

## AT-8676 SELF-SUPPORTING TOWER

### DESCRIPTION

	CONTENTS	PAGE
1.	<b>GENERAL</b> . . . . .	1
2.	<b>FOUNDATIONS AND ANCHORS</b> . . . . .	1
3.	<b>LOT REQUIREMENTS</b> . . . . .	1
4.	<b>CHARACTERISTICS</b> . . . . .	5
5.	<b>ANTENNA MOUNTING CAPABILITIES</b> . . . . .	6
6.	<b>WEIGHT</b> . . . . .	8
7.	<b>WIND LOADING AND STABILITY</b> . . . . .	8
8.	<b>ANTENNA MOUNTING</b> . . . . .	9
9.	<b>LIGHTING AND PAINTING</b> . . . . .	9
10.	<b>SAFETY</b> . . . . .	9

**1. GENERAL**

1.01 The AT-8676 self-supporting towers and associated components comprise a structure which is available in different heights and has the capability of supporting microwave antennas and related waveguides in a number of space-diversity configurations. The general appearance of the tower is shown in Fig. 1.

1.02 When this section is reissued, the reason for reissue will be listed in this paragraph.

1.03 The tower will support as many as four KS-15676 horn-reflector antennas which may be deployed either all at the top or two at the top, with two at an intermediate level. The tower also has the capabilities for supporting two 8-foot parabolic antennas which may be arranged in a number of space-diversity configurations in combination with the horn-reflector antennas. The number of parabolic antennas may be increased by decreasing the number of horn-reflector antennas on a one-for-one basis. A maximum of two levels of mountings can be used for the horn-reflector antennas. If additional levels, other types of antennas, or other arrangements are desired, the

Tower and Foundation Design Group, Western Electric Company, Merrimack Valley, Massachusetts, should be contacted.

1.04 Unless otherwise indicated, the mounting levels mentioned in this section are referenced to the top of the tower (ie, 0'-0 level is the top of the tower and 75'-0 level is 75 feet below the top).

1.05 List numbers have been assigned to readily identify the various basic tower configurations and associated components. These list numbers, which shall be used for ordering, are shown in Tables A, B, C, and D, and correspond to the list numbers shown on the erection drawings.

**2. FOUNDATIONS AND ANCHORS**

2.01 The AT-8676 self-supporting tower is secured to its foundation with 16 B anchor bolts. These anchor bolts are *not* furnished with the tower and must be ordered *separately*.

2.02 The tower is supported on reinforced foundations which are described in Section 760-927-201. The foundations described therein are for use in soil which has a minimum bearing capacity of 4000 pounds per square foot.

2.03 Concrete foundations associated with towers are inherently susceptible to damage from lightning unless the tower is grounded properly. Grounding details are covered in Section 760-925-135. Installation is discussed in Section 760-927-201. The B self-supporting tower ground should be used to provide this protection; however, this material is *not* furnished with the tower and must be ordered *separately*.

**3. LOT REQUIREMENTS**

3.01 The land required to accommodate the AT-8676 self-supporting tower is influenced by factors such as the height of the tower, the type of footings on which it will be supported, and local zoning ordinances.

