AT-8676 SELF-SUPPORTING TOWERS

FOUNDATIONS

CONTENTS PAGE

1. GENERAL

1.01 This section describes the reinforced concrete foundations for AT-8676 self-supporting towers.

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

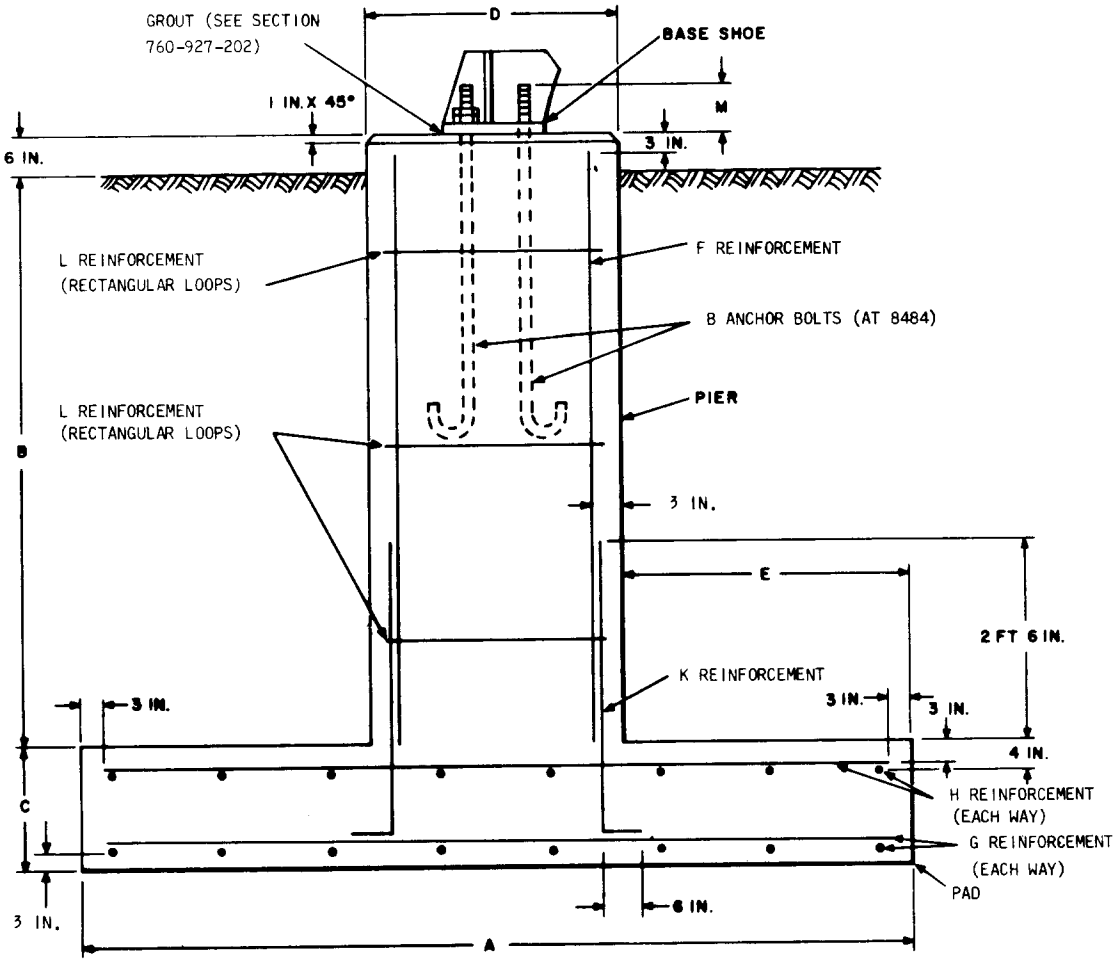
1.03 In addition to supporting the weight of the tower, foundations for self-supporting towers also must resist the shear and overturning moment resulting from wind pressure on the tower and its attachments. Depending on the direction and force of the wind, a given footing will be subjected to either a down load or an uplift. Foundation loads are described in Part 5.

1.04 Foundations for the towers are designed to include 16 B anchor bolts (AT-8484). Reinforcing steel for the foundations usually is supplied by the foundation contractor. General information on concrete for foundations is provided in Section 760-925-130. Quantities of concrete and reinforcing steel are covered in Part 2 of this section.

