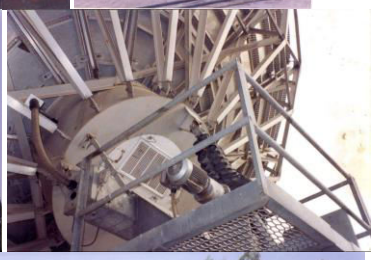
MELTEK
INFOSYSTEMS
PVT. LTD.

VERTEX MAKE 9MTR ANTENNA I&C FOR DEAL DEHRADUN (BEL PROJECT)



Scope of Work

1. Vertex makes 9mtr Antenna Erection, Installation & commissioning and NOCC at DEAL Dehradun.
2. Unpacking of Antenna, Subsystems.
3. Transportation of Antenna, Subsystems to the site Deal Dehradun.
4. Mechanical Erection of the Antenna to be done as per the notes in drawing with the help of Scaffoldings/crane.
5. Connection to the earth pit.
6. Mechanical adjustment during RMS measurement.
7. NOCC Testing.
8. Testing of the antenna and handing over of Antenna to the user including NOCC.

Vertex 9M Antenna Specs

1. Frequency in GHz…… 3.400-4.200 **Rx** 5.725-6.725 **Tx**

2. Port Type…… Rx1 Tx1

3. Polarization…… Linear **Rx** Linear **Tx**

4. Feed Port Polarization…… VLP or HLP **Rx** HLP or VLP **Tx**

5. Antenna Gain (+/- 0.2 dB): **Rx** **Tx**

3.400/5.725 GHZ……	48.70 dBi	53.00 dBi
4.000/6.225 GHZ……	50.00 dBi	53.70 dBi
4.200/6.725 GHZ……	50.30 dBi	53.90 dBi

6. Antenna Noise Temperature:

5° El……	55 K
10° El……	45 K
20° El……	40 K
40° El……	38 K

7. Typical G/T at 20° El 4.000GHz, Clear Horizon :

35° K LAN……	31.2 dB/K
50° K LAN……	30.5 dB/K

8. Pattern Beam-width in degrees at 4.000/6.225 GHz

-3 dB Beam-width……	0.56 Rx	0.34 Tx
-15 dB Beam-width……	1.18 Rx	0.71Tx

9. Sidelobes:

For Angles from 1° to 48°…… Meets FCC regulation 25.209

For Angles from 48° to 180°…… IESS (Intelsat) or ITU-RS-580

10. Cross Polarization Isolation

On Axis…… 35.0 dB **Rx** 35.0 dB **TX**

11. Within 1.0dB Beam-width……30.0dB **Rx** 30.0dB **Tx**
12. VSWR (Return Loss)…… 1.30:1(17.7 dB)**Rx** 1.30:1(17.7 dB) **Tx**
13. Feed Insertion or Ohmic Loss…… … 0.30 dB **Rx** 0.30dB **Tx**
14. Port to Port Isolation…… 0.0 dB (Input) -30.0 dB
15. Port to Port Isolation…… -85.0 dB 0.0 dB(Input)
16. Output Waveguide Flange Interface……CPR-229G CPR-159G
17. Total Power Handling Capability……5.00 kW cW

Foundation interface loads for 120° azimuth travel configuration of 9.0 meter KPC/KPK Satellite earth station antenna

1.0 INTRODUCTION:

This document provides foundation interface loads for the 120o azimuth travel configuration of the General Dynamics SATCOM Technologies (GDST) 9.0 meter KPC/KPK satellite earth station antenna. Design loads are provided for 3 speed scenarios, 30 mph gusting to 45 mph excluding dead weight, 45 mph gusting to 60 mph excluding dead weight, and 125 mph in combination with dead weight. Use the 30 mph gusting to 45 mph and 45 mph gusting to 60 mph wind loads to evaluate the antenna support system for adequate rigidity as required by GDST specification 300-2107. The loads for 125 mph wind combined with dead weight are maximum antenna survival loads, and they should be used to evaluate the antenna support system for adequate strength as required by the governing building and/or construction codes.

