfaces lbs/ft ² (kg/m ²)		Estimated Survival Velocity (F.S. 1.65) mi/hr (km/hr)	
10	16.1	0.4	1.95	0.266	1.29	12.9	20.8
20	32.2	1.6	7.80	1.067	5.21	25.8	41.5
30	48.3	3.6	17.57	2.40	11.71	38.6	62.1
40	64.4	6.4	31.23	4.27	20.83	51.5	82.9
50	80.5	10.0	48.80	6.67	32.55	64.4	103.6
60	96.5	14.4	70.27	9.60	46.85	77.3	124.4
70.7	113.8	20.0	97.60	13.33	65.05	91.1	146.6
80	128.7	25.6	124.9	17.10	83.45	103.0	165.7
86.6	139.3	30.0	146.4	20.00	97.60	111.5	179.4
90	144.8	32.4	158.1	21.60	105.4	115.9	186.5
100	160.9	40.0	195.2	26.70	130.3	128.8	207.2
110	176.9	48.4	236.2	32.30	157.6	141.7	228.0
111.8	179.9	50.0	244.0	33.30	162.5	144.0	231.7
120	193.1	57.6	281.1	38.50	187.9	154.6	248.8
122.5	197.1	60.0	292.8	40.00	195.2	157.8	253.9
130	209.2	67.6	329.9	45.00	219.6	167.4	269.3
132.3	212.9	70.0	341.6	46.67	227.7	170.4	274.2
140	225.3	78.4	382.6	52.33	255.3	180.3	290.1
141.4	227.5	80.0	390.4	53.33	260.3	182.1	293.0
150	241.4	90.0	439.2	60.00	292.8	193.2	310.9
160	257.4	102.2	498.7	68.20	332.8	206.1	331.6
170	273.5	115.6	564.1	77.00	375.8	219.0	352.4
180	289.6	129.6	632.4	86.60	419.7	231.8	373.0
190	305.7	144.4	704.7	96.30	469.9	244.7	393.7
200	321.8	160.0	780.8	106.66	520.5	257.6	414.5

be connected to the antenna tuning unit output feedthrough insulator and attached to the tower by bolt or brazing. At a point between the tower and the feed-through insulator the line should be formed into a one or two turn coil, 12 to 18 inches in diameter. This coil can be self-supporting and is intended to retard lightning and aid in the breakdown at the ball or horn gap provided at the tower

base thus keeping lightning discharges from damaging the radio equipment.

Tower Lighting

The configuration of tower lights and the lighting equipment must conform to applicable government specifications. The a-c power required to operate the lights may be conducted on wires which are buried in the ground or carried on the

same poles which carry the transmission line from the transmitter house to the antenna tuning unit. The a-c power lines will have to be isolated from the RF power where they cross the base insulator. This isolation can be provided either through the use of an antenna lighting choke and appropriate bypass condensers or by the use of an air core lighting transformer.

