DESCRIPTION OF B SELF SUPPORTING TOWER

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1. GENERAL

1.01 This section describes the B Self Supporting Tower which is primarily intended for use with TJ radio systems, although it may also be used with other light route radio systems.

2. FOUNDATIONS

2.01 The B Self Supporting Tower is designed to rest on reinforced concrete foundations described in Bell System Practice AG25.260. Foundations for towers of 100 feet height or less require a single excavation; larger towers require four separate excavations.

2.02 The B Self Supporting Tower is fastened to its foundations by means of the B Self Supporting Tower Anchor. This anchor consists of sixteen "j" shaped partly galvanized anchor bolts, each equipped with two nuts. It is not furnished with the tower and must be ordered separately.

2.03 Foundations for B Self Supporting Towers must be equipped with the B Self Supporting Tower Ground to protect them against lightning damage. Installation details are covered in Bell System Practice AG25.260. This ground consists of four D ground rods, miscellaneous clamps and a length of #2 AWG copper wire. It is not shipped with the tower and must be ordered separately.

3. LOT REQUIREMENTS

3.01 Ground requirements for the B Self Supporting Tower must be based upon the actual type of footings used. Sufficient land should be obtained, however, to allow for the angle of shear of the soil extended from the bottom of the mat to the surface of the ground.

3.02 Where standard footings as described in Bell System Practice AG25.260 are employed, the following size minimum lot will be required. This includes an allowance for a 30 degree angle of shear from the top of the mat to the surface of the ground at the property line, but does not include any allowance for the building or waveguide supporting structures.

TOWER HEIGHT (Feet)	LOT SIZE (Feet)
40	20 by 20
60	23 by 23
80	25 by 25
100	28 by 28
120	37 by 37
140	42 by 42
160	44 by 44
180	47 by 47
200	50 by 50
220	53 by 53
240	57 by 57
260	60 by 60
280	62 by 62
300	65 by 65

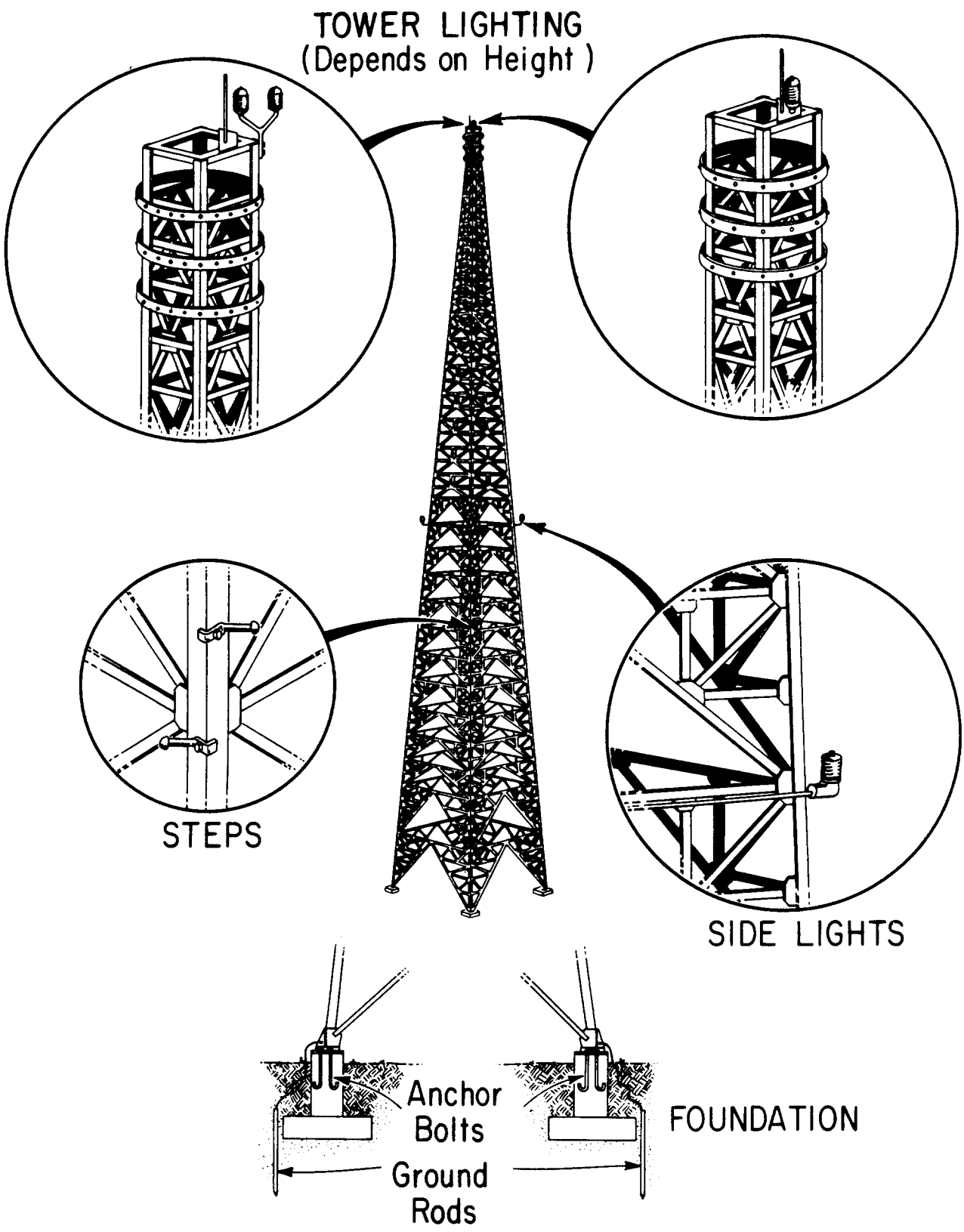
TOWER LIGHTING
(Depends on Height)
STEPS
SIDE LIGHTS
Anchor
Bolts
Ground
Rods
FOUNDATION

