



RANDOLPH COUNTY PURCHASING OFFICE

725 McDowell Road
Asheboro, North Carolina 27205
Tel: (336) 318-6304
Fax: (336) 636-7568

APPENDIX A

Bid# 16-0613

FOR

ESHQ Tower Information

At

Emergency Services Headquarters Building
New Century Dr.
Asheboro, NC 27203

Randolph County
Due Date: Thursday, June 30th, 2016 @ 11:00 AM EST

Bid# 16-0613
Wireless Back-Haul for purposes of Network Redundancy



1 Fairholm Avenue
Peoria, IL 61603 USA
Phone 309-566-3000
FAX 309-566-3079

May 24, 2016

Randolph County
Attn: Paxton Arthurs
725 McDowell Road
Ashboro, NC. 27205

Reference: Randolph County Communication Tower, Randolph County, NC.
150' SSV Tower

File Number: 218077

Enclosed, please find the following for your use:

<u>Copies</u>	<u>Drawing Number</u>	<u>Description</u>
1	218077-01-D1	Design Drawing Sealed for the State of North Carolina
1	218077-01-F1	Mat with Raised Piers Foundation Sealed for the State of North Carolina

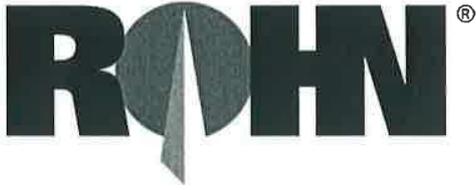
Contact Phone Number: 336 318 6605

Email Only: Paxton.arthurs@randolphcountync.gov

Sincerely,

Ray Adams

crp



1 Fairholm Avenue
Peoria, IL 61603 USA
Phone: (309)-566-3000
Fax: (309)-566-3079

DATE: MAY 23, 2016

PURCHASER: RANDOLPH COUNTY

PROJECT: 150 FT SSV SELF SUPPORT TOWER
RANDOLPH COUNTY, NORTH CAROLINA

FILE NUMBER: 218077

DRAWINGS: 218077-01-D1 , 218077-01-F1

I CERTIFY THAT THE REFERENCED DRAWINGS WERE PREPARED UNDER MY SUPERVISION IN ACCORDANCE WITH THE DESIGN AND LOADING CRITERIA SPECIFIED BY THE PURCHASER AND THAT I AM A REGISTERED PROFESSIONAL ENGINEER UNDER THE LAWS OF THE STATE OF NORTH CAROLINA.

CERTIFIED BY: _____

A handwritten signature in blue ink, appearing to be "H.A.", written over a horizontal line.

DATE: _____

5/23/16



Products for a Growing World of Technology®

REV	DESCRIPTION	DWN	CHK	APP

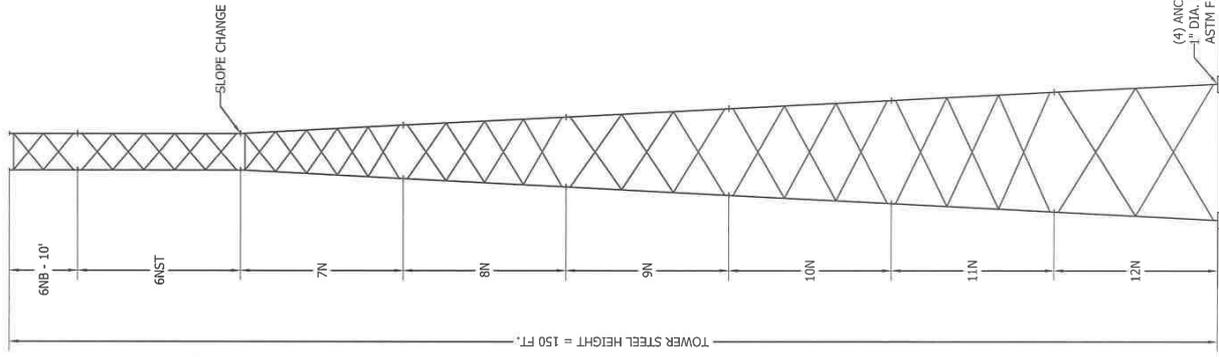
GENERAL NOTES

- ROHN PRODUCTS, LLC TOWER DESIGNS CONFORM TO ANSI/TIA-222-G UNLESS OTHERWISE SPECIFIED UNDER TOWER DESIGN LOADING.
- THE DESIGN LOADING CRITERIA INDICATED HAS BEEN PROVIDED TO ROHN. THE DESIGN LOADING CRITERIA HAS BEEN ASSUMED TO BE BASED ON SITE-SPECIFIC DATA IN ACCORDANCE WITH ANSI/TIA-222-G AND MUST BE VERIFIED BY OTHERS PRIOR TO INSTALLATION.
- ANTENNAS AND LINES LISTED IN TOWER DESIGN LOADING TABLE ARE PROVIDED BY OTHERS UNLESS OTHERWISE SPECIFIED.
- TOWER MEMBER DESIGN DOES NOT INCLUDE STRESSES DUE TO ERECTION SINCE ERECTION EQUIPMENT AND CONDITIONS ARE UNKNOWN. DESIGN ASSUMES COMPETENT AND QUALIFIED PERSONNEL WILL ERECT THE TOWER.
- WORK SHALL BE IN ACCORDANCE WITH ANSI/TIA-222-G, "STRUCTURAL STANDARDS FOR STEEL ANTENNA TOWERS AND ANTENNA SUPPORTING STRUCTURES".
- THE MINIMUM YIELD STRENGTH OF STRUCTURAL STEEL MEMBERS SHALL BE 50 KSI, EXCEPT AS NOTED BELOW:
 - ALL ANGLE BRACING SHALL BE 36 KSI.
 - STRUCTURAL PLATES SHALL BE 36 KSI.
- FIELD CONNECTIONS SHALL BE BOLTED. NO FIELD WELDS SHALL BE ALLOWED.
- STRUCTURAL BOLTS SHALL CONFORM TO ASTM A325, EXCEPT WHERE NOTED.
- PAL NUTS ARE PROVIDED FOR ALL TOWER BOLTS.
- STRUCTURAL STEEL AND CONNECTION BOLTS SHALL BE HOT-DIPPED GALVANIZED AFTER FABRICATION IN ACCORDANCE WITH ANSI/TIA-222-G.
- ALL HIGH STRENGTH BOLTS ARE TO BE TIGHTENED TO A "SNIUG TIGHT" CONDITION AS DEFINED IN THE RSCC SPECIFICATION FOR STRUCTURAL JOINTS USING HIGH-STRENGTH BOLTS. NO OTHER "MINIMUM BOLT TENSION OR TORQUE VALUES ARE REQUIRED.
- PURCHASER SHALL VERIFY THE INSTALLATION IS IN CONFORMANCE WITH LOCAL, STATE, AND FEDERAL REQUIREMENTS FOR OBSTRUCTION MARKING AND LIGHTING.
- TOLERANCE ON TOWER STEEL HEIGHT IS EQUAL TO PLUS 1% OR MINUS 1/2%.
- DESIGN ASSUMES THAT, AS A MINIMUM, MAINTENANCE AND INSPECTION WILL BE PERFORMED OVER THE LIFE OF THE STRUCTURE IN ACCORDANCE WITH ANSI/TIA-222-G.
- DESIGN ASSUMES LEVEL GRADE AT TOWER SITE.
- FOUNDATIONS SHALL BE DESIGNED TO SUPPORT THE REACTIONS SHOWN FOR THE CONDITIONS EXISTING AT THE SITE.
- TOWER DESIGN INCLUDES CONSIDERATION OF A CONTAINED FALL RADIUS EQUAL TO 75 FEET BY PROVIDING STRONGER SECTIONS THAN REQUIRED BY ANALYSIS IN THE LOWER PORTION OF THE TOWER.

TOWER DESIGN LOADING

DESIGN WIND LOAD PER ANSI/TIA-222-G USING THE FOLLOWING DESIGN CRITERIA:
 BASIC WIND SPEED (NO ICE): 120 MPH ULTIMATE WIND SPEED PER ASCE 7-10
 BASIC WIND SPEED (W/ ICE): 30 MPH
 DESIGN ICE THICKNESS: 0.75 IN.
 STRUCTURE CLASS: III
 EXPOSURE CATEGORY: C
 TOPOGRAPHIC CATEGORY: 1
 EARTHQUAKE SPECTRAL RESPONSE ACCELERATION, S_s: 0.29
 THIS TOWER IS DESIGNED TO SUPPORT THE FOLLOWING LOADS:

ELEVATION (FT)	ANTENNA TYPE	LINE SIZE (NOM)
TOP	LIGHTNING ROD	-
150	(2) DB222 ANTENNAS ON (2) 3 FT SA	(2) 7/8"
148	(1) 2 FT. STANDARD DISH [222]	(1) CAT5
142	(3) ANT734-960F2 ON (3) 3 FT SA	(3) 1/2"
136	(1) 2 FT. STANDARD DISH [2]	(1) CAT5
136	(3) ANT734-960F2 ON (3) 3 FT SA	(3) 1/2"
128	(3) ANT734-960F2 ON (3) 3 FT SA	(3) 1/2"
122	(3) ANT734-960F2 ON (3) 3 FT SA	(3) 1/2"
116	(3) ANT734-960F2 ON (3) 3 FT SA	(3) 1/2"
110	(1) 3 SQFT YAGI LEG MOUNTED	(1) 7/8"
106	(1) 6 FT. STANDARD DISH [0]	(1) 7/8"
104	(1) 2 FT. HP DISH [43] 11 GHZ	(1) 3/8"
102	(1) 2 FT. HP DISH [2] 11 GHZ	(1) 3/8"
60	(1) ULTRANTENNA60 LEG MTD & (1) GPS ANTENNA LEG MTD	(2) CAT5



(4) ANCHOR BOLTS (12 TOTAL)
 1" DIA. X 70" LONG
 ASTM F1554 Gr. 105

SECTION	LEG	DIAGONAL	HORIZONTALS
6NB - 10'	PIPE 2.375x0.154	L1 1/2x1 1/2x1/8 (2)	L1 1/2x1 1/2x1/8 (1)
6NST	PIPE 2.375x0.154	L1 1/2x1 1/2x1/8 (5)	N/A
7N	PIPE 2.375x0.218	L1 1/2x1 1/2x1/8 (5)	N/A
8N	PIPE 2.875x0.276	L1 3/4x1 3/4x1/8 (4)	N/A
9N	PIPE 3.500x0.300	L2x2x3/16 (3)	N/A
10N	PIPE 4x0.318	L2 1/2x2 1/2x3/16 (3)	N/A
11N	PIPE 4.500x0.337	L2 1/2x2 1/2x3/16 (3)	N/A
12N	PIPE 5.563x0.375	L3x3x3/16 (2)	N/A

NOTE: SECTION NUMBERS ARE FOR REFERENCE ONLY. FOR NOMINAL FACE WIDTH DIMENSIONS, REFER TO THE STRESS ANALYSIS.
 THE NUMBERS SHOWN IN PARENTHESES INDICATE THE NUMBER OF BAYS FROM TOP TO BOTTOM.

