SAFEbuilt Wisconsin, LLC
W241 S4135 Pine Hollow Court
Waukesha, WI 53188

10/07/2021

Attention:
Village of Bayside, WI
Architecture Review Committee

PROJECT/SITE OWNER:	PROJECT SUMMARY:
William Greaves PROJECT ADDRESS: 8851 N Bayside Dr	New 55 foot at maximum height radio tower

I have reviewed the proposed new radio tower for compliance with the Village's ordinances and have determined the following for consideration

Sec. 125-89. - "A" residence district regulations.

(4) A side yard of not less than twenty feet shall be provided for on each side of every building.

(5) A rear yard of not less than 20 feet shall be provided for every building.

1. The placement of the radio tower complies with the required setbacks

Sec. 104-4 (h) 2 - Accessory structures.

Height restrictions. No radio or TV tower shall exceed a height of 20 feet above the roof line of the building on the property upon which the antenna is located or 60 feet above the ground measured at ground level, whichever is the minimum.

The information the applicant provided states that his roof line if 31 feet 7 inches feet above grade.

The height of the radio tower at its maximum height is 3 feet 5 inches over the allowable height above the roof line. This does not consider any variance in grade from the house to the tower site.

VILLAGE CODE REVIEW

Supporting documentation or testimony must be provide at the meeting to verify code compliance with the above observations in red.

Dave Hendrix
SAFEbuilt
Wisconsin Operations Manager

Project Proposal

Date September 28, 2021

Property Address 8851 N. Bayside Dr.

Zoning

- [x] Accessory Structures/Generators
- [ ] Additions/Remodel
- [ ] Bluff Management
- [ ] Commercial Signage
- [ ] Decks/Patios
- [ ] Fence
- [ ] Fire Pits
- [ ] Landscaping requiring Impervious Surface/Fill/Excavation Permit
- [ ] New Construction
- [ ] Play Structures
- [ ] Recreational Facilities/Courts
- [ ] Roofs
- [ ] Solar Panels/Skylights
- [ ] Swimming Pools
- [ ] Windows/Doors-change exceeds 25% of opening
- [ ] Other

Proposed project details (type of work, size, materials, etc.):

Please see submitted documents.

********** *For Office Use Only* **********

Yes	No	
☐	☐	Color photographs showing project location, elevations and surrounding views
☐	☐	Two (2) complete sets of building plans (including elevations and grading)
☐	☐	Survey
☐	☐	Samples or brochures showing materials, colors and designs
☐	☐	Application Fee
☐	☐	Parcel Number
☐	☐	ARC Agenda Date:
☐	☐	Building Permit
☐	☐	Fill Permit
☐	☐	Impervious Surface Permit
☐	☐	Plan Commission/Conditional Use Permit
☐	☐	Tax Key Number
☐	☐	Right-of-Way/Excavation Permit
☐	☐	Variance Required

1-262-346-4577
SAFEbuilt, Inc.

WI UNIFORM PERMIT APPLICATION

hartfordinspections@safebuilt.com
Inspections need to be called in by 4 pm for next business day inspections

PERMIT NO.

TAXKEY#

ISSUING MUNICIPALITY

☐ TOWN ☒ VILLAGE ☐ CITY
OF Bayside
COUNTY: Milwaukee

PROJECT LOCATION (Building Address): 8851 N. Bayside Dr.

PROJECT DESCRIPTION

☐ COMMERCIAL ☐ ONE & TWO FAMILY

Owner's Name: William Greaves & Kathleen Stokes	Mailing Address - Include City & Zip: 8851 N. Bayside Dr. Bayside 53217	Telephone - Include Area Code: 414.353.3046 414.352.2113
Construction Contractor (OC Lic No.): Jon Rodgers	Mailing Address - Include City & Zip: 621 Michigan Ave, Oostburg 53070	Telephone - Include Area Code: 920.912.1204
Dwelling Contractor Qualifier (DCQ Lic No.)	Dwelling Contractor Qualifier shall be an owner, CEO, COB, or employee of Dwelling Contractor	Telephone - Include Area Code
Plumbing Contractor (Lic No.) TOWER Mark Higgins	Mailing Address - Include City & Zip: 6620 W. Mitchell St, West Allis 53214	Telephone - Include Area Code: 414.774.1971
Electrical Contractor (Lic No.) Tom Rodgers	Mailing Address - Include City & Zip: 2004 Waverly Court, Sheboygan 53083	Telephone - Include Area Code: 920.458.4286
HVAC Contractor (Lic No.)	Mailing Address - Include City & Zip	Telephone - Include Area Code

PROJECT INFORMATION

Subdivision Name	Lot No.	Block No.

Zoning District	Lot Area Sq. Ft.	N.S.E.W. Setbacks	Front Ft.	Rear Ft.	Left Ft.	Right Ft.

