C SELF-SUPPORTING TOWERS
DESCRIPTION

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1. GENERAL

1.01 This section describes the C Self-Supporting Tower which is primarily intended for TL microwave radio relay systems. This tower may also be used with other radio systems.

2. STRUCTURAL FEATURES

2.01 The general appearance of the tower is shown in Fig. 1A. The tower is available in six heights from 32 to 106-2/3 feet, in increments of approximately 15 feet. The cross section of the tower is an equilateral triangle. These towers may be either ground mounted or rooftop mounted. The 32-foot tower is primarily intended for rooftop mounting.

2.02 The tower is fabricated of galvanized structural steel. It is shipped knocked-down and is field assembled by bolting the members together. Facilities for mounting antennas and reflectors on the top section of the tower are provided as shown in Fig. 3. The tower has a 16-2/3 foot straight top section with a constant face width of 4 feet (Fig. 2). Below the top section, the lower portions are of constantly increasing width reaching a maximum of 17-3/4′ at the bottom of the 106 foot tower. The grating platform shown in Fig. 3D is provided at the top of the tapered portion.

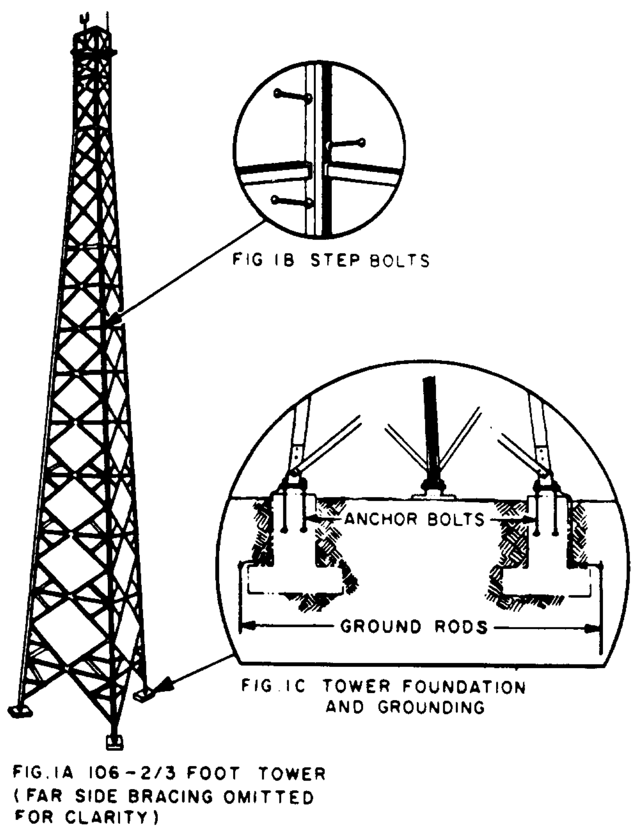


Fig. 1 – C Self-Supporting Tower

2.03 The tower is provided with step bolts which mount on the outside surface of one leg (Fig. 1B), from about 15 inches above the top of the pier to approximately 5 feet above the platform. Steps may be omitted from the bottom 8 feet to discourage unauthorized climbing. This precaution is, of course, unnecessary if the tower base is surrounded by a locked fence. Above the platform, step bolts are provided on