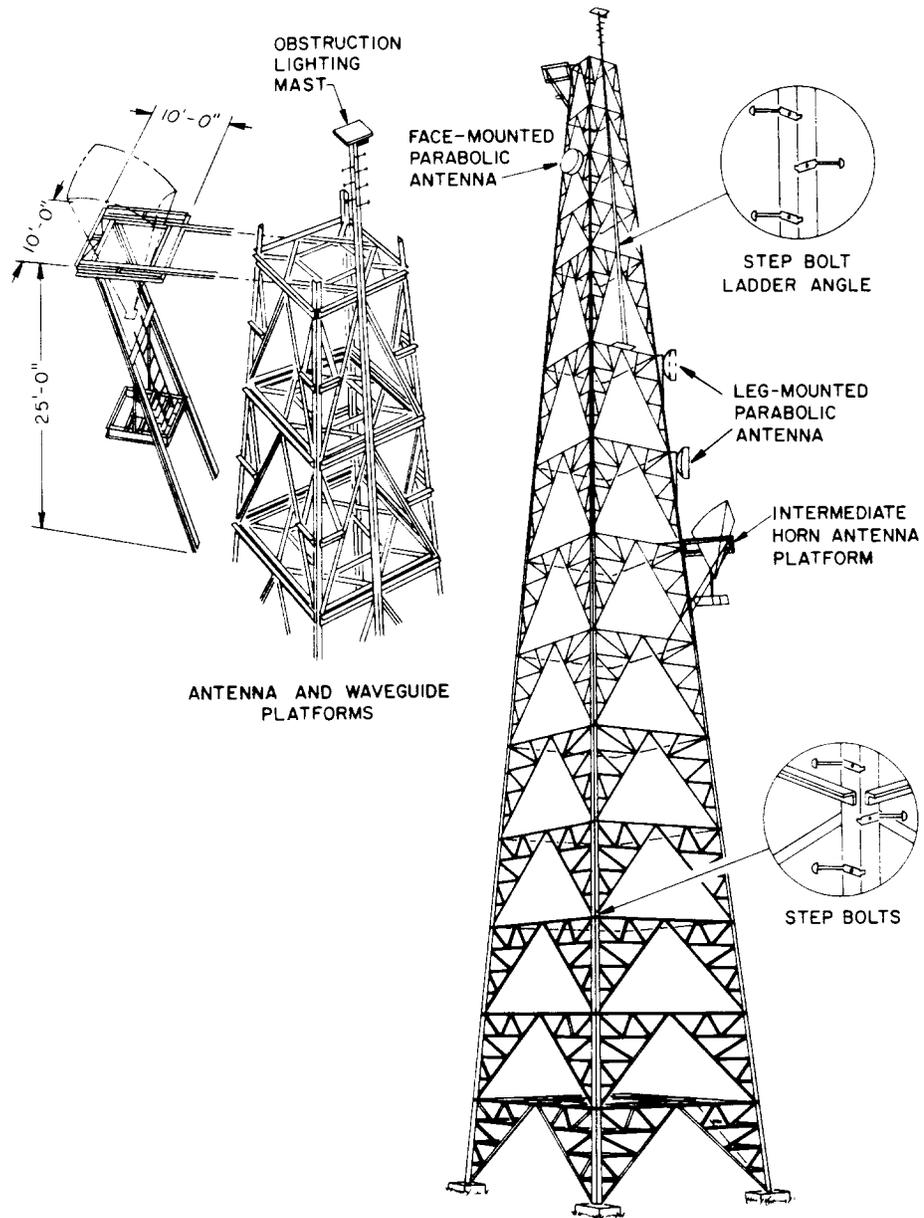


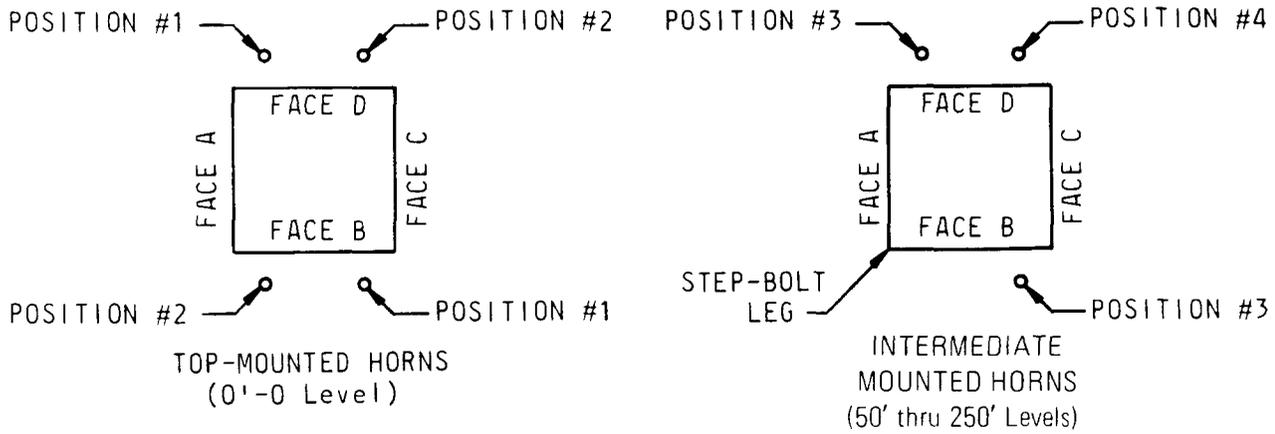
Fig. 1—AT-8676 Self-Supporting Tower

TABLE A - BASIC TOWERS										
TOWER HEIGHT	HORN-REFLECTOR PLATFORM CAPABILITY LEVEL									
	4@ Top	2@ Top & 2@ Intermediate level of								
	0'-0	50'	75'	100'	125'	150'	175'	200'	225'	250'
300'	L11	L20	L28	L35	L41	L46	L50	L53	L55	L56
275'	L10	L19	L27	L34	L40	L45	L49	L52	L54	-
250'	L9	L18	L26	L33	L39	L44	L48	L51	-	-
225'	L8	L17	L25	L32	L38	L43	L47	-	-	-
200'	L7	L16	L24	L31	L37	L42	-	-	-	-
175'	L6	L15	L23	L30	L36	-	-	-	-	-
150'	L5	L14	L22	L29	-	-	-	-	-	-
125'	L4	L13	L21	-	-	-	-	-	-	-
100'	L3	L12	-	-	-	-	-	-	-	-
75'	L2	-	-	-	-	-	-	-	-	-
50'	L1	-	-	-	-	-	-	-	-	-

TABLE B - HORN-REFLECTOR PLATFORMS										
PLATFORM MOUNTING LEVEL (1)										
0'-0	50'	75'	100'	125'	150'	175'	200'	225'	250'	
L60	L61	L62	L63	L64	L65	L66	L67	L68	L69	
1. Level should correspond with capability level (or levels) of Basic Tower selected in Table "A".										

TABLE C WAVEGUIDE SUPPORTS

PLAN OF WAVEGUIDE RUNS (1)



TOWER HEIGHT	CORRESPONDING PLATFORM MOUNTING LEVEL (2)											