2.0 LOAD CONDITIONS:

All wind loads presented in this document were derived from the results of extensive wind tunnel studies of parabolic antenna structures. Load conditions are defined by specific combinations of wind speed, antenna orientation (azimuth and elevation) and wind direction. Each condition is represented by three angles (azimuth, elevation and wind approach). X, Y, Z Cartesian coordinate axes have been defined to facilitate the description of load vectors and antenna orientations. Sign conventions for the X, Y, Z coordinate axes, azimuth angle and elevation angle are shown on pages 3 and 4. Using the right hand sign convention, wind approach angle (wind angle) is measured about the Z-axis from the azimuth heading of the antenna. A 0o wind angle represents a head wind or frontal wind approach. A 180o wind angle represents a tail wind. Antenna symmetry precludes the need to consider wind angles between 180o and 360o.

3.0 CRITICAL LOADS:

Design loads acting on each foundation interface have been tabulated according to load condition and interface location. Each row represents a specific load condition with all forces acting concurrently. Forces that are critical design loads are shown in reverse print. Note that due to antenna structural configuration, varying wind direction and the antenna's steerability, all maximum interface component forces do not occur simultaneously under a single load condition. Sign conventions for the lower pintle loads correspond to those of the X, Y, Z coordinate axes (shown on pages 3 and 4). Azimuth jack and pedestal leg loads are axial forces that act along the member's centroidal axis; tensile loads are positive; compression is negative.

4.0 REFERENCE DRAWINGS:

000388 Pedestal
012052 or 011020 Reflector
000386 Foundations

5.0 RESOLUTION OF FORCE COMPONENTS:

During the course of structural analysis, it is often desirable to resolve forces into orthogonal vector components that correspond to convenient coordinate axes. Any orthogonal vector components of the leg loads can be easily resolved by applying appropriate trigonometric functions to the leg geometry (angles) illustrated on pages 3 and 4.

The X, Y vector components of the azimuth jack depend on azimuth angle of the load condition. Refer to page 9 to determine the angle of the azimuth jack relative to the foundation coordinate axes and the corresponding X, Y load coefficients.