1a. PROJECT
☐ New ☐ Addition ☐ Raze
☐ Alteration ☐ Repair ☐ Move
☐ Other

1b. GARAGE
☐ Attached ☐ Detached

2. AREA
Basement ____ Sq. Ft.
Living Area ____ Sq. Ft.
Garage ____ Sq. Ft.
Other ____ Sq. Ft.
TOTAL ____

3. TYPE
☐ Single Family
☐ Two Family
☐ Multi
☐ Commercial

4. CONST. TYPE
☐ Site Constructed
☐ Mfd. UDC
☐ Mfd. HUD

5. ELECTRICAL
Entrance Panel
Size: ____ amp
Service: ___ New ___ Rewire
___ Phase ___ Volts
___ Underground
___ Overhead
Power Company:

6. STORIES
☐ 1-Story
☐ 2-Story
☐ Other

7. FOUNDATION
☐ Concrete
☐ Masonry
☐ Treated Wood
☐ ICF
☐ Other

8. USE
☐ Seasonal
☐ Permanent
☐ Other

9. HVAC EQUIPMENT
☐ Forced Air Furnace
☐ Radiant Baseboard or Panel
☐ Heat Pump
☐ Boiler
☐ Central Air Conditioning
☐ Other

10. PLUMBING
Sewer
☐ Municipal
☐ Septic No.

11. WATER
☐ Municipal Utility
☐ Private On-Site Well

12. ENERGY SOURCE

Fuel	Nat. Gas	L.P.	Oil	Elec.*	Solid	Solar
Space Htg	☐	☐	☐	☐	☐	☐
Water Htg	☐	☐	☐	☐	☐	☐

*☐ Dwelling unit will have 3 kilowatt or more installed electric space heater equipment capacity.

13. HEAT LOSS (Calculated)
Total ____ BTU/HR

14. ESTIMATED COST
$

I understand that I: am subject to all applicable codes, laws, statutes and ordinances, including those described on the Notice to Permit Applicants form; am subject to any conditions of this permit; understand that the issuance of this permit creates no legal liability, express or implied, on the state or municipality; and certify that all the above information is accurate. If one acre or more of soil will be disturbed, I understand that this project is subject to ch. NR 151 regarding additional erosion control and stormwater management and the owner shall sign the statement on the Notice to Permit Applicants form. I expressly grant the building inspector, or the inspector's authorized agent, permission to enter the premises for which this permit is sought at all reasonable hours and for any proper purpose to inspect the work which is being done.

☒ I vouch that I am or will be an owner-occupant of this dwelling for which I am applying for an erosion control or construction permit without a Dwelling Contractor Certification and have read the cautionary statement regarding contractor responsibility on the Notice to Permit Applicants form.

APPLICANT (PRINT): William Greaves ____ ____
SAFEbuilt, Inc.

INSPECTIONS NEEDED Building ☐ Footing ☐ Foundation ☐ Rough ☐ Insulation ☐ Bsmt. Fl. ☐ Final
Electric ☐ Rough ☐ Service ☐ Final Plumbing ☐ Rough ☐ Underfloor ☐ Final HVAC ☐ Rough ☐ Final

FEES:		PERMIT(S) ISSUED	SEAL NO. ____	Municipality No. ___ - ___
Building Fee		Bldg. # At top of form	RECEIPT	PERMIT EXPIRATION:
Zoning Fee		Zoning #	CK #	Permit expires two years from date issued unless municipal ordinance is more restrictive.
WI Seal		Elec. #	Amount $	
Electric Fee		Plmb. #	Date	
Plumbing Fee		HVAC #	From	
HVAC Fee			Rec By.	
Adm. Fee				
Other				
Total				

PERMIT ISSUED BY MUNICIPAL AGENT:
Name ____
Date ____
Certification No. ____

White - Municipal Files Yellow - Applicant Pink - Clerk/Assessor

Scope of Work

Only items listed are part of this permit. If work is done on items not listed on this permit they will be considered to have been completed without a permit and are subject to double fees.

Item	Cost (est.)
Remodel basement corner	6,500.-
Electrical work	2,500.-
Antenna tower + ground system	15,000.-

Total Cost #24,000.-

Signature William Goard Date Sept 28, 2021

Requested Changes at time of work

Must be submitted to the Village prior to or same day work is completed. Failure to return the same day will result in double permit fees.

Item	Cost

Total Cost

Signature Date

SCOPE of WORK

Location: 8851 N Bayside Dr, Bayside WI 53217

Summary: Basement amateur (ham) radio room and antenna tower

Enclosures: (1). Residential plat survey drawing with distances noted from antenna tower base to the house, north lot line, and west lot line. (2). Plat survey drawing at 100% enlargement with approximate locations of radial ground lines and transmission line to basement radio room.

Description: This project includes remodeling a basement corner and constructing an antenna tower base for use in amateur (ham) radio. A qualified electrician will be employed with the contractor. A tower service company will provide complete antenna tower installation.

The corner of the basement that will become the radio room contains the current power service main breaker panel and utility (power, telephone, fiberoptic line) entrances. A new branch circuit with two 120V/20A lines and one 240V/20A line will be added. Within the radio room, all equipment will be bonded together with a bonding bus. A single point ground plate will have lightning arrestors installed for all coaxial cabling, as well as connections to the equipment bus and the external power service ground.

The antenna base will be concrete with rebar and anchors per specifications of the tower manufacturer, e.g., US Tower model HDX-538 (5x5x7ft concrete base, 21ft 6 inches self-supporting triangular crank-up tower to a maximum of 38ft with electric crank-up and tilt-over features). The tower will be grounded, per manufacturer's specifications, and will have ground radials (6-9) of about 60ft each with 8-10 foot ground rods exothermically welded every 20 feet to heavy copper wire or strap. The tower will be bonded to the power service external ground rod which is near the coaxial cable transmission lines entrance into the basement radio room. The coaxial cabling will be suitable for below ground installation via direct bury or in a PVC conduit; control wiring for the tower winches and antenna, e.g., rotator, will be in electrical conduit to the tower. Coaxial cable lightning arrestors will be installed on an external entrance panel that will be grounded to the external power line ground rod.