	POS #	0'-0	POS #	50'	75'	100'	125'	150'	175'	200'	225'	250'
300'	1	L80	3	L100	L117	L132	L145	L156	L165	L172	L177	L180
	2	L91	4	L109	L125	L139	L151	L161	L169	L175	L179	L181
275'	1	L79	3	L99	L116	L131	L144	L155	L164	L171	L176	-
	2	L90	4	L108	L124	L138	L150	L160	L168	L174	L178	-
250'	1	L78	3	L98	L115	L130	L143	L154	L163	L170	-	-
	2	L89	4	L107	L123	L137	L149	L159	L167	L173	-	-
225'	1	L77	3	L97	L114	L129	L142	L153	L162	-	-	-
	2	L88	4	L106	L122	L136	L148	L158	L166	-	-	-
200'	1	L76	3	L96	L113	L128	L141	L152	-	-	-	-
	2	L87	4	L105	L121	L135	L147	L157	-	-	-	-
175'	1	L75	3	L95	L112	L127	L140	-	-	-	-	-
	2	L86	4	L104	L120	L134	L146	-	-	-	-	-
150'	1	L74	3	L94	L111	L126	-	-	-	-	-	-
	2	L85	4	L103	L119	L133	-	-	-	-	-	-
125'	1	L73	3	L93	L110	-	-	-	-	-	-	-
	2	L84	4	L102	L118	-	-	-	-	-	-	-
100'	1	L72	3	L92	-	-	-	-	-	-	-	-
	2	L83	4	L101	-	-	-	-	-	-	-	-
75'	1	L71	-	-	-	-	-	-	-	-	-	-
	2	L82	-	-	-	-	-	-	-	-	-	-
50'	1	L70	-	-	-	-	-	-	-	-	-	-
	2	L81	-	-	-	-	-	-	-	-	-	-

1. Stack-mounting (two horns on the same leg) is not permitted.
2. Mounting level should be in accord with the capability level (or levels) of the Basic Tower selected in Table "A".