MAXIMUM ADJUSTED FACTORED REACTIONS	
COMPRESSION =	160.9 KIPS
TENSION =	135.4 KIPS
TOTAL SHEAR =	28.1 KIPS
O.T.M. =	2245.3 FT-KIPS



PO BOX 5999
 PEORIA, IL 61601-5999
 TOLL FREE 800-72-ROHN

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RANDOLPH COUNTY
 DESIGN PROFILE
 150 FT SSV TOWER
 RANDOLPH COUNTY, NC

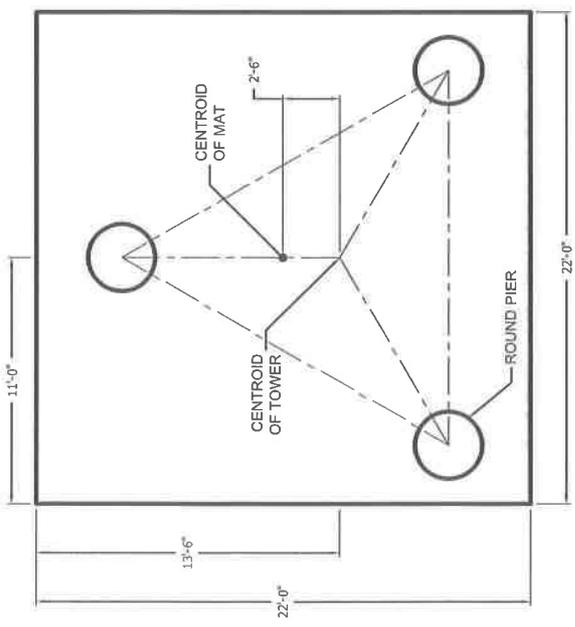
DWN:	DWG:	CHK'D:	HA:	DATE:	05/23/16
ENGR:	HA	SHEET #:			
PRJ. ENGR:	DWG	PRJ. MANGR:			
DRAWING NO:	218077-01-D1				REV:
					0

FILE NO.	218077
DESCRIPTION	REVISIONS
REV	DWN
	CHK
	APP

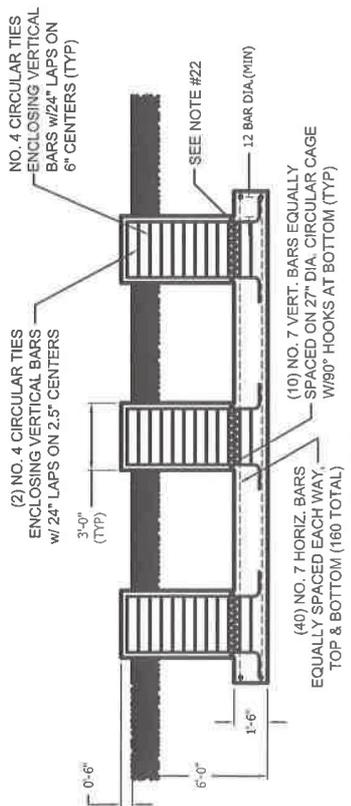
GENERAL NOTES

- FOUNDATION DESIGN HAS BEEN DEVELOPED IN ACCORDANCE WITH GENERALLY ACCEPTED PROFESSIONAL ENGINEERING PRINCIPLES AND PRACTICES WITHIN THE LIMITS OF THE SUBSURFACE DATA PROVIDED. FOUNDATION DESIGN MODIFICATIONS MAY BE REQUIRED IN THE EVENT THE FOLLOWING DESIGN PARAMETERS ARE NOT APPLICABLE FOR THE SUBSURFACE CONDITIONS ENCOUNTERED.
 - ULTIMATE SOIL BEARING PRESSURE AT 6 FT DEPTH = 6,000 PSF. (ALLOWABLE SOIL BEARING PRESSURE AT 6 FT DEPTH = 3000 PSF.)
 - GROUND WATER TABLE IS AT OR BELOW FOUNDATION DEPTH.
 - MAXIMUM FROST PENETRATION DEPTH LESS THAN FOUNDATION DEPTH.
- WORK SHALL BE IN ACCORDANCE WITH LOCAL CODES, SAFETY REGULATIONS AND UNLESS OTHERWISE NOTED, THE LATEST REVISION OF ACI 318, "BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE", PROCEDURES FOR THE PROTECTION OF EXCAVATIONS, EXISTING CONSTRUCTION AND UTILITIES SHALL BE ESTABLISHED PRIOR TO FOUNDATION INSTALLATION.
- CONCRETE MATERIALS SHALL CONFORM TO THE APPROPRIATE STATE REQUIREMENTS FOR EXPOSED STRUCTURAL CONCRETE.
- PROPORTIONS OF CONCRETE MATERIALS SHALL BE SUITABLE FOR THE INSTALLATION METHOD UTILIZED AND SHALL RESULT IN DURABLE CONCRETE FOR RESISTANCE TO LOCAL ANTICIPATED AGGRESSIVE ACTIONS. THE DURABILITY REQUIREMENTS OF ACI 318 CHAPTER 4 SHALL BE SATISFIED BASED ON THE CONDITIONS EXPECTED AT THE SITE. AS A MINIMUM, CONCRETE SHALL DEVELOP A MINIMUM COMPRESSIVE STRENGTH OF 4,500 PSI IN 28 DAYS.
- MAXIMUM SIZE OF AGGREGATE SHALL NOT EXCEED SIZE SUITABLE FOR INSTALLATION METHOD UTILIZED OR 1/3 CLEAR DISTANCE BEHIND OR BETWEEN REINFORCING. MAXIMUM SIZE MAY BE INCREASED TO 2/3 CLEAR DISTANCE PROVIDED WORKABILITY AND METHODS OF CONSOLIDATION SUCH AS VIBRATING WILL PREVENT HONEYCOMBS OR VOIDS.
- REINFORCEMENT SHALL BE DEFORMED AND CONFORM TO THE REQUIREMENTS OF ASTM A615 GRADE 60 UNLESS OTHERWISE NOTED. SPLICES IN REINFORCEMENT SHALL NOT BE ALLOWED UNLESS OTHERWISE INDICATED.
- WELDING IS PROHIBITED ON REINFORCING STEEL AND EMBEDMENTS.
- MINIMUM CONCRETE COVER FOR REINFORCEMENT SHALL BE 3 INCHES (76 MM) UNLESS OTHERWISE NOTED. APPROVED SPACERS SHALL BE USED TO INSURE A 3 INCH (76 MM) MINIMUM COVER ON REINFORCEMENT.
- CONCRETE COVER FROM TOP OF FOUNDATION TO ENDS OF VERTICAL REINFORCEMENT SHALL NOT EXCEED 3 INCHES (76MM) NOR BE LESS THAN 2 INCHES (51MM).
- FOUNDATION DESIGN ASSUMES STRUCTURAL BACKFILL TO BE COMPACTED IN 8 INCH (200 MM) MAXIMUM LAYERS TO 95% OF MAXIMUM DRY DENSITY AT OPTIMUM MOISTURE CONTENT IN ACCORDANCE WITH ASTM D998. ADDITIONALLY, STRUCTURAL BACKFILL MUST HAVE A MINIMUM COMPACTED UNIT WEIGHT OF 110 POUNDS PER CUBIC FOOT (17 KN/M³).
- FOUNDATION DESIGN HAS BEEN BASED ON GEOTECHNICAL REPORT NO. 1335-15-037 DATED 06/21/15 BY SAME, INC.
- FOUNDATION DEPTH INDICATED IS BASED ON THE GRADE LINE DESCRIBED IN THE REFERENCED GEOTECHNICAL REPORT. FOUNDATION MODIFICATION MAY BE REQUIRED IN THE EVENT CUT OR FILL OPERATIONS HAVE TAKEN PLACE SUBSEQUENT TO THE GEOTECHNICAL INVESTIGATION.
- FOUNDATION DESIGN ASSUMES LEVEL GRADE AT STRUCTURE SITE.
- FOUNDATION DESIGN ASSUMES THE RECOMMENDATIONS IN THE REFERENCED GEOTECHNICAL REPORT CONCERNING VERIFICATION OF SUBSURFACE CONDITIONS ARE IMPLEMENTED PRIOR TO PLACEMENT OF CONCRETE.
- FOUNDATION INSTALLATION SHALL BE SUPERVISED BY PERSONNEL KNOWLEDGEABLE AND EXPERIENCED WITH THE PROPOSED FOUNDATION TYPE. CONSTRUCTION SHALL BE IN ACCORDANCE WITH GENERALLY ACCEPTED INSTALLATION PRACTICES.
- FOUNDATION DESIGN ASSUMES INSTALLATION PROCEDURES WILL INCORPORATE THE PROCEDURES RECOMMENDED IN THE REFERENCED GEOTECHNICAL REPORT.
- FOUNDATION DESIGN ASSUMES FIELD INSPECTIONS WILL BE PERFORMED TO VERIFY THAT CONSTRUCTION MATERIALS, INSTALLATION METHODS AND ASSUMED DESIGN PARAMETERS ARE ACCEPTABLE BASED ON CONDITIONS EXISTING AT THE SITE.
- FOR FOUNDATION AND ANCHOR TOLERANCES SEE DRAWING A810214.
- LOOSE MATERIAL SHALL BE REMOVED FROM BOTTOM OF EXCAVATION PRIOR TO CONCRETE PLACEMENT. SIDES OF EXCAVATION SHALL BE ROUGH AND FREE OF LOOSE CUTTINGS.
- CONCRETE SHALL BE PLACED IN A MANNER THAT WILL PREVENT SEGREGATION OF CONCRETE MATERIALS. DURABILITY OF WATER OR SOIL AND OTHER OCCURRENCES WHICH MAY DECREASE THE STRENGTH OR DURABILITY OF THE FOUNDATION.
- CONCRETE PREFERABLY SHALL BE PLACED AGAINST UNDISTURBED SOIL. WHEN FORMS ARE NECESSARY, THEY SHALL BE REMOVED PRIOR TO PLACING STRUCTURAL BACKFILL.
- CONSTRUCTION JOINTS, IF REQUIRED AT THE BASE OF THE PIERS, MUST BE INTENTIONALLY ROUGHENED TO A FULL AMPLITUDE OF 1/4 INCH (6 MM). FOUNDATION DESIGN ASSUMES NO OTHER CONSTRUCTION JOINTS.
- TOP OF FOUNDATION OUTSIDE LIMITS OF ANCHOR BOLTS SHALL BE SLOPED TO DRAIN WITH A FLOATED FINISH. AREA INSIDE LIMITS OF ANCHOR BOLTS SHALL BE LEVEL WITH A SCRATCHED FINISH.
- EXPOSED EDGES OF CONCRETE SHALL BE CHAMFERED 3/4" X 3/4" (19MM X 19MM) MINIMUM.

