Foundation Specifications

for 7.6-Meter High Wind Earth Station Antenna

Introduction

This document specifies the typical foundation characteristics, designs, requirements, and dimensional specifications for the Kratos 7.6-Meter High Wind Earth Station Antenna. The foundation design enables the antenna to meet wind gusting of 45 to 65 mph operational requirements. The foundation also allows for 125 mph survival in any operating position or 200 mph survival at 90° elevation.

Foundation Loading Characteristics

The 7.6m foundation consists of a reinforced concrete pad. Foundation loads are applied to 3 points on the foundation pad as shown in Figure 1. Positive applied forces are in the direction of the X, Y and Z coordinate system.

Varying load conditions are dependent upon incident wind angle and elevation/azimuth angles of the antenna. Foundation loads including antenna weight plus various wind conditions are listed in Table 1. Wind Vector (WV) in Table 1 is the angle of approach into the reflector measured clockwise from the reflector normal pointing direction as shown in Figure 1.

At 90° elevation, and 200 mph, the foundation loads are no greater than the maximum loads listed in Table 1.

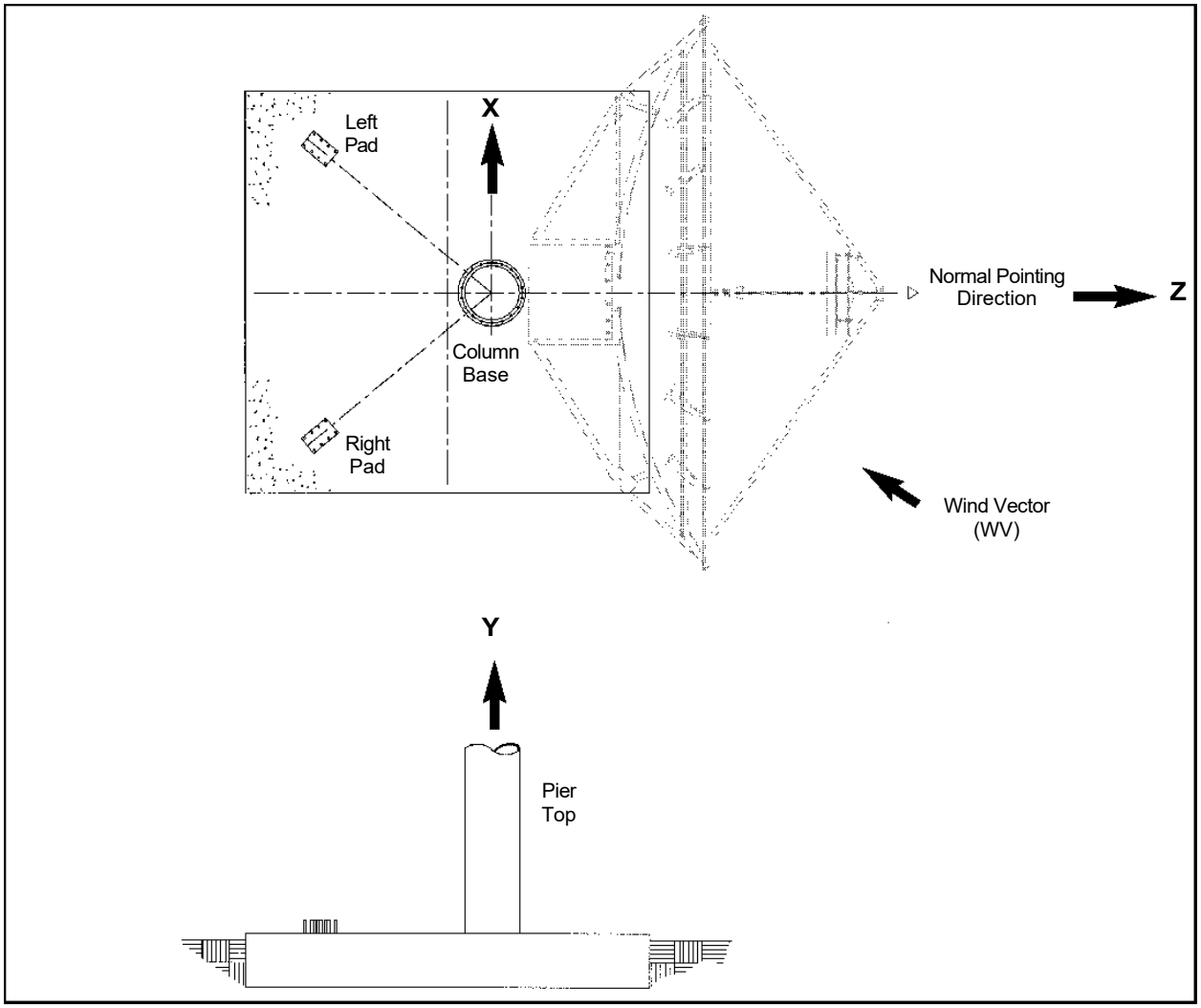

Figure 1

Foundation Designs

The foundation design for a particular site is dependent upon local soil conditions. Soil borings and foundation analysis should be performed by a qualified civil engineer.

A typical foundation design based on normal soil conditions is shown Figure 2. This design represents the minimum requirements for the foundation, and defines the interface requirements between the antenna and mount. A copy of this design is available from Kratos on request. Refer to Drawing 303544.

Anchor Bolt Requirements

A typical anchor bolt installation configuration and corresponding dimensions are shown in Figure 3.

Kratos Type 303546 Foundation Kit includes, anchor bolts, and required mounting as shown in Figure 3.

Foundation Orientation

Proper foundation orientation is required to obtain the desired orbital arc coverage from a particular site location. The required azimuth and elevation angles of the antenna, relative to the mount, must be determined to establish the appropriate foundation orientation.

