

ERI #35662E

**TRASAR® Top Mounted
UHF Elliptically Polarized
Television Antenna Manual**

**KTKA-TV, RF Channel 16
Nexstar Broadcasting, Inc., Topeka, KS
April 30, 2020 Rev.A**

**Antenna Model:
ATW17H3-ETP230-16L**

**This manual supersedes
Specification Number
20181228-237r1**

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TRASAR® Top Mounted
UHF Elliptically Polarized
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Electrical Characteristics:

Channel:	16		
Frequency:	482 MHz to 488 MHz		
Service:	ATSC		
Azimuth Pattern Number:	Horizontal Polarization	ATW-P230	
	Vertical Polarization	ATW-P230-V	
Elevation Pattern Number:	Horizontal Polarization	ATW17H3H	
	Vertical Polarization	ATW14H3H	
Azimuth Directivity:	Horizontal Polarization	2.30	(3.62 dB)
	Vertical Polarization	1.41	(1.49 dB)
Elevation Directivity:	Horizontal Polarization	17.00	(12.30 dBd)
	Vertical Polarization	14.00	(11.46 dBd)
Peak Power Gain:	Horizontal Polarization	30.80	(14.89 dBd)
	Vertical Polarization	4.19	(6.22 dBd)
Gain at Horizontal:	Horizontal Polarization	25.62	(14.09 dBd)
	Vertical Polarization	3.78	(5.78 dBd)
ERP Vertical/Horizontal Ratio:	0.136		
Power Ratio:	0.269		
Electrical Beam Tilt:	0.75 Degrees		
Input Power Required:	1.46 kW	(1.64 dBk)	
RF Input:	6-1/8-inch EIA, 75 Ω, flanged male		
Input Power Rating (maximum):	20 kW Average Power, 8VSB		
Antenna VSWR (maximum):	1.10 Over 6 MHz Channel		

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Antenna Mechanical Characteristics:

Mounting Configuration:	Top Mounted		
Height of Antenna:	38.53 feet	(11.7 meters)	
Height of Center of Radiation:	19.27 feet	(5.9 meters)	
Overall Height (Includes four 3.5 ft lightning spurs):	42.03 feet	(12.8 meters)	
Deicing:	Fully enclosed pressurized radome		
Radome Diameter:	18.40 inches	(467.4 millimeters)	
Radome Color:	Aviation Orange		
Climbing Device:	Fiberglass Ladder		
Measured Weight:	No Ice	3930.0 lb	1782.6 kg
Effective Projected Area (EPA-ft ²):	No Ice	62.38 ft ²	(5.8 m ²)
	1/2" (13 mm) ice	115.53 ft ²	(10.7 m ²)
Effective Moment Arm:	No Ice	20.81 feet	(6.34 meters)
	1/2" (13 mm) ice	20.57 feet	(6.27 meters)

MOUNTING FLANGE BOLT CIRCLE: Quantity (16), 1.38 inch holes for 1.25 inch bolts, equally spaced on a 21.50 inch bolt circle.

This antenna is designed to be supported by a structure that can resist the antenna base reactions and which provides a support that is rigid in the three translational and three rotational degrees of freedom.

Antenna design based on a wind speed of 90 miles per hour (MPH) with no ice and 40 MPH with 0.75-inches of design radial ice (2.1-inches of factored ice at antenna, tiz) with a height above ground level (HAGL) of 1381 feet per ANSI/TIA-222-G. Structure Class II, Exposure Category C and Topographic Category I. Weight and wind area values include four lightning spurs and a standard beacon.

NOTE: The purchaser or their representative shall be required to contact the tower owner, state and/or local building officials for specific design requirements and suitable parameters for a particular structure. Any variation from the parameters shown above must be communicated to ERI for comprehensive assessment.

Broadcast Antenna System Power Analysis

KTKA-TV **RF Channel: 16**
Nexstar Broadcasting, Inc.
Topeka, KS
ATW17H3-ETP230-16L

Antenna Parameters

Azimuth Directivity:

Horizontal:	2.30	(3.62 dB)
Vertical:	1.41	(1.49 dB)

Elevation Directivity:

Horizontal:	17.00	(12.30 dB)
Vertical:	14.00	(11.46 dB)

Transmission Line

Vertical Run:

Type:	6-1/8-inch EIA, 75 Ω
Length:	1,380 feet 420.6 meters
Attenuation:	0.100 dB/100 feet 0.328 dB/100 mtrs

Horizontal Run:

Type:	6-1/8-inch EIA, 75 Ω
Length:	138 feet 42.1 meters
Attenuation:	0.100 dB/100 feet 0.328 dB/100 mtrs

Transmission Line Efficiency: 70.50%

RF System/Other Efficiency: 100.00%

Effective Radiated Power:

Horizontal:	44.90 kW	(16.52 dBk)
Vertical:	6.11 kW	(7.86 dBk)

Peak Power Gain:

Horizontal:	30.80 numeric	(14.89 dBd)
Vertical:	4.19 numeric	(6.22 dBd)

Antenna Input Power:

1.46 kW	(1.64 dBk)
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Transmission Line Losses:

-0.61 kW	(1.518 dB)
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RF System/Other Losses:

0.00 kW	(0.000 dB)
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Total Losses:

-0.61 kW	(1.518 dB)
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Transmitter Power Output:

2.07 kW
(3.15 dBk)

CH.16 TOPEKA, KS

#35662E

FINAL ANTENNA DATA INCLUDED

LD35662E-1

Truck Removal / Lifting Instructions

PM35662E-1

Mechanical Parameter / Installation Drawings

Measured VSWR

Frequency (MHz)