NOTE: SEE STRUCTURE ASSEMBLY DRAWING FOR FOUNDATION LAYOUT AND ANCHORAGE EMBEDMENT DRAWING NUMBER.



PLAN VIEW



ELEVATION VIEW

ADJUSTED FACTORED REACTIONS

Maximum Q/T/M =	2,245 30 FT-K
Total Tower Wt =	14.90 KIPS
Total Shear =	28.10 KIPS
Max. Shear/Leg =	16.70 KIPS
Max. Ten./Leg =	135.50 KIPS
Max. Comp./Leg =	160.90 KIPS

CONCRETE VOLUME (cu.yds)

ROUND	3.9
PIER	26.9
PAD	30.8
TOTAL	

ROHN
INCORPORATED, LLC
PO BOX 5999
PEORIA, IL 61601-5999
TOLL FREE 800-722-ROHN
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RANDOLPH COUNTY
MAT W/RAISED PIERS FOUNDATION

DWN:	DWG	CHKD:	HA	DATE:	05/23/16
ENGR:	HA	SHEET #:	1 OF 1		
PRO ENGR:	DWG	PRO MANGR:			
DRAWING NO:	218077-01-F1	REV:	0		



1 Fairholm Avenue
Peoria, IL 61603 USA
Phone 309-566-3000
FAX 309-566-3079
Toll Free 800-727-ROHN

May 23, 2016

Randolph County
911 Emergency Services
152-A North Fayetteville St.
Asheboro, NC 27203
Attn: Lisa Garner

Reference: 150' Self Supporting Tower
Site Name: Randolph Co. Comm Tower
Asheboro, NC
File # 218077

Dear Ms. Garner

The referenced tower is designed to meet the specified loading requirements in accordance with ANSI/TIA-222-G for a 120 MPH Ultimate Wind Speed per ASCE 7-10 with no ice and a 30 MPH 3-second gust wind speed with 0.75 inch radial ice, Structure Class: III; Exposure Category: C and Topographic Category: 1.

It is our understanding that the design of the referenced tower requires consideration of a contained fall radius in the event that a catastrophic wind speed would result in collapse. Although the tower is not designed to fail, stronger sections than required by analysis is provided in the lower sections of the tower. This will result in an increased safety factor in the lower sections. This design enables the tower to fail through a combination of bending and buckling in the upper portion of the tower under a catastrophic wind loading. Failure in this manner will result in the upper portion of the tower folding over the lower portion, resulting in a fall radius no greater than **75ft.**

Please contact us at your convenience should you have further questions concerning the safety of towers or other aspects of tower design.

Sincerely,


Habib Azouri, P.E.
Engineering Manager

cc: Ken Cordrey



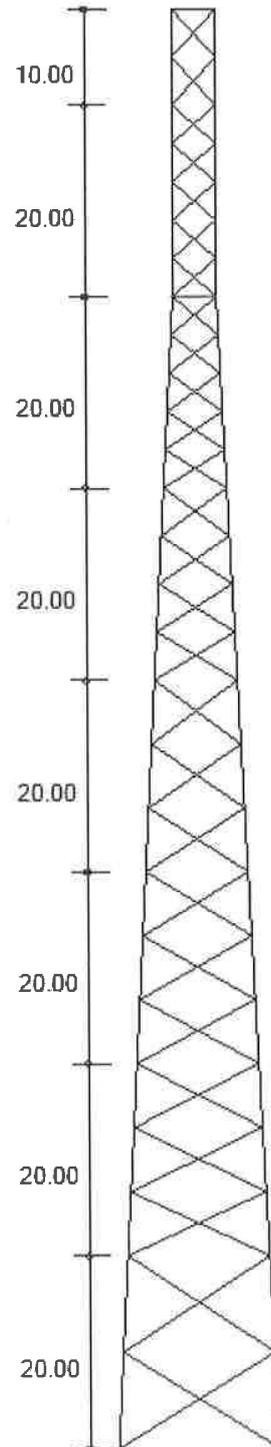
File: W:\Jobs\2016\218077\218077.out
Contract: 218077
Project: 150 FT SSV TOWER DESIGN
Date and Time: 5/23/2016 10:38:32 AM

Revision: 0
Site: RANDOLPH CO. COMM TOWER, NC
Engineer: DWG ✓HA

DESIGN SPECIFICATION

Design Standard: ANSI/TIA-222-G-2005 Add.2
Ultimate Design Wind Speed (No Ice) = 120.0 (mph)
Nominal Design Wind Speed (No Ice) = 93.0 (mph)
Basic Wind Speed (With Ice) = 30.0 (mph)
Design Ice Thickness = 0.75 (in)
Structure Class = III
Exposure Category = C
Topographic Category = 1

Sct.	Length (ft)	Top W. (in)	Bot Width (in)
1	20.00	177.24	201.22
2	20.00	152.17	177.24
3	20.00	127.68	152.17
4	20.00	103.19	127.68
5	20.00	78.74	103.19
6	20.00	54.25	78.74
7	20.00	54.25	54.25
8	10.00	54.25	54.25



MAXIMUM BASE REACTIONS

Download (Kips)	136.4
Uplift (Kips)	114.8
Shear (Kips)	14.1

ADJUSTED REACTIONS

160.9 ^k
135.4 ^k
16.6 ^k



TSTower - v 5.6.0 Tower Analysis Program
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Peoria, IL

File: W:\Jobs\2016\218077\218077.out
Contract: 218077
Project: 150 FT SSV TOWER DESIGN
Date and Time: 5/23/2016 10:38:32 AM

Revision: 0
Site: RANDOLPH CO. COMM TOWER
Engineer: DWG

Section A: PROJECT DATA

Project Title: 150 FT SSV TOWER DESIGN
Customer Name: RANDOLPH COUNTY
Site: RANDOLPH CO. COMM TOWER
Contract No.: 218077
Revision: 0
Engineer: DWG
Date: May 23 2016
Time: 10:37:28 AM

Design Standard: ANSI/TIA-222-G-2005 Addendum 2

GENERAL DESIGN CONDITIONS

Start wind direction: 0.00 (Deg)
End wind direction: 330.00 (Deg)
Increment wind direction: 30.00 (Deg)
Elevation above ground: 0.00 (ft) ✓
Gust Response Factor Gh: 0.85
Structure class: III
Exposure category: C ✓
Topographic category: 1
Material Density: 490.1 (lbs/ft³)
Young's Modulus: 29000.0 (ksi) ✓
Poisson Ratio: 0.30
Weight Multiplier: 1.25
Minimum Bracing Resistance as per 4.4.1

WIND ONLY CONDITIONS:

Ultimate Design Wind Speed (No Ice): 120.00 (mph) ✓
Nominal Design Wind Speed (No Ice): 92.95 (mph)
Directionality Factor Kd: 0.85
Importance Factor I: 1.15 ✓
Wind Load Factor: 1.60
Dead Load Factor: 1.20
Dead Load Factor for Uplift: 0.90

WIND AND ICE CONDITIONS:

Basic Wind Speed (With Ice): 30.00 (mph) ✓
Directionality Factor Kd: 0.85
Wind Load Importance Factor Iw: 1.00
Ice Thickness Importance Factor Ii: 1.25 ✓
Ice Thickness: 0.75 (in) ✓
Ice Density: 56.19 (lbs/ft³)
Wind Load Factor: 1.00
Dead Load Factor: 1.20
Ice Load Factor: 1.00

WIND ONLY SERVICEABILITY CONDITIONS:

Serviceability Wind Speed: 60.00 (mph)
Directionality Factor Kd: 0.85 ✓
Importance Factor I: 1.00
Wind Load Factor: 1.00
Dead Load Factor: 1.00