1.05 Most towers are likely targets for lightning. The AT-8676 tower is massive enough so that it will not be damaged, but its foundations are vulnerable unless the tower is suitably grounded. The B self-supporting tower ground contains the necessary material for grounding the AT-8676 tower. It is ***not*** shipped with the tower and must be ordered as a ***separate*** item. (See Section 760-925-135 for grounding details.)

2. FOUNDATION DETAILS

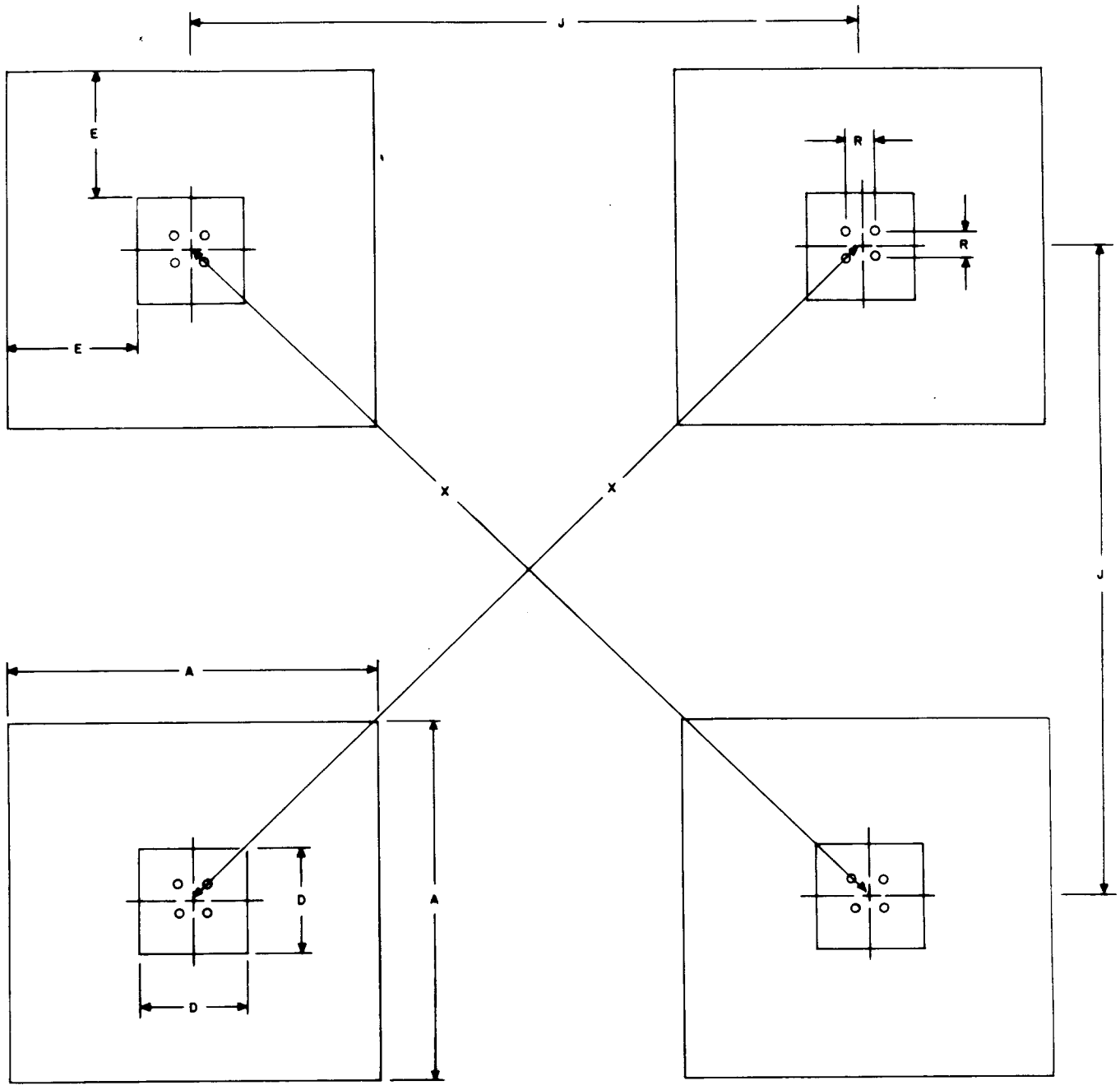
2.01 Foundations for the AT-8676 self-supporting tower consist of four reinforced concrete piers on reinforced concrete pads. Details of these foundations are shown in Fig. 1 and 2. Information regarding reinforcing steel is shown in Table A. The reinforcement shown in the table is that required for each foundation, and indicates the number of bars and the bar size. Note that these foundations are designed for soil which has a bearing capability of at least 4000 pounds per square foot.