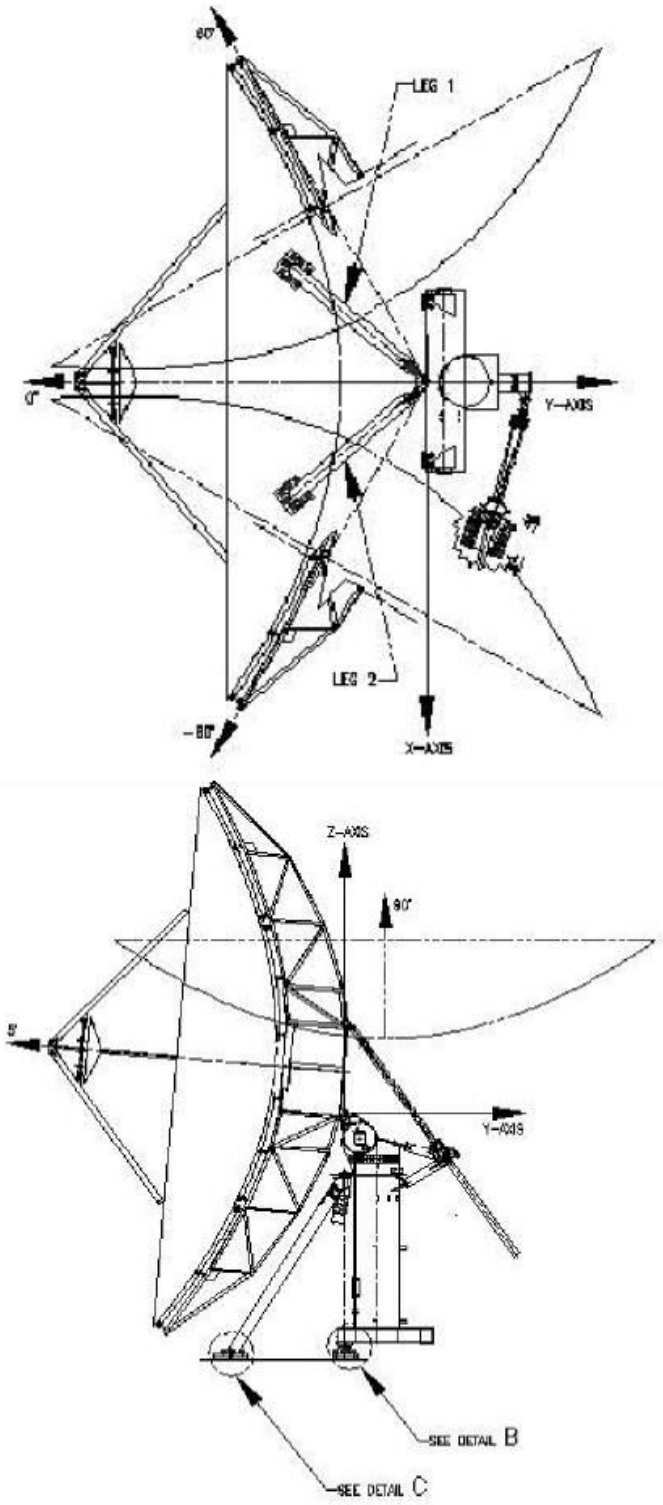


Figure 1. Top and Side Views, 9.0M KPC/KPK with Coordinate System and Azimuth Axes