1.02

482.00

1.03

483.00

1.02

484.00

1.02

485.00

1.01

486.00

1.01

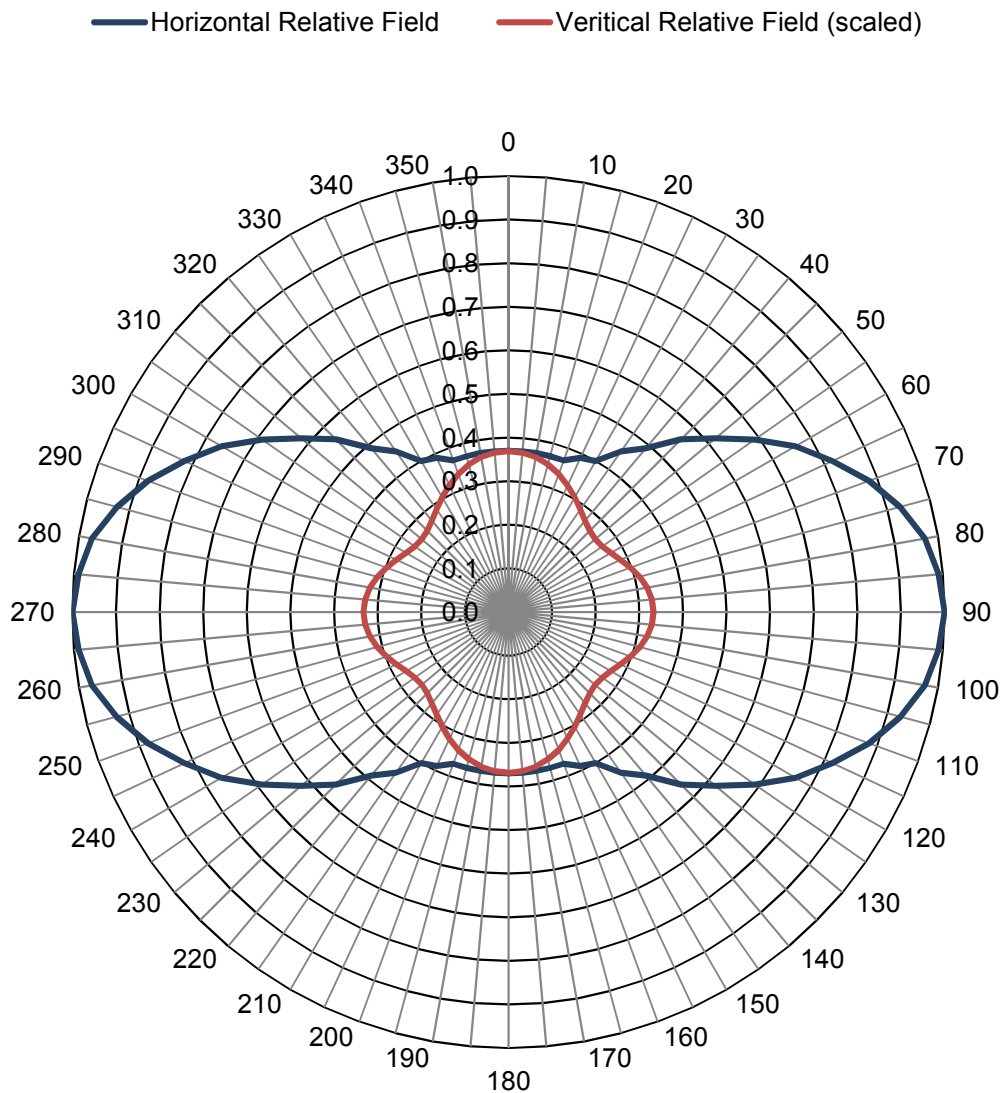
487.00

1.03

488.00

Composite Azimuth Patterns

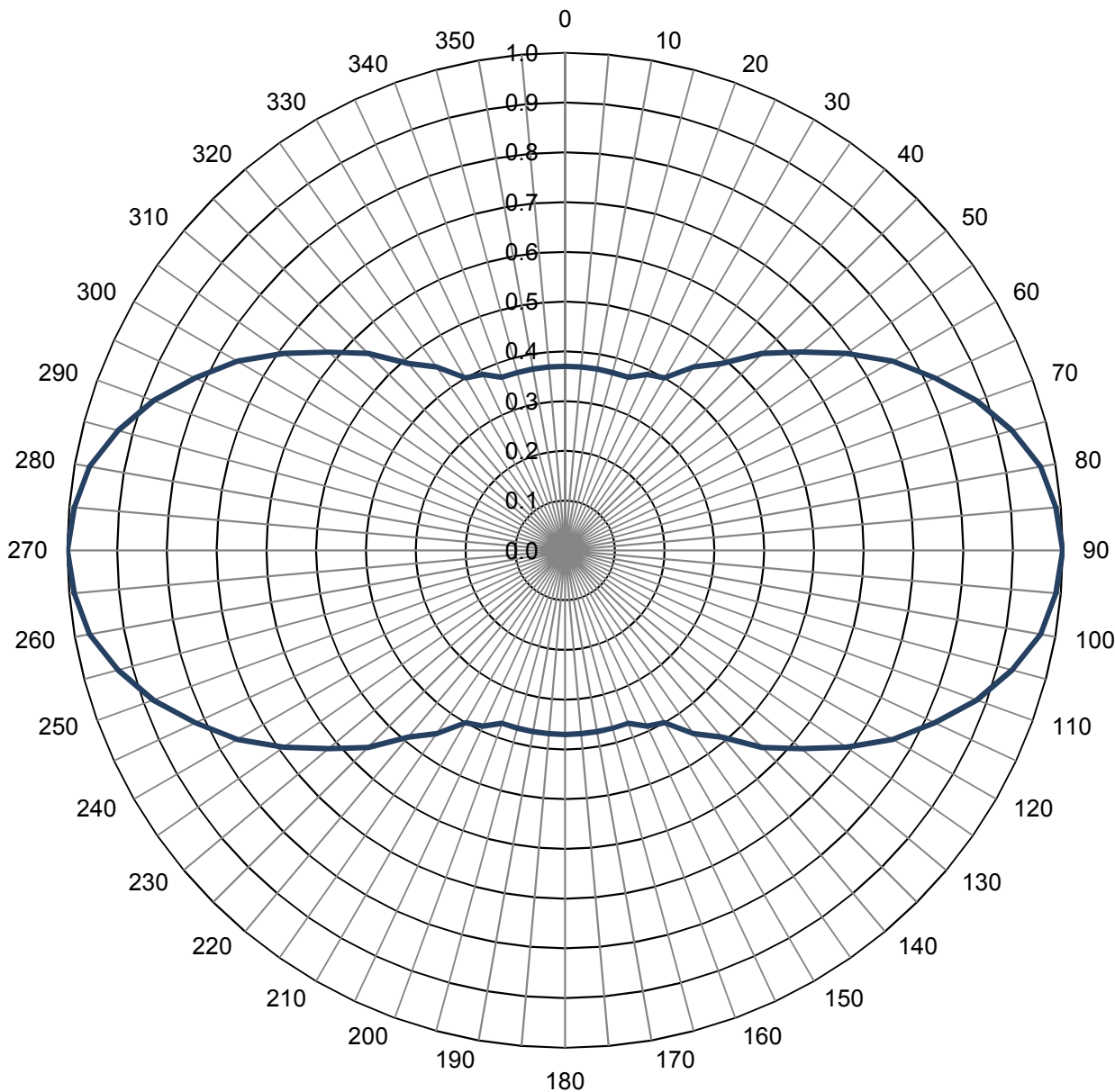
Type:	ATW-P230		Polarization:	Elliptical
Directivity (H-Pol):	2.30 numeric	(3.62 dB)	Frequency:	16 (ATSC)
Directivity (V-Pol):	1.41 numeric	(1.49 dB)	Location:	Topeka, KS
Percent Horizontal:	78.77%		NOTE: Pattern shape and directivity may vary with channel and mounting	
Percent Vertical:	21.23%			
Power Ratio:	26.95%			
ERP V/H Ratio::	13.60%			



Azimuth Pattern

Type:	ATW-P230	Polarization:	Horizontal
Directivity:	2.30 numeric (3.62 dB)	Frequency:	16 (ATSC)
Peak(s) at:		Location:	Topeka, KS
		NOTE: Pattern shape and directivity may vary with channel and mounting configuration.	

Relative Field



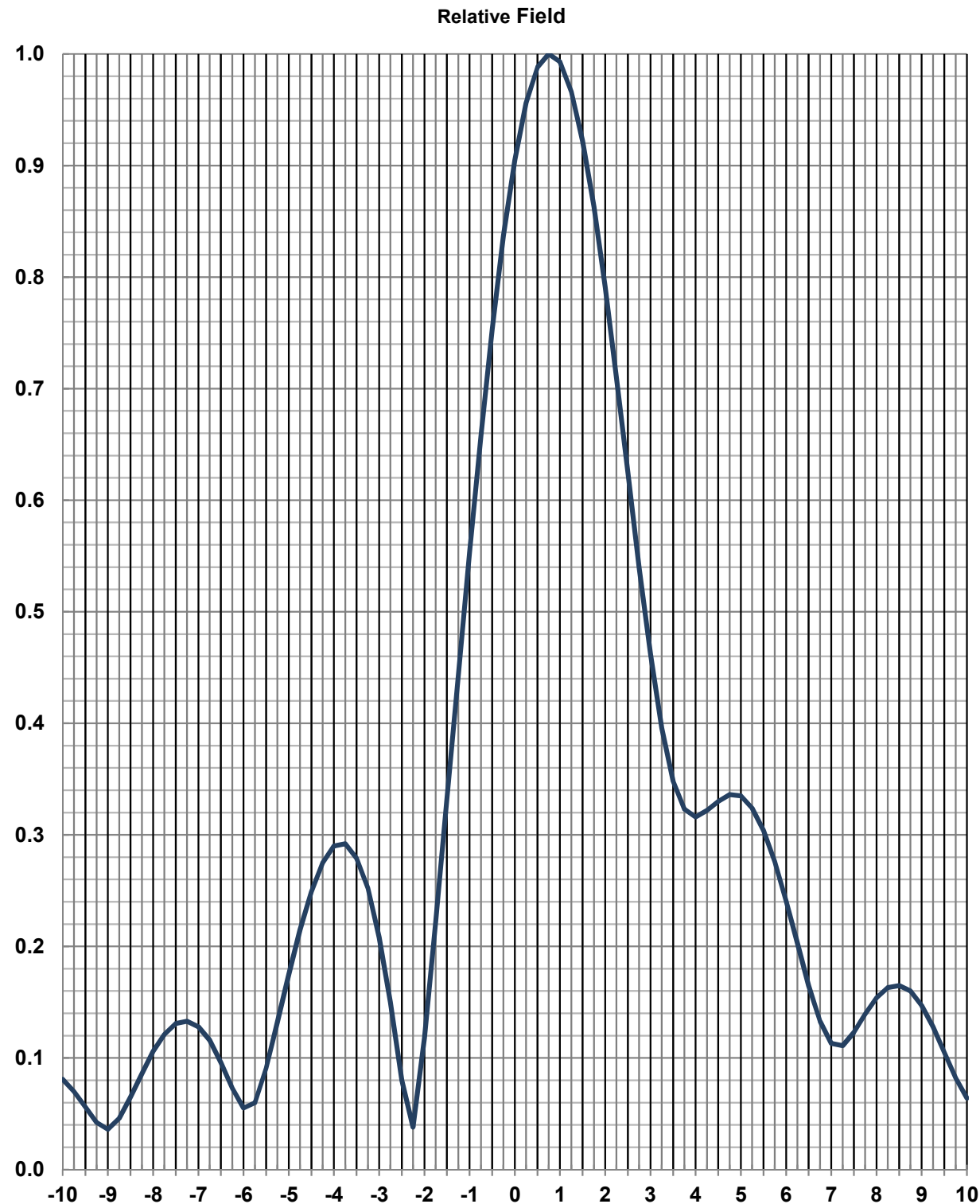
Tabulated Data for Azimuth Pattern

Type: ATW-P230

Angle	Field	dB	Angle	Field	dB	Angle	Field	dB	Angle	Field	dB
0	0.370	-8.64	100	0.970	-0.26	200	0.370	-8.64	300	0.760	-2.38
2	0.370	-8.64	102	0.950	-0.45	202	0.380	-8.40	302	0.730	-2.73
4	0.370	-8.64	104	0.940	-0.54	204	0.380	-8.40	304	0.700	-3.10
6	0.370	-8.64	106	0.920	-0.72	206	0.390	-8.18	306	0.680	-3.35
8	0.370	-8.64	108	0.900	-0.92	208	0.400	-7.96	308	0.650	-3.74
10	0.370	-8.64	110	0.880	-1.11	210	0.400	-7.96	310	0.620	-4.15
12	0.370	-8.64	112	0.860	-1.31	212	0.420	-7.54	312	0.590	-4.58
14	0.370	-8.64	114	0.830	-1.62	214	0.440	-7.13	314	0.570	-4.88
16	0.370	-8.64	116	0.810	-1.83	216	0.460	-6.74	316	0.540	-5.35
18	0.370	-8.64	118	0.780	-2.16	218	0.470	-6.56	318	0.520	-5.68
20	0.370	-8.64	120	0.760	-2.38	220	0.490	-6.20	320	0.490	-6.20
22	0.380	-8.40	122	0.730	-2.73	222	0.520	-5.68	322	0.470	-6.56
24	0.380	-8.40	124	0.700	-3.10	224	0.540	-5.35	324	0.460	-6.74
26	0.390	-8.18	126	0.680	-3.35	226	0.570	-4.88	326	0.440	-7.13
28	0.400	-7.96	128	0.650	-3.74	228	0.590	-4.58	328	0.420	-7.54
30	0.400	-7.96	130	0.620	-4.15	230	0.620	-4.15	330	0.400	-7.96
32	0.420	-7.54	132	0.590	-4.58	232	0.650	-3.74	332	0.400	-7.96
34	0.440	-7.13	134	0.570	-4.88	234	0.680	-3.35	334	0.390	-8.18
36	0.460	-6.74	136	0.540	-5.35	236	0.700	-3.10	336	0.380	-8.40
38	0.470	-6.56	138	0.520	-5.68	238	0.730	-2.73	338	0.380	-8.40
40	0.490	-6.20	140	0.490	-6.20	240	0.760	-2.38	340	0.370	-8.64
42	0.520	-5.68	142	0.470	-6.56	242	0.780	-2.16	342	0.370	-8.64
44	0.540	-5.35	144	0.460	-6.74	244	0.810	-1.83	344	0.370	-8.64
46	0.570	-4.88	146	0.440	-7.13	246	0.830	-1.62	346	0.370	-8.64
48	0.590	-4.58	148	0.420	-7.54	248	0.860	-1.31	348	0.370	-8.64
50	0.620	-4.15	150	0.400	-7.96	250	0.880	-1.11	350	0.370	-8.64
52	0.650	-3.74	152	0.400	-7.96	252	0.900	-0.92	352	0.370	-8.64
54	0.680	-3.35	154	0.390	-8.18	254	0.920	-0.72	354	0.370	-8.64
56	0.700	-3.10	156	0.380	-8.40	256	0.940	-0.54	356	0.370	-8.64
58	0.730	-2.73	158	0.380	-8.40	258	0.950	-0.45	358	0.370	-8.64
60	0.760	-2.38	160	0.370	-8.64	260	0.970	-0.26	360	1.000	0.00
62	0.780	-2.16	162	0.370	-8.64	262	0.980	-0.18			
64	0.810	-1.83	164	0.370	-8.64	264	0.980	-0.18			
66	0.830	-1.62	166	0.370	-8.64	266	0.990	-0.09			
68	0.860	-1.31	168	0.370	-8.64	268	0.990	-0.09			
70	0.880	-1.11	170	0.370	-8.64	270	1.000	0.00			
72	0.900	-0.92	172	0.370	-8.64	272	0.990	-0.09			
74	0.920	-0.72	174	0.370	-8.64	274	0.990	-0.09			
76	0.940	-0.54	176	0.370	-8.64	276	0.980	-0.18			
78	0.950	-0.45	178	0.370	-8.64	278	0.980	-0.18			
80	0.970	-0.26	180	0.370	-8.64	280	0.970	-0.26			
82	0.980	-0.18	182	0.370	-8.64	282	0.950	-0.45			
84	0.980	-0.18	184	0.370	-8.64	284	0.940	-0.54			
86	0.990	-0.09	186	0.370	-8.64	286	0.920	-0.72			
88	0.990	-0.09	188	0.370	-8.64	288	0.900	-0.92			
90	1.000	0.00	190	0.370	-8.64	290	0.880	-1.11			
92	0.990	-0.09	192	0.370	-8.64	292	0.860	-1.31			
94	0.990	-0.09	194	0.370	-8.64	294	0.830	-1.62			
96	0.980	-0.18	196	0.370	-8.64	296	0.810	-1.83			
98	0.980	-0.18	198	0.370	-8.64	298	0.780	-2.16			

Elevation Pattern

Type:	ATW17H3H		Polarization:	Horizontal
Directivity:			Frequency:	16 (ATSC)
Main Lobe:	17.00 numeric	(12.30 dB)	Location:	Topeka, KS
Horizontal:	14.14 numeric	(11.50 dB)	Beam Tilt:	0.75 degrees



Tabulated Data for Elevation PatternType: ATW17H3H

-10 to 10 degrees in 0.25 degree increments.