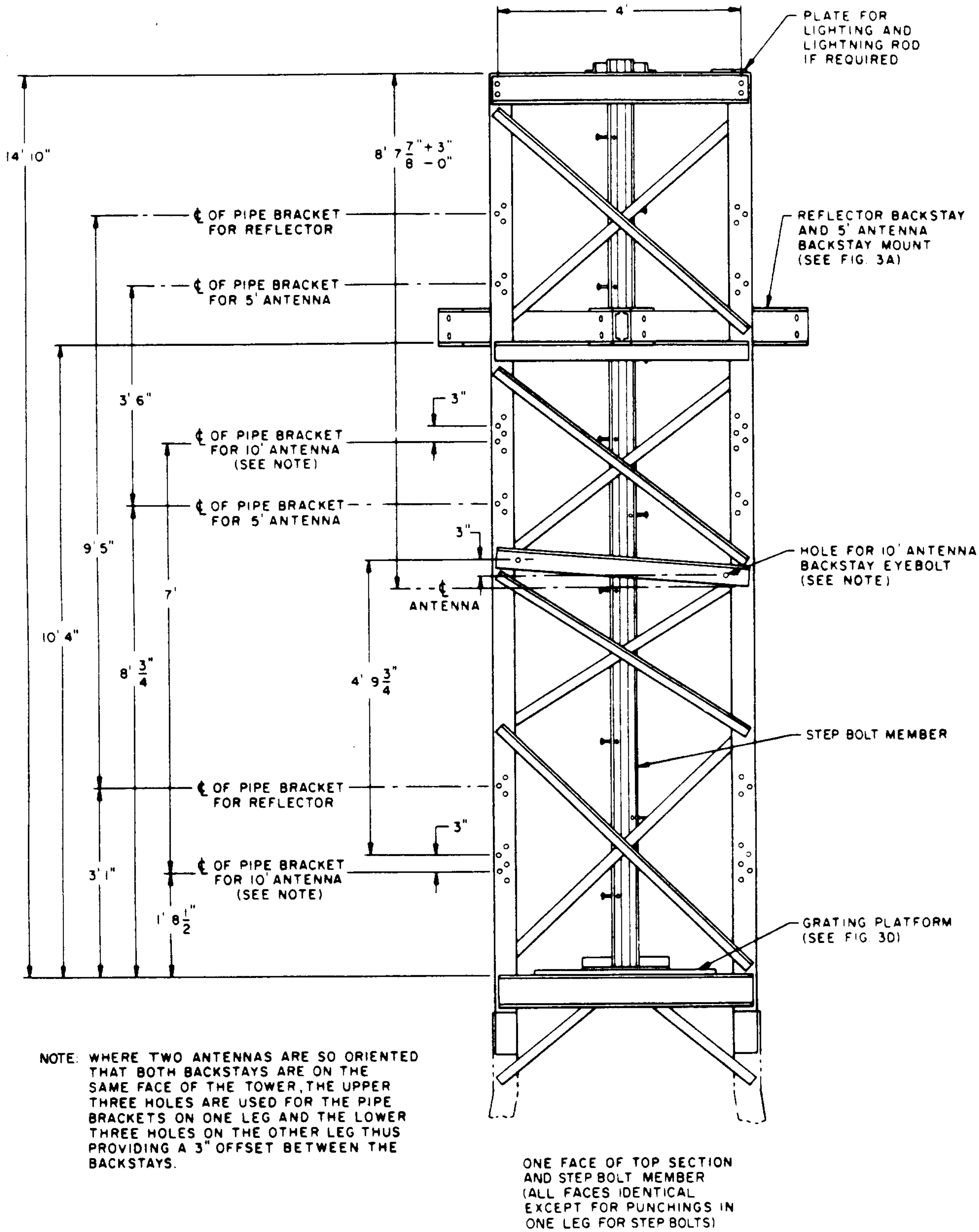


Fig. 2 – Top Section of C Self-Supporting Tower

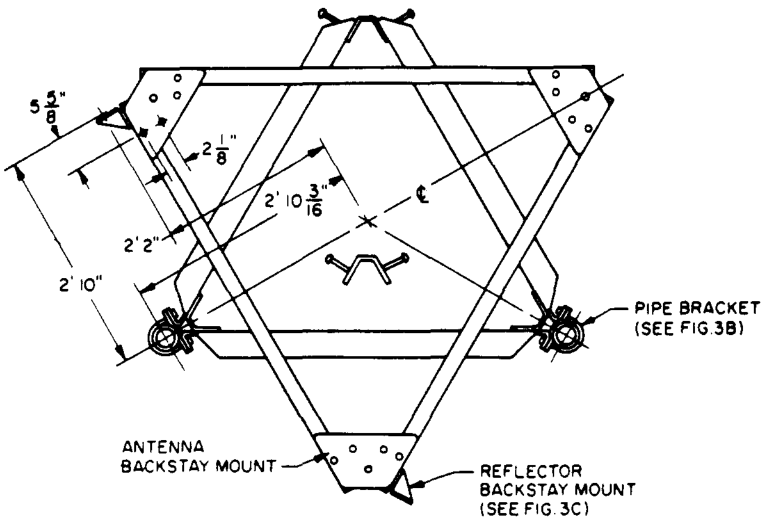


FIG. 3A - REFLECTOR BACKSTAY AND
5' ANTENNA BACKSTAY MOUNT

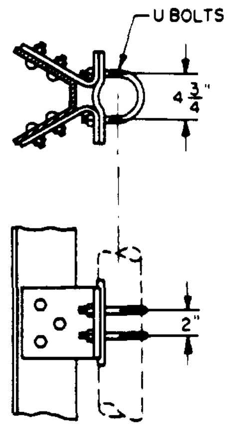


FIG. 3B - PIPE BRACKET FOR
KS-15852 ANTENNA
AND KS-16320 REFLECTOR

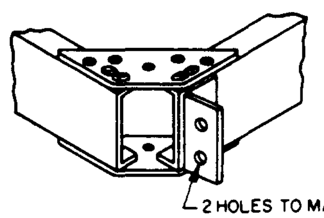


FIG. 3C - REFLECTOR BACKSTAY MOUNT

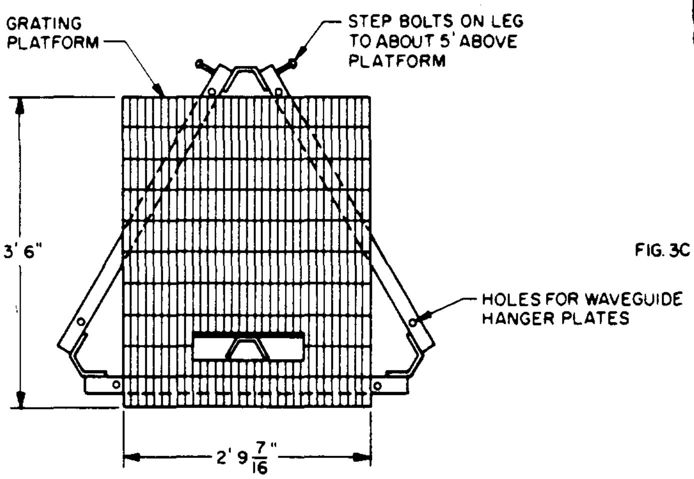


FIG. 3D - GRATING PLATFORM AND
STEP BOLT MEMBER BASE

NOTE: SEE FIG. 2 FOR LOCATION OF MOUNTING FACILITIES ON TOP SECTION OF TOWER.

Fig. 3 – Mounting Facilities and Grating Platform

a special member inside the top section as shown in Fig. 2. These bolts form a horizontal angle of 120° between alternate steps, with the vertical spacing between steps about 15 inches. A Tower Ladder Safety Device, if desired, may be installed on the step bolt leg of the tower and the step bolt member in the top section. The device is not furnished with the tower, but may be ordered separately.

3. FOUNDATIONS

3.01 Information on the foundations is contained in Section AG25.460. This information includes design loads, maximum reaction per tower leg, and the overturning moment.

3.02 The tower is secured to its foundation by means of the C Self-Supporting Tower Anchor. This anchor consists of 12 anchor bolts which are to be embedded in the concrete foundation piers as shown in Fig. 1C. The exposed end of each bolt is equipped with a washer, nut, and jam nut. For roof mountings, suitable supports should be designed to accommodate the standard base plate assemblies.