Analysis performed using: Robot Millenium Finite Element Analysis Software (by Robobat)



TSTower - v 5.6.0 Tower Analysis Program
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 Peoria, IL

File: W:\Jobs\2016\218077\218077.out
 Contract: 218077
 Project: 150 FT SSV TOWER DESIGN
 Date and Time: 5/23/2016 10:38:32 AM

Revision: 0
 Site: RANDOLPH CO. COMM TOWER
 Engineer: DWG

Section B: STRUCTURE GEOMETRY

TOWER GEOMETRY

Cross-Section	Height (ft)	Tot Height (ft)	# of Section	Bot Width (in)	Top Width (in)
Triangular	150.00	150.00	8	201.22	54.25

SECTION GEOMETRY

Sec #	Sec. Name	Elevation		Widths		Legs (lbs)	Brcg. (lbs)	Masses			Brcg. Clear. (in)	
		Bottom (ft)	Top (ft)	Bottom (in)	Top (in)			Sec.Brc (lbs)	Int.Brc (lbs)	Sect. (lbs)		Database (lbs)
8	6NB - 10'*	140.00	150.00	54	54	138	144	0	0	282	0	0.787
7	R-6N6	120.00	140.00	54	54	276	277	0	0	553	553	0.787
6	R-7N1	100.00	120.00	79	54	379	314	0	0	692	694	0.787
5	R-8N66	80.00	100.00	103	79	576	390	0	0	966	968	0.787
4	R-9N6	60.00	80.00	128	103	772	637	0	0	1409	1413	0.787
3	R-10N7	40.00	60.00	152	128	941	926	0	0	1867	1872	0.787
2	R-11N5	20.00	40.00	177	152	1127	1052	0	0	2180	2185	0.787
1	R-12N4	0.00	20.00	201	177	1562	1039	0	0	2601	2608	0.787
Total Mass:						5770	4780	0	0	10550	10293	

PANEL GEOMETRY

Sec#	Pnl#	Type	SecBrcg	Mid. Horiz Continuous	Horiz	Height (ft)	Bottom Width (in)	Top Width (in)	Plan Bracing	Hip Bracing	Gusset Plate Area (ft^2)	Gusset Plate Weight (lbs)
8	2	X	(None)	Yes	5.0	54.3	54.3	(None)	(None)	0.000	0.00	
8	1	X	(None)	None	5.0	54.3	54.3	(None)	(None)	0.000	0.00	
7	5	X	(None)	None	4.0	54.3	54.3	(None)	(None)	0.604	0.00	
7	4	X	(None)	None	4.0	54.3	54.3	(None)	(None)	0.604	0.00	
7	3	X	(None)	None	4.0	54.3	54.3	(None)	(None)	0.604	0.00	
7	2	X	(None)	None	4.0	54.3	54.3	(None)	(None)	0.604	0.00	
7	1	X	(None)	None	4.0	54.3	54.3	(None)	(None)	0.604	0.00	
6	5	X	(None)	None	4.0	59.1	54.3	(None)	(None)	0.604	0.00	
6	4	X	(None)	None	4.0	64.0	59.1	(None)	(None)	0.604	0.00	
6	3	X	(None)	None	4.0	68.9	64.0	(None)	(None)	0.604	0.00	
6	2	X	(None)	None	4.0	73.8	68.9	(None)	(None)	0.604	0.00	
6	1	X	(None)	None	4.0	78.7	73.8	(None)	(None)	0.604	0.00	
5	4	X	(None)	None	5.0	84.9	78.7	(None)	(None)	0.755	0.00	
5	3	X	(None)	None	5.0	91.0	84.9	(None)	(None)	0.755	0.00	
5	2	X	(None)	None	5.0	97.1	91.0	(None)	(None)	0.755	0.00	
5	1	X	(None)	None	5.0	103.2	97.1	(None)	(None)	0.755	0.00	
4	3	X	(None)	None	6.7	111.4	103.2	(None)	(None)	1.006	0.00	
4	2	X	(None)	None	6.7	119.5	111.4	(None)	(None)	1.006	0.00	
4	1	X	(None)	None	6.7	127.7	119.5	(None)	(None)	1.006	0.00	
3	3	X	(None)	None	6.7	135.8	127.7	(None)	(None)	1.006	0.00	
3	2	X	(None)	None	6.7	144.0	135.8	(None)	(None)	1.006	0.00	
3	1	X	(None)	None	6.7	152.2	144.0	(None)	(None)	1.006	0.00	
2	3	X	(None)	None	6.7	160.5	152.2	(None)	(None)	1.006	0.00	
2	2	X	(None)	None	6.7	168.9	160.5	(None)	(None)	1.006	0.00	
2	1	X	(None)	None	6.7	177.2	168.9	(None)	(None)	1.006	0.00	
1	2	X	(None)	None	10.0	189.2	177.2	(None)	(None)	1.509	0.00	
1	1	X	(None)	None	10.0	201.2	189.2	(None)	(None)	1.509	0.00	

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Engineer: DWG

MEMBER PROPERTIES

Sec/ Pnl	Type	Description	Steel Grade	Conn. Type	Bolt #-Size (in)	Bolt Grade	End Dist. (in)	Edge Dist. (in)	Gusset Thick. (in)	Gusset Grade	Bolt Space (in)
8/2	Leg	PIPE 2.375x0.154	A572	gr.50Tension	4-0.625	A325X					
8/2	Diag	L1.50x1.50x0.13	A36	Bolted	1-0.500	A325X	0.750	0.750	0.188	A36	0.000
8/2	Horiz	L1.50x1.50x0.13	A36	Bolted	1-0.500	A325X	0.750	0.750	0.188	A36	0.000
8/1	Leg	PIPE 2.375x0.154	A572	gr.50Tension	4-0.625	A325X					
8/1	Diag	L1.50x1.50x0.13	A36	Bolted	1-0.500	A325X	0.750	0.750	0.188	A36	0.000
7/5	Leg	PIPE 2.375x0.154	A572	gr.50Tension	4-0.625	A325X					
7/5	Diag	L1 1/2x1 1/2x1/8	A36	Bolted	1-0.500	A325N	0.750	0.690	0.188	A36	1.500
7/4	Leg	PIPE 2.375x0.154	A572	gr.50Tension	4-0.625	A325X					
7/4	Diag	L1 1/2x1 1/2x1/8	A36	Bolted	1-0.500	A325N	0.750	0.690	0.188	A36	1.500
7/3	Leg	PIPE 2.375x0.154	A572	gr.50Tension	4-0.625	A325X					
7/3	Diag	L1 1/2x1 1/2x1/8	A36	Bolted	1-0.500	A325N	0.750	0.690	0.188	A36	1.500
7/2	Leg	PIPE 2.375x0.154	A572	gr.50Tension	4-0.625	A325X					
7/2	Diag	L1 1/2x1 1/2x1/8	A36	Bolted	1-0.500	A325N	0.750	0.690	0.188	A36	1.500
7/1	Leg	PIPE 2.375x0.154	A572	gr.50Tension	4-0.625	A325X					
7/1	Diag	L1 1/2x1 1/2x1/8	A36	Bolted	1-0.500	A325N	0.750	0.690	0.188	A36	1.500
6/5	Leg	PIPE 2.375x0.218	A572	gr.50Tension	4-0.625	A325X					
6/5	Diag	L1 1/2x1 1/2x1/8	A36	Bolted	1-0.500	A325N	0.750	0.690	0.188	A36	1.500
6/4	Leg	PIPE 2.375x0.218	A572	gr.50Tension	4-0.625	A325X					
6/4	Diag	L1 1/2x1 1/2x1/8	A36	Bolted	1-0.500	A325N	0.750	0.690	0.188	A36	1.500
6/3	Leg	PIPE 2.375x0.218	A572	gr.50Tension	4-0.625	A325X					
6/3	Diag	L1 1/2x1 1/2x1/8	A36	Bolted	1-0.500	A325N	0.750	0.690	0.188	A36	1.500
6/2	Leg	PIPE 2.375x0.218	A572	gr.50Tension	4-0.625	A325X					
6/2	Diag	L1 1/2x1 1/2x1/8	A36	Bolted	1-0.500	A325N	0.750	0.690	0.188	A36	1.500
6/1	Leg	PIPE 2.375x0.218	A572	gr.50Tension	4-0.625	A325X					
6/1	Diag	L1 1/2x1 1/2x1/8	A36	Bolted	1-0.500	A325N	0.750	0.690	0.188	A36	1.500
5/4	Leg	PIPE 2.875x0.276	A572	gr.50Tension	4-0.750	A325X					
5/4	Diag	L1 3/4x1 3/4x1/8	A36	Bolted	1-0.500	A325N	0.750	0.940	0.188	A36	1.500
5/3	Leg	PIPE 2.875x0.276	A572	gr.50Tension	4-0.750	A325X					
5/3	Diag	L1 3/4x1 3/4x1/8	A36	Bolted	1-0.500	A325N	0.750	0.940	0.188	A36	1.500
5/2	Leg	PIPE 2.875x0.276	A572	gr.50Tension	4-0.750	A325X					
5/2	Diag	L1 3/4x1 3/4x1/8	A36	Bolted	1-0.500	A325N	0.750	0.940	0.188	A36	1.500
5/1	Leg	PIPE 2.875x0.276	A572	gr.50Tension	4-0.750	A325X					
5/1	Diag	L1 3/4x1 3/4x1/8	A36	Bolted	1-0.500	A325N	0.750	0.940	0.188	A36	1.500
4/3	Leg	PIPE 3.500x0.300	A572	gr.50Tension	4-0.875	A325X					
4/3	Diag	L2x2x3/16	A36	Bolted	1-0.500	A325N	0.750	1.000	0.188	A36	1.500
4/2	Leg	PIPE 3.500x0.300	A572	gr.50Tension	4-0.875	A325X					
4/2	Diag	L2x2x3/16	A36	Bolted	1-0.500	A325N	0.750	1.000	0.188	A36	1.500
4/1	Leg	PIPE 3.500x0.300	A572	gr.50Tension	4-0.875	A325X					
4/1	Diag	L2x2x3/16	A36	Bolted	1-0.500	A325N	0.750	1.000	0.188	A36	1.500
3/3	Leg	PIPE 4x0.318	A572	gr.50Tension	4-0.875	A325X					
3/3	Diag	L2 1/2x2 1/2x3/16	A36	Bolted	1-0.500	A325N	0.750	1.438	0.188	A36	1.500
3/2	Leg	PIPE 4x0.318	A572	gr.50Tension	4-0.875	A325X					
3/2	Diag	L2 1/2x2 1/2x3/16	A36	Bolted	1-0.500	A325N	0.750	1.438	0.188	A36	1.500
3/1	Leg	PIPE 4x0.318	A572	gr.50Tension	4-0.875	A325X					
3/1	Diag	L2 1/2x2 1/2x3/16	A36	Bolted	1-0.500	A325N	0.750	1.438	0.188	A36	1.500
2/3	Leg	PIPE 4.500x0.337	A572	gr.50Tension	4-1.000	A325X					
2/3	Diag	L2 1/2x2 1/2x3/16	A36	Bolted	1-0.500	A325N	0.750	1.438	0.188	A36	1.500
2/2	Leg	PIPE 4.500x0.337	A572	gr.50Tension	4-1.000	A325X					
2/2	Diag	L2 1/2x2 1/2x3/16	A36	Bolted	1-0.500	A325N	0.750	1.438	0.188	A36	1.500
2/1	Leg	PIPE 4.500x0.337	A572	gr.50Tension	4-1.000	A325X					
2/1	Diag	L2 1/2x2 1/2x3/16	A36	Bolted	1-0.500	A325N	0.750	1.438	0.188	A36	1.500
1/2	Leg	PIPE 5.563x0.375	A572	gr.50Tension	4-1.000	A325X					
1/2	Diag	L3x3x3/16	A36	Bolted	1-0.625	A325N	0.938	1.938	0.250	A36	1.875
1/1	Leg	PIPE 5.563x0.375	A572	gr.50Tension	4-1.000	A325X					
1/1	Diag	L3x3x3/16	A36	Bolted	1-0.625	A325N	0.938	1.938	0.250	A36	1.875