10 to 90 degrees in 0.50 degree increments.

Angle	Field	dB	Angle	Field	dB	Angle	Field	dB	Angle	Field	dB	Angle	Field	dB
-10.00	0.081	-21.83	2.25	0.710	-2.97	19.00	0.056	-25.04	43.50	0.003	-50.46	68.00	0.051	-25.85
-9.75	0.070	-23.10	2.50	0.625	-4.08	19.50	0.043	-27.33	44.00	0.021	-33.56	68.50	0.059	-24.58
-9.50	0.056	-25.04	2.75	0.540	-5.35	20.00	0.025	-32.04	44.50	0.038	-28.40	69.00	0.067	-23.48
-9.25	0.042	-27.54	3.00	0.462	-6.71	20.50	0.026	-31.70	45.00	0.053	-25.51	69.50	0.072	-22.85
-9.00	0.036	-28.87	3.25	0.396	-8.05	21.00	0.048	-26.38	45.50	0.062	-24.15	70.00	0.076	-22.38
-8.75	0.046	-26.74	3.50	0.348	-9.17	21.50	0.067	-23.48	46.00	0.066	-23.61	70.50	0.079	-22.05
-8.50	0.065	-23.74	3.75	0.323	-9.82	22.00	0.074	-22.62	46.50	0.064	-23.88	71.00	0.080	-21.94
-8.25	0.086	-21.31	4.00	0.316	-10.01	22.50	0.069	-23.22	47.00	0.057	-24.88	71.50	0.079	-22.05
-8.00	0.106	-19.49	4.25	0.322	-9.84	23.00	0.052	-25.68	47.50	0.046	-26.74	72.00	0.077	-22.27
-7.75	0.121	-18.34	4.50	0.330	-9.63	23.50	0.027	-31.37	48.00	0.033	-29.63	72.50	0.074	-22.62
-7.50	0.131	-17.65	4.75	0.336	-9.47	24.00	0.018	-34.89	48.50	0.023	-32.77	73.00	0.070	-23.10
-7.25	0.133	-17.52	5.00	0.335	-9.50	24.50	0.042	-27.54	49.00	0.023	-32.77	73.50	0.065	-23.74
-7.00	0.128	-17.86	5.25	0.324	-9.79	25.00	0.063	-24.01	49.50	0.032	-29.90	74.00	0.059	-24.58
-6.75	0.116	-18.71	5.50	0.304	-10.34	25.50	0.075	-22.50	50.00	0.041	-27.74	74.50	0.053	-25.51
-6.50	0.096	-20.35	5.75	0.276	-11.18	26.00	0.075	-22.50	50.50	0.048	-26.38	75.00	0.046	-26.74
-6.25	0.073	-22.73	6.00	0.241	-12.36	26.50	0.064	-23.88	51.00	0.050	-26.02	75.50	0.040	-27.96
-6.00	0.055	-25.19	6.25	0.203	-13.85	27.00	0.045	-26.94	51.50	0.048	-26.38	76.00	0.034	-29.37
-5.75	0.060	-24.44	6.50	0.165	-15.65	27.50	0.024	-32.40	52.00	0.042	-27.54	76.50	0.028	-31.06
-5.50	0.091	-20.82	6.75	0.133	-17.52	28.00	0.022	-33.15	52.50	0.032	-29.90	77.00	0.024	-32.40
-5.25	0.132	-17.59	7.00	0.113	-18.94	28.50	0.037	-28.64	53.00	0.021	-33.56	77.50	0.021	-33.56
-5.00	0.175	-15.14	7.25	0.111	-19.09	29.00	0.049	-26.20	53.50	0.012	-38.42	78.00	0.020	-33.98
-4.75	0.215	-13.35	7.50	0.123	-18.20	29.50	0.052	-25.68	54.00	0.016	-35.92	78.50	0.021	-33.56
-4.50	0.249	-12.08	7.75	0.139	-17.14	30.00	0.044	-27.13	54.50	0.028	-31.06	79.00	0.023	-32.77
-4.25	0.275	-11.21	8.00	0.154	-16.25	30.50	0.028	-31.06	55.00	0.039	-28.18	79.50	0.025	-32.04
-4.00	0.290	-10.75	8.25	0.163	-15.76	31.00	0.009	-40.92	55.50	0.048	-26.38	80.00	0.028	-31.06
-3.75	0.292	-10.69	8.50	0.165	-15.65	31.50	0.024	-32.40	56.00	0.054	-25.35	80.50	0.030	-30.46
-3.50	0.279	-11.09	8.75	0.160	-15.92	32.00	0.048	-26.38	56.50	0.056	-25.04	81.00	0.032	-29.90
-3.25	0.252	-11.97	9.00	0.147	-16.65	32.50	0.066	-23.61	57.00	0.056	-25.04	81.50	0.034	-29.37
-3.00	0.208	-13.64	9.25	0.128	-17.86	33.00	0.076	-22.38	57.50	0.052	-25.68	82.00	0.035	-29.12
-2.75	0.150	-16.48	9.50	0.105	-19.58	33.50	0.077	-22.27	58.00	0.045	-26.94	82.50	0.035	-29.12
-2.50	0.080	-21.94	9.75	0.082	-21.72	34.00	0.068	-23.35	58.50	0.037	-28.64	83.00	0.035	-29.12
-2.25	0.038	-28.40	10.00	0.064	-23.88	34.50	0.052	-25.68	59.00	0.028	-31.06	83.50	0.035	-29.12
-2.00	0.118	-18.56	10.50	0.075	-22.50	35.00	0.030	-30.46	59.50	0.021	-33.56	84.00	0.034	-29.37
-1.75	0.222	-13.07	11.00	0.118	-18.56	35.50	0.009	-40.92	60.00	0.019	-34.42	84.50	0.032	-29.90
-1.50	0.332	-9.58	11.50	0.150	-16.48	36.00	0.018	-34.89	60.50	0.023	-32.77	85.00	0.031	-30.17
-1.25	0.443	-7.07	12.00	0.159	-15.97	36.50	0.035	-29.12	61.00	0.029	-30.75	85.50	0.029	-30.75
-1.00	0.553	-5.15	12.50	0.145	-16.77	37.00	0.046	-26.74	61.50	0.034	-29.37	86.00	0.026	-31.70
-0.75	0.658	-3.64	13.00	0.115	-18.79	37.50	0.049	-26.20	62.00	0.038	-28.40	86.50	0.024	-32.40
-0.50	0.753	-2.46	13.50	0.085	-21.41	38.00	0.045	-26.94	62.50	0.039	-28.18	87.00	0.021	-33.56
-0.25	0.837	-1.55	14.00	0.078	-22.16	38.50	0.033	-29.63	63.00	0.039	-28.18	87.50	0.018	-34.89
0.00	0.905	-0.87	14.50	0.094	-20.54	39.00	0.018	-34.89	63.50	0.036	-28.87	88.00	0.014	-37.08
0.25	0.956	-0.39	15.00	0.110	-19.17	39.50	0.005	-46.02	64.00	0.030	-30.46	88.50	0.011	-39.17
0.50	0.988	-0.10	15.50	0.111	-19.09	40.00	0.019	-34.42	64.50	0.023	-32.77	89.00	0.007	-43.10
0.75	1.000	0.00	16.00	0.096	-20.35	40.50	0.033	-29.63	65.00	0.015	-36.48	89.50	0.004	-47.96
1.00	0.993	-0.06	16.50	0.068	-23.35	41.00	0.042	-27.54	65.50	0.008	-41.94	90.00	0.000	---
1.25	0.966	-0.30	17.00	0.034	-29.37	41.50	0.044	-27.13	66.00	0.011	-39.17			
1.50	0.922	-0.71	17.50	0.020	-33.98	42.00	0.040	-27.96	66.50	0.021	-33.56			
1.75	0.863	-1.28	18.00	0.041	-27.74	42.50	0.030	-30.46	67.00	0.031	-30.17			
2.00	0.791	-2.04	18.50	0.056	-25.04	43.00	0.016	-35.92	67.50	0.041	-27.74			

Azimuth Pattern**Type:**

ATW-P230-V

Polarization:

Vertical

Directivity:

1.41 numeric

(1.49 dB)

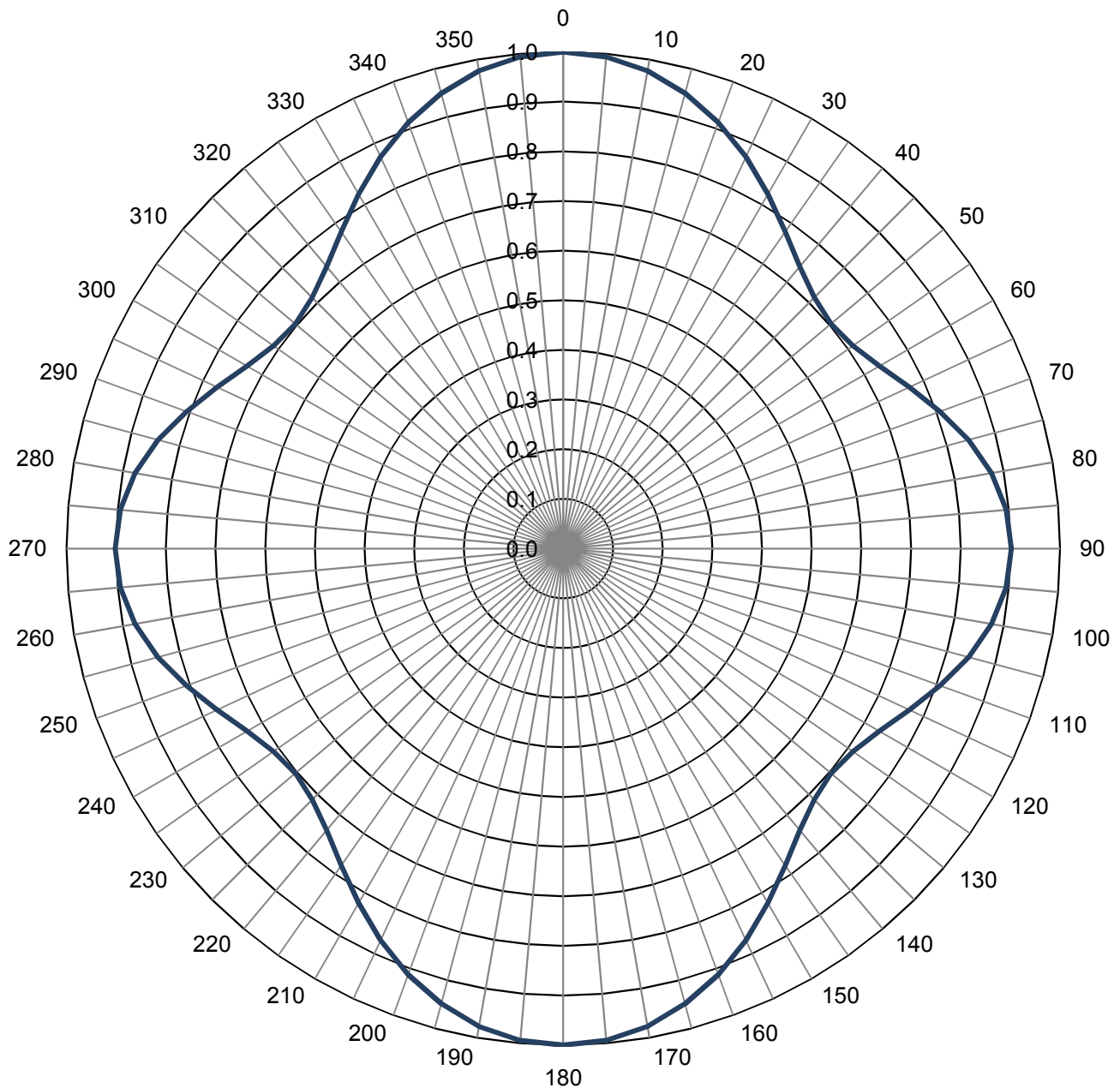
Frequency:

16 (ATSC)

Peak(s) at:**Location:**

Topeka, KS

NOTE: Pattern shape and directivity may vary with channel and mounting configuration.