NOTES:

1. VALUES OF DIMENSIONS AND QUANTITIES OF REINFORCING STEEL ARE SHOWN IN TABLE A.
2. FOUNDATIONS ARE DESIGNED TO WITHSTAND 100% OVERLOAD IN UPLIFT WITH THE FOLLOWING ASSUMPTIONS:
   (1) CONCRETE WEIGHS 140 LB/FT^3.
   (2) EARTH WEIGHS 100 LB/FT^3.
   (3) PAD ENGAGES EARTH IN THE SHAPE OF AN INVERTED FRUSTUM OF A PYRAMID WITH 30-DEGREE ANGLE OF SHEAR MEASURED FROM THE TOP OF THE PAD.

Fig. 1—Cross-Sectional View of Typical Foundation



NOTE:
VALUES OF DIMENSIONS ARE SHOWN IN TABLE A.

Fig. 2—Plan of Foundations

TABLE A

FOUNDATION DIMENSIONS AND REINFORCING STEEL

	TOWER HEIGHT										
	50'	75'	100'	125'	150'	175'	200'	225'	250'	275'	300'
Dimension A	10'6"	11'0"	12'0"	12'6"	12'6"	13'0"	13'0"	13'6"	14'0"	14'6"	15'0"
Dimension B	6'0"	7'6"	8'0"	8'6"	9'6"	9'6"	10'6"	10'6"	10'6"	11'0"	11'6"
Dimension C	1'6"	1'6"	1'6"	1'9"	2'0"	2'3"	2'3"	2'3"	2'6"	2'6"	2'6"
Dimension D	3'0"	3'0"	3'6"	3'6"	3'6"	4'0"	4'0"	4'6"	4'6"	4'6"	5'0"
Dimension E	3'9"	4'0"	4'3"	4'6"	4'6"	4'6"	4'6"	4'6"	4'9"	5'0"	5'0"
Dimension M (±1/2")	0'6-3/8"	0'7-1/2"	0'8"	0'8-1/8"	0'8-5/8"	0'8-3/4"	0'8-3/4"	0'9-1/2"	0'9-1/2"	0'9-1/2"	0'9-1/2"
Dimension J (±1/8")	15'8-7/8"	18'9-5/8"	21'11-3/16"	25'11/16"	28'2-3/16"	31'3-5/8"	34'5-1/8"	37'6-3/8"	40'7-7/8"	43'9-3/8"	46'10-7/8"
Dimension R*	0'8-1/2"	0'11"	0'11"	0'11-1/4"	0'11-1/4"	1'0"	1'0"	1'1-3/4"	1'1-3/4"	1'2-3/4"	1'2-3/4"
Dimension X†	22'3-1/16"	26'7-1/16"	31'11-3/16"	35'5-1/4"	39'10-1/4"	44'3-3/16"	48'8-1/4"	53'15/16"	57'5-15/16"	61'11"	66'4"
F Reinforcement	16 #6	20 #7	24 #7	24 #7	24 #8	24 #8	28 #8	28 #8	28 #8	32 #8	32 #8
K Reinforcement	16 #7	20 #8	24 #7	24 #7	24 #8	24 #8	28 #8	28 #8	28 #9	32 #8	32 #9
G Reinforcement	16 #5	18 #6	22 #6	22 #6	20 #6	21 #6	20 #6	22 #6	22 #6	22 #6	27 #6
H Reinforcement	16 #5	18 #6	22 #6	22 #6	20 #6	21 #6	20 #6	22 #6	22 #6	22 #6	27 #6
L Reinforcement	3 #3	3 #3	3 #3	3 #3	3 #3	3 #3	3 #3	4 #3	4 #3	4 #3	4 #3

* Distance from the center of any bolt to the center line of its pier must be held to within 1/16 inch.

† Difference between diagonal measurements must not exceed 1/4 inch.

2.02 At the time concrete is placed, reinforcement shall be free from mud, oil, or other coatings that adversely affect the bonding capacity.

2.03 Reinforcement shall be placed accurately and supported adequately before concrete is placed. It shall be secured against displacement so it does not exceed the tolerances permitted by American Concrete Institute (ACI) 318. The contractor should wire wrap all joints of the reinforcing steel and the anchor bolts in each foundation to adjacent rebars.