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Section C: ANTENNA DATA

Structure Azimuth from North: 0

ANTENNAS

Ant No.	Elev. (ft)	Antenna (#) Type	Ant. Azim.	Mount. Radius (ft)	Mount Type	Mount Azim.	Tx Line (#)Type	Mounting Pipe Size (in)	Mounting Pipe Length (ft) Full Shielded	Ka
1	148.00	(1) SD2ft TIA w/o radome		222	2.90			240		1.00
		Vert. Offset	0.00 (ft)							
2	136.00	(1) SD2ft TIA w/o radome		2	2.67			0		1.00
		Vert. Offset	0.00 (ft)							
3	106.00	(1) PL6 w/o radome		0	3.60			0		1.00
		Vert. Offset	0.00 (ft)							
4	104.00	(1) HP2		43	3.78			0		1.00
		Vert. Offset	0.00 (ft)							
5	102.00	(1) HP2		2	3.86			0		1.00
		Vert. Offset	0.00 (ft)							

ANTENNA AND MOUNT WIND AREAS AND WEIGHTS

Ant No.	Antenna/Mount	Frontal Bare Area (ft)^2	Lateral Bare Area (ft)^2	Frontal Iced Area (ft)^2	Lateral Iced Area (ft)^2	Weight Bare (lbs)	Weight Iced (lbs)	Frequency GHz	Allowable Signal Loss dB	Gh	Mount Ka
1	SD2ft TIA w/o radome	4.87	0.13	4.87	0.13	16.00	171.46	6.00	10	0.85	
2	SD2ft TIA w/o radome	4.87	0.13	4.87	0.13	16.00	170.25	6.00	10	0.85	
3	PL6 w/o radome	49.34	1.34	49.34	1.34	160.93	692.92	6.00	10	0.85	
4	HP2	4.86	0.34	4.86	0.34	40.78	212.57	11.00	10	0.85	
5	HP2	4.86	0.34	4.86	0.34	40.78	212.23	11.00	10	0.85	



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Section D: TRANSMISSION LINE DATA

Transmission Lines Position

No.	Bot El (ft)	Top El (ft)	Desc.	Radius (ft)	Az.	Orient.	No.	No. of Rows	Vert.	Antenna	User Ka
1	0.00	150.00	3/8 CABLE	10.00	300.00	300.00	1	1	No		
2	0.00	150.00	Std Ladder	4.84	300.00	300.00	1	1	No		
3	0.00	150.00	TX Ladder	4.84	60.00	60.00	1	1	No		
4	0.00	150.00	LDF5P-50A	7.53	60.00	10.00	2	1	No		
5	0.00	148.00	LDF2-50	6.82	60.00	15.00	1	1	No		
6	0.00	142.00	LDF4P-50A	5.88	60.00	25.00	3	1	No		
7	0.00	136.00	LDF4P-50A	5.32	60.00	35.00	3	1	No		
8	0.00	136.00	LDF2-50	5.13	60.00	40.00	1	1	No		
9	0.00	128.00	LDF4P-50A	4.99	60.00	45.00	3	1	No		
10	0.00	122.00	LDF4P-50A	4.84	60.00	55.00	3	1	No		
11	0.00	116.00	LDF4P-50A	4.84	60.00	65.00	3	1	No		
12	0.00	110.00	LDF5P-50A	4.99	60.00	75.00	1	1	No		
13	0.00	106.00	LDF5P-50A	5.13	60.00	80.00	1	1	No		
14	0.00	104.00	LDF2-50	5.32	60.00	85.00	1	1	No		
15	0.00	102.00	LDF2-50	5.57	60.00	90.00	1	1	No		
16	0.00	60.00	LDF2-50	6.32	60.00	100.00	2	1	No		

Transmission Lines Details

No.	Desc.	Width (in)	Depth (in)	Unit Mass (lb/ft)	Line Spacing (in)	Row Spacing (in)
1	3/8 CABLE	0.38	0.38	1.00	2.750	2.750
2	Std Ladder	2.98	1.25	3.75	2.750	2.750
3	TX Ladder	4.70	1.50	4.00	2.750	2.750
4	LDF5P-50A	1.10	1.10	0.33	2.250	2.250
5	LDF2-50	0.43	0.43	0.08	2.750	2.750
6	LDF4P-50A	0.63	0.63	0.15	2.250	2.250
7	LDF4P-50A	0.63	0.63	0.15	2.250	2.250
8	LDF2-50	0.43	0.43	0.08	2.750	2.750
9	LDF4P-50A	0.63	0.63	0.15	2.250	2.250
10	LDF4P-50A	0.63	0.63	0.15	2.250	2.250
11	LDF4P-50A	0.63	0.63	0.15	2.250	2.250
12	LDF5P-50A	1.10	1.10	0.33	2.750	2.750
13	LDF5P-50A	1.10	1.10	0.33	2.750	2.750
14	LDF2-50	0.43	0.43	0.08	2.750	2.750
15	LDF2-50	0.43	0.43	0.08	2.750	2.750
16	LDF2-50	0.43	0.43	0.08	2.250	2.250



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Section F: POINT LOAD DATA

Structure Azimuth from North:0.00

POINT LOADS

No.	Description	Elev. (ft)	Radius (ft)	Azim. (Deg)	Orient. (Deg)	Vertical Offset (ft)	Tx Line	Comments
1	IROD	150.00	1.00	0.0	0.0	0.00		
2	2-DB222 ON A 2-3 FT SA	150.00	2.72	0.0	0.0	0.00		
3	(3)ANT734-960F2 ON (3)	142.00	2.50	0.0	0.0	0.00		
4	(3)ANT734-960F2 ON (3)	136.00	2.50	0.0	0.0	0.00		
5	(3)ANT734-960F2 ON (3)	128.00	2.50	0.0	0.0	0.00		
6	(3)ANT734-960F2 ON (3)	122.00	2.50	0.0	0.0	0.00		
7	(3)ANT734-960F2 ON (3)	116.00	2.50	0.0	0.0	0.00		
8	3 SQFT YAGI LEG MOUNTED	110.00	3.54	0.0	0.0	0.00		
9	ULTRANTENNA60 LEG MTD	60.00	6.00	0.0	0.0	0.00		
10	GPS LEG MTD.	60.00	6.00	120.0	120.0	0.00		

POINT LOADS WIND AREAS AND WEIGHTS

No.	Description	Frontal Bare Area (ft^2)	Lateral Bare Area (ft^2)	Frontal Iced Area (ft^2)	Lateral Iced Area (ft^2)	Weight Bare (Kips)	Weight Iced (Kips)	Gh
1	IROD	1.00	1.00	2.00	2.00	0.10	0.20	0.85
2	2-DB222 ON A 2-3 FT SA	13.00	13.00	36.00	36.00	0.25	1.40	0.85
3	(3)ANT734-960F2 ON (3)	12.00	12.00	29.50	29.50	0.33	1.53	0.85
4	(3)ANT734-960F2 ON (3)	12.00	12.00	29.50	29.50	0.33	1.53	0.85
5	(3)ANT734-960F2 ON (3)	12.00	12.00	29.50	29.50	0.33	1.53	0.85
6	(3)ANT734-960F2 ON (3)	12.00	12.00	29.50	29.50	0.33	1.53	0.85
7	(3)ANT734-960F2 ON (3)	12.00	12.00	29.50	29.50	0.33	1.53	0.85
8	3 SQFT YAGI LEG MOUNTED	3.00	6.00	9.00	9.00	0.05	0.15	0.85
9	ULTRANTENNA60 LEG MTD	5.00	5.00	15.00	15.00	0.10	0.30	0.85
10	GPS LEG MTD.	2.00	2.00	4.00	4.00	0.10	0.20	0.85