This project is intended to produce a high level of safety, lightning protection, and radio frequency control for amateur radio.

William Greaves

K9GN, FCC Amateur Radio Extra Class Licensee

SSOCIATES, INC.

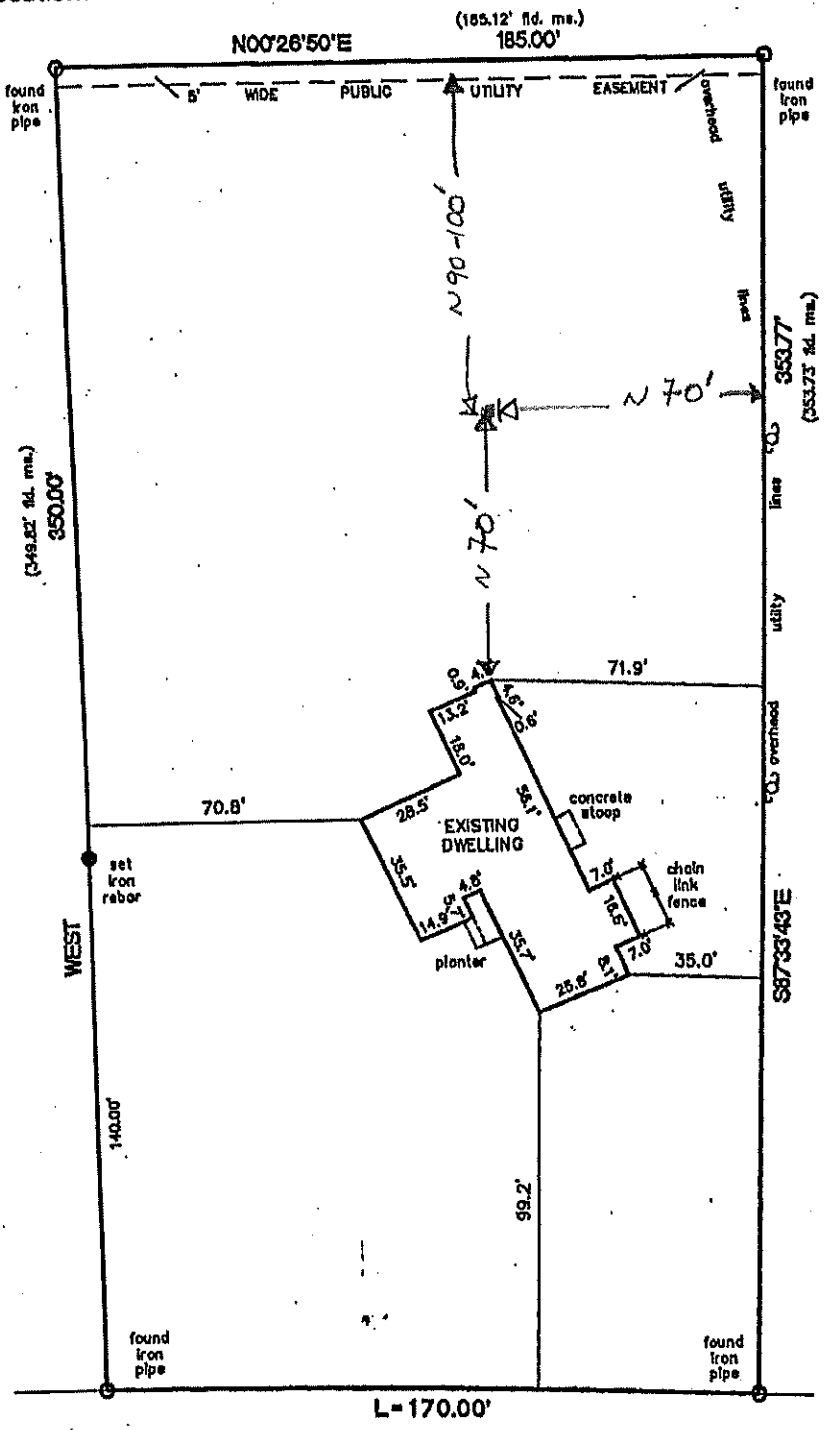
MEMBER WISCONSIN SOCIETY OF LAND SURVEYORS AND AMERICAN CONGRESS ON SURVEYING AND MAPPING

William J. Karpen RLS
Frederick W. Shibilski RLS

PLAT OF SURVEY

LOT 4, BLOCK 3, ALBERTA ACRES, being a Subdivision of a part of the Southeast 1/4 of Section 4, Town 8 North, Range 22 East, in the Village of Bayside, Milwaukee County, Wisconsin.

Survey location: 8851 N. Bayside Drive



VILLAGE OF BAYSIDE

APPROVED
VILLAGE OF BAYSIDE
BUILDING COMMITTEE
DATE

AREA OF PROPERTY = 62,340.8 SQ. FT.