2.04 For estimating purposes, the approximate quantities of concrete and reinforcing steel, along with the volume of excavation required for the various sizes of towers, are shown in Table B.

TABLE B

QUANTITIES OF CONCRETE AND STEEL
VOLUME OF EXCAVATION

TOWER HEIGHT (FEET)	CONCRETE (CUBIC YARDS)	REINFORCING STEEL (POUNDS)	EXCAVATION* (CUBIC YARDS)
50	33.2	3,790	122.5
75	37.6	6,640	161.4
100	47.5	8,700	202.7
125	56.9	9,850	237.3
150	64.5	9,470	266.2
175	80.0	10,020	294.2
200	82.4	10,580	319.3
225	93.8	11,470	351.0
250	105.6	11,740	377.5
275	112.4	12,790	420.5
300	127.8	15,030	466.7

* Assuming perpendicular walls and exact size of excavation.

2.05 On the 50-, 75-, 100-, and 125-foot towers, the step-bolt ladder will be used for the total tower height. It will be terminated 6 inches above grade and bolted to a clip iron, which in turn is bolted to a concrete pad (see Fig. 3). This concrete pad should be installed at the same time as the tower foundations and located as shown in Fig. 4. (No anchor bolts are required to be set in this pad.) Connection of the materials, which are supplied with the tower steel, requires the drilling of two holes (1-1/8 inches in diameter and 3-5/8 inches deep) in the concrete for expansion anchors.

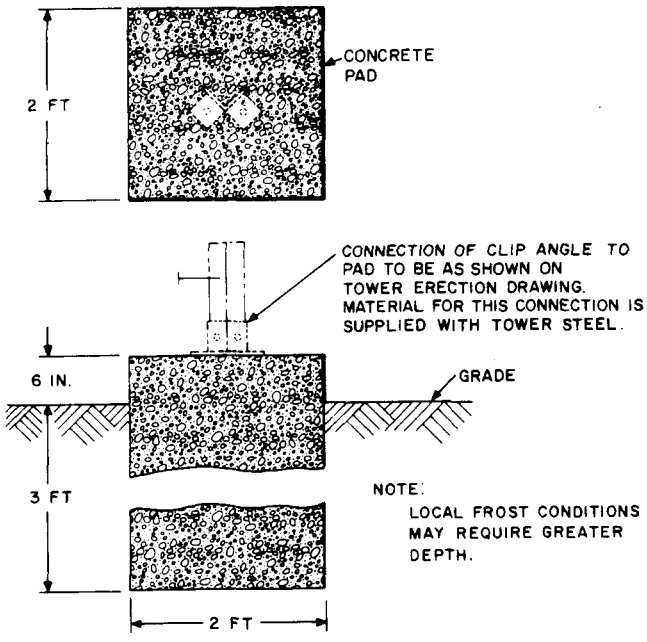
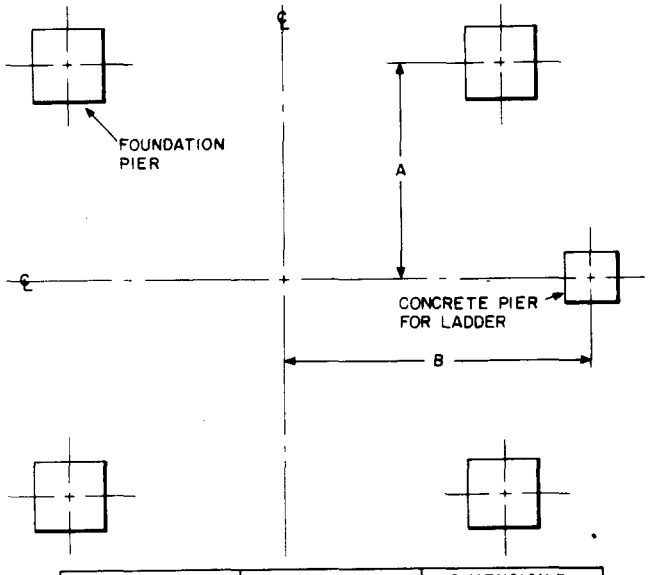


Fig. 3—Ladder, Pad, and Connection



TOWER HEIGHT	DIMENSION A	DIMENSION B
50 FT	7 FT 10-1/2 IN.	9 FT 1-3/8 IN.
75 FT	9 FT 4-7/8 IN.	10 FT 8-1/8 IN.
100 FT	10 FT 11-5/8 IN.	12 FT 2-7/8 IN.
125 FT	12 FT 6-3/8 IN.	13 FT 9-5/8 IN.