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 Engineer: DWG

Section G: WIND LOAD DATA

Load Combination Wind Only

Wind Direction 0.00 (deg)

Wind Pressure

Section	Panel	Bot Elev (ft)	Top Elev (ft)	Kz	Kzt	Wind Pressure (psf)	Ice Thickness (tiz) (in)
8	2	145.00	150.00	1.37	1.00	35.09	0.000
	1	140.00	145.00	1.36	1.00	34.83	0.000
7	5	136.00	140.00	1.35	1.00	34.60	0.000
	4	132.00	136.00	1.35	1.00	34.38	0.000
	3	128.00	132.00	1.34	1.00	34.16	0.000
	2	124.00	128.00	1.33	1.00	33.94	0.000
	1	120.00	124.00	1.32	1.00	33.71	0.000
6	5	116.00	120.00	1.31	1.00	33.48	0.000
	4	112.00	116.00	1.30	1.00	33.23	0.000
	3	108.00	112.00	1.29	1.00	32.98	0.000
	2	104.00	108.00	1.28	1.00	32.73	0.000
	1	100.00	104.00	1.27	1.00	32.46	0.000
5	4	95.00	100.00	1.26	1.00	32.16	0.000
	3	90.00	95.00	1.25	1.00	31.80	0.000
	2	85.00	90.00	1.23	1.00	31.43	0.000
	1	80.00	85.00	1.22	1.00	31.05	0.000
4	3	73.33	80.00	1.20	1.00	30.57	0.000
	2	66.67	73.33	1.17	1.00	29.99	0.000
	1	60.00	66.67	1.15	1.00	29.36	0.000
3	3	53.33	60.00	1.12	1.00	28.69	0.000
	2	46.67	53.33	1.09	1.00	27.94	0.000
	1	40.00	46.67	1.06	1.00	27.11	0.000
2	3	33.33	40.00	1.02	1.00	26.17	0.000
	2	26.67	33.33	0.98	1.00	25.09	0.000
	1	20.00	26.67	0.93	1.00	23.80	0.000
1	2	10.00	20.00	0.85	1.00	21.71	0.000
	1	0.00	10.00	0.85	1.00	21.71	0.000

Calculated Effective Wind Areas

Sec.	Pan.	Flat Area (ft^2)	App. Flat Area (ft^2)	Round Area (ft^2)	App. Round Area (ft^2)	Solid. Ratio	Flat Drag	Round Drag	Flat Dir	Round Dir	Eff. Area (ft^2)	
8	2	2.213	0.000	1.979	0.000	0.000	0.178	2.672	1.526	0.80	1.00	7.751
	1	1.648	0.000	1.979	0.000	0.000	0.154	2.758	1.566	0.80	1.00	6.737
7	5	2.080	0.000	1.583	0.000	0.000	0.194	2.616	1.500	0.80	1.00	6.728
	4	2.080	0.000	1.583	0.000	0.000	0.194	2.616	1.500	0.80	1.00	6.728
	3	2.080	0.000	1.583	0.000	0.000	0.194	2.616	1.500	0.80	1.00	6.728
	2	2.080	0.000	1.583	0.000	0.000	0.194	2.616	1.500	0.80	1.00	6.728
	1	2.080	0.000	1.583	0.000	0.000	0.194	2.616	1.500	0.80	1.00	6.728
6	5	2.119	0.000	1.586	0.000	0.000	0.188	2.636	1.509	0.80	1.00	6.863
	4	2.199	0.000	1.586	0.000	0.000	0.178	2.673	1.526	0.80	1.00	7.123
	3	2.282	0.000	1.586	0.000	0.000	0.168	2.705	1.541	0.80	1.00	7.381
	2	2.366	0.000	1.586	0.000	0.000	0.161	2.732	1.554	0.80	1.00	7.638
	1	2.452	0.000	1.586	0.000	0.000	0.154	2.757	1.566	0.80	1.00	7.892
5	4	3.177	0.000	2.400	0.000	0.000	0.158	2.742	1.559	0.80	1.00	10.710
	3	3.300	0.000	2.400	0.000	0.000	0.151	2.769	1.572	0.80	1.00	11.081
	2	3.424	0.000	2.400	0.000	0.000	0.144	2.793	1.583	0.80	1.00	11.451
	1	3.551	0.000	2.400	0.000	0.000	0.139	2.814	1.594	0.80	1.00	11.819
4	3	4.663	0.000	3.896	0.000	0.000	0.139	2.812	1.511	0.80	1.00	16.378
	2	4.849	0.000	3.896	0.000	0.000	0.132	2.838	1.527	0.80	1.00	16.956
	1	5.038	0.000	3.896	0.000	0.000	0.127	2.860	1.542	0.80	1.00	17.535
3	3	6.278	0.000	4.452	0.000	0.000	0.142	2.800	1.451	0.80	1.00	20.523



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	2	6.523	0.000	4.452	0.000	0.000	0.137	2.819	1.465	0.80	1.00	21.235
	1	6.772	0.000	4.452	0.000	0.000	0.133	2.836	1.480	0.80	1.00	21.953
2	3	7.017	0.000	5.009	0.000	0.000	0.135	2.829	1.417	0.80	1.00	22.981
	2	7.278	0.000	5.009	0.000	0.000	0.131	2.844	1.436	0.80	1.00	23.747
	1	7.541	0.000	5.009	0.000	0.000	0.127	2.857	1.457	0.80	1.00	24.532
1	2	10.498	0.000	9.287	0.000	0.000	0.126	2.863	1.346	0.80	1.00	36.539
	1	10.922	0.000	9.287	0.000	0.000	0.121	2.882	1.350	0.80	1.00	37.721

Calculated Effective UDL Wind Areas

Sec.	Pan.	Flat Area (ft^2)	Round Area (ft^2)	Flat Drag	Round Drag	Ka	Eff. Area (ft^2)
8	2	2.35	0.26	1.85	1.20	0.62	2.88
	1	2.35	0.65	1.85	1.20	0.61	3.16
7	5	1.88	0.90	1.85	1.20	0.61	2.80
	4	1.88	1.67	1.85	1.20	0.61	3.36
	3	1.88	1.67	1.85	1.20	0.61	3.36
	2	1.88	2.30	1.85	1.20	0.61	3.81
	1	1.88	2.62	1.85	1.20	0.61	4.04
6	5	1.88	2.93	1.85	1.20	0.61	4.26
	4	1.88	3.56	1.85	1.20	0.61	4.72
	3	1.88	3.75	1.85	1.20	0.61	4.85
	2	1.88	4.11	1.85	1.20	0.61	5.11
	1	1.88	4.51	1.85	1.20	0.61	5.40
5	4	2.35	5.73	1.85	1.20	0.61	6.82
	3	2.35	5.73	1.85	1.20	0.61	6.82
	2	2.35	5.73	1.85	1.20	0.61	6.82
	1	2.35	5.73	1.85	1.20	0.61	6.82
4	3	3.14	7.64	1.85	1.20	0.61	9.09
	2	3.14	7.64	1.85	1.20	0.61	9.09
	1	3.14	7.64	1.85	1.20	0.61	9.09
3	3	3.14	8.13	1.85	1.20	0.61	9.44
	2	3.14	8.13	1.85	1.20	0.61	9.44
	1	3.14	8.13	1.85	1.20	0.61	9.44
2	3	3.14	8.13	1.85	1.20	0.61	9.44
	2	3.14	8.13	1.85	1.20	0.61	9.44
	1	3.14	8.13	1.85	1.20	0.61	9.44
1	2	4.71	12.19	1.85	1.20	0.61	14.16
	1	4.71	12.19	1.85	1.20	0.61	14.16

App. Concentrated Loads

Ant.	Description	Qty	Mount	Desc.	Elev. (ft)	CaAc X-Dir E-W (ft^2)	CaAc Y-Dir N-S (ft^2)	XForce E-W (Kips)	YForce N-S (Kips)	ZForce (Kips)	M-x (kipsft)	M-y (kipsft)	M-z (kipsft)
1	SD2ft TIA	1			148	-0.11	-2.24	0.00	-0.08	-0.02	0.03	-0.05	0.22
2	SD2ft TIA	1			136	-0.23	-4.86	-0.01	-0.17	-0.02	-0.05	0.00	0.02
3	PL6	1			106	0.00	-49.34	0.00	-1.61	-0.19	-0.70	0.00	0.00
4	HP2	1			104	-2.17	-3.95	-0.07	-0.13	-0.05	-0.19	0.00	0.28
5	HP2	1			102	0.04	-1.12	0.00	-0.04	-0.05	-0.19	0.00	0.00
1	LROD				150	0.00	-1.00	0.00	-0.04	-0.12	-0.12	0.00	0.00
2	2-DB222 ON A 2-3 FT SA				150	0.00	-13.00	0.00	-0.46	-0.30	-0.82	0.00	0.00
3	(3)ANT734-960F2 ON (3)				142	0.00	-12.00	0.00	-0.42	-0.40	-0.99	0.00	0.00
4	(3)ANT734-960F2 ON (3)				136	0.00	-12.00	0.00	-0.41	-0.40	-0.99	0.00	0.00
5	(3)ANT734-960F2 ON (3)				128	0.00	-12.00	0.00	-0.41	-0.40	-0.99	0.00	0.00



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6	(3)ANT734-960F2 ON (3)	122	0.00	-12.00	0.00	-0.40	-0.40	-0.99	0.00	0.00
7	(3)ANT734-960F2 ON (3)	116	0.00	-12.00	0.00	-0.40	-0.40	-0.99	0.00	0.00
8	3 SQFT YAGI LEG MOUNTED	110	0.00	-3.00	0.00	-0.10	-0.06	-0.21	0.00	0.00
9	ULTRANTENNA60 LEG MTD	60	0.00	-5.00	0.00	-0.15	-0.12	-0.72	0.00	0.00
10	GPS LEG MTD.	60	0.00	-2.00	0.00	-0.06	-0.12	0.36	0.62	-0.30