Ordering Information

Tower Accessories

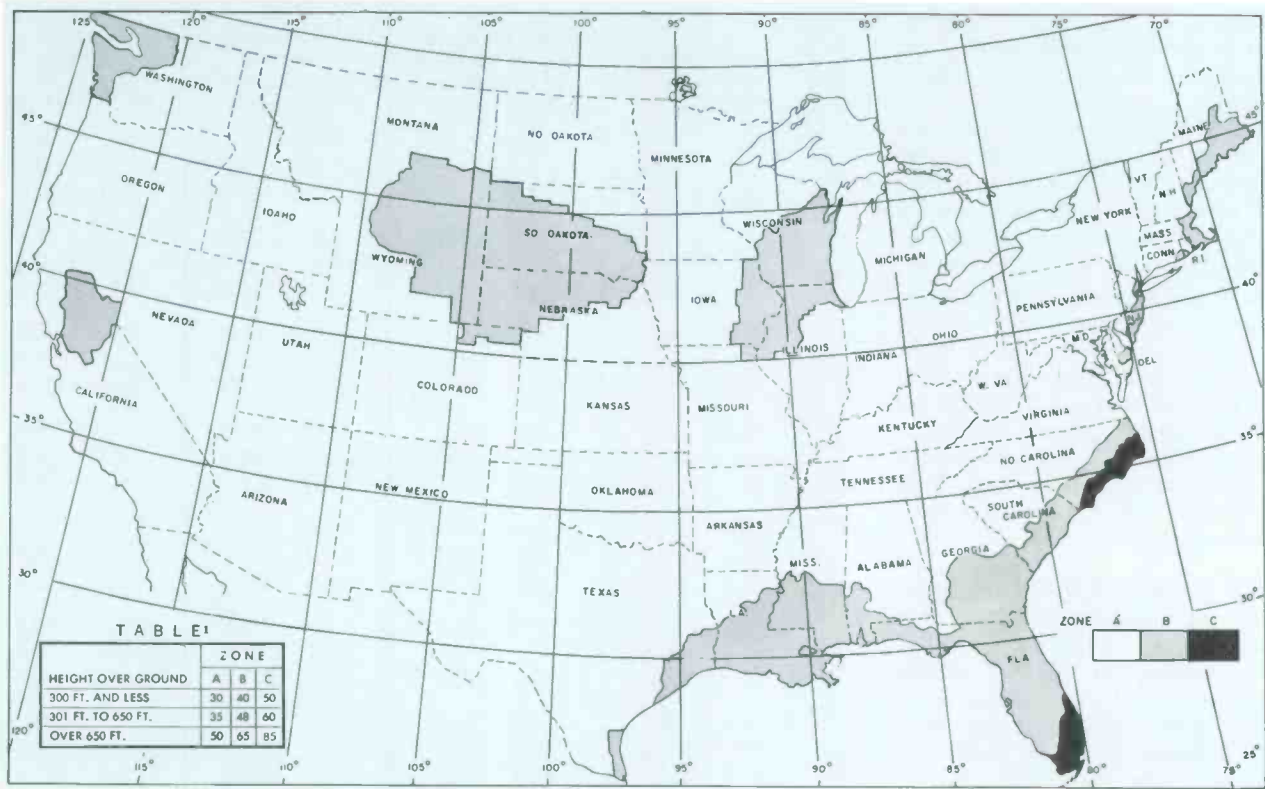
- 8 ft. by 24 ft. (2.4 x 7.3 m) Section Expanded Copper Ground ScreenMI-27765
- No. 10 Copper Wire.....MI-28405-8
- 3" by 0.020 (76 x 0.5 mm) Ground StrapMI-28405-A4
- Double RF Antenna Lighting Choke.....MI-7112-C
- Triple RF Antenna Lighting ChokeMI-27726-A
- Capacitor for Lighting Chokes.....MI-27728-1
- Weatherproof HousingMI-27741
- Tower Lighting TransformersOn Request

Tower Lighting Kits (Triangular Tower)

Tower Height ft (m)	No. Beacons	Obstruction Lights	Order No.
21'- 150' (6.4 - 45.7)	0	1 double (on top)	A-1
151'- 300' (46.0 - 91.4)	1	3 at one level	A-2
301'- 450' (91.7 - 137)	1	3 at two levels	A-3
451'- 600' (137 - 183)	2	3 at two levels	A-4

(Lighting Kits include all materials required to light and wire a tower of heights specified, such as original and 100 percent spare lamps, beacon flasher, photo-electric control, color coded wire, stainless steel wraplock tape condulets, locknuts, supporting arms, unions, pipe compound, installation print, and bill of materials in accordance with FCC, CAA and National Electric Code Requirements.)

See separate catalog section for other antenna accessories.



This map and table, extracted from EIA Standard RS-222B, gives minimum horizontal design windload pressures in pounds per square foot, on flat surfaces and with no ice for the zones indicated. The map, as well as the table, must be interpreted in view of local knowledge and applicable building codes. See RS-222B for zone boundaries defined by state and county.

¹Wind pressure specified in pounds per square foot only shall be assumed to be uniform over the entire height of the tower. Wind pressures specified by both zone and pressures, in pounds per square foot shall be designed for the more severe loading. (From Page 3 of RS-222B.)