SCALE : 1" = 50'

edge of pavement

N. BAYSIDE DR.

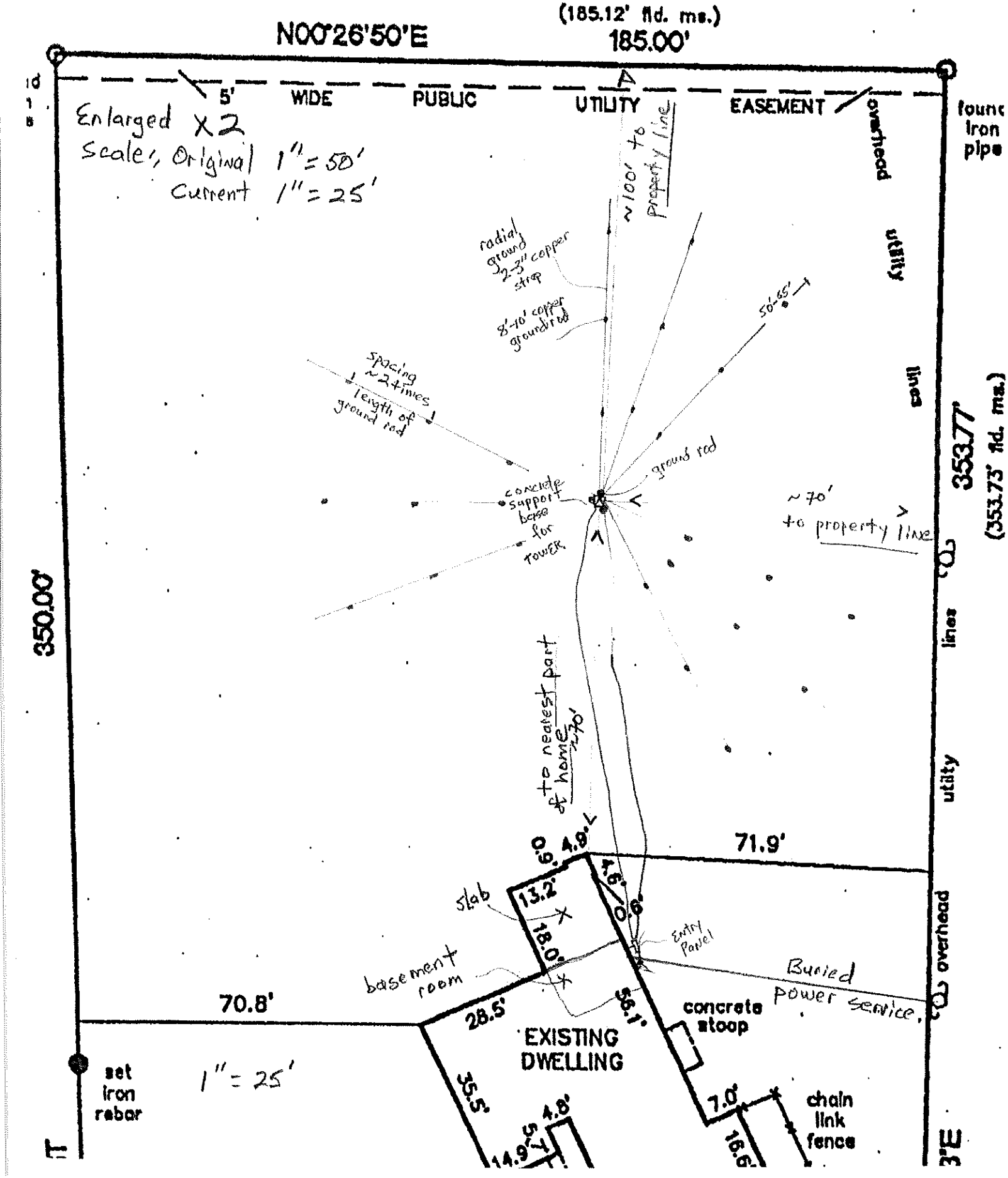
(60' WIDE)

KATHY STOKES

WISCONSIN
LAND SURVEYOR

...Village of Bayside, Milwaukee County, Wisc...

...tion: 8851 N. Bayside Drive



HDX-538 DESCRIPTION

US Tower's HDX Series heavy-duty crank-up towers have up to 2½ times more wind-loading capacity than others commonly advertised. This superior strength allows for large stacked arrays, while using our commercial type bases and anchor bolts that can be easily installed and vertically adjusted. All HDX Series T-bases are designed to use our TRX Series raising fixtures which make installations and antenna servicing a one-man job.

US Tower carries as accessories many different sizes and strengths of masts which can be used with the HDX Series towers. The HDX-572MDPL and 589MDPL motorized towers provide dual level wind, positive pull down and heavy-duty gear box features. The HDX-589MDPL comes complete with the MCL-100 limit switch package included. All towers using MDP-750 and MDPL-1000 motor drives may use the RMC-1000 accessory limit switch package which allows the raising and lowering of your tower from the comfort of your ham shack or any remote location. MCL-100 is also available (see accessory page).

US Tower's special T-base design allows the tower to hinge for easy installation. US Tower's crank towers require no guying. The HDX Series towers are rated at 90 mph winds per TIA/EIA specifications. To assist you in getting a construction permit, IBC 2006 calculations are available for most towers.

HDX-538 SPECIFICATIONS

- Extended Height: 38 FT
- Min. Height: 21′ 6″
- Transport Weight: 600 LBS
- Tower Sections: 2
- Sec. OD Top: 15″
- Sec OD Bottom: 18″

Structural Analysis Report

Structural Analysis: Self-Supporting Triangular Crank-Up Tower

Tower Model: HDX-538

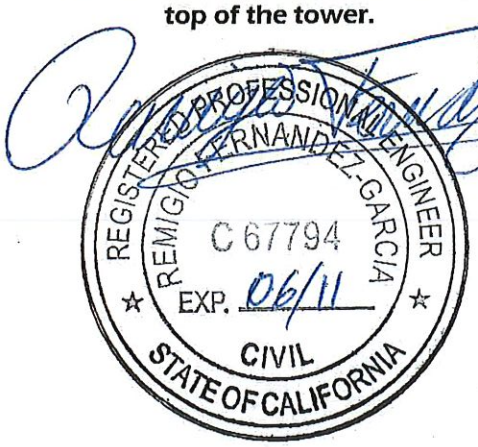
Design Code: IBC 2006 (TIA/EIA-222-F)