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Section H: STRUCTURE DISPLACEMENT DATA

Load Combination Max Envelope

Wind Direction Maximum displacements

Node	Elev. (ft)	N-S Disp (in)	W-E Disp (in)	Vert. Disp (in)	N-S Rot (Deg)	W-E Rot (Deg)	Twist (Deg)
84	150.0	16.3	15.4	-0.2	1.08	1.01	0.48
81	145.0	15.1	14.3	-0.2	1.09	1.02	0.47
78	140.0	14.0	13.2	-0.2	1.05	0.99	0.44
75	136.0	13.1	12.4	-0.2	1.08	1.02	0.45
72	132.0	12.2	11.6	-0.2	1.01	0.96	0.40
69	128.0	11.4	10.7	-0.2	1.03	0.98	0.40
66	124.0	10.5	9.9	-0.2	0.93	0.89	0.34
63	120.0	9.7	9.2	-0.2	0.93	0.88	0.34
60	116.0	8.9	8.5	-0.2	0.84	0.79	0.28
57	112.0	8.2	7.8	-0.2	0.84	0.79	0.28
54	108.0	7.5	7.1	-0.2	0.75	0.71	0.23
51	104.0	6.9	6.5	-0.2	0.74	0.70	0.22
48	100.0	6.3	5.9	-0.2	0.65	0.61	0.17
45	95.0	5.6	5.3	-0.2	0.64	0.60	0.16
42	90.0	4.9	4.7	-0.2	0.56	0.53	0.12
39	85.0	4.3	4.1	-0.1	0.54	0.51	0.11
36	80.0	3.8	3.6	-0.1	0.46	0.43	0.08
33	73.3	3.1	3.0	-0.1	0.43	0.40	0.07
30	66.7	2.5	2.4	-0.1	0.36	0.34	0.05
27	60.0	2.0	1.9	-0.1	0.32	0.30	0.05
24	53.3	1.6	1.5	-0.1	0.27	0.25	0.04
21	46.7	1.2	1.2	-0.1	0.24	0.22	0.03
18	40.0	0.9	0.8	-0.1	0.19	0.18	0.02
15	33.3	0.6	0.6	-0.1	0.16	0.15	0.02
12	26.7	0.4	0.4	0.0	0.12	0.11	0.01
9	20.0	0.2	0.2	0.0	0.08	0.08	0.01
6	10.0	0.1	0.1	0.0	0.03	0.03	0.01
3	0.0	0.0	0.0	0.0	0.00	0.00	0.00



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Section J: ANTENNA DISPLACEMENT DATA

Load Combination Max Envelope ✓

Wind Direction Maximum displacements

Ant.	Elev. (ft)	N-S Disp (in)	W-E Disp (in)	Vert.Disp (in)	N-S Rot (Deg)	W-E Rot (Deg)	Twist Tot (Deg)
1	148.00	15.8	14.9	-0.2	1.08	1.02	0.47
2	136.00	13.1	12.4	-0.2	1.08	1.02	0.45
3	106.00	7.2	6.8	-0.2	0.74	0.70	0.22
4	104.00	6.9	6.5	-0.2	0.74	0.70	0.22
5	102.00	6.6	6.2	-0.2	0.70	0.66	0.19

Load Combination Wind Only - Serviceability

Wind Direction Maximum displacements ✓

Ant.	Elev. (ft)	N-S Disp (in)	W-E Disp (in)	Vert.Disp (in)	N-S Rot (Deg)	W-E Rot (Deg)	Twist Tot (Deg)	Allow. (Deg)
1	148.00	4.3	3.9	0.0	0.30	0.26	0.12	4.43
2	136.00	3.5	3.2	0.0	0.30	0.27	0.12	4.43 ✓
3	106.00	1.9	1.8	0.0	0.20	0.18	0.06	1.48
4	104.00	1.8	1.7	0.0	0.20	0.18	0.06	2.42 ✓
5	102.00	1.8	1.6	0.0	0.19	0.17	0.05	2.42 ✓



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Section L: STRENGTH ASSESSMENT SORTED DATA

Sec	Pnl	Elev.	MType	Desc.	Len	kl/r	Gov. comp. cap.	Gov. tens. cap.	Max Compr.	Max Tens.	Asses. Ratio
		(ft)			(ft)		(Kips)	(Kips)	(Kips)	(Kips)	
8	2	145.00	Leg	PIPE 2.375x0.154	5.00	76.2	31.8	48.7	1.9	0.2	0.06
8	1	140.00	Leg	PIPE 2.375x0.154	5.00	76.2	31.8	48.7	3.8	2.0	0.12
7	5	136.00	Leg	PIPE 2.375x0.154	4.00	54.9	39.0	48.7	5.0	3.5	0.13
7	4	132.00	Leg	PIPE 2.375x0.154	4.00	61.2	37.0	48.7	8.2	6.3	0.22
7	3	128.00	Leg	PIPE 2.375x0.154	4.00	61.2	37.0	48.7	10.8	9.2	0.29
7	2	124.00	Leg	PIPE 2.375x0.154	4.00	61.2	37.0	48.7	15.3	13.1	0.41
7	1	120.00	Leg	PIPE 2.375x0.154	4.00	51.7	40.0	48.7	19.8	17.4	0.49
6	5	116.00	Leg	PIPE 2.375x0.218	4.01	56.4	52.8	66.7	24.0	21.3	0.45
6	4	112.00	Leg	PIPE 2.375x0.218	4.01	62.9	49.9	66.7	28.1	24.8	0.56
6	3	108.00	Leg	PIPE 2.375x0.218	4.01	62.9	49.9	66.7	31.3	28.0	0.63
6	2	104.00	Leg	PIPE 2.375x0.218	4.01	62.9	49.9	66.7	35.2	31.5	0.71
6	1	100.00	Leg	PIPE 2.375x0.218	4.01	53.1	54.2	66.7	39.1	35.1	0.72
5	4	95.00	Leg	PIPE 2.875x0.276	5.01	59.8	78.0	101.4	44.0	39.3	0.56
5	3	90.00	Leg	PIPE 2.875x0.276	5.01	65.2	74.3	101.4	49.1	43.6	0.66
5	2	85.00	Leg	PIPE 2.875x0.276	5.01	65.2	74.3	101.4	54.4	48.1	0.73
5	1	80.00	Leg	PIPE 2.875x0.276	5.01	57.1	79.8	101.4	59.2	52.1	0.74
4	3	73.33	Leg	PIPE 3.500x0.300	6.68	66.1	98.8	136.0	65.1	57.0	0.66
4	2	66.67	Leg	PIPE 3.500x0.300	6.68	70.5	94.6	136.0	71.3	62.1	0.75
4	1	60.00	Leg	PIPE 3.500x0.300	6.68	63.9	100.9	136.0	77.7	67.4	0.77
3	3	53.33	Leg	PIPE 4x0.318	6.68	57.5	130.1	165.7	83.8	72.5	0.64
3	2	46.67	Leg	PIPE 4x0.318	6.68	61.3	125.9	165.7	90.3	77.8	0.72
3	1	40.00	Leg	PIPE 4x0.318	6.68	55.6	132.2	165.7	96.4	82.8	0.73
2	3	33.33	Leg	PIPE 4.500x0.337	6.68	50.9	164.3	198.6	102.7	87.9	0.63
2	2	26.67	Leg	PIPE 4.500x0.337	6.68	54.3	160.1	198.6	108.8	92.8	0.68
2	1	20.00	Leg	PIPE 4.500x0.337	6.68	49.2	166.4	198.6	114.9	97.8	0.69
1	2	10.00	Leg	PIPE 5.563x0.375	10.02	62.8	206.2	220.2	122.6	103.9	0.59
1	1	0.00	Leg	PIPE 5.563x0.375	10.02	61.4	208.8	220.2	131.9	111.3	0.63
8	2	145.00	Diag	L1.50x1.50x0.13	6.74	119.8	5.5	3.7	0.8	0.8	0.22
8	1	140.00	Diag	L1.50x1.50x0.13	6.74	119.8	5.5	3.7	1.1	1.0	0.28
7	5	136.00	Diag	L1 1/2x1 1/2x1/8	6.04	110.4	6.1	3.4	1.4	1.4	0.40
7	4	132.00	Diag	L1 1/2x1 1/2x1/8	6.04	110.4	6.1	3.4	1.8	1.8	0.54
7	3	128.00	Diag	L1 1/2x1 1/2x1/8	6.04	110.4	6.1	3.4	2.1	2.0	0.58
7	2	124.00	Diag	L1 1/2x1 1/2x1/8	6.04	110.4	6.1	3.4	2.3	2.4	0.71
7	1	120.00	Diag	L1 1/2x1 1/2x1/8	6.04	110.4	6.1	3.4	2.8	2.7	0.80
6	5	116.00	Diag	L1 1/2x1 1/2x1/8	6.19	116.5	5.7	3.4	2.4	2.2	0.65
6	4	112.00	Diag	L1 1/2x1 1/2x1/8	6.51	122.0	5.3	3.4	2.3	2.5	0.72
6	3	108.00	Diag	L1 1/2x1 1/2x1/8	6.84	128.8	4.9	3.4	2.5	2.4	0.69
6	2	104.00	Diag	L1 1/2x1 1/2x1/8	7.17	135.7	4.4	3.4	2.6	2.9	0.84
6	1	100.00	Diag	L1 1/2x1 1/2x1/8	7.51	142.8	4.0	3.4	3.3	3.0	0.89
5	4	95.00	Diag	L1 3/4x1 3/4x1/8	8.45	138.0	5.0	4.1	3.3	3.4	0.81
5	3	90.00	Diag	L1 3/4x1 3/4x1/8	8.87	145.3	4.5	4.1	3.4	3.1	0.75
5	2	85.00	Diag	L1 3/4x1 3/4x1/8	9.30	152.8	4.1	4.1	3.2	3.2	0.78
5	1	80.00	Diag	L1 3/4x1 3/4x1/8	9.73	160.4	3.7	4.1	3.3	3.1	<u>0.89</u>
4	3	73.33	Diag	L2x2x3/16	11.15	165.6	5.8	6.2	3.4	3.5	0.59
4	2	66.67	Diag	L2x2x3/16	11.71	174.3	5.3	6.2	3.6	3.3	0.67
4	1	60.00	Diag	L2x2x3/16	12.27	183.2	4.8	6.2	3.5	3.5	0.72
3	3	53.33	Diag	L2 1/2x2 1/2x3/16	12.85	152.0	7.9	6.2	3.7	3.5	0.56
3	2	46.67	Diag	L2 1/2x2 1/2x3/16	13.43	159.4	7.9	6.2	3.7	3.7	0.59
3	1	40.00	Diag	L2 1/2x2 1/2x3/16	14.03	166.8	7.3	6.2	3.9	3.6	0.58
2	3	33.33	Diag	L2 1/2x2 1/2x3/16	14.64	173.8	6.7	6.2	3.8	3.7	0.60
2	2	26.67	Diag	L2 1/2x2 1/2x3/16	15.26	181.6	6.2	6.2	3.9	3.7	0.64
2	1	20.00	Diag	L2 1/2x2 1/2x3/16	15.89	189.4	5.7	6.2	3.9	3.9	0.69
1	2	10.00	Diag	L3x3x3/16	18.26	180.8	7.5	7.9	4.6	4.5	0.61
1	1	0.00	Diag	L3x3x3/16	19.10	189.5	6.9	7.9	4.7	4.6	0.69
8	2	145.00	Horiz	L1.50x1.50x0.13	4.52	162.7	3.1	3.7	0.1	0.2	0.05