FIG. 1

3.03 If the minimum lot size recommendations are to be employed, a definite understanding or agreement should be obtained from abutting property owners as to temporary use of additional land to permit temporary storage of steel and erection facilities. In this connection it should be noted that the B tower leg members are fabricated in approximately 30 foot lengths. Also, it should be noted that efficient erection requires sorting and arranging of members in logical order. This obviously requires some space. Generally a circle of diameter equal to the minimum size lot dimension plus 100 feet will be ample. This may be reduced to a ***minimum*** area of width equal to that of the minimum lot by about 100 feet deep and abutting the lot. For towers of 200 feet height or more, the minimum depth should be increased by about 10 feet for every 20 feet of added tower height.

4. STRUCTURAL FEATURES

4.01 The B Self Supporting Tower is fabricated of galvanized structural steel and is shipped knocked down to be assembled using bolts only. It is square in cross section, with a top section 5 feet 4½ inches on a side. The top 15 feet of the tower is of constant cross section; the lower portions are of constantly increasing width, reaching a maximum of 41 feet 1 inch at the bottom of the 300 foot tower. The general appearance of the tower is shown in Fig. 1.

4.02 The B Self Supporting Tower is available in fourteen sizes ranging from a minimum height of 40 feet to a maximum height of 300 feet with 20 foot increments for intermediate heights. Towers of 240 feet and less are all of the same design with sections removed from the base to obtain the particular height desired. Towers of 260 feet and larger are of the same general design but the leg members of two sections near the top of the tower are heavier.

4.03 Access to the tower is provided by special step bolts mounted on one corner. These step bolts are specially formed so as to provide a flat angle (180 degrees) between alternate steps instead of the usual 90 degree angle. The Tower Ladder Safety Device is not furnished with the tower but may be installed if desired.

5. WEIGHT

5.01 The approximate weight of the various sizes of the B Self Supporting Tower, exclusive of lighting fixtures, antennas, anchor bolts and other appurtenances or auxiliary equipment is as follows:

HEIGHT (Feet)	WEIGHT (Pounds)	HEIGHT (Feet)	WEIGHT (Pounds)
40	8,400	180	34,000
60	10,400	200	40,000
80	12,800	220	48,000
100	16,000	240	55,600
120	19,600	260	64,800
140	24,000	280	74,000
160	29,200	300	80,800

6. WIND LOADING AND STABILITY

6.01 All B Self Supporting Towers are designed to withstand a wind loading equivalent to a pressure of 40 lbs/square foot. (Roughly 100 miles/hour wind) Design stresses under this wind loading are such as to provide a safety factor of 1.65 to the yield point of the material. (Design stresses are indicated in another section of the AG25. series of practices.)

6.02 Under a wind loading of 20 lbs/square foot, the 300 foot tower will limit the movement of antenna or reflector mountings to a maximum of ± ¼ degree in tilt and ± ½ degree in twist for any of the loads described in Part 7 of this section. Towers of less than 300 feet will limit the movement of antenna or reflector mountings to smaller angles. In this connection, it should be noted that a self supporting tower is essentially a tapered cantilever beam. The deflection of a nontapered cantilever beam with a concentrated load is proportional to the cube of the length, and for a uniformly loaded cantilever beam is proportional to the fourth power of the length. Tower loading is actually a combination of distributed wind loading plus the concentrated load of wind pressure acting on the antennas or reflectors. Because of this, and because of the tapering cross section and changing member sizes, the deflection and twist limitations cannot be expressed as a simple function of tower height.