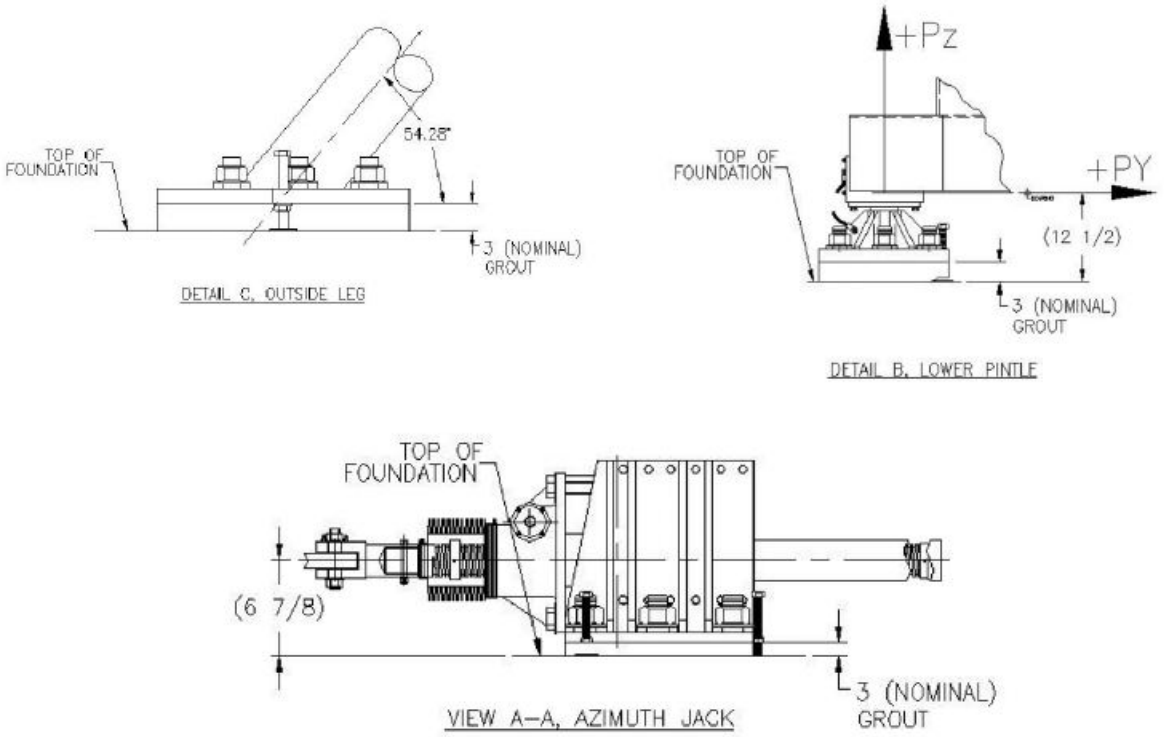


Figure 2. Interface Details of 9.0M KPC/KPK

Table 1. FOUNDATION INTERFACE LOADS: 125 MPH Wind, Dead Weight Included

9.0 Meter KPC/KPK Antenna

LOAD CONDITION			AZ JACK	LOWER PINTLE LOADS				AXIAL LEG LOADS	
Az Angle	Elev Angle	Wind Angle	Axial Load	Px	Py	Pr	Pz	No 1	No 2
(deg)	(deg)	(deg)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)
-60	0	60	32892	51455	-9655	52353	-60055	-29971	94575
-60	0	120	-62938	-68219	7552	68636	32456	-13225	-35543
-60	0	60	32892	51455	-9655	52353	-60055	-29971	94575
-60	0	135	-62936	-70471	8993	71042	40900	-10516	-48655
-10	40	165	-8358	-6782	24014	24953	77896	-50808	-46737
5	0	60	16633	15314	-24211	28648	-120149	72213	66431
-60	0	135	-62936	-70471	8993	71042	40900	-10516	-48655
0	20	180	1388	2198	21365	21477	86701	-56165	-54114
-5	20	30	8041	6119	-19397	20340	-133026	70048	65834
-50	0	30	16751	31916	-15263	35378	-91607	-3751	106657
45	20	180	1683	17620	14512	22826	59353	-78035	1450
0*	0*	15*	6006	-4375	22016	22446	-129970	78447	71724

*This load case produces maximum overturning moments at the lower pintle about the X axis: Mx = -6,626,786 in-lbs with a horizontal force of Fy = 41391 pounds. This point is located 12.5 inches above the top of the foundation.

Notes:
1) Pr is the Vector Resultant of Px and Py.
2) Relative maximum loads for each interface are shown in shaded print.

Table 2. FOUNDATION INTERFACE LOADS: Dead Weight Only

9.0 Meter KPC/KPK Antenna

LOAD CONDITION			AZ JACK	LOWER PINTLE LOADS				AXIAL LEG LOADS	
Az Angle	Elev Angle	Wind Angle	Axial Load	Px	Py	Pr	Pz	No 1	No 2
(deg)	(deg)	(deg)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)
-60	0	0	0	-1500	866	1732	-5698	768	-2864
-60	0	0	0	-1500	866	1732	-5698	768	-2864
60	0	0	0	1500	866	1732	-5698	-2864	768
-60	0	0	0	-1500	866	1732	-5698	768	-2864
0	0	0	0	0	1732	1732	-3996	-2097	-2097
0	90	0	0	0	-574	574	-8528	695	695
-45	0	0	0	-1225	1225	1732	-4993	0	-2965
0	0	0	0	0	1732	1732	-3996	-2097	-2097
0	90	0	0	0	-574	574	-8528	695	695
-45	90	0	0	406	-406	574	-8197	0	982
-45	0	0	0	-1225	1225	1732	-4993	0	-2965

Notes:
1) Pr is the Vector Resultant of Px and Py.
2) Relative maximum loads for each interface are shown in shaded print.

Table 3. FOUNDATION INTERFACE LOADS: 30 MPH Wind Gusting to 45 MPH, Dead Weight Excluded

9.0 Meter KPC/KPK Antenna

LOAD CONDITION			AZ JACK	LOWER PINTLE LOADS				AXIAL LEG LOADS	
Az Angle	Elev Angle	Wind Angle	Axial Load	Px	Py	Pr	Pz	No 1	No 2
(deg)	(deg)	(deg)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)	(lb)
-60	0	60	2683	4320	-858	4404	-4434	-2507	7949
-60	0	120	-5134	-5443	545	5470	3112	-1141	-2666
-60	0	60	2683	4320	-858	4404	-4434	-2507	7949
-60	0	135	-5134	-5626	663	5665	3801	-920	-3735
-15	40	165	-704	-715	1879	2010	6805	-3728	-4040
5	0	60	1357	1237	-2116	2451	-9474	6076	5575
-60	0	135	-5134	-5626	663	5665	3801	-920	-3735
0	20	180	113	179	1624	1634	7442	-4437	-4270
-5	20	30	656	510	-1701	1776	-10481	5845	5527
-50	0	30	1366	2712	-1336	3023	-7048	-327	8942
45	20	180	137	1353	1100	1744	5280	-6162	118

Notes:
1) Pr is the Vector Resultant of Px and Py.
2) Relative maximum loads for each interface are shown in shaded print.