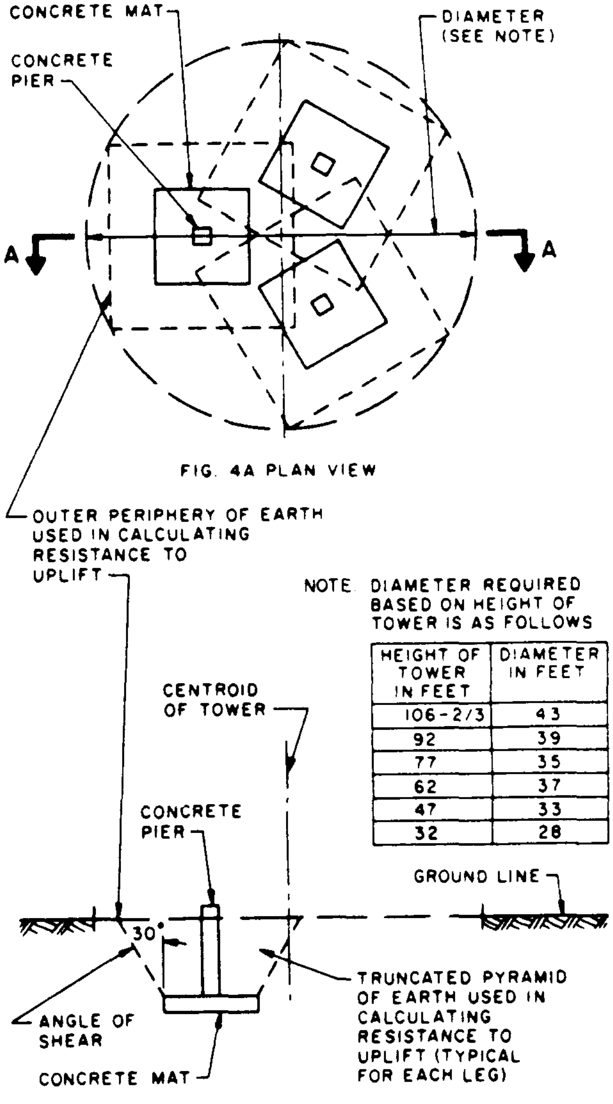
3.03 The C Self-Supporting Tower Ground should be installed to protect the foundation of the tower from lightning damage. Fig. 1C illustrates the grounding arrangement.

3.04 The C Self-Supporting Tower Anchor and the C Self-Supporting Tower Ground are not furnished with the tower but must be ordered separately. This arrangement permits construction of the foundation prior to receipt of the tower members.

4. AREA REQUIREMENTS

4.01 The type of foundation used determines the size of the ground area required for the C Self-Supporting Tower. This area should be large enough to allow for the angle of shear of the earth, usually considered to be 30°, extended from the top of the mat to the surface of the ground. (See Fig. 4B.) The angle of shear determines the outer periphery of the earth surrounding the foundation, and this is used in calculating the resistance to uplift of the foundation.

4.02 If the standard foundations described in Section AG25.460 are used, the minimum ground dimensions for any height tower may be determined from Fig. 4. If other than the standard foundation designs are used, the angle of shear should be included in calculations for minimum ground requirements. Consideration for ground area requirements must include allowances for associated buildings, waveguide supporting structures, and auxiliary equipment.



HEIGHT OF TOWER IN FEET	DIAMETER IN FEET
106-2/3	43
92	39
77	35
62	37
47	33
32	28

FIG. 4A PLAN VIEW

FIG. 4B CROSS-SECTIONAL VIEW A-A

Fig. 4 – Land Area Required for Tower Foundation

4.03 Efficient erection procedures require sorting and arranging tower members in a logical order prior to beginning assembly. Space must be available to permit this arrangement and to accommodate erection equipment. In this connection, it should be noted that the leg members of the tower are fabricated in approximately 16-foot lengths and the longest bracing members for the 106-2/3 foot tower are approximately 22 feet. If the minimum lot size is to be used for the tower and additional space will be required during construction, definite agreements should be made with neighboring property owners for temporary use of their land.