TOWER HEIGHT	FM(2)	LEG MOUNT MOUNTING LEVEL (3)									
		0'-0	25'	50'	75'	100'	125'	150'	175'	200'	225'
300'	L199	L208	L217	L225	L232	L238	L243	L247	L250	L252	L253
275'	L198	L207	L216	L224	L231	L237	L242	L246	L249	L251	-
250'	L197	L206	L215	L223	L230	L236	L241	L245	L248	-	-
225'	L196	L205	L214	L222	L229	L235	L240	L244	-	-	-
200'	L195	L204	L213	L221	L228	L234	L239	-	-	-	-
175'	L194	L203	L212	L220	L227	L233	-	-	-	-	-
150'	L193	L202	L211	L219	L226	-	-	-	-	-	-
125'	L192	L201	L210	L218	-	-	-	-	-	-	-
100'	L191	L200	L209	-	-	-	-	-	-	-	-
75'	L190	-	-	-	-	-	-	-	-	-	-
50'	-	-	-	-	-	-	-	-	-	-	-

1. Not more than two per tower.  
2. FM = Face Mount. May be positioned at either the 25' or the 37'-6 level.  
3. Stack-mounting not permitted.

**3.02** If local zoning ordinances do *not* require that the tower be erected on a lot sufficient to accommodate its fall, and if the standard footings described in Section 760-927-201 are to be employed, a minimum lot size may be used. These lot sizes, which are listed below, include an allowance for a 30-degree angle of shear as measured from the top of the concrete pad to the surface of the ground, but do not include any allowance for buildings or waveguide supporting structures.

TOWER HEIGHT (FEET)	LOT SIZE (FEET)
50	34 × 34
75	39 × 39
100	44 × 44
125	48 × 48
150	52 × 52
175	56 × 56
200	60 × 60
225	64 × 64

250	67 × 67
275	71 × 71
300	76 × 76

**3.03** If a minimum size lot is to be employed, it is recommended that a firm understanding or agreement be made with the owners of abutting property concerning the temporary use of their land for the storage of material, tools, etc, during tower erection. The AT-8676 tower is constructed in 25-foot sections, and efficient erection requires space for the sorting and arranging of tower members in some logical order of assembly. Generally, an area having a circular diameter equal to the lot dimension plus 100 feet is required. However, since terrain, treed areas, and contractor's equipment can affect the usable area, each site should be reviewed individually.

#### 4. CHARACTERISTICS

**4.01** The AT-8676 self-supporting towers consist of the basic tower structures and associated

## SECTION 760-927-100

components: beacon mast, antenna mounting platforms, waveguide supports, and parabolic antenna mounts. Each of these items, and variations thereof, has a specific list number which designates the item and defines its intended usage. Deviations from the intended usage are not permitted unless explicitly authorized by the Tower and Foundation Design Group.

**4.02** The basic towers and associated components are constructed of galvanized structural steel shapes. All components are shipped knocked-down and are field assembled using the bolts that are specified on the erection drawings supplied with each component.

**4.03** The basic towers are square in cross section, measure 9 feet 9 inches across the face at the top, and flare uniformly to a wider base. The width of the face at the base of a 300-foot tower is 47 feet 4 inches.

**4.04** The towers are available in 11 basic heights, ranging from 50 to 300 feet in 25-foot increments. The shorter towers are composites of the taller towers, with the lower sections removed to obtain the desired height.

**4.05** Access to the top of the tower is by means of step bolts. For levels below the 75'-0 level, the step bolts are bolted to the outside corner of the tower leg located at the junction of faces "A" and "B". For the top 75 feet of the tower (0'-0 to 75'-0), the step bolts are mounted to a step-bolt ladder angle located on the inside of the tower against face "A". (See Fig. 1 and the sketch associated with Table C.)

### 5. ANTENNA MOUNTING CAPABILITIES

**5.01** Each of the basic towers has the ability to support up to four horn-reflector antenna platforms. All four may be mounted at the top, or two at the top plus two at some intermediate level ranging from a level 50 feet below the top of the tower (50'-0 level) to 50 feet above grade, in 25-foot increments. The levels at which a horn-reflector platform may be located is a function of the tower list number (see Table A).

**5.02** The platforms for supporting the horn-reflector antennas must be installed at the same level or levels used for selecting the basic tower design (see Table B). Because of the physical interference

with other vertical waveguide runs and increased torsional loadings, the mounting of more than one horn antenna on the same leg is not permitted. In addition, horn antenna platforms located at intermediate levels must not be mounted on the step-bolt leg.

**5.03** Each antenna platform has as an integral part a smaller platform (approximately 4 feet by 5 feet) located approximately 16 feet below the main platform. The smaller platform is used when installing and servicing the feed horn and waveguide associated with the horn-reflector antenna.