Basic Wind Velocity: 90 mph 3 second gust, 76 mph fastest mile

Ice: None

Max. Allowable Antenna Wind Load (lbs):	409	
Max. Allowable Antenna Weight (lbs):	250	
Max. Allowable Antenna Wind Area (sq. ft.):	26.6	(All Round Members)
Max. Allowable Antenna Wind Area (sq. ft.):	15.2	(All Flat Members)

Note: The maximum antenna values shown above include the antenna, rotator, and any other items placed at the top of the tower. For purposes of these calculations the antenna was placed 1 ft. above the top of the tower.



Date Prepared: 8/21/2009

Prepared By: Remigio Fernandez P.E.

1099 W. Ropes Ave - Woodlake, CA 93285 - Ph: 559-564-6000

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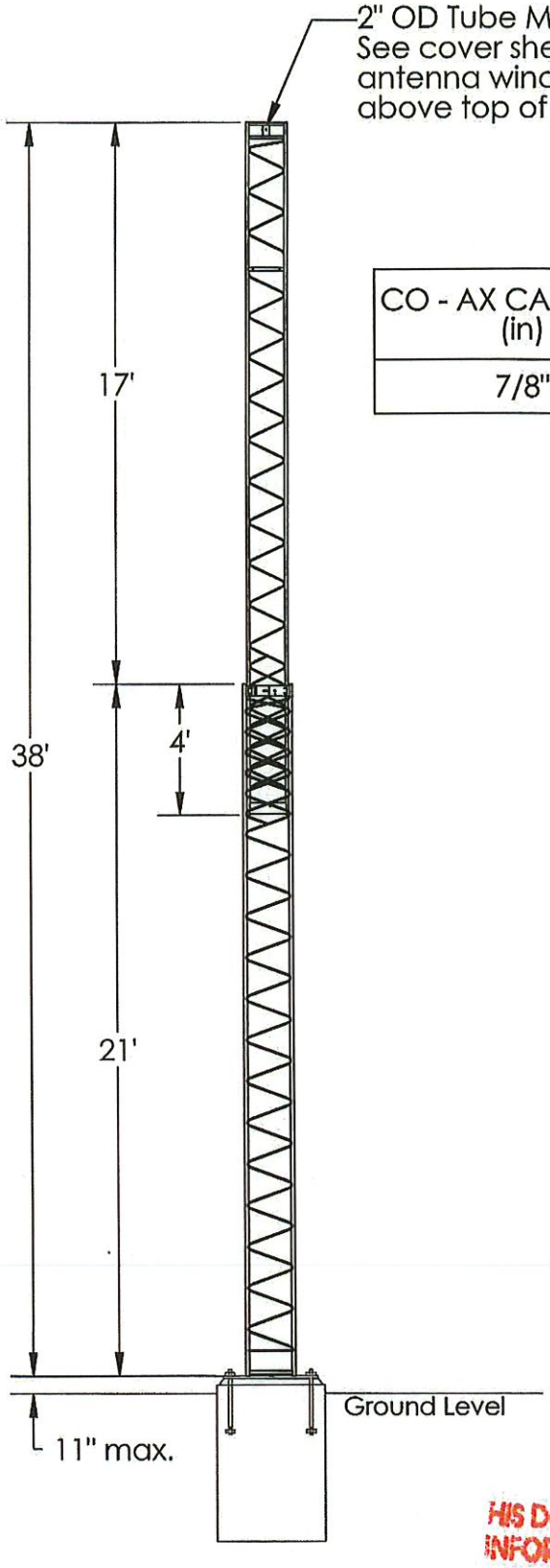
RF/MC 12/21/09

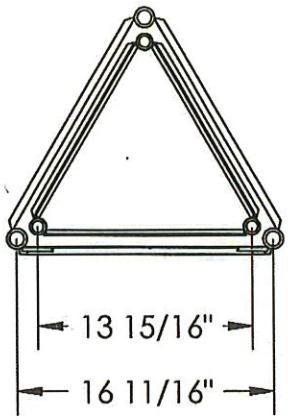
HDX-538 TOWER ELEVATION

SECTION NO.	LEG SIZE	DIAGONAL SIZE
NO. 5 TOP	PIPE 1.05" OD X 0.154" WALL	3/8" SOLID ROD
NO. 6 BASE	PIPE 1.315" OD X 0.179" WALL	7/16" SOLID ROD



Elevation View
No Scale

CO - AX CABLE DIA. (in)	MAX. QUANTITY
7/8"	1



Plan View
No Scale

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General Notes:

Tower Model: **HDX-538**

1. All work shall be in conformance with the requirements of the "International Building Code - 2006" and "Structural Standards for Steel Antenna Towers and Antenna Supporting Structures TIA/EIA-222-F", by the Telecommunications Industry Association.
2. The 2006 International Building Code requires the use TIA/EIA-222-F for tower design. TIA/EIA requires the use of the American Institute of Steel Construction, Specification for Structural Steel Buildings, June 1, 1989. (AISC 9th Edition). Consequently, all steel design was performed using the AISC 9th Ed.
3. All concrete shall have a minimum compressive strength of 2500 psi at 28 days unless noted otherwise. All concrete shall conform to the requirements of the International Building Code and referenced edition of ACI 318. Slump shall not exceed 4-1/2 inches.
4. Reinforcing steel shall be intermediate grade deformed bars conforming to ASTM A-615. No. 4 bars and smaller shall be Grade 40, No. 5 bars and larger shall be Grade 60. All reinforcing details, placement etc. shall conform to the requirements of the International Building Code and ACI 318. No welding allowed.
5. All reinforcing steel, anchor bolts, dowels and other inserts etc. shall be securely anchored in place, in the required positions, prior to pouring concrete.
6. Steel fabrication and erection shall conform to the requirements of the AISC Manual of Steel Construction and the Electronic Industries Association (as referenced in note 1 & 2 above).
7. All welding shall be performed by AWS certified welders for each type of weld used. (Using the GMAW (spray arc) welding process with ER70S-6 welding wire.
8. All tower section lift cables & guy cables shall be 7 x 19 Aircraft cable with the following minimum strengths:

Cable diameter (in)	Minimum Strength (lbs)
3/16	4200
1/4	7000
5/16	9800
3/8	14400
7/16	17600
1/2	22800

9. This tower analysis is based the antenna being installed at a height of one foot above the top of the tower. The wind load of the antenna(s) shall not exceed the load shown in these calculations. The Owner of the tower shall assume full liability for verification of the antenna loading.
10. This tower is designed to be used in its fully extended position.
11. The design of the hoist system is not with in the scope of these calculations and shall be designed by others.
12. This tower has not been designed to meet any twist or sway criteria.
13. The Owner shall verify that the quantity and size of waveguide / Coax cables match the values used in these calculations.
14. The engineering and design of the antennas are not with-in the scope of these calculations.
15. Installations on hills, escarpments and other special wind areas is not with-in the scope of these calcuations.
16. US Tower Corp. recommends that the installation of this tower and its foundation be performed by a Professional, licensed Contractor with experience installing these types of structures.
17. The Contractor is responsible for conducting all construction in accordance with all Federal, State, OSHA, and Local laws and ordinances. The Contractor is also responsible for checking the site for underground facilities prior to the start of work.
18. US Tower Corp. and it's Engineers shall not be responsible for errors and omissions in the project not in conformance with these calculations and the Codes and Standards referenced here-in.
19. US Tower Corp. and it's Engineers accept no responsibility for field inspection during construction nor for the method of construction.
20. The Owner shall assume full responsibility & liability for the periodic inspection of all tower section lift cables & guy cables. Any cable with any sign of distress or excessive stretch shall be replaced immediately.
21. The information contained in these calculations is the property of US Tower Corp. and shall only be used to obtain an installation permit. Any other use shall be authorized by US Tower in writing prior to utilizing the information contained herein.

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Code & Material Specifications

Tower Model: HDX-538

Governing Codes, Stresses, and Materials (Min.)

International Building Code	2006 Edition (Occ. Cat. II)
TIA/EIA-222-F	
AISC Specification for Steel Bldgs	AISC 9th Edition
ACI 318	2005 Edition
Wind Loading (Governed by the TIA/EIA standard so used fastest mile speed in the calculations.)	Basic Wind Speed 90 mph, 3 second gust 75 mph, fastest mile (Exposure C Terrain)
Structural Steel (All plates, bars, angles)	ASTM A36 (F-y = 36 ksi) (Min. F-y for plates - 42 ksi)
Structural Pipe	ASTM A53 Gd. B, A500 Gd. B (F-y = 50 ksi for tower legs)
Structural Tubing (HSS)	ASTM A500 Gd. B (F-y = 46 ksi)
Welding	AWS D1.1-04 GMAW w/ ER70S-6 wire
Hot-Dip Galvanizing	ASTM A123
Hardware	ASTM A153
Bolts: Tower & Accessories	ASTM A325
Reinforced Concrete	2500 psi strength @ 28 days
Reinforcing Steel	ASTM A615 Gd. 40 for #4 & smaller dia. Gd. 60 for $5 & larger dia.
Anchor Rods	ASTM F1554 Gd. 36 or ASTM A-36
Foundation & Soils	1500 psf Bearing (TL = DL+LL)
Lateral Bearing Pressure	100 psf/ft of depth

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Tower Section Properties

Code: EIA-222-F
All units are in lbs. and inches U.O.N.
Ice: 0
Density: 56 (pcf)

Note: If a tower section is not in the tower being designed then input 0 for section length and top & bottom lap lengths.

Tower Model: HDX-538

Tower Height: (ft) 38

Tower section No.:	3	4	5	6	7	8	9	10
Lgth. of Section (ft):	0	0	21	21	0	0	0	0
Face width (C.L.):	8.95	11.47	13.94	16.68	19.94	23.725	28.25	34.25
Leg dia.:	1.05	1.05	1.05	1.315	1.66	1.9	2.375	2.875
Leg Thkn's: Spec.	0.154	0.154	0.154	0.179	0.191	0.2	0.218	0.276
Leg Thkn's: Design	0.143	0.143	0.143	0.166	0.178	0.186	0.203	0.257
Leg F-y:	50000	50000	50000	50000	50000	50000	50000	50000
Web dia:	0.375	0.375	0.375	0.4375	0.5	0.625	0.75	0.875
Web F-y:	36000	36000	36000	36000	36000	36000	36000	36000
Web spacing: (leg unsupported length)	15	15	15	15	15	30	30	30
Web "phi":	37.3	28.37	22.55	18.46	14.15	30.35	26.12	19.8
Web clear width:	7.90	10.42	12.89	15.37	18.28	21.83	25.88	31.38
Web L:	9.93	11.84	13.96	16.20	18.85	25.29	28.82	33.35
No. of diagonal webs:	0	0	40	40	0	0	0	0
Top Lap (ft):	0	0	0	4	0	0	0	0
Bottom Lap (ft):	0	0	4	0	0	0	0	0
No. of additional lap diagonal webs:	0	0	7	7	0	0	0	0
Top plate depth:	4	4	5	4	6	8	6	8
Bot plate depth:	2.5	2.5	3	6	5	8	8	8
Plate Thkn's:	0.375	0.375	0.375	0.375	0.375	0.375	0.375	0.375