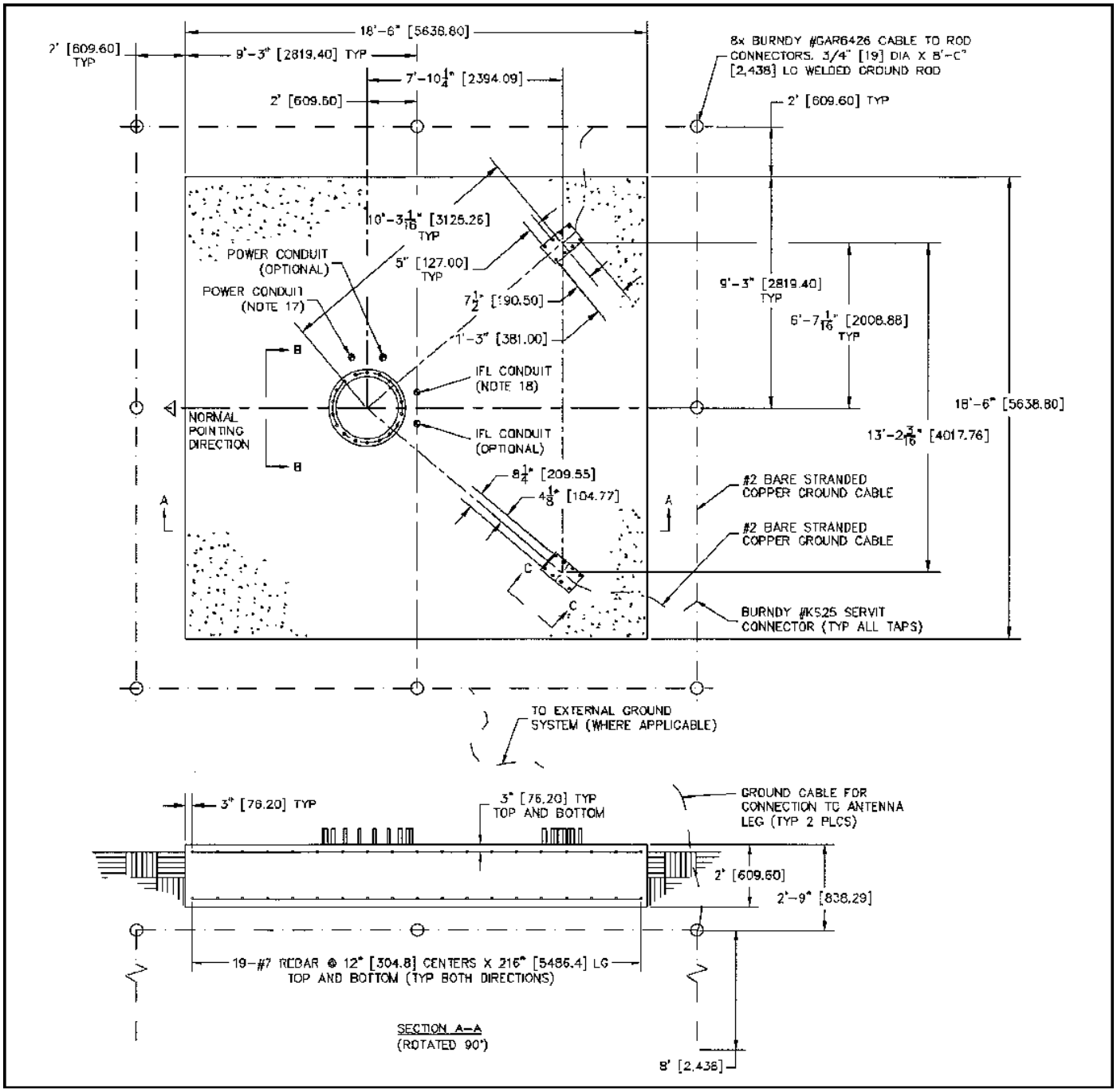

Figure 2

7.6M Foundation Load Table

Wind = 125 mph

LOAD CASE	FOUNDATION POINT	FX	FY lbs	FZ	MX	MY in.lbs	MZ
ELOWO	Column Base	37	22634	-6149	**1517042**	2016	-1628
	Left Pad	**9373**	**-14866**	**-11190**			
	Right Pad	**-9409**	**-14922**	**-11232**			
ELOW60	Column Base	-385	18454	-5911	1331157	-462686	230119
	Left Pad	7597	-12102	-9068			
	Right Pad	-8630	-13708	-10303			
ELOW120	Column Base	840	-17642	630	-519297	**920691**	**-459048**
	Left Pad	-2465	3564	2940			
	Right Pad	4484	6704	5355			
ELoW180	Column Base	-5	**-28826**	2771	-1100741	770	-117
	Left Pad	-7088	10760	8462			
	Right Pad	7098	10775	8473			
EL30WO	Column Base	96	-124	**-7424**	1164003	-24830	12096
	Left Pad	6645	-10621	-7934			
	Right Pad	-6819	-10891	-8141			
EL30W60	Column Base	495	-562	-5388	931196	-237324	117729
	Left Pad	4877	-7869	-5824			
	Right Pad	-6208	-9938	-741 0			
EL30W120	Column Base	-1425	-14203	-1091	-433258	746874	-372382
	Left Pad	-1334	1806	1595			
	Right Pad	5435	8182	6485			
EL30W 180	Column Base	-24	-19205	-1173	-757594	12515	-6342
	Left Pad	-5759	8692	6875			
	Right Pad	5836	8810	6966			
EL60WO	Column Base	44	-21702	-5430	503800	-2393	840
	Left Pad	2633	-4374	-3143			
	Right Pad	-2643	-4389	-3155			
EL60W60	Column Base	-433	-10407	-1344	266608	81719	-40634
	Left Pad	2305	-3862	-2750			
	Right Pad	-1359	-2392	-1624			
EL60W120	Column Base	**-2342**	-9149	-1271	-248604	388472	-193689
	Left Pad	222	-614	-258			
	Right Pad	4452	6651	5308			
EL60W180	Column Base	-67	-13705	-3119	-447039	-7614	3507
	Left Pad	-4059	6045	4845			
	Right Pad	4126	6149	4925			
EL90WO	Column Base	150	6826	2450	70923	4516	-2263
	Left Pad	2000	-3221	-2387			
	Right Pad	-2129	-3421	-2540			
EL90W60	Column Base	-832	-196	518	34033	33327	-16551
	Left Pad	1235	-2028	-1472			
	Right Pad	406	523	482			
EL90W120	Column Base	-869	-2679	-427	-38196	29168	-14564
	Left Pad	465	-829	-552			
	Right Pad	1208	1772	1439			
EL90W180	Column Base	-36	-3891	-844	-73403	-3593	1547
	Left Pad	-726	1024	867			
	Right Pad	769	1090	918			

Bold values are maximums.