**5.04** The material for supporting the WC281 waveguide associated with a horn-reflector antenna is part of the specification, but must be ordered on an individual as-needed basis. This is necessary because the components required are a function of the mounting level and mounting position. (The waveguide depends on only two faces, "B" and "D".) Waveguides for antennas mounted at the same tower level and traversing the same face use similar but opposite hand support brackets. As indicated in the figures associated with Table C, position numbers have been assigned to the waveguide locations to conform with the mounting location of the horn antennas. ***It is important***, therefore, that the level and position of the horn antenna mounting be determined so that the proper waveguide supports can be ordered. As previously noted, horn antennas located at intermediate levels of the tower must ***not*** be mounted on the step-bolt leg. The material furnished with the waveguide support includes all the bracketry, restrainer tubes, and the support and protection for the combining networks. It does not include any restrainer tubes which may be required on the slot angles. These must be engineered and provided for ***separately***.

**5.05** The approximate range of azimuth orientation through which two horn antennas may be adjusted when mounted on opposite legs and aligned on different routes is shown in Fig. 2. The inherent range of azimuth orientation attainable for two antennas mounted on adjacent legs and operating on the same route is shown in Fig. 3.

**5.06** Parabolic antennas of 8-foot diameter also may be mounted on the tower. These may be deployed in a variety of space-diversity configurations (see 8.04) operating on the same routes as the horn-reflector antennas or as antennas operating on separate routes. Provisions have not

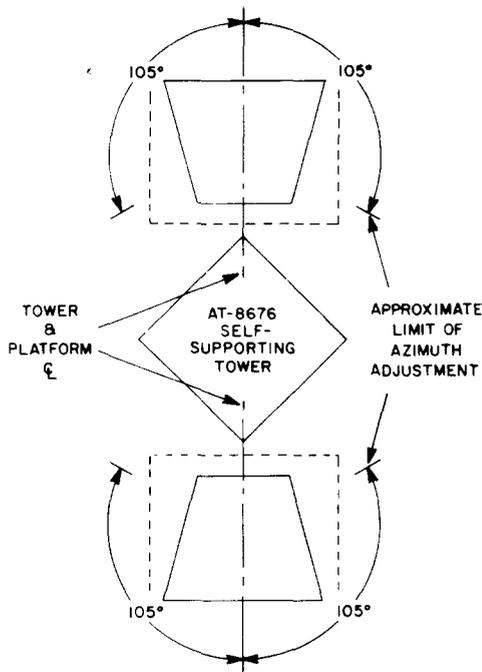


Fig. 2—Range of Antenna Adjustment—Two Antennas on Opposite Platforms

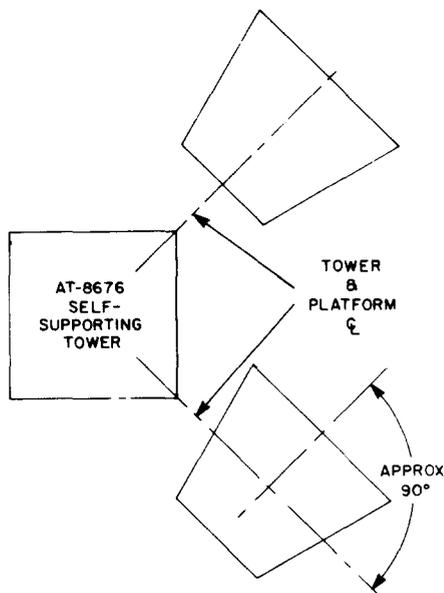


Fig. 3—Limiting Position of Two Adjacent Antennas on Same Azimuth

been developed for supporting parabolic antennas on the 50-foot tower.

5.07 The number of parabolic antennas which may be mounted on a tower is related directly to the number of horn-reflector antennas mounted on the tower. If the tower supports four horn antennas, only two parabolic dishes may be accommodated. However, as the number of horn antennas is decreased, the number of parabolic dishes may be increased on a one-for-one basis.

5.08 The parabolic antennas may be face-mounted near the top of the tower or leg-mounted at 25-foot incremental levels between the top of the tower (0'-0 level) to a level 75 feet above grade. Mounting of the parabolic antennas on the step-bolt leg is not recommended. Provisions have not been made for leg-mounting on the 75-foot tower, only face-mounting.