Table 4. FOUNDATION INTERFACE LOADS: 45 MPH Wind Gusting to 60 MPH, Dead Weight Excluded

9.0 Meter KPC/KPK Antenna

LOAD CONDITION			AZ JACK	LOWER PINTLE LOADS				AXIAL LEG LOADS	
Az Angle (deg)	Elev Angle (deg)	Wind Angle (deg)	Axial Load (lb)	Px (lb)	Py (lb)	Pr (lb)	Pz (lb)	No 1 (lb)	No 2 (lb)
-60	0	60	5369	8644	-1717	8813	-8872	-5017	15905
-60	0	120	-10273	-10890	1091	10945	6228	-2284	-5334
-60	0	60	5369	8644	-1717	8813	-8872	-5017	15905
-60	0	135	-10273	-11258	1327	11336	7606	-1842	-7474
-15	40	165	-1409	-1431	3759	4023	13616	-7459	-8084
5	0	60	2715	2475	-4234	4904	-18957	12158	11154
-60	0	135	-10273	-11258	1327	11336	7606	-1842	-7474
0	20	180	226	359	3249	3269	14891	-8879	-8544
-5	20	30	1313	1020	-3404	3553	-20972	11696	11058
-50	0	30	2734	5426	-2673	6049	-14102	-654	17891
45	20	180	275	2707	2200	3489	10564	-12329	237

Notes:
1) Pr is the Vector Resultant of Px and Py.
2) Relative maximum loads for each interface are shown in shaded print.

Table 5. AZIMUTH JACK LOADS COEFFICIENTS

9.0 Meter KPC/KPK Antenna

AZIMUTH MOUNT #1		
Angle deg	X-coeff unit	Y-coeff unit
-60	-1.000	0.000
-55	-1.000	0.025
-50	-0.999	0.050
-45	-0.997	0.073
-40	-0.995	0.096
-35	-0.993	0.118
-30	-0.990	0.138
-25	-0.987	0.158
-20	-0.984	0.176
-15	-0.981	0.192
-10	-0.978	0.207
-5	-0.976	0.219
0	-0.973	0.230
5	-0.971	0.237
10	-0.970	0.242
15	-0.970	0.243
20	-0.971	0.240
25	-0.973	0.233
30	-0.975	0.220
35	-0.979	0.202
40	-0.984	0.177
45	-0.989	0.145
50	-0.994	0.105
55	-0.998	0.057
60	-1.000	0.000

9.0M Antenna Installation Program

Sr. No.	Description of Work	Date	Team of Engineer	Remark
1	9Mtr Antenna BOM Verification			
2	Unpack & Assembly of BOM			
3	Mechanical Erection as per Procedure			
4	Alignment of 9Mtr Reflector using alignment kit & Topcon Thedolite			
5	Fixing Reflector/Hub to KPC			
6				
7				

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RMS measurements for vertex make 9 Mtr Ex-C BAND Antenna at Deal Dehradun

Panel No. / Target Number		L 1 R	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	Deg	104															
	Min	27 27	27 27	27 27	27 27	27 27	27 26	26 26	26 26	26 26	25 26	26 26	26 27	27 27	27 27	27 27	27 27
	Sec	37 39	38 36	32 21	18 7	00 57	45 35	28 18	7 4	00 2	58 8	13 30	40 02	17 25	14 25	34 38	40 43
2.	Deg	93															
	Min	16 16	16 16	16 15	15 15	15 15	15 15	14 14	14 14	14 14	14 14	14 15	15 15	15 15	15 16	16 16	16 16
	Sec	12 13	15 10	6 55	50 38	30 18	10 00	58 52	45 38	30 35	25 35	45 00	5 20	30 45	52 6	10 15	10 15
3.	Deg	86															
	Min	22 22	22 22	22 21	21 21	21 21	21 20	20 20	20 20	20 20	20 20	20 20	21 21	21 21	21 21	22 22	22 22
	Sec	10 13	6 2	00 50	40 30	20 10	6 55	52 48	40 32	35 35	30 45	43 48/58	10 25	30 35	50 55	7 9	10 14
4	Deg	81															
	Min	11 10	10 10	10 10	10 10	10 9	9 9	9 9	9 9	9 9	9 9	9 9	9 10	10 10	10 10	10 10	10 10
	Sec	00 58	57 50	40 30	27 15	5 55	50 40	38 32	30 20	22 23	20 25	38 45	55 10	15 30	35 40	42 45	50 53
5.	Deg	76															
	Min	27 27	27 27	27 26	26 26	26 26	26 25	25 25	25 25	25 25	25 25	25 26	26 26	26 27	27 27	27 27	27 27
	Sec	13 14	13 5	00 50	40 25	10 5	2 55	53 47	45 43	42 48	37 50	45 00	15 30	40 00	01 10	13 21	18 13

Some Pics