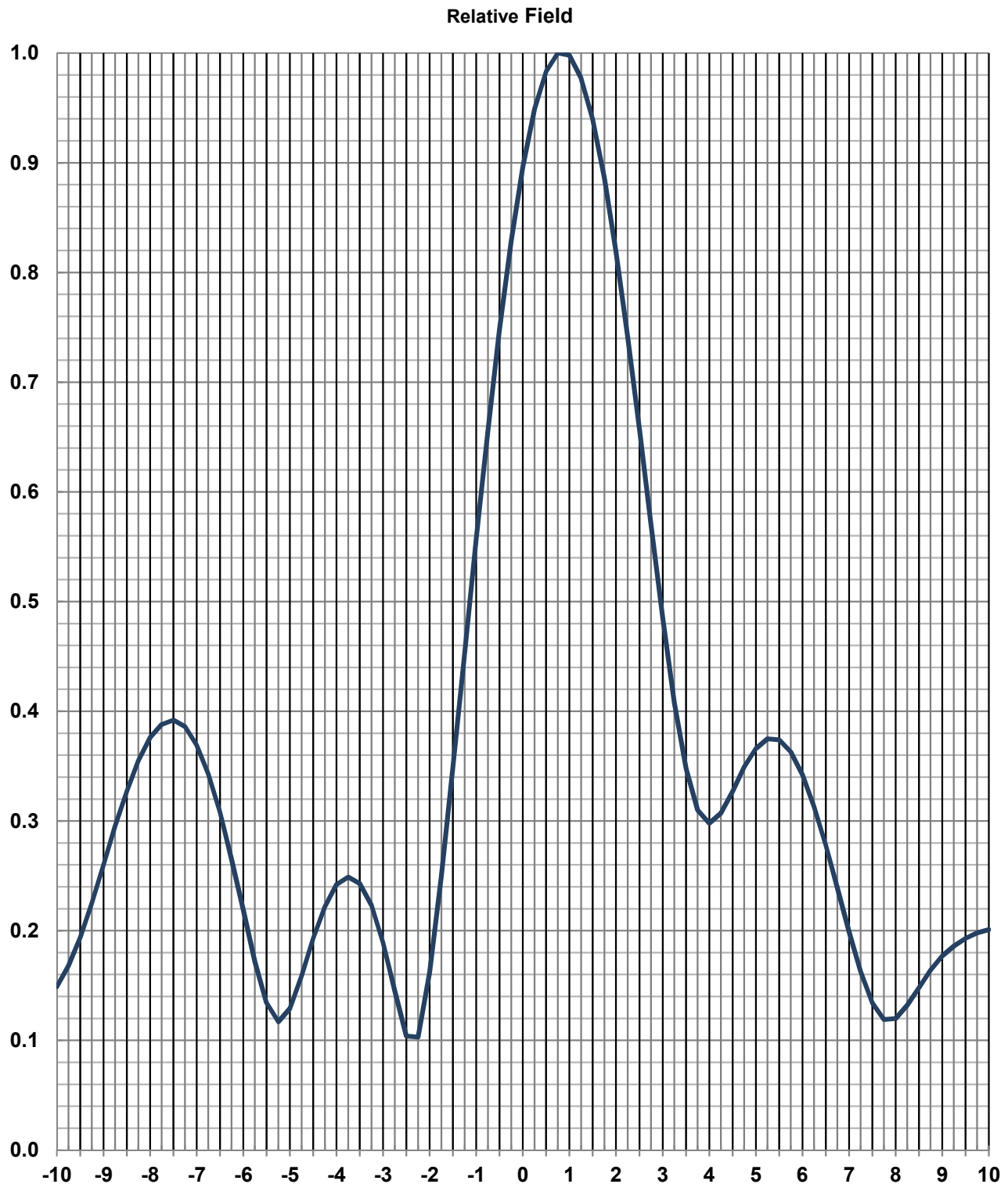
Relative Field

Tabulated Data for Azimuth PatternType: ATW-P230-V

Angle	Field	dB	Angle	Field	dB	Angle	Field	dB	Angle	Field	dB
0	1.000	0.00	100	0.875	-1.16	200	0.913	-0.79	300	0.735	-2.67
2	0.999	-0.01	102	0.864	-1.27	202	0.896	-0.95	302	0.724	-2.81
4	0.996	-0.03	104	0.852	-1.39	204	0.879	-1.12	304	0.715	-2.91
6	0.992	-0.07	106	0.838	-1.54	206	0.861	-1.30	306	0.709	-2.99
8	0.985	-0.13	108	0.823	-1.69	208	0.843	-1.48	308	0.705	-3.04
10	0.977	-0.20	110	0.807	-1.86	210	0.824	-1.68	310	0.704	-3.05
12	0.967	-0.29	112	0.792	-2.03	212	0.806	-1.87	312	0.706	-3.02
14	0.956	-0.39	114	0.776	-2.20	214	0.788	-2.07	314	0.711	-2.96
16	0.943	-0.51	116	0.761	-2.37	216	0.771	-2.26	316	0.719	-2.87
18	0.929	-0.64	118	0.747	-2.53	218	0.755	-2.44	318	0.729	-2.75
20	0.913	-0.79	120	0.735	-2.67	220	0.741	-2.60	320	0.741	-2.60
22	0.896	-0.95	122	0.724	-2.81	222	0.729	-2.75	322	0.755	-2.44
24	0.879	-1.12	124	0.715	-2.91	224	0.719	-2.87	324	0.771	-2.26
26	0.861	-1.30	126	0.709	-2.99	226	0.711	-2.96	326	0.788	-2.07
28	0.843	-1.48	128	0.705	-3.04	228	0.706	-3.02	328	0.806	-1.87
30	0.824	-1.68	130	0.704	-3.05	230	0.704	-3.05	330	0.824	-1.68
32	0.806	-1.87	132	0.706	-3.02	232	0.705	-3.04	332	0.843	-1.48
34	0.788	-2.07	134	0.711	-2.96	234	0.709	-2.99	334	0.861	-1.30
36	0.771	-2.26	136	0.719	-2.87	236	0.715	-2.91	336	0.879	-1.12
38	0.755	-2.44	138	0.729	-2.75	238	0.724	-2.81	338	0.896	-0.95
40	0.741	-2.60	140	0.741	-2.60	240	0.735	-2.67	340	0.913	-0.79
42	0.729	-2.75	142	0.755	-2.44	242	0.747	-2.53	342	0.929	-0.64
44	0.719	-2.87	144	0.771	-2.26	244	0.761	-2.37	344	0.943	-0.51
46	0.711	-2.96	146	0.788	-2.07	246	0.776	-2.20	346	0.956	-0.39
48	0.706	-3.02	148	0.806	-1.87	248	0.792	-2.03	348	0.967	-0.29
50	0.704	-3.05	150	0.824	-1.68	250	0.807	-1.86	350	0.977	-0.20
52	0.705	-3.04	152	0.843	-1.48	252	0.823	-1.69	352	0.985	-0.13
54	0.709	-2.99	154	0.861	-1.30	254	0.838	-1.54	354	0.992	-0.07
56	0.715	-2.91	156	0.879	-1.12	256	0.852	-1.39	356	0.996	-0.03
58	0.724	-2.81	158	0.896	-0.95	258	0.864	-1.27	358	0.999	-0.01
60	0.735	-2.67	160	0.913	-0.79	260	0.875	-1.16	360	1.000	0.00
62	0.747	-2.53	162	0.929	-0.64	262	0.885	-1.06			
64	0.761	-2.37	164	0.943	-0.51	264	0.892	-0.99			
66	0.776	-2.20	166	0.956	-0.39	266	0.898	-0.93			
68	0.792	-2.03	168	0.967	-0.29	268	0.901	-0.91			
70	0.807	-1.86	170	0.977	-0.20	270	0.902	-0.90			
72	0.823	-1.69	172	0.985	-0.13	272	0.901	-0.91			
74	0.838	-1.54	174	0.992	-0.07	274	0.898	-0.93			
76	0.852	-1.39	176	0.996	-0.03	276	0.892	-0.99			
78	0.864	-1.27	178	0.999	-0.01	278	0.885	-1.06			
80	0.875	-1.16	180	1.000	0.00	280	0.875	-1.16			
82	0.885	-1.06	182	0.999	-0.01	282	0.864	-1.27			
84	0.892	-0.99	184	0.996	-0.03	284	0.852	-1.39			
86	0.898	-0.93	186	0.992	-0.07	286	0.838	-1.54			
88	0.901	-0.91	188	0.985	-0.13	288	0.823	-1.69			
90	0.902	-0.90	190	0.977	-0.20	290	0.807	-1.86			
92	0.901	-0.91	192	0.967	-0.29	292	0.792	-2.03			
94	0.898	-0.93	194	0.956	-0.39	294	0.776	-2.20			
96	0.892	-0.99	196	0.943	-0.51	296	0.761	-2.37			
98	0.885	-1.06	198	0.929	-0.64	298	0.747	-2.53			

Elevation Pattern

Type:	ATW14H3H		Polarization:	Vertical
Directivity:			Frequency:	16 (ATSC)
Main Lobe:	14.00 numeric	(11.46 dB)	Location:	Topeka, KS
Horizontal:	12.64 numeric	(11.02 dB)	Beam Tilt:	0.75 degrees



Tabulated Data for Elevation Pattern

Type:

ATW14H3H

-10 to 10 degrees in 0.25 degree increments.

10 to 90 degrees in 0.50 degree increments.