NOTE:
IN SOME CASES, A SINGLE EXCAVATION MAY BE MADE FOR THE FOUR PIERS. THE LADDER PAD MAY BE POURED ON FILL MATERIAL OR EXTENDED DOWN TO UNDISTURBED EARTH BY POURING ADDITIONAL CONCRETE. FILL MATERIAL MUST BE THOROUGHLY TAMPED TO OBTAIN THE DESIRED BEARING CAPABILITY.

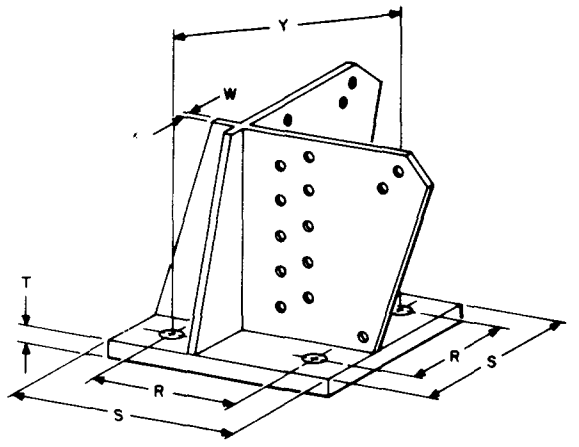
Fig. 4—Plan of Foundations

3. ANCHOR BOLTS

3.01 Each standard foundation requires 16 B anchor bolts (AT-8484). These bolts are ***not*** shipped with the tower, but must be ordered ***separately.*** The B anchor bolt is a galvanized steel, J-shaped bolt equipped with two nuts. The following sizes of bolts are used in foundations for towers of the heights indicated:

TOWER HEIGHT (FEET)	BOLT SIZE DIAMETER-LENGTH (INCHES)
50	1-1/4 × 38
75	1-1/2 × 51
100, 125	1-3/4 × 65
150, 175, 200	2 × 81
225, 250, 275, 300	2-1/4 × 105

3.02 The spacing of anchor bolts in each pier must conform to the dimensions given in Table A in order to ensure proper fit of the base shoes on the anchor bolts. The exposed part of the anchor bolts should not deviate from true vertical by more than 1/16 inch. The base shoe and pertinent dimensions are shown in Fig. 5.



TOWER HEIGHT (FEET)	R (INCHES)	S (INCHES)	T (INCHES)	W (INCHES)	Y* (INCHES)
50	8-1/2	12	1-7/8	1/2	12
75, 100	11	14-1/2	2-1/2	5/8	15-9/16
125, 150	11-1/4	16-1/2	2-5/8	5/8	15-15/16
175, 200	12	19	2-3/4	3/4	16-15/16
225, 250	13-3/4	22	3	1	19-7/16
275, 300	14-3/4	24	3	1	20-7/8

* ROUNDED TO NEAREST SIXTEENTH

Fig. 5—Base Shoe

4. GROUNDING

4.01 The B self-supporting tower ground kit contains ground rods, grooved washers, connectors, and a length of No. 2 AWG tinned bare copper wire. ***One kit*** is required for each tower. Sufficient wire is provided for the tower system ground, but not to connect the tower grounding system to the station grounding system. This connection is required; but since the distance between the tower ground and the station grounding system will vary for each installation, the length of wire required for this connection should be included in the wire ordered for the station grounding system. Grounding information is covered in Section 760-925-135.

5. FOUNDATION LOADS

5.01 The foundation loads shown in Table C are based on a wind pressure of 40 pounds per square foot applied to 1.75 times the projected area of one face of the tower, plus the sail area of the permitted appurtenances (antennas, waveguide, etc). The dead weight of the tower and its appurtenances has been included in the vertical reactions.

TABLE C

FOUNDATION LOADS

HEIGHT OF TOWER (FEET)	MAXIMUM REACTIONS PER LEG (THOUSANDS OF POUNDS)		
	DOWN LOAD	UPLIFT	SHEAR
50	78.4	56.2	9.8
75	105.9	79.3	11.1
100	130.7	99.3	12.5
125	154.3	117.1	13.9
150	177.1	133.5	15.5
175	199.9	149.3	17.2
200	212.9	164.7	18.9
225	246.4	179.8	20.7
250	270.4	194.6	22.6
275	295.0	209.6	24.9
300	320.6	225.2	26.3