Yellow = No Ice Condition Green = With Ice Condition

Projected Areas Outside Lap Areas:

Section L (ft) Used:	0	0	17	17	0	0	0	0
Section PA (sqft/ft):	0.000	0.000	0.451	0.571	0.000	0.000	0.000	0.000
Section PA (sqft/ft):	0.000	0.000	0.451	0.571	0.000	0.000	0.000	0.000

Projected Areas at Laps:

Lap PA (sqft/ft):	Lap 3+4:	0.000	0.000	Lap 6+7:	0.000	0.000	Lap9+10:	0.000
	Lap 4+5:	0.000	0.000	Lap 7+8:	0.000	0.000		0.000
	Lap 5+6:	1.295	1.295	Lap 8+9:	0.000	0.000		

Weight:

Legs:	0	0	93	137	0	0	0	0
Webs:	0	0	63	98	0	0	0	0
Anchors:	0	0	36	53	0	0	0	0
Misc.:	0	0	19	29	0	0	0	0
Total weight:	0	0	211	318	0	0	0	0
Total weight:	0	0	211	318	0	0	0	0

Note:
1. Program assumes that all lap areas have x-braced webs in all tower sections.
   This will result in slightly conservative design values if x-braces are not in the lap area.

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Tower Loading - Shear & Moments

Tower Model: HDX-538

Design per EIA-222-F

Wind velocity (mph): 76

Tower Section	Projected Area	Analysis height (ft)	z height (ft)	K-z	G-h	q-z (basic)	No ICE Condition w (plf)	Shear (lbs)	Moment (ft-lbs)
Mast	0.670	39	39	1.049	1.238	14.79	12.9	13	13
3	0.000	38	38.5	1.045	1.238	14.79	0.0	13	26
3&4	0.000	38	38	1.041	1.238	14.79	0.0	13	26
4	0.000	38	38	1.041	1.238	14.79	0.0	13	26
4&5	0.000	38	38	1.041	1.238	14.79	0.0	13	26
5	0.538	21	29.5	1.000	1.238	14.79	9.9	180	1669
5&6	1.382	17	19	1.000	1.238	14.79	25.3	282	2593
6	0.659	0.1	8.55	1.000	1.238	14.79	12.1	485	9074
6&7	0.088	0	0.05	1.000	1.238	14.79	1.6	486	9123
7	0.000	0	0	1.000	1.238	14.79	0.0	486	9123
7&8	0.000	0	0	1.000	1.238	14.79	0.0	486	9123
8	0.000	0	0	1.000	1.238	14.79	0.0	486	9123
8&9	0.000	0	0	1.000	1.238	14.79	0.0	486	9123
9	0.000	0	0	1.000	1.238	14.79	0.0	486	9123
9&10	0.000	0	0	1.000	1.238	14.79	0.0	486	9123
10	0.000	0	0	1.000	1.238	14.79	0.0	486	9123

Tower Section Weights: (No Ice)

Section	Weight (lbs)	Lift cable force (lbs) (at top of tower)
Antenna	250	
Co-ax Wt:	12	
3	0	0
4	0	0
5	211	523
6	318	1045
7	0	0
8	0	0
9	0	0
10	0	0

Note:

1. 1 <= G-h <= 1.25
2. 1 <= K-z <= 2.58

Co-ax Cable Data:

Cable dia. (in):	0.875	
No. of cables:	1	
C-a:	1.2	Table 3 - EIA
Cable Proj. Area	**0.088**	**(sq.ft. / ft.):**
Wght. / Cable (lb/ft):	0.30	
Total Wght (lb):	12	

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Lift Cable Analysis

Note: All units are in pounds.

Tower Data:

No. of twr. sections:	2
Antenna weight (lb):	250
Ant. mount wt. (lb):	50
Accessories wt. (lb):	0
Coax cable wt. (lb):	12

Tower Section:	Section Wt. (lb):	Vert. Component of Guy Cables (lb):
5	211	0
6	318	0
7	0	0
8	0	0
9	0	0
10	0	0

Pulley Frame - Tower Section: 5

F-v: 312 (Force on Section)

Pulley Frame - Tower Section: 6

Cable dia (in):	0.25	
Cable MBS:	7000	
No. of faces w/cable:	1	
Sum F-v:	1045	(Force on Section)
CF-tot:	523	(At Anchor In above section)
CF-face:	523	(At Anchor in above section)
Cable Safety Factor:	**13.39**	

Pulley Frame - Tower Section: 7

Cable dia (in):	0.25	
Cable MBS:	7000	
No. of faces w/cable:	1	
Bottom locked out? 1=y, 2=n:	2	
Sum F-v:	NA	(Force on Section)
CF-tot:	NA	(At Anchor in above section)
CF-face:	NA	(At Anchor in above section)
Cable Safety Factor:	**NA**	