TABLE 1

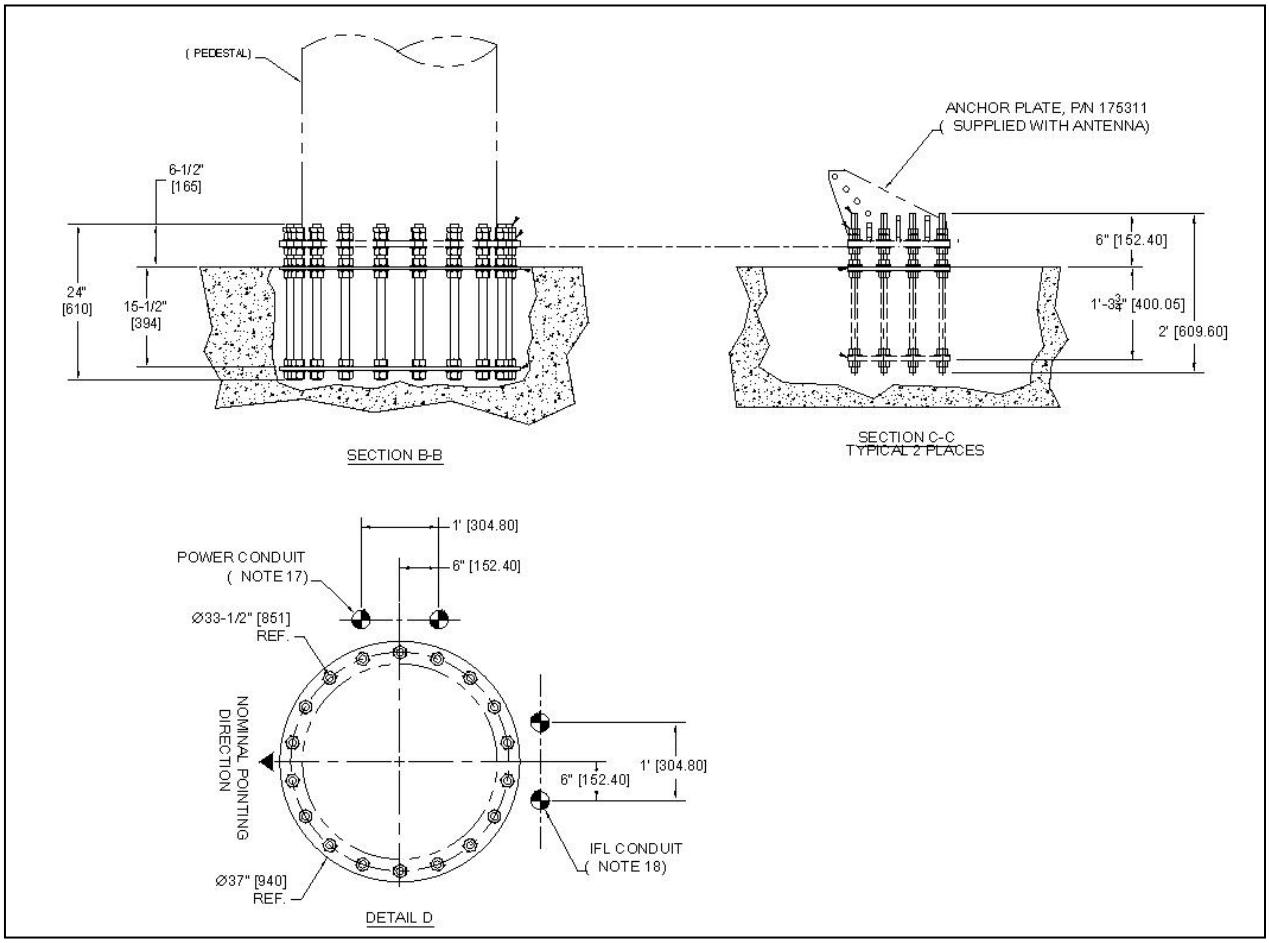
(PEDESTAL)
6-1/2"
[165]
24"
[610]
15-1/2"
[394]
SECTION B-B
ANCHOR PLATE, P/N 175311
(SUPPLIED WITH ANTENNA)
6" [152.40]
1'-3¾" [400.05]
2' [609.60]
SECTION C-C
TYPICAL 2 PLACES
1' [304.80]
6" [152.40]
POWER CONDUIT
(NOTE 17)
Ø33-1/2" [851]
REF.
NOMINAL POINTING
DIRECTION
1' [304.80]
6" [152.40]
IFL CONDUIT
(NOTE 18)
Ø37" [940]
REF.
DETAIL D