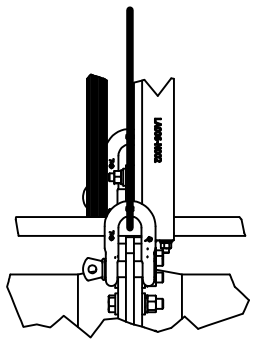
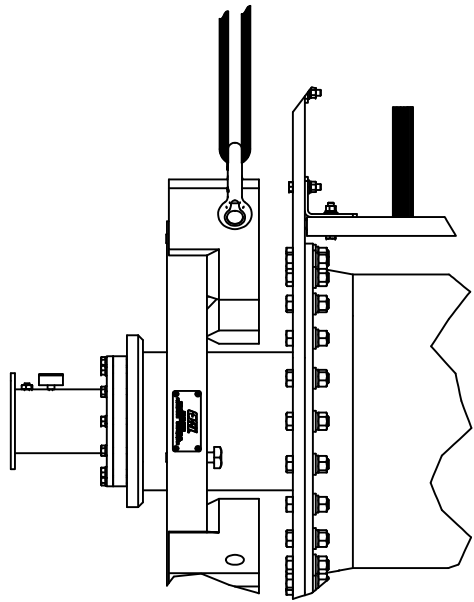
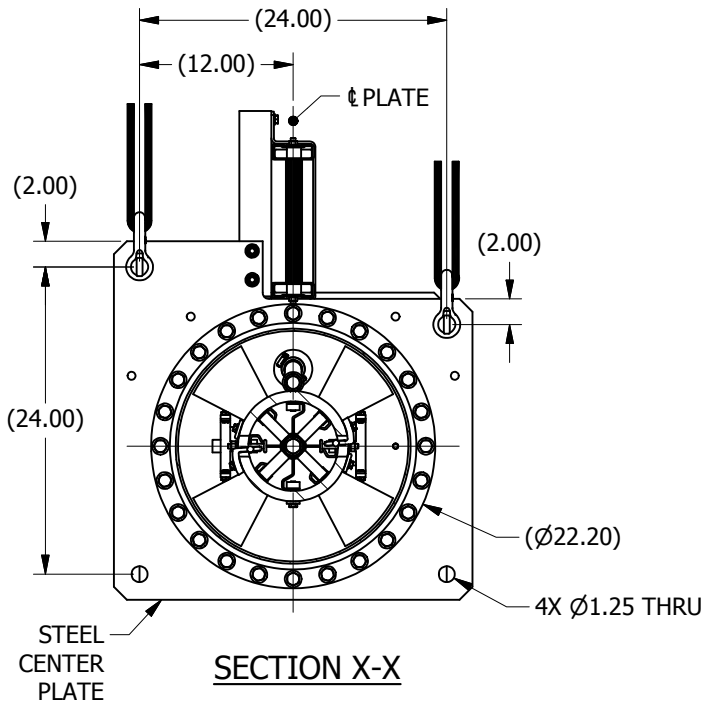
Angle	Field	dB	Angle	Field	dB	Angle	Field	dB	Angle	Field	dB	Angle	Field	dB
-10.00	0.149	-16.54	2.25	0.741	-2.60	19.00	0.009	-40.92	43.50	0.147	-16.65	68.00	0.048	-26.38
-9.75	0.168	-15.49	2.50	0.657	-3.65	19.50	0.018	-34.89	44.00	0.154	-16.25	68.50	0.051	-25.85
-9.50	0.194	-14.24	2.75	0.570	-4.88	20.00	0.037	-28.64	44.50	0.154	-16.25	69.00	0.057	-24.88
-9.25	0.225	-12.96	3.00	0.485	-6.29	20.50	0.063	-24.01	45.00	0.146	-16.71	69.50	0.062	-24.15
-9.00	0.260	-11.70	3.25	0.408	-7.79	21.00	0.096	-20.35	45.50	0.132	-17.59	70.00	0.067	-23.48
-8.75	0.295	-10.60	3.50	0.348	-9.17	21.50	0.133	-17.52	46.00	0.111	-19.09	70.50	0.071	-22.97
-8.50	0.327	-9.71	3.75	0.310	-10.17	22.00	0.166	-15.60	46.50	0.086	-21.31	71.00	0.074	-22.62
-8.25	0.355	-9.00	4.00	0.298	-10.52	22.50	0.192	-14.33	47.00	0.059	-24.58	71.50	0.075	-22.50
-8.00	0.376	-8.50	4.25	0.307	-10.26	23.00	0.207	-13.68	47.50	0.033	-29.63	72.00	0.075	-22.50
-7.75	0.388	-8.22	4.50	0.327	-9.71	23.50	0.207	-13.68	48.00	0.016	-35.92	72.50	0.073	-22.73
-7.50	0.392	-8.13	4.75	0.349	-9.14	24.00	0.194	-14.24	48.50	0.025	-32.04	73.00	0.070	-23.10
-7.25	0.386	-8.27	5.00	0.366	-8.73	24.50	0.171	-15.34	49.00	0.039	-28.18	73.50	0.066	-23.61
-7.00	0.369	-8.66	5.25	0.375	-8.52	25.00	0.141	-17.02	49.50	0.050	-26.02	74.00	0.061	-24.29
-6.75	0.343	-9.29	5.50	0.374	-8.54	25.50	0.113	-18.94	50.00	0.056	-25.04	74.50	0.055	-25.19
-6.50	0.308	-10.23	5.75	0.363	-8.80	26.00	0.094	-20.54	50.50	0.057	-24.88	75.00	0.049	-26.20
-6.25	0.265	-11.54	6.00	0.342	-9.32	26.50	0.088	-21.11	51.00	0.054	-25.35	75.50	0.042	-27.54
-6.00	0.219	-13.19	6.25	0.313	-10.09	27.00	0.091	-20.82	51.50	0.049	-26.20	76.00	0.036	-28.87
-5.75	0.172	-15.29	6.50	0.278	-11.12	27.50	0.095	-20.45	52.00	0.046	-26.74	76.50	0.029	-30.75
-5.50	0.134	-17.46	6.75	0.239	-12.43	28.00	0.095	-20.45	52.50	0.046	-26.74	77.00	0.023	-32.77
-5.25	0.117	-18.64	7.00	0.199	-14.02	28.50	0.093	-20.63	53.00	0.049	-26.20	77.50	0.018	-34.89
-5.00	0.129	-17.79	7.25	0.163	-15.76	29.00	0.091	-20.82	53.50	0.055	-25.19	78.00	0.013	-37.72
-4.75	0.159	-15.97	7.50	0.134	-17.46	29.50	0.090	-20.92	54.00	0.060	-24.44	78.50	0.011	-39.17
-4.50	0.193	-14.29	7.75	0.119	-18.49	30.00	0.091	-20.82	54.50	0.062	-24.15	79.00	0.011	-39.17
-4.25	0.222	-13.07	8.00	0.120	-18.42	30.50	0.091	-20.82	55.00	0.062	-24.15	79.50	0.013	-37.72
-4.00	0.242	-12.32	8.25	0.132	-17.59	31.00	0.088	-21.11	55.50	0.057	-24.88	80.00	0.016	-35.92
-3.75	0.249	-12.08	8.50	0.148	-16.59	31.50	0.080	-21.94	56.00	0.049	-26.20	80.50	0.019	-34.42
-3.50	0.243	-12.29	8.75	0.164	-15.70	32.00	0.069	-23.22	56.50	0.039	-28.18	81.00	0.022	-33.15
-3.25	0.223	-13.03	9.00	0.177	-15.04	32.50	0.061	-24.29	57.00	0.030	-30.46	81.50	0.024	-32.40
-3.00	0.189	-14.47	9.25	0.186	-14.61	33.00	0.061	-24.29	57.50	0.030	-30.46	82.00	0.026	-31.70
-2.75	0.145	-16.77	9.50	0.193	-14.29	33.50	0.071	-22.97	58.00	0.042	-27.54	82.50	0.027	-31.37
-2.50	0.104	-19.66	9.75	0.198	-14.07	34.00	0.085	-21.41	58.50	0.060	-24.44	83.00	0.027	-31.37
-2.25	0.103	-19.74	10.00	0.201	-13.94	34.50	0.098	-20.18	59.00	0.079	-22.05	83.50	0.028	-31.06
-2.00	0.162	-15.81	10.50	0.211	-13.51	35.00	0.105	-19.58	59.50	0.098	-20.18	84.00	0.027	-31.37
-1.75	0.250	-12.04	11.00	0.227	-12.88	35.50	0.106	-19.49	60.00	0.115	-18.79	84.50	0.027	-31.37
-1.50	0.349	-9.14	11.50	0.245	-12.22	36.00	0.102	-19.83	60.50	0.129	-17.79	85.00	0.025	-32.04
-1.25	0.453	-6.88	12.00	0.254	-11.90	36.50	0.094	-20.54	61.00	0.139	-17.14	85.50	0.024	-32.40
-1.00	0.557	-5.08	12.50	0.248	-12.11	37.00	0.088	-21.11	61.50	0.147	-16.65	86.00	0.022	-33.15
-0.75	0.656	-3.66	13.00	0.223	-13.03	37.50	0.086	-21.31	62.00	0.150	-16.48	86.50	0.020	-33.98
-0.50	0.748	-2.52	13.50	0.181	-14.85	38.00	0.090	-20.92	62.50	0.150	-16.48	87.00	0.018	-34.89
-0.25	0.829	-1.63	14.00	0.128	-17.86	38.50	0.096	-20.35	63.00	0.146	-16.71	87.50	0.015	-36.48
0.00	0.896	-0.95	14.50	0.074	-22.62	39.00	0.101	-19.91	63.50	0.138	-17.20	88.00	0.012	-38.42
0.25	0.949	-0.45	15.00	0.041	-27.74	39.50	0.102	-19.83	64.00	0.128	-17.86	88.50	0.009	-40.92
0.50	0.983	-0.15	15.50	0.055	-25.19	40.00	0.099	-20.09	64.50	0.116	-18.71	89.00	0.006	-44.44
0.75	1.000	0.00	16.00	0.077	-22.27	40.50	0.093	-20.63	65.00	0.103	-19.74	89.50	0.003	-50.46
1.00	0.998	-0.02	16.50	0.087	-21.21	41.00	0.089	-21.01	65.50	0.089	-21.01	90.00	0.000	---
1.25	0.977	-0.20	17.00	0.081	-21.83	41.50	0.091	-20.82	66.00	0.075	-22.50			
1.50	0.940	-0.54	17.50	0.065	-23.74	42.00	0.101	-19.91	66.50	0.063	-24.01			
1.75	0.886	-1.05	18.00	0.043	-27.33	42.50	0.117	-18.64	67.00	0.053	-25.51			
2.00	0.819	-1.73	18.50	0.022	-33.15	43.00	0.133	-17.52	67.50	0.048	-26.38			

FIGURE #1
REMOVAL FROM TRUCK

LIFT ANTENNA FROM TRUCK BED USING ANTENNA PLATES, NOT THE RADOMES, AT THE LOCATIONS INDICATED. TO PREVENT ROLLING, LIFT FROM THE PLATES AS SHOWN IN VIEW "X-X". DO NOT LIFT ANTENNA BY FIBERGLASS RADOMES, **DAMAGE WILL OCCUR.**