5.09 Only one parabolic antenna may be mounted on any one face or leg; furthermore, when mounted on the same leg as a horn-reflector antenna, it must not be mounted within the area 75 feet below the horn-reflector antenna.

5.10 The inherent flexibility of the mast mount which is employed when face-mounting a parabolic antenna permits locating the antenna at either the 25- or 37 1/2-foot levels.

5.11 The type of mount, the height of the tower, and the level at which the parabolic antennas will be supported are a function of the list number, as indicated in Table D. The list number designates all the material necessary for mounting the antenna to the tower and all the brackets and hardware for supporting the waveguide restrainers associated with the rectangular waveguides. However, the hanger plate and restrainer blocks are not included, and must be engineered and provided for *separately*.

5.12 The range of azimuth orientation attainable when using an inverted "figure-4" type antenna mount is illustrated in Fig. 4 for face-mounted antennas. Since the versatility of a "figure-4" mount permits supporting the antenna on either side of the mount, the azimuth range can be doubled. Figure 5 shows the azimuth range for leg-mounted parabolic antennas.

5.13 A beacon mast for supporting aircraft obstruction warning lights when required by the Federal Aviation Agency (FAA) is available. The mast is utilized for all towers, and is designated as List 59.

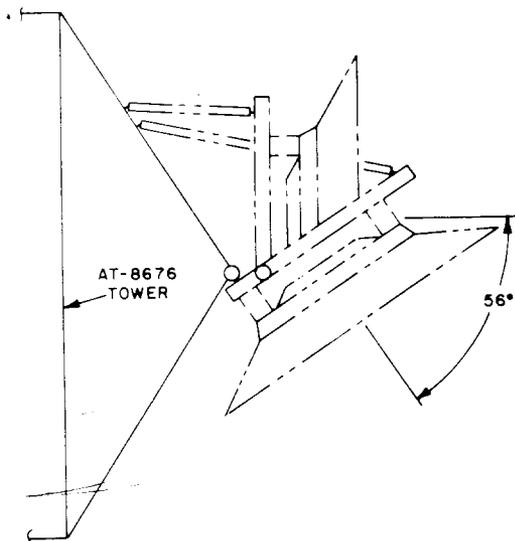


Fig. 4—Parabolic Antenna—Face-Mount

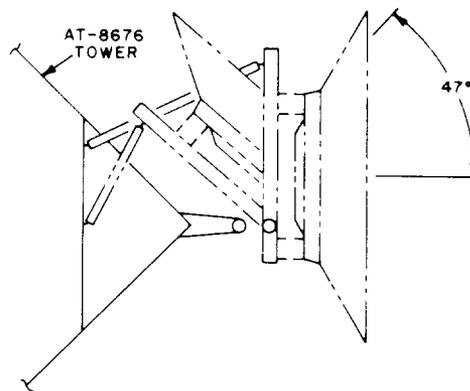


Fig. 5—Parabolic Antenna—Leg-Mount

**6. WEIGHT**

6.01 The approximate weights for the various heights of the basic tower structures, as covered by List 1 through List 56, are given below:

HEIGHT (FEET)	WEIGHT (POUNDS)
50	14,500
75	23,500
100	33,300
125	43,500
150	55,500
175	68,700
200	82,600
225	99,200
250	116,800
275	135,700
300	157,000

6.02 The weight of a horn-reflector platform (List 60 through List 69) is approximately 2450 pounds per unit.

6.03 The beacon mast (List 59) weighs approximately 230 pounds.

6.04 The weights of the waveguide supports (List 70 through List 181) and the parabolic antenna mounts (List 190 through List 253) vary relative to the height aboveground of the associated antenna. Because of the numerous weights involved, only approximate limits are to be considered.

Waveguide—600 to 800 pounds

Parabolic Antenna Mount—150 to 300 pounds.

**7. WIND LOADING AND STABILITY**

7.01 All AT-8676 self-supporting towers are designed to safely sustain a wind loading of 40 pounds per square foot while carrying a full complement of antennas. This corresponds to a static wind load of approximately 100 miles per hour. See Section 760-926-100 for a discussion of wind velocity. Resulting design stresses using this loading provide a factor of safety of 1.65 relative to the yield point of the tower steel.