Figure 3

General Notes - Pedestal Mount

General Notes

1. All dimensions are shown in inches [and millimeters] and (reference).

2. Contractor shall field verify all dimensions locating existing construction before fabrication of new construction begins.

3. Ground rods shall be driven to depths as shown (below permanent moisture level) and ground system resistance measured. The antenna structure shall be connected to a grounding system consisting of a number of interconnected ground rods. The system shall meet the standards of the Underwriters' Laboratories Publication No. UL96A for Lightning protection. The ground rod system-to-earth resistance shall not exceed 1.0 Ohm at any time during the year.

4. Grounding system shown is the minimum necessary. Local conditions will dictate grounding system design.

5. For electrical power to antenna, 1-1/2" [38] to 2-1/2" [64] size conduit is recommended. Type and depth to bury conduit to be determined by customer, in compliance with local codes. Direction to route conduit to be determined by location of communications building/shelter. Conduit to extend 6" [152] minimum above surface of foundation slab. Open ends of conduit to be sealed to prevent moisture and foreign matter contamination.

6. IFL conduit required if no other means of routing cables are provided.

7. For routing IFL cables, 4" [100] size conduit is recommended. Type and depth to bury conduit to be determined by customer, in compliance with local codes. Location of conduit on foundation and direction to route conduit to be determined by location of communications building/shelter. Conduit to extend 36" [914] minimum above surface of foundation slab. All bends to be large radius. Maximum of two bends per run. Open ends of conduit to be sealed to prevent moisture and foreign matter contamination.

8. **Grounding Electrode System**

   The grounding system shown represents the minimum requirements to achieve satisfactory grounding. Actual site conditions and soil resistivity levels will determine final grounding system design to comply with the following:

   A) All ground ring, ground rod and antenna structure connections to be ERICO® products, Inc. Calweld® exothermic type welded electrical connections or equivalent.
   B) Ground rods shall be driven to a depth below permanent moisture level (minimum depth shown) as dictated by geographical location.
   C) The antenna structure shall be connected to a grounding electrode system consisting of a number of interconnected ground rods. The system shall meet the requirements of the Underwriters' Laboratories Publication No. UL96A for Lightning protection.
   D) The grounding electrode system to earth resistance shall not exceed 10 Ohms, measured with a Biddle 3 terminal device or equivalent. The grounded conductor (neutral) supplied to all ac equipment on the antenna structure should be disconnected before taking measurement.
   E) Actual site conditions may require longer ground rods, additional ground rods and/or land fill additives to reduce soil resistivity levels.
   F) Avoid sharp bends when routing grounding wire, Grounding wires to antenna structure to be run as short and straight as possible.
   G) Final grade directly above grounding electrode system to be water permeable.

Foundations

9. Foundations have been designed to rest on undisturbed soil (per EIA-41 1-A and RS-222-D with a minimum allowable net vertical bearing capacity of 2000 psf. If undesirable soil conditions are encountered, the engineer shall be notified.

10. Backfill shall be suitable excavated material or other suitable material compacted in 6" [152] lifts to 90% of maximum density as determined by ASTM D1557.

11. This foundation is a typical design only. Certification of its suitability for a particular installation by a professional engineer is required prior to it's use for actual fabrication.

12. If this foundation is to be located in an area where the annual frost penetration depth exceeds 15" [381], the local building code specifying a minimum required foundation depth should be consulted.

Concrete

13. Concrete and related work shall be mixed, placed and cured in accordance with the "Building Code Requirements for Reinforced Concrete" ACI 318 and "Specifications for Structural Concrete" ACI 301, publication SP-15.

14. Concrete shall develop compressive strength of at least 3000 psi [20 MPa] in 28 days with a maximum slump of 3" [76] at time of placing. Cement shall be normal Portland cement (Type 10) unless local soil conditions require the use of sulphate resistant cement.