7. ANTENNA LOADING

7.01 The B Self Supporting Tower is designed to accommodate the following antennas:

KS-15837 8 ft parabolic (4 KMC)
KS-15838 10 ft parabolic (4 KMC)
KS-15852 10 ft parabolic (11 KMC)

The B Self Supporting Tower will also accommodate the following reflectors:

KS-16320 List 1 6 ft by 8 ft
KS-16320 List 2 8 ft by 12 ft

Nonstandard antennas and reflectors of the same size as the above mentioned standard items may also be used although modification of mounting arrangements may be required.

7.02 The B Self Supporting Tower may be loaded with any of the following combinations of antennas and reflectors.

TOWER SIZE (Feet)	PARABOLIC ANTENNAS 10 Feet	8 Feet	PASSIVE REFLECTORS 8′ x 12′	6′ x 8′
300 or less	—	—	4	—
	—	—	—	4
	2	—	—	—
	—	3	—	—
	1	—	2	—
	1	—	—	3
	1	2	—	—
	—	2	1	—
	—	2	—	2
180 or less	—	4	—	—
	—	3	—	1
160 or less	3	—	—	1
	2	—	1	—
	2	1	—	—
	2	—	—	2
	1	3	—	—
	1	—	3	—
	—	3	1	—
	—	2	2	—
	—	1	3	—
140 or less	2	2	—	—
120 or less	4	—	—	—

In general not all possible combinations are shown, but any combination shown for a given tower height can also be used for a lesser tower height, and any combination which will result in decreased tower loading may be used to replace another combination. Antennas should not be substituted for reflectors principally because of the added loading of their associated waveguides.

8. ANTENNA MOUNTING

8.01 The B Self Supporting Tower is equipped with three mounting rings (9 foot outside diameter) which make the orientation of the tower completely independent of the orientation requirements of the antennas or reflectors. With the adjustability inherent in the KS-16320 List 1 and List 2 reflectors, it is possible to orient adjacent reflectors to a minimum angular separation of 25 degrees. Three such adjacent reflectors may be oriented to a minimum angular separation of 75 degrees between the outside reflectors. Two adjacent 10 foot parabolic antennas may be oriented to a minimum angular separation of 35 degrees. Adjacent 8 foot parabolic antennas may be oriented to a zero degree angular separation.

8.02 When the standard mounting arrangements are used on the rings, the center of the 8′ by 12′ reflector will be approximately 6½ feet below the top of the tower; the center of the 6′ by 8′ reflector will be approximately 7 ft 10 inches below the top of the tower. When parabolic antennas are mounted on the rings, their centers will be approximately 8½ feet below the top of the tower.

8.03 When it is necessary to mount antennas or reflectors at other than the standard location, special engineering will be required. Limited experience has indicated that the cost of these modifications range from $1200—$1500.

9. LIGHTING

9.01 Part 17 of the Regulations of the Federal Communications Commission may require the installation of air obstruction lighting on B Self Supporting Towers. Lighting is available in three types as follows:

FCC 17.24 — Top light only. (Generally used for towers of 140 ft height or less.)

FCC 17.25 — Top Beacon plus one set side lights half way up the tower. (Generally used for towers 160 feet high and up to 280 feet high.)

FCC 17.26 — Top Beacon plus one set of side lights at one third tower height and a second set of side lights at two thirds tower height. (Generally required only for 300 ft towers.)

It should be noted, however, that FCC rules may require 17.26 lighting on say a 200 ft (or smaller) tower, depending upon its proximity to airfields.

9.02 Lighting is not shipped with the tower; it must be ordered separately. All wiring of standard lighting for B Self Supporting Towers is in conduit which is fastened to the tower by metal tapes. Sufficient wire and conduit with the standard lighting kit is supplied to bring the wiring from the lighting fixtures to a junction box at the base of the tower. The lighting control equipment is not furnished with the standard lighting kit. Conduit and wiring from the base of the tower to the lighting control box is not furnished with the standard lighting kit.

10. PAINTING

10.01 Painting to increase visibility of the tower to air traffic is required by FCC regulations under the same conditions that require air obstruction lighting. Under the present FCC rules, this takes the form of alternate equal bands of aviation surface orange and outside white. (Federal specification TT-P-102) The width of the bands shall be approximately one-seventh of the height of the tower provided the widths do not exceed 40 feet. The paint bands at the top and bottom of the tower must be of aviation surface orange (Federal specification TT-P-59). Painting should be included in the erection contract.

11. DESIGN FACTORS AND LIMITATIONS

11.01 Good engineering practice and safe design considerations have led to the adoption of certain limitations which have been followed in the design of the B Self Supporting Tower. Some of these have been more or less developed by the steel tower fabricating industry. Others have been developed by the American Institute of Steel Construction. Some are peculiar to the Bell System. Design details are covered in section AG25.290.