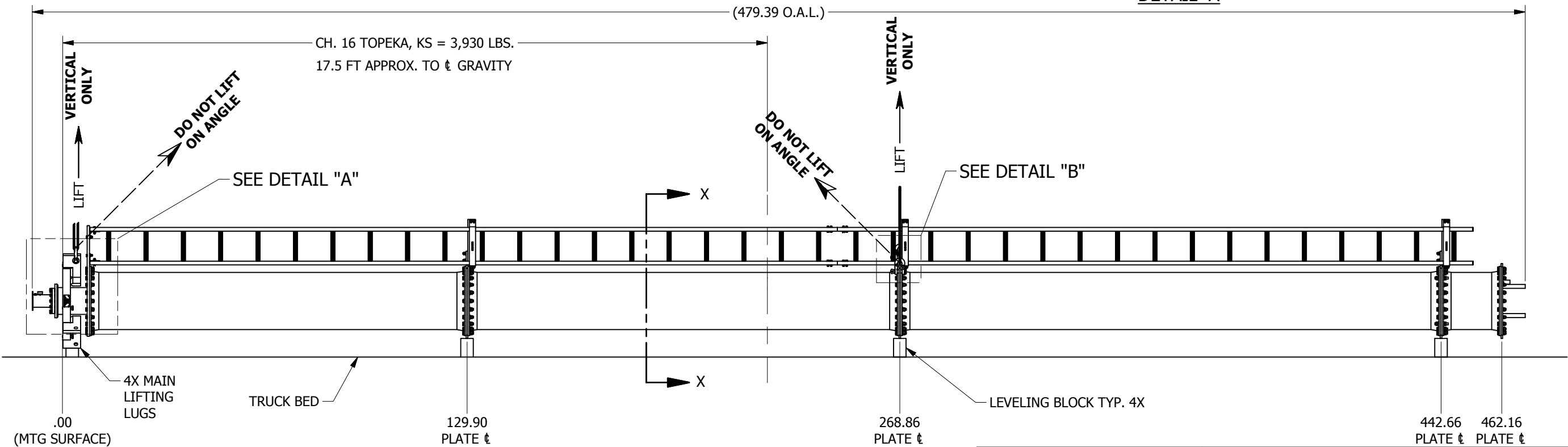
NOTES:

1. THE LIFTING DETAILS PROVIDED IDENTIFY THE PRIMARY RIGGING ATTACHMENT POINTS ON THE ANTENNA FOR DELIVERY LOADING/UNLOADING, UPENDING, AND HOISTING OPERATIONS.
2. ALL RIGGING COMPONENTS SHALL BE PROPERLY SELECTED AND SIZED BY THE CONTRACTOR'S QUALIFIED PERSON TO ENSURE THE COMPONENTS ARE UTILIZED IN ACCORDANCE WITH RIGGING MANUFACTURER'S WLL LIMITS AND ASSOCIATED SPECIFICATIONS.
3. CONTACT ERI FOR REVIEW AND APPROVAL IF ALTERNATE RIGGING ATTACHMENT POINTS ARE NEEDED FOR HANDLING OR HOISTING OPERATIONS.




DETAIL B

DETAIL A

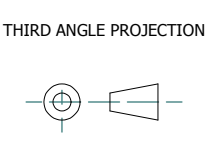


PROJECT NO.	35662E/1	
ERI APPROVAL	NAME	DATE
DRAWN BY	ACB	7/10/2019
DRAFTING	GAG	7/10/2019
DESIGN MGR.	K.SCHARP	7/10/2019
ENG.		
MANUF.		
EXT. APPROVAL		
SUPERSEDES PART NO.		
FILE NAME: LD35662E-1.idw		

		ELECTRONICS RESEARCH INC. <i>ESTABLISHED 1943</i>		7777 GARDNER Rd. CHANDLER, IN 47610-9219 PHONE: (812) 925-6000 FAX: (812) 925-4030
TITLE: LIFTING DETAILS				
35662E - TOPEKA, KS - CH. 16				
SIZE B	CAGE CODE OZNS1	DWG NO. LD35662E-1		REV. A
SCALE : 1 / 30		WEIGHT: N/A	SHEET: 1 OF 4	



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MATERIAL

FINISH

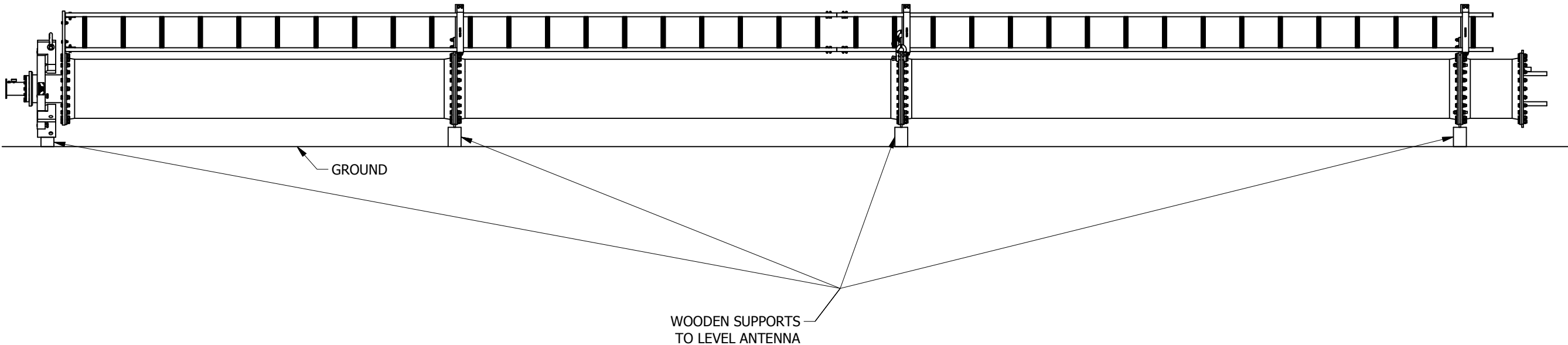
TOLERANCES
OVERALL-NOT CUMULATIVE
UNLESS OTHERWISE SPECIFIED,
ALL DIMENSIONS ARE IN INCHES
AND APPLICABLE AT 20°C (68°F)
INTERPRET DIMENSIONS AND TOLERANCES
PER ASME Y14.5M-1994

1 PLACE DECIMAL ± .1
2 PLACE DECIMAL ± .03
3 PLACE DECIMAL ± .010
ANGULAR ± .5°
FRACTIONAL ± 1/16"

4 3 2 1

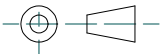
FIGURE #2

PLACE ALL ANTENNA RADOME JOINTS WITH THE STEEL CENTER PLATES ON WOODEN SUPPORTS AS SHOWN. ANTENNA SHOULD BE LEVEL TO PREVENT DAMAGE. USE SUPPORTS HIGH ENOUGH TO AVOID DAMAGING THE RADOMES AND TO ALLOW FOR ELECTRICAL GROUND TEST OF THE ANTENNA. PLATES RESTING 6.0 INCHES ABOVE THE GROUND IS SUFFICIENT.



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THIRD ANGLE PROJECTION



MATERIAL

FINISH

TOLERANCES
OVERALL-NOT CUMULATIVE
UNLESS OTHERWISE SPECIFIED,
ALL DIMENSIONS ARE IN INCHES
AND APPLICABLE AT 20°C (68°F)
INTERPRET DIMENSIONS AND TOLERANCES
PER ASME Y14.5M-1994

1 PLACE DECIMAL ± .1
2 PLACE DECIMAL ± .03
3 PLACE DECIMAL ± .010
ANGULAR ± .5°
FRACTIONAL ± 1/16"

PROJECT NO. 35662E/1		
ERI APPROVAL	NAME	DATE
DRAWN BY	ACB	7/10/2019
DRAFTING	GAG	7/10/2019
DESIGN MGR.	K.SCHARP	7/10/2019
ENG.		
MANUF.		
EXT. APPROVAL		
SUPERSEDES PART NO.		
FILE NAME: LD35662E-1.idw		



ELECTRONICS RESEARCH INC.
ESTABLISHED 1943

7777 GARDNER Rd.
CHANDLER, IN
47610-9219
PHONE: (812) 925-6000
FAX: (812) 925-4030

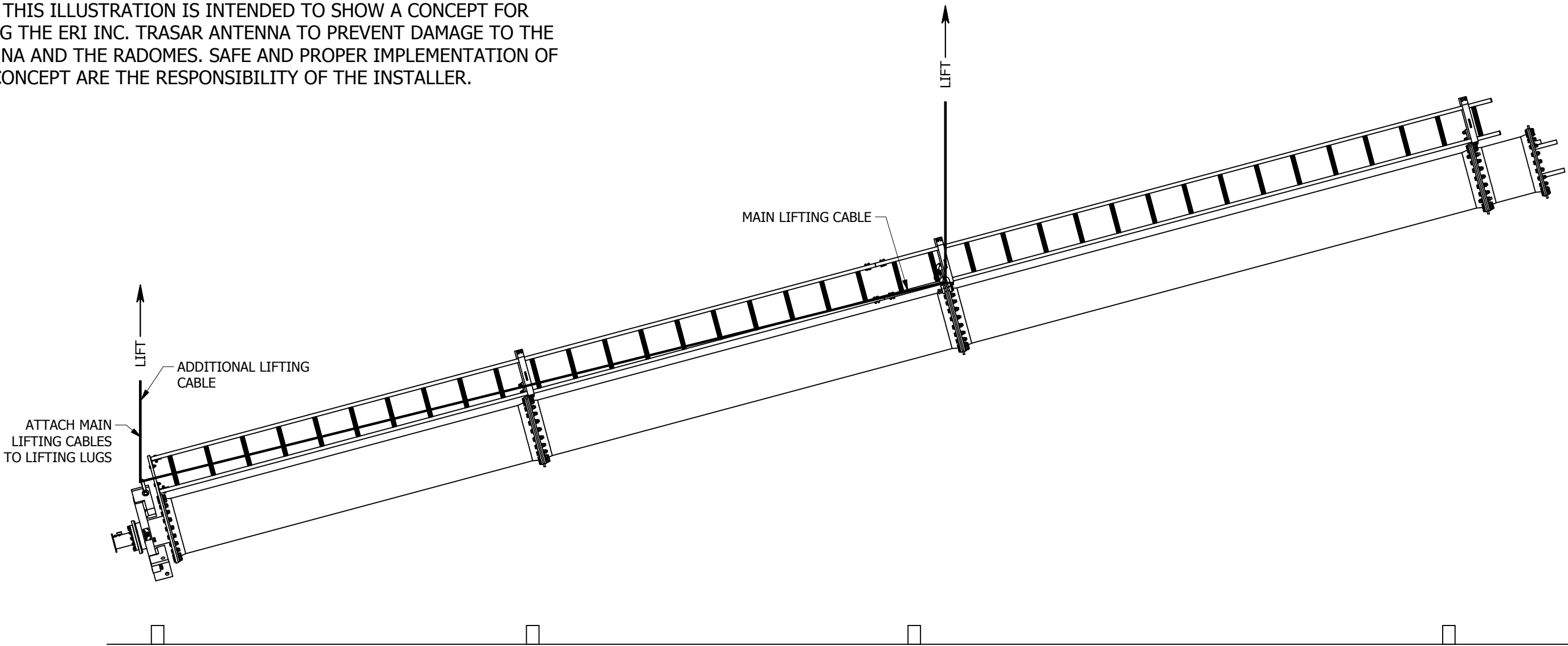
TITLE: LIFTING DETAILS 35662E - TOPEKA, KS - CH. 16			
SIZE B	CAGE CODE OZNS1	DWG NO. LD35662E-1	REV. A
SCALE : 1 / 30		WEIGHT: N/A	SHEET: 2 OF 4

4 3 2 1

FIGURE #3A

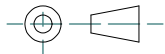
WHEN LIFTING THE ANTENNA FOR INSTALLATION, LIFT AS SHOWN TO PREVENT DAMAGE TO THE BASE OF THE ANTENNA. WHEN THE ANTENNA IS VERTICAL, THE ADDITIONAL BASE LIFTING CABLE CAN BE REMOVED. (SEE FIGURE #3B).