15. Concrete subjected to freeze-thaw than cycles to be air entrained to 5% - 8%.

16. Reinforcing bars shall conform to ASTM A 615 [S1] grade 60 deformed type Fy = 60000 psi [400 MPa].

17. Unless otherwise noted, concrete cover for reinforcing bars shall conform to the minimum requirements of ACI 318.

18. Fabrication of reinforcing steel shall be in accordance with the "Manual of Standard Practice for Detailing Reinforced Concrete Structures" ACI 315.

19. Provide 3/4" x 45° [19 x 45°] chamfer on all exposed concrete edges.

20. A tolerance of ±1/8" [3] applies to all anchor bolt layout dimensions.

21. Level plates for struts individually and to within ±1/8" [3] of each other.

22. Level plate for antenna to within 0.1° of horizontal.

Antenna Geometry 7.6M

Basic dimensional characteristics and elevation and azimuth adjustment ranges are shown in Figures 4 and 5. The antenna has five coarse azimuth positions consisting of the normal position as shown in Figure 5, plus positions at 45 deg and 90 deg right and left of center. At any coarse azimuth setting the antenna has +/-60 degrees continuous azimuth adjustment and 0 to 90 degrees continuous elevation adjustment. Figures 4 and 6 illustrate varying dimensions from the ground reference of selected antenna points as the elevation angle changes from 0° to 90°.