7.02 Under a wind loading of 20 pounds per square foot, the 300-foot tower will limit the deflection of the main radio beam of any antenna mounted at the top level to a maximum of  $\pm 1/4$  degree in tilt and  $\pm 1/4$  degree in twist. Antennas mounted at lower levels or on shorter towers will experience somewhat lesser deflections. The 20-pounds-per-square-foot loading corresponds approximately to a 70-mile-per-hour wind.

## 8. ANTENNA MOUNTING

**8.01** The mounting platforms used with the AT-8676 self-supporting towers were developed to interface with the mounting ring that is furnished with the standard KS-15676 horn-reflector antenna. It is possible that other antennas may be supported by the platform; however, it is recommended that any changes from the standard be reviewed with the Tower and Foundation Group.

**8.02** The mounting platform at the 0'-0 level positions the horn antennas so that the center line of transmission is approximately 7 feet 6 inches above the 0'-0 level. For horn antennas mounted at intermediate levels (50'-0 through 250'-0), the transmission center line is approximately 8 feet 5 inches above the respective mounting level.

**8.03** As previously indicated, parabolic antennas may be either face-mounted or leg-mounted. The center line of transmission for face-mounted antennas is located approximately at the mounting level (25 feet or 37 feet 6 inches). For leg-mounted antennas, the transmission center line lies approximately 11 inches below the level of mounting.

**8.04** The transmission line separations for various combinations of parabolic antennas deployed in a space-diversity configuration with horn-reflector antennas are:

LEVEL OF HORN REFLECTOR	METHOD AND LEVEL OF PARABOLIC ANTENNA*	SEPARATION AND DIRECTION RELATIVE TO HORN REFLECTOR
0' —0	FM @ 25' —0	32' —6 below
0' —0	FM @ 37' —6	45' —0 below
0' —0	LM @ 25' —0	33' —5 below
50' —0	FM @ 25' —0	16' —8 above
50' —0	LM @ 0' —0	40' —8 above
50' —0	LM @ 25' —0	15' —8 above
50' —0	LM @ 75' —0	34' —4 below
50' —0	LM @ 100' —0	59' —4 below
75' —0	FM @ 25' —0	41' —8 above
75' —0	FM @ 37' —6	29' —2 above
75' —0	LM @ 0' —0	65' —8 above
100' —0	FM @ 37' —6	54' —2 above

\*FM = Face-mount. LM = Leg-mount.

As previously discussed, certain restrictions do exist. However, careful planning and the use of Table D should result in most antenna mounting objectives being met.

## 9. LIGHTING AND PAINTING

**9.01** Federal Communications Commission (FCC) and/or the FAA rules may require that the tower be marked to increase its visibility to air traffic. Such marking generally will be painting in combination with "red" obstruction lighting. The option to mark the tower with high-intensity lighting in lieu of the aforementioned may be requested by the applicant, or it may be required by the FAA if they determine that increased conspicuity is required. In either case, the type of marking will be specified on the construction permit issued by the FCC.

**9.02** Guidelines for marking the tower are covered in Section 400-100-003.

**9.03** The requirement to mark an antenna structure is based on the overall height of the structure above ground level and its distance to the nearest airport. For application filing purposes, the height of the tower is increased by the appurtenances it supports at the top. The height of the AT-8676 self-supporting towers when supporting System Standard horn-reflector antennas is increased by 13 feet. If the tower is to be lighted with "red" obstruction lights, the beacon mast (List 59) is required to support the top lights at the proper elevation. The beacon mast plus the lightning rod, which provides a cone of protection to the tower lights, adds 18 feet to the tower height. Accordingly, with the standard horn-reflector antenna and no lights, add 13 feet; with lights, add 18 feet.

**9.04** Towers which are to have permanent marking must be lighted during the construction stage.

**9.05** Marking of the tower is covered in Section 760-925-230. Lighting is *not* furnished with the tower and, if required, must be ordered *separately*.

## 10. SAFETY

**10.01** Safety strand for engaging a climber's safety straps is provided with the tower for installation at antenna and lighting levels.

**10.02** A tower climbing safety device (see Section 081-725-105) is available but is *not* furnished with the tower. It must be ordered *separately*.