NOTE: THIS ILLUSTRATION IS INTENDED TO SHOW A CONCEPT FOR LIFTING THE ERI INC. TRASAR ANTENNA TO PREVENT DAMAGE TO THE ANTENNA AND THE RADOMES. SAFE AND PROPER IMPLEMENTATION OF THIS CONCEPT ARE THE RESPONSIBILITY OF THE INSTALLER.



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THIRD ANGLE PROJECTION



MATERIAL

FINISH

TOLERANCES
OVERALL-NOT CUMULATIVE
UNLESS OTHERWISE SPECIFIED,
ALL DIMENSIONS ARE IN INCHES
AND APPLICABLE AT 20°C (68°F)
INTERPRET DIMENSIONS AND TOLERANCES
PER ASME Y14.5M-1994

1 PLACE DECIMAL ± .1
2 PLACE DECIMAL ± .03
3 PLACE DECIMAL ± .010
ANGULAR ± .5°
FRACTIONAL ± 1/16"

PROJECT NO. 35662E/1		
ERI APPROVAL	NAME	DATE
DRAWN BY	ACB	7/10/2019
DRAFTING	GAG	7/10/2019
DESIGN MGR.	K.SCHARP	7/10/2019
ENG.		
MANUF.		
EXT. APPROVAL		
SUPERSEDES PART NO.		
FILE NAME: LD35662E-1.idw		



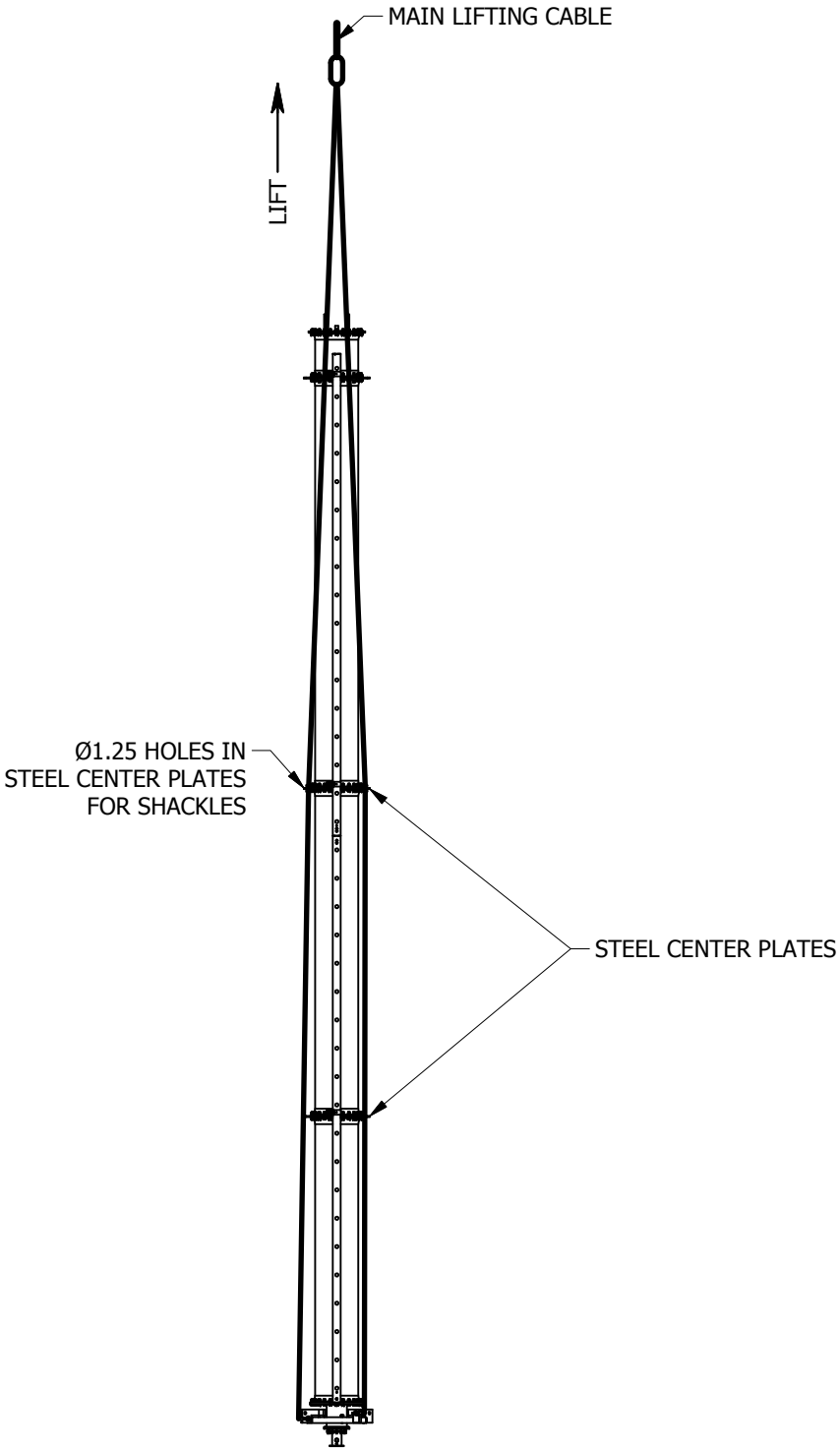
ELECTRONICS RESEARCH INC.
ESTABLISHED 1943

7777 GARDNER Rd.
CHANDLER, IN
47610-9219
PHONE: (812) 925-6000
FAX: (812) 925-4030

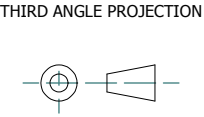
TITLE: LIFTING DETAILS 35662E - TOPEKA, KS - CH. 16			
SIZE B	CAGE CODE OZNS1	DWG NO. LD35662E-1	REV. A
SCALE : 1 / 30		WEIGHT: N/A	SHEET: 3 OF 4

FIGURE #3B

NOTE: THIS ILLUSTRATION IS INTENDED TO SHOW A CONCEPT FOR LIFTING THE ERI, INC. TRASAR ANTENNA TO PREVENT DAMAGE TO THE ANTENNA AND THE RADOMES. SAFE AND PROPER IMPLEMENTATION OF THIS CONCEPT ARE THE RESPONSIBILITY OF THE INSTALLER.



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MATERIAL

FINISH

TOLERANCES
OVERALL-NOT CUMULATIVE
UNLESS OTHERWISE SPECIFIED,
ALL DIMENSIONS ARE IN INCHES
AND APPLICABLE AT 20°C (68°F)
INTERPRET DIMENSIONS AND TOLERANCES
PER ASME Y14.5M-1994

1 PLACE DECIMAL ± .1
2 PLACE DECIMAL ± .03
3 PLACE DECIMAL ± .010
ANGULAR ± .5°
FRACTIONAL ± 1/16"

PROJECT NO. 35662E/1		
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DRAWN BY	ACB	7/10/2019
DRAFTING	GAG	7/10/2019
DESIGN MGR.	K.SCHARP	7/10/2019
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MANUF.		
EXT. APPROVAL		
SUPERSEDES PART NO.		
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TITLE: LIFTING DETAILS 35662E - TOPEKA, KS - CH. 16					
SIZE B	CAGE CODE OZNS1	DWG NO. LD35662E-1			REV. A
SCALE : 1 / 30		WEIGHT: N/A		SHEET: 4 OF 4	

4

3

2

1

NOTES:

1. REMOVE ALL BURRS AND SHARP EDGES.

2. LOC-TITE ALL THREADS PER BOP 2.02.01.

3. TORQUE ALL 5/8" HARDWARE TO 60-65 FT/LBS.

4. TORQUE ALL 1/2" HARDWARE TO 50-65 FT/LBS.

5. TORQUE ALL 3/8" HARDWARE TO 28 FT/LBS.

6. ALL EXTERIOR HARDWARE TO BE ASSEMBLED WITH THE HEAD OF THE BOLT TOWARDS THE BOTTOM OF THE ANTENNA.

7. USE SMALL ERI SHIPPING LABEL WHERE NOTED.

8. USING BLACK PAINT, STENCIL AS SHOWN, USING MIN. 1/2" HIGH CHARACTERS.

9. BEFORE PULLING ELECTRICAL CABLE FOR LIGHT, RELEASE PRESSURE ON ANTENNA TO PREVENT DAMAGE. AFTER CABLE IS INSTALLED, ANTENNA MUST BE PLACED BACK UNDER PRESSURE TO 5 PSIG MAX.

CONNECTION NOTES:

1. FOR PROPER PERFORMANCE AFTER INSTALLATION, PLUMB THE ANTENNA TO WITHIN 0.1° FROM VERTICAL (5/8 INCH IN 30 FEET). A KIT OF SHIMS IS INCLUDED WITH THE ANTENNA. AS REQUIRED FOR PROPER PLUMB, GAPS BETWEEN ANTENNA MOUNTING FLANGE AND TOWER TOP PLATE MUST BE FILLED USING THE SUPPLIED SHIM KIT OR SUITABLE STEEL SHIM STOCK.

2. ANTENNA MOUNTING FLANGE BOLTED CONNECTION SHALL BE BROUGHT TO A SNUG-TIGHT CONDITION WHERE JOINT TIGHTNESS IS ATTAINED WITH A FEW IMPACTS OF AN IMPACT WRENCH OR FULL EFFORT OF AN IRONWORKER USING AN ORDINARY SPUD WRENCH TO BRING THE PLIES INTO "FIRM" CONTACT, AND THEN AN ADDITIONAL 1/3 TURN (120° ± 30°) APPLIED TO THE NUT OR BOLT HEAD FOR FINAL BOLT TIGHTENING. A SYSTEMATIC APPROACH SHALL BE USED WHEN TIGHTENING THE BOLTS STARTING WITH THE MOST RIGID PART OF THE JOINT. THE PART NOT TURNED BY THE WRENCH SHALL BE PREVENTED FROM ROTATING DURING THIS OPERATION.

3. IT IS ERI'S INTENTION THAT AN ANCO LOCKNUT BE PROVIDED FOR ALL HIGH-STRENGTH ASTM A325 BOLTED CONNECTIONS, UNLESS OTHERWISE NOTED. FLAT WASHERS ARE REQUIRED ON MOUNTING FLANGE CONNECTIONS.

4. UNLESS OTHERWISE NOTED, ALL ANTENNA MOUNTING FLANGE HARDWARE GRADES ARE AS FOLLOWS:

TABLE	
COMPONENT	DESCRIPTION
STRUCTURAL BOLT	ASTM A325 GALVANIZED
ANCO LOCKNUT	ASTM A563 GRADE DH GALVANIZED HEAVY HEX NUT WITH STAINLESS PIN
FLAT WASHER	ASTM F436 TYPE I GALVANIZED

PROJECT NO.35662E/1

ERI APPROVALNAMEDATE

DRAWN BYACB7/9/2019

DRAFTINGGAG7/11/2019

DESIGN MGR.K.SCHARP7/11/2019

ENG.

MANUF.

EXT. APPROVAL

SUPERSEDES PART NO.