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Engineer: DWG

Section N: LEG REACTION DATA

Load Combination	Max Envelope				
Wind Direction	Maximum				
	Force-Y Download (Kips)	Force-Y Uplift (Kips)	Shear-X (Kips)	Shear-Z (Kips)	Max Shear (Kips)
	136.41	114.82			14.14



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Section O: TOWER FOUNDATION DATA

Load Combination			Max Envelope				Total Moment
Wind Direction			Maximum				
Axial Load (Kips)	Shear Load-X (Kips)	Shear Load-Z (Kips)	Total Shear (Kips)	Moment-X (Kipsft)	Moment-Y (Kipsft)	Moment-Z (Kipsft)	
13.41	13.29	19.80	23.84	1556.94	-8.62	-1094.47	1903.13
17.88	13.29	19.80	23.84	1556.79	-8.62	-1092.41	1901.83

Customer: RANDOLPH COUNTY
 Project: 150 FT SSV TOWER DESIGN
 Site: RANDOLPH CO. COMM TOWER, NC
 Engr. File: 218077
 Build Code: ANSI/TIA-222-G-2005



Mat Foundation

ver.2.1.7

Design Parameters

Description	Load Case					Service
	1	2	3	4	5	
Total Moment, ft-kips	2,243.70	2,245.30	304.46			494.24
Total Shear, kips	28.10	28.10	3.80			6.27
Total Tower Wt, kips	21.10	15.80	80.60			14.90
Max. Uplift, kips	133.80	135.50	.00			26.44
Shear, kips	14.30	14.40	14.40			3.00
Max Download, kips	160.90	159.30	50.70			38.89
Shear	16.70	16.60	3.70			3.92
Soil L.F.	1.20	0.90	1.20			1.00
Concrete L.F.	1.20	0.90	1.20			1.00

Foundation	
Ht. AGL, ft	0.50
Depth, ft.	6.00
Tower	
Face Width, ft	16.77
Offset, in	30.00
Soil	
Blow Count	N/A
Inplace Unit Wt, pcf	110.00
Submerged Unit Wt, pcf	60.00
Friction Angle, ϕ , deg.	30.00
Cohesion, ksf	N/A
Uplift Angle, deg.	30.00
Water Depth, ft	None
Ult Bearing Capacity, ksf	6.00

Mat	
Thickness, ft	1.50
Width, ft	22.00
EA, in	12.00
Batter, in/ft	0.00

Pier	
Height, ft	5.00
Diameter, ft	3.00
No. Piers	3
Shape	Round

Anchor Bolts	
Diameter, in	1.0000
No.	4
Length, in	70.00
Bolt Circle, in	9.50
Projection, in	6.00

Pocket	
Diameter, in	N/A
Thickness, ft	N/A

Concrete	
28 Day Strength, ksi	4.50
Dry Unit Wt, pcf	150.00
Wet Unit Wt, pcf	88.00

Rebar Fy	
Vertical, ksi	60.00
Circular, ksi	60.00
Horizontal, ksi	60.00

Results

ALLOWABLE BEARING PRESSURE = 3,000 psf.

ϕM_N - Parallel Axis 3,377.52 ft-kips
 ϕM_N - Diagonal Axis 3,529.27 ft-kips
 Moment - Interaction Ratio 0.735
 ϕV_N - Lateral Load 87.75 kips
 Lateral Load - Interaction Ratio 0.320

Final Mat Dimension : 22.00 x 22.00 x 1.50 ft. thick w/ (3) 3.00 ft. Dia. Piers

Final Pocket Dimension : Pockets not required

Total Volume of Concrete : 30.8 yd³

Designed By: DWG
 Date: 23 May, 16 @ 11:25 AM

Checked By: HA
 Date: 5/23/16

Customer: RANDOLPH COUNTY
 Project: 150 FT SSV TOWER DESIGN
 Site: RANDOLPH CO. COMM TOWER
 Engr. File: 218077
 Build Code: ANSI/TIA-222-G-2005



Mat Foundation

ver.2.1.7

Design for OTM Capacity

Controlling Load Case: 2 [Wind w/Min. Dead Load]

Foundation Width = 22.00 ft

$M_U = 2,481.0$ ft-kips

	ϕM_N , ft-kips	x, ft	N	σ_{ur}
Parallel	3,377.5	3.588	0.163	6.00
Diagonal	3,529.3	8.885	0.286	6.00

$\phi M_N = 3,377.52$ ft-kips

IRatio = 0.735

$\phi V_N = 87.75$ kips

IRatio = 0.320

Mat Design

$\gamma_c = 120.00$ pcf

	x, ft	P_s , kips	N	σ_R , ksf	Moment, ft-kips			Shear, kips		
					Rt	Lt	M_U /ft	Rt	Lt	V_U /ft
Parallel	8.170	15.74	0.371	1.95	1,595.28	1,246.38	72.51	290.05	231.84	13.18
Diagonal	12.962	15.74	0.417	2.08	1,643.09	1,180.61	52.81	306.49	231.84	9.85
Use				2.08			72.51			13.18

2.78 \Leftarrow Ultimate soil bearing capacity required

0.463 \Leftarrow IRatio

Punching Shear

	Download			Uplift		
	Interior	Edge	Corner	Interior	Edge	Corner
b_o , ft	14.97	12.71	10.02	12.31	11.38	9.35
V_{su} , psi	82.86	105.61	143.55	82.26	95.31	126.13
ϕV_c , psi	228.08	228.08	228.08	228.08	228.08	228.08
IR	0.36	0.46	0.63	0.36	0.42	0.55

Critical Sections
 $a = 3.82$ ft.
 $b = 2.62$ ft.
 $c = 3.66$ ft.
 $g = 2.62$ ft.
 $g = (\text{min. of } a, b, \text{ or } c)$

Transfer of Pier Moment by Flexure

Download
 $M_{fc} = 50.1$ ft-kips
 $B_e = 6.4$ ft.
 $M_{fc} / B_e = 7.9$ ft-kips / ft

Uplift
 $M_{fc} = 43.2$ ft-kips
 $B_e = 6.0$ ft.
 $M_{fc} / B_e = 7.2$ ft-kips / ft

Mat Reinforcement

Min. Steel Area (Strength) = 1.090 in²/ft.
 Min Steel Area (Temperature) = .194 in²/ft.
 Height of compression block, x = 3.17 in.

One-Way Shear

$V_U = 13.18$ kips
 $\phi V_c = 17.79$ kips
 Min. Slab Thickness = 14.6 in.

40 - #7 Horizontal bars equally spaced @6.62 in., each way, top and bottom.
 (Total of 160)

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Mat Foundation

ver.2.1.7

Pier Design

Controlling Load Case: 1 [Wind w/Max. Dead Load]

C = 160.90 kips	Vc = 16.70 kips	Mc = 83.50 ft-kips
T = 133.80 kips	Vt = 14.30 kips	Mt = 71.50 ft-kips
Fy = 60.00 ksi	Fyt = 60.00 ksi	L.F. = 1.00
H = 36.00 in.	Ds = 27.00 in.	F'c = 4.50 ksi
U = 1.00	Irs = Round	

*** NOTE: Pier cross section is Round ***

SUMMARY OF ANALYSIS

Minimum area of steel required	= 5.089 in ²	(Rho _{min} = 0.0050)
Area of steel provided.	= 6.013 in ²	(Rho _{actual} = 0.0059)
Maximum steel area limit	= 81.430 in ²	(Rho _{max} = 0.0800)

(10) #7 Vertical Bars equally spaced w/ #4 Circular Ties @ 6" on center.

CIRCULAR TIE DATA

$V_u < 0.85 * V_c / 2$, shear reinforcement is not required

Use maximum tie spacing specified in ACI 318,
Section 7.10.5 for compression reinforcement.

DEVELOPMENT LENGTH MODIFIERS FOR BAR DEVELOPMENT

Modifier for tension development = 0.946

Modifier for compression development = 0.146

REQUIRED L_d = MODIFIER * BASIC L_d * ACI 318 MODIFIERS, (12 in. min.)

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