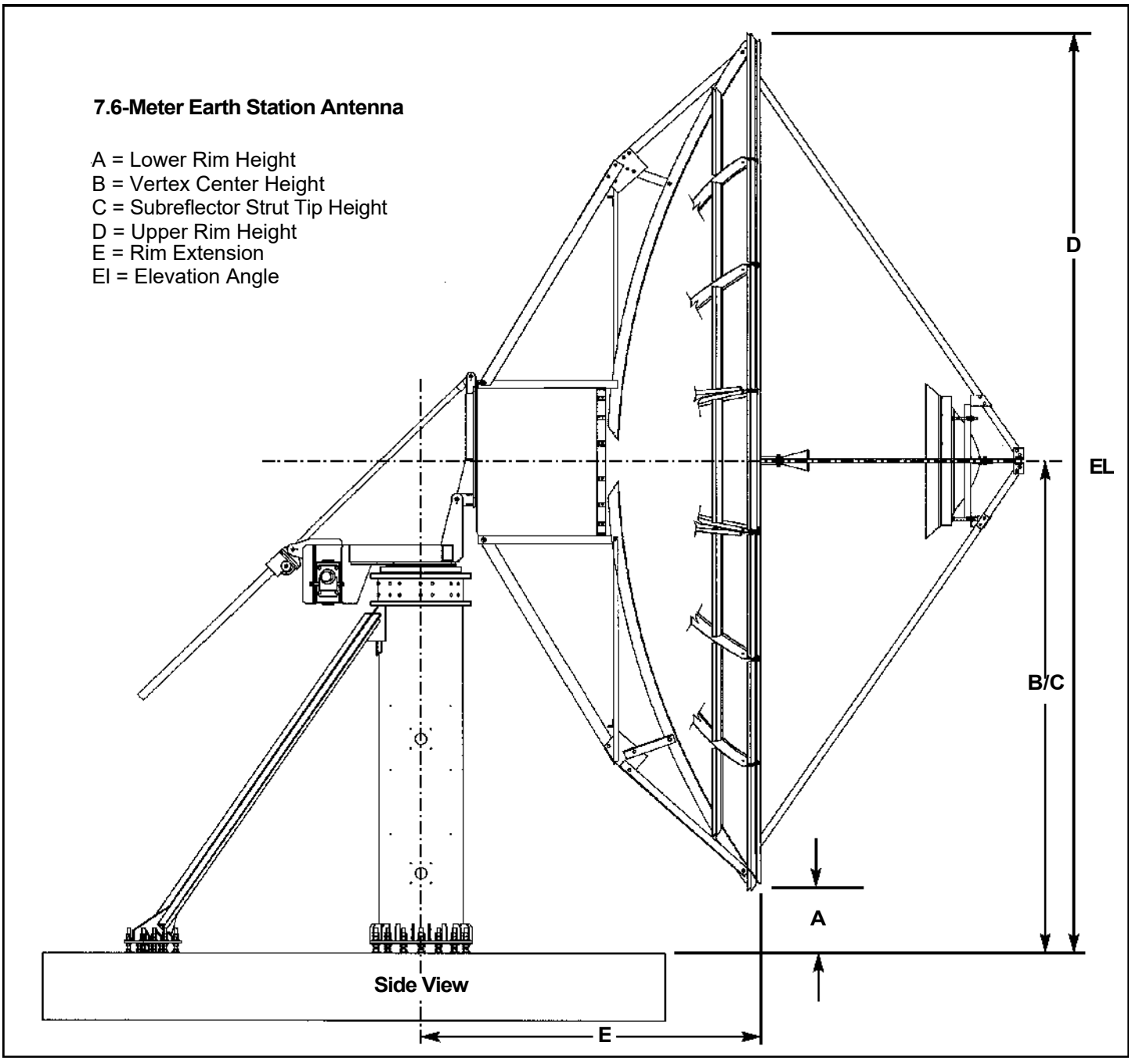

Figure 4

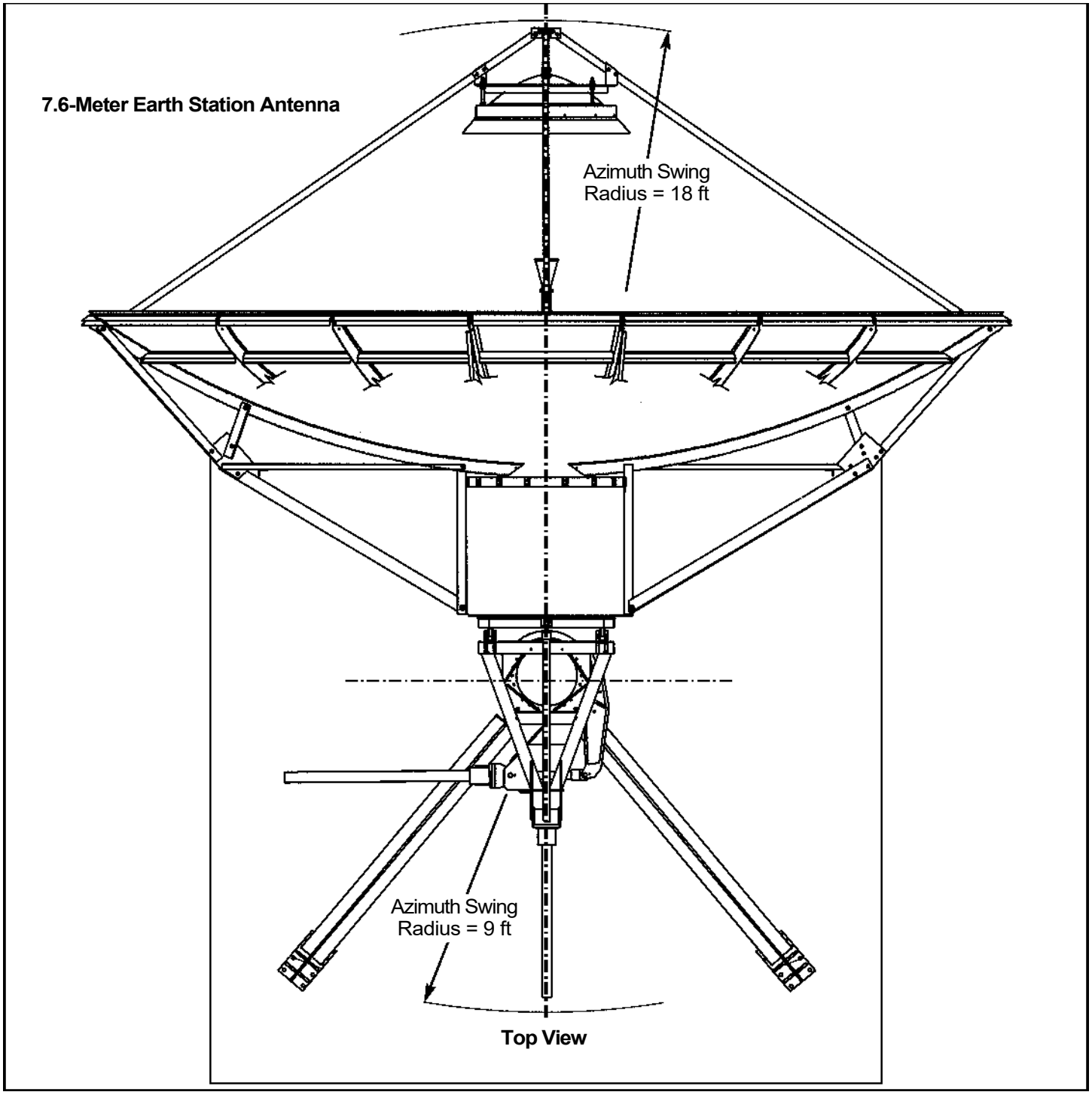
7.6-Meter Earth Station Antenna
Azimuth Swing
Radius = 18 ft
Azimuth Swing
Radius = 9 ft
Top View