5. DIMENSIONS AND WEIGHTS

5.01 The approximate dimensions and weight of the six sizes of the tower, exclusive of lighting fixtures, antennas, anchor bolts, and other appurtenances or auxiliary equipment, are shown in Table A.

TABLE A

TOWER DIMENSIONS AND WEIGHTS

HEIGHT (feet)	WIDTH AT BASE* (feet)	WEIGHT (pounds)
32	6-1/2	3,210
47	8-3/4	4,250
62	11	5,450
77	13-1/4	6,850
92	15-1/2	8,500
106-2/3	17-3/4	10,100

* Center-to-center of base plate.

6. ANTENNA LOADING

6.01 The tower is designed to support two KS-15852 10-foot parabolic antennas on towers up to 62 feet. Towers up to the maximum height available (106-2/3 feet) will support either two KS-16320-L1 6- by 8-foot passive reflectors or two KS-15970 5-foot parabolic antennas. Other antennas or reflectors of the same or smaller size may also be used; however, modification of the mounting arrangements may be required.

6.02 The maximum height tower adequate to support various loading combinations without derating is indicated in Table B. Any antenna or reflector combination which will not exceed the tower loading combinations shown may be substituted. If antennas are to be substituted for reflectors, the effect of the antenna and its associated waveguide on the tower should be evaluated. The projected area of perforated antennas should be considered as though the antenna were solid for these evaluations. The effect of wind pressure on perforated antennas is nearly the same as on solid antennas, due to eddies, and in some areas the perforations may be closed by ice.

TABLE B

LOADING COMBINATIONS AND TOWER HEIGHTS

LOADING COMBINATION EQUIPMENT	NO.	MAXIMUM TOWER HEIGHT* (feet) WITH 1/2-INCH ICE	WITHOUT ICE
6′ by 8′ Refl.	2	106-2/3	106-2/3
6′ by 8′ Refl.	3	92	106-2/3
5′ Ant.	2	106-2/3	106-2/3
10′ Ant.	1	92	106-2/3
10′ Ant.	2	62	62

*Based on 30 pounds per square foot wind pressure.

7. WIND LOAD AND STABILITY

7.01 All C Self-Supporting Towers equipped as indicated in 6.01 are designed to withstand a wind load equivalent to a pressure of 30 pounds per square foot (approximately 86 miles per hour wind velocity) concurrent with a 1/2-inch build-up of glaze ice. Design considerations under this loading include a safety factor of 1.65 based on the yield point of the steel.

7.02 Tower loading is a combination of distributed wind load over the projected area of the tower members plus the concentrated load of wind pressure acting on the antennas or reflectors. The appropriate shielding and shape factors for the most severe antenna or reflector configuration are included. Under a wind load of 20 pounds per square foot with no ice, C Self-Supporting Towers up to 62 feet high with parabolic antennas attached will not deflect more than 1/2 degree in both tilt and twist; for towers up to the maximum of 106-2/3 feet with reflectors attached, deflection is limited tc 1/2 degree in tilt and 1 degree in twist.

8. ANTENNA MOUNTING

8.01 Facilities are provided in the top section of the tower on each of the three leg members to mount the antennas or reflectors. When the standard mounting facilities are used, the center of the 6- by 8-foot passive reflector and the center of the 5-foot parabolic antenna will be approximately 5 feet below the top of the tower; the center of the 10-foot parabolic antenna will be approximately 9 feet below the top of the tower. Fig. 5, 6, and 7 show the three items of equipment mounted on the tower.