FILE NAME: PM35662E-1.idw

SIZEB

CAGE CODEOZNS1

DWG NO.PM35662E-1

SCALE:1 / 55

WEIGHT:N/A

SHEET:1 OF 3

TITLE:MECH. PARAMETERS / INSTALLATION ASS'Y.
35662E - TOPEKA, KS - CH. 16

7777 GARDNER Rd.
CHANDLER, IN
47610-9219
PHONE: (812) 925-6000
FAX: (812) 925-4030

REV:C

AMERICAN INSTITUTE OF STEEL CONSTRUCTION
FOUNDED 1921

ASCE
CERTIFIED
FABRICATOR

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THIRD ANGLE PROJECTION

MATERIAL

FINISH

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ANGULAR ± .5°
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INTERPRET DIMENSIONS AND TOLERANCES
PER ASME Y14.5M-1994

REVISION HISTORY

REV	DESCRIPTION	DATE	APPROVED
A	ADDED ITEMS #13, #14 & #15	10/31/19	K. SCHARP
B	ITEM #5 QTY WAS 2, ITEM #6 WAS STUB-6.25, ITEM #7 WAS INPUT-6.25-1.711	11/5/19	K. SCHARP
C	ADDED NOTE #9 TO ALL (3) PAGES	4/29/2020	K. SCHARP

15	16	NLA2007GA	1 1/4-7 GALV. ANCO LOCK NUT
14	32	WF20GA	1-1/4" FLAT WASHER F436 HDG STRUCTURAL
13	16	SC2007H0700GA	1 1/4-7 UNC x 7.00 in A325 Galv. Hex Bolt, 4" THREAD
12	1	167423	SHIM PAK (NOT SHOWN)
11	4	LRK0007-KIT	LIGHTNING SPUR HARDWARE KIT
10	12	LR0075-N003	LIGHTNING ROD ARRESTOR TIP
9	4	LR0062-4800GA-N001	5/8"-11 X 48" 30 DEG BENT GALV W/2 NUT
8	1	ACX675-20	6-1/8" 75 OHM STANDARD INNER CONNECTOR
7	1	STRINPUT-6.25-1.711	6.25" INPUT ADAPTOR
6			
5	1	RLA600-21	6-1/8" HARDWARE KIT
4	1	68157	6" INPUT HARDWARE KIT
3	1	66593	PRESSURE LABEL
2	1	38296-61	TRASAR LABEL
1	1	TA35662E-1	Ø8.625 TOP LEVEL ASSEMBLY

BILL OF MATERIAL

PROJECT NO.35662E/1

ERI APPROVALNAMEDATE

DRAWN BYACB7/9/2019

DRAFTINGGAG7/11/2019

DESIGN MGR.K.SCHARP7/11/2019

ENG.

MANUF.

EXT. APPROVAL

SUPERSEDES PART NO.

FILE NAME: PM35662E-1.idw

SIZEB

CAGE CODEOZNS1

DWG NO.PM35662E-1

SCALE:1 / 55

WEIGHT:N/A

SHEET:1 OF 3

TITLE:MECH. PARAMETERS / INSTALLATION ASS'Y.
35662E - TOPEKA, KS - CH. 16

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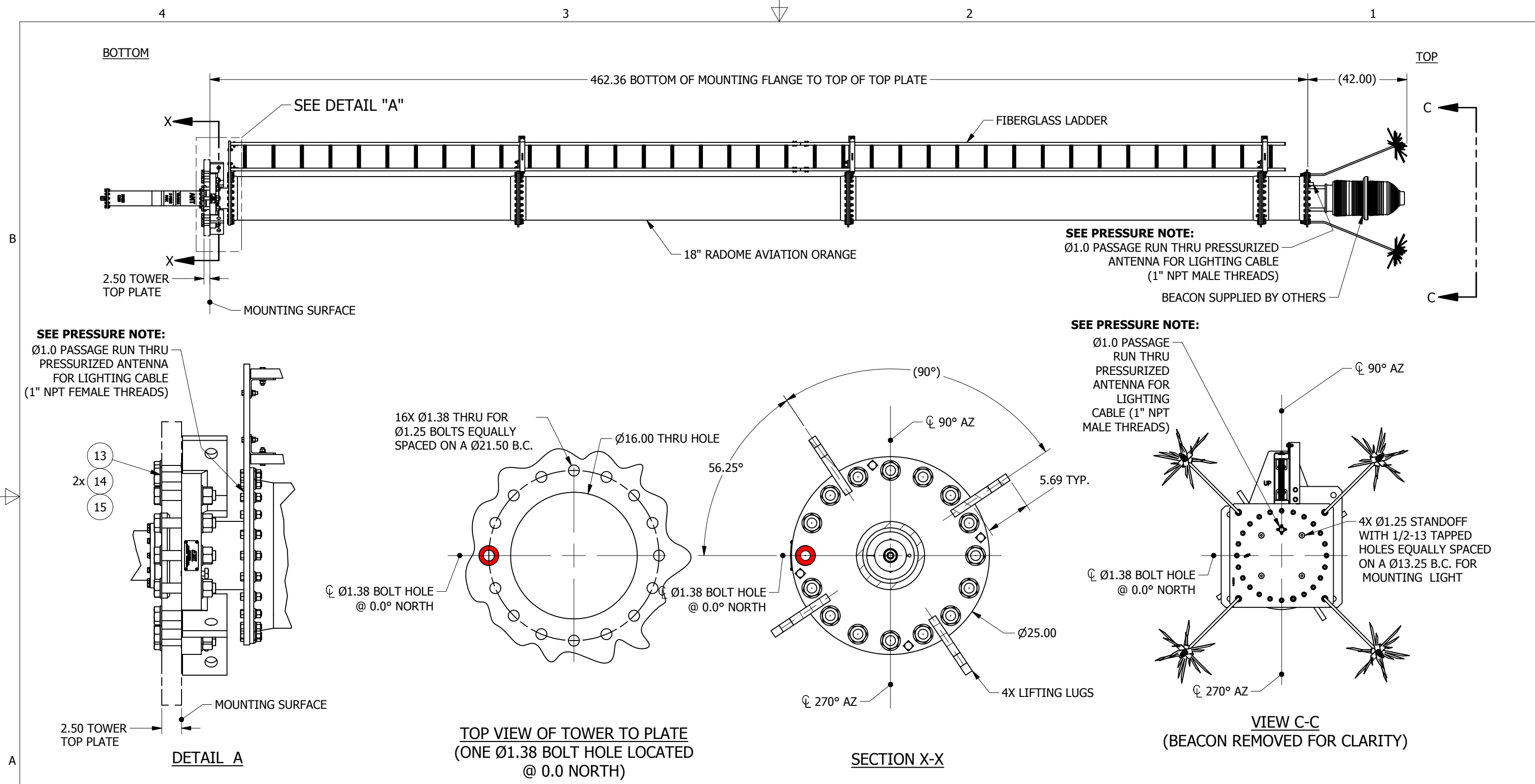
REV:C

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3

2


1



PRESSURE NOTE:

BEFORE PULLING ELECTRICAL CABLE FOR LIGHT, RELEASE PRESSURE ON ANTENNA TO PREVENT DAMAGE. AFTER CABLE IS INSTALLED, ANTENNA MUST BE PLACED BACK UNDER PRESSURE TO 5 PSIG MAX.

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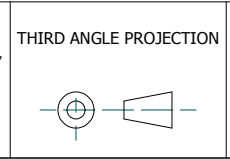
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MECH. PARAMETERS / INSTALLATION ASS'Y.
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SIZE B	CAGE CODE OZNS1	DWG NO. PM35662E-1	REV. C
SCALE: 1 / 55	WEIGHT: N/A	SHEET: 2 OF 3	



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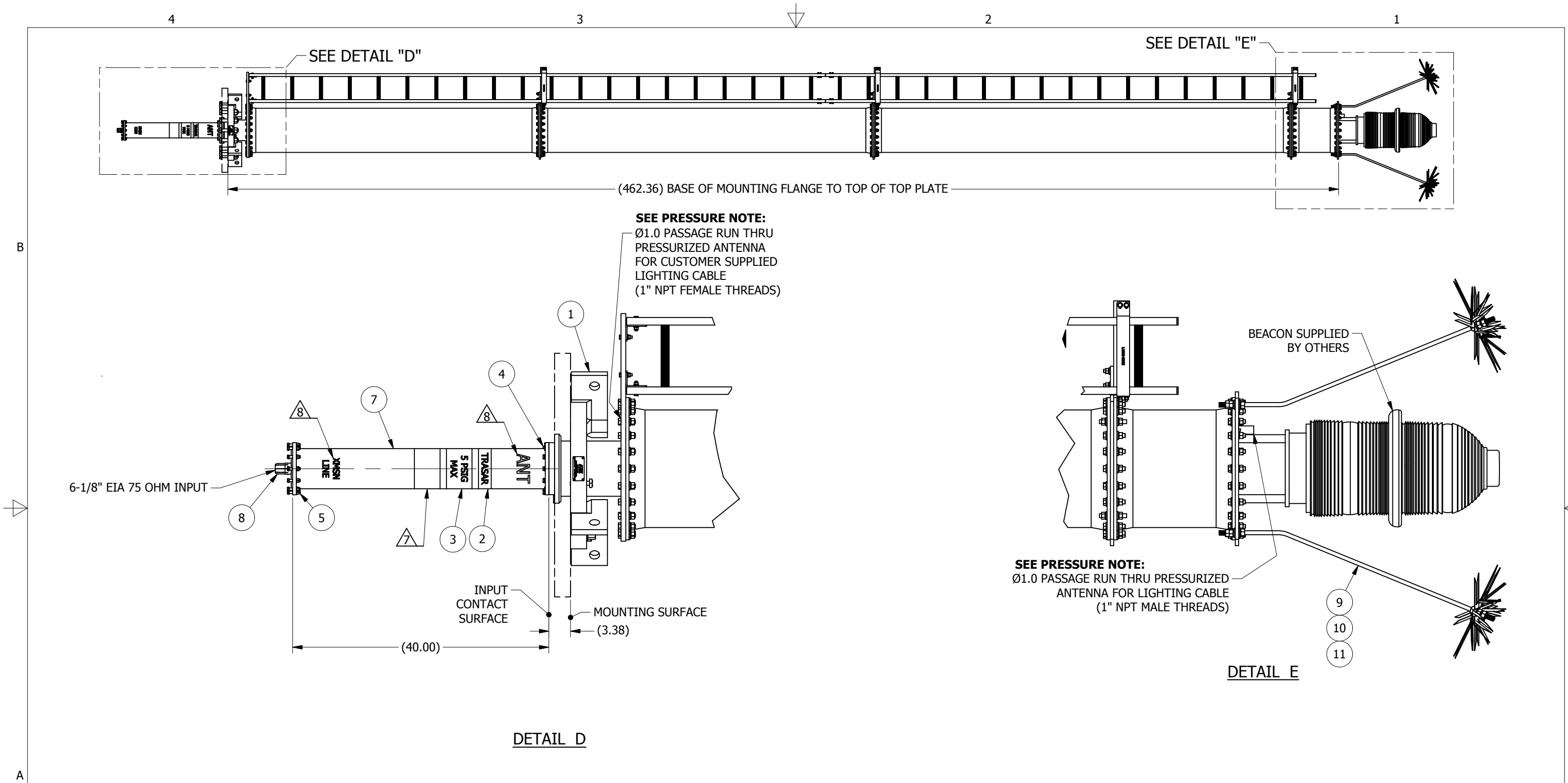
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DETAIL D

DETAIL E

PRESSURE NOTE:

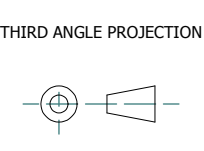
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