Figure 5

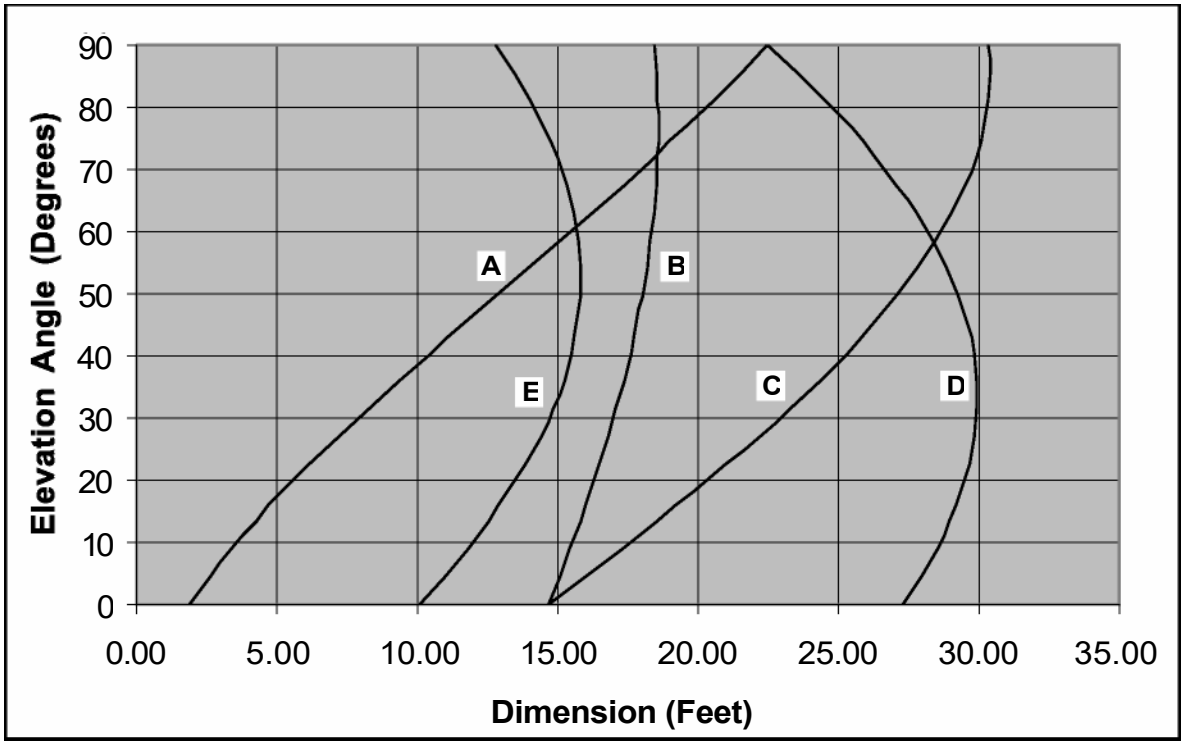
Elevation Angle (Degrees)
90
80
70
60
50
40
30
20
10
0
0.00
5.00
10.00
15.00
20.00
25.00
30.00
35.00
Dimension (Feet)
A
B
C
D
E

Figure 6