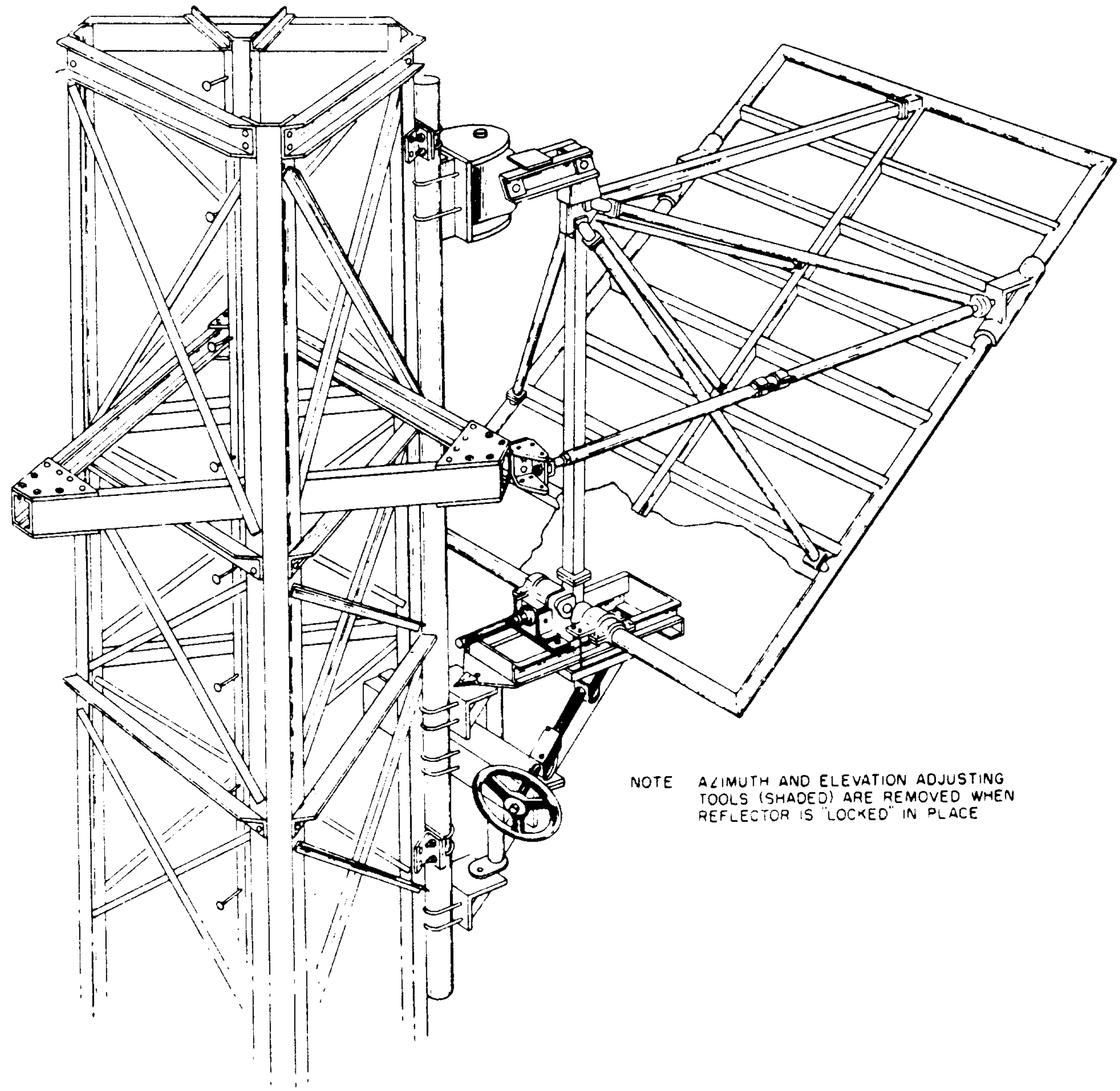


Fig. 5 – Mounted 6- by 8-Foot Reflector

Fig. 6 – Mounted 5-Foot Antenna

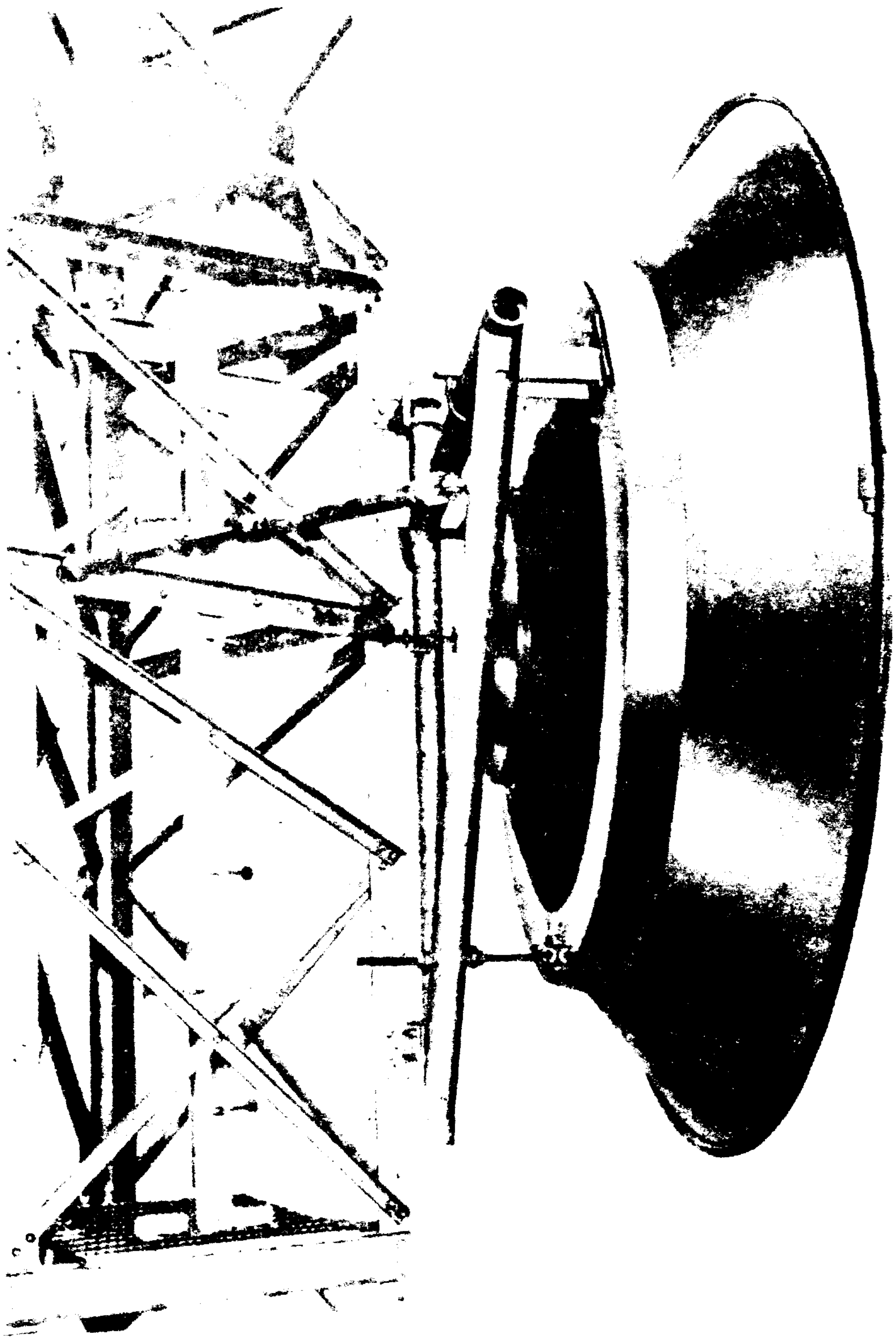


Fig. 7 – Mounted 10-Foot Antenna

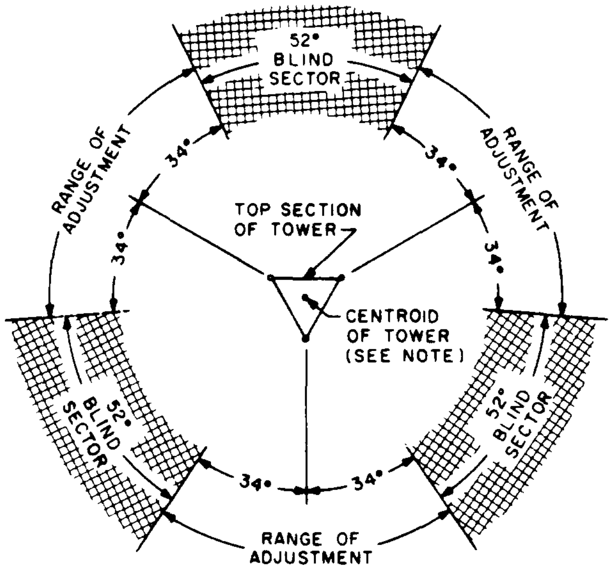


FIG. 8A AZIMUTH LIMITATIONS OF KS-15852
10' PARABOLIC ANTENNA

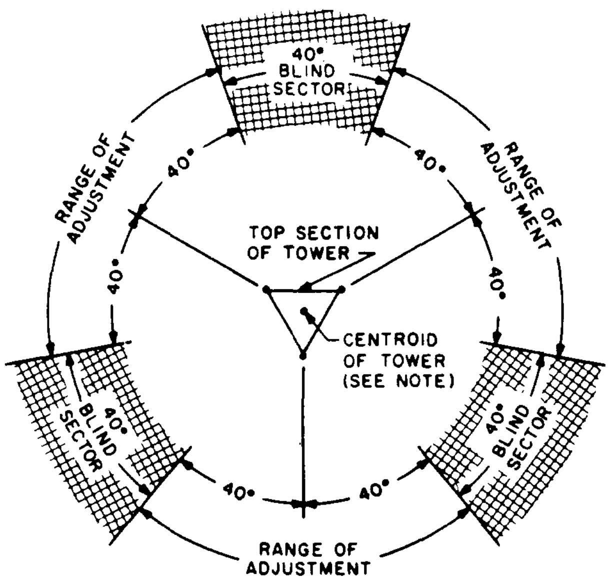


FIG. 8B AZIMUTH LIMITATIONS OF KS-16320-L1
6' X 8' REFLECTORS

NOTE: CENTROID OF TOWER AND NOT ACTUAL ATTACHMENT POINT OF REFLECTOR OR ANTENNA IS USED FOR DETERMINING BLIND SECTORS.

Fig. 8 – Range of Azimuth Adjustment

8.02 The nominal center of the reflectors or antennas will be separated by 120 degrees. The range of azimuth adjustability is ±34 degrees for the KS-15852 10-foot antenna, and ±40 degrees for the reflector. Care in orienting the tower will be necessary so that the intended transmission route paths will avoid blind sectors caused by azimuth adjustment limitations. This condition is illustrated in Fig. 8. Mounting facilities for the KS-15970 5-foot antenna will provide azimuth adjustability of ±60 degrees off each leg for complete coverage of the horizon, with no blind sectors.

8.03 Special engineering will be required if other than standard equipment, mounting facilities or arrangements are used. Consulting service in this regard may be obtained from the Western Electric Company.

9. LIGHTING AND PAINTING

9.01 Federal Communications Commission and/or Federal Aviation Agency rules may require that the tower be lighted and painted to improve its visibility to air traffic.

9.02 If lighting and painting are required, it will be specified in the construction permit issued by the Federal Communications Commission. Methods for lighting and painting towers are described in Sections AG25.230 and AG25.300. Lighting equipment is not furnished with the tower, and if required, the appropriate lighting kit must be ordered separately. Painting, when required, is usually made part of the erection contract.