Pulley Frame - Tower Section: 8

Cable dia (in):	0.25	
Cable MBS:	7000	
No. of faces w/cable:	3	
Sum F-v:	NA	(Force on Section)
CF-tot:	NA	(At Anchor in above section)
CF-face:	NA	(At Anchor in above section)
Cable Safety Factor	**NA**	

Pulley Frame - Tower Section: 9

Cable dia (in):	0.25	
Cable MBS:	7000	
No. of faces w/cable:	4	
Bottom locked out? 1=y, 2=no:	2	
Sum F-v:	NA	(Force on Section)
CF-tot:	NA	(At Anchor in above section)
CF-face:	NA	(At Anchor in above section)
Cable Safety Factor:	**NA**	

Pulley Frame - Tower Section: 10

Cable dia (in):	0.25	
Cable MBS:	7000	
No. of faces w/cable:	4	
Sum F-v:	NA	(Force on Section)
CF-tot:	NA	(At Anchor In above section)
CF-face:	NA	(At Anchor in above section)
Cable Safety Factor	**NA**	

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Max. Allowable Antenna Area

Based on Leg Compressive Strength

Tower Model: **HDX-538**

Reference "Tower Section Property" sheets for section data.

Tower Section	Analysis Height (ft)	KL/r	F-a (psi)	Allow. 'P' (lbs)	Actual 'P' (lbs)	Allow. Mom. ft-lb	Actual Mom. ft-lb	P-antenna (lbs)
3	38	41.6	34136	13927	40	8883	26	4429
4	38	41.6	34136	13927	31	11384	26	5679
5	21	41.6	34136	13927	1833	13835	1669	640
6	0.1	32.9	35709	21449	7887	25400	9074	409
7	0	25.6	36903	30527	6340	43929	9123	10000
8	0	44.3	33614	33666	5328	57641	9123	10000
9	0	35.0	35344	48901	4475	99694	9123	10000
10	0	29.0	36356	76761	3691	189732	9123	10000

Allow. Antenna Wind Load (lb): 409
Allow. Antenna Area (sq. ft.): 16.4

NOTE:

1. Allow. Moment = 0.866 * (face width / 12)(allow. axial load - lift cable force / 3)
2. Allow. Antenna Wind Load = (allow. mom. - actual mom.) / (antenna hgt - analysis hgt.)
3. Allow. Antenna Area = allow. ant. wind load / (1.3 *K-z*G-h* q-z)
4. P-antenna column - the value of 10000 means that this tower section was not used on this tower.
5. The tower height is shown in analysis height until you get down to the actual first tower section used in this tower.

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Max. Allowable Antenna Area

Based on Webs - Outside Lap Areas

Tower Model: HDX-538

Reference "Tower Section Property" sheets for section data.

Tower Section	Analysis Height (ft)	Web 'L' (in)	KL/r	F-a (psi)	Allow. 'P' (lbs)	Actual 'P' (lbs)	Allow. F-h (lbs)	Actual Shr (lbs)	P-antenna (lbs)
3	38	11.25	96.0	13606	1503	9	1195	13	2058
4	38	13.04	111.2	11677	1290	8	1135	13	1953
5	21	15.09	128.8	12002	1326	113	1224	180	1940
6	0.1	17.58	128.6	12036	1809	295	1716	485	2487
7	0	20.56	131.6	11495	2257	289	2189	486	10000
8	0	27.49	140.8	10049	3083	325	2660	486	10000
9	0	31.46	134.2	11049	4881	312	4383	486	10000
10	0	36.40	133.1	11235	6756	298	6356	486	10000

Allow. Antenna Wind Load (lb): 1940
Allow. Antenna Area (sq. ft.): 77.7

NOTE:

1. Allow. F-h = allow. P * cos(phi). = Allow. shear in one face of tower.
2. Allow. Antenna Wind Load = 2 * cos(30) * allow. F-h - actual shear.
3. Allow. Antenna Area = allow. ant. wind load / (1.3 *K-z*G-h* q-z)
4. P-antenna column - the value of 10000 means that this tower section was not used on this tower.
5. The tower height is shown in analysis height until you get down to the actual first tower section used in this tower.

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Max. Allowable Antenna Area

Based on Webs in Lap Areas

Tower Model: HDX-538

Reference "Tower Section Property" sheets for section data.

Tower Section	Analysis Height (ft)	Web 'L' (in)	KL/r	F-a (psi)	Allow. 'P' (lbs)	Actual 'P' (lbs)	Allow. Mom ft-lb	Actual Mom ft-lb	P-antenna (lbs)
3	38	11.25	96.0	17966	3968	0	21819	26	10897
4	38	13.04	111.2	15337	1694	4	10274	26	5124
5	21	15.09	96.6	17868	3947	130	24532	1669	1203
6	0.1	17.58	96.5	17891	5379	690	33406	9074	10000
7	0	20.56	98.7	17518	6879	679	44271	9123	10000
8	0	27.49	105.6	16344	10029	763	58014	9123	10000
9	0	31.46	100.7	17185	15184	733	92512	9123	10000
10	0	36.40	99.8	17327	20838	700	133887	9123	10000

Allow. Antenna Wind Load (lb): 1203
Allow. Antenna Area (sq. ft.): 48.2

NOTE:

1. Allow. Moment = allow. P * cos(phi) * 8 * cos(30).
2. Allow. Antenna Wind Load = (allow. mom. - act. mom.) / (antenna hgt. - analysis hgt.).
3. Allow. Antenna Area = allow. ant. wind load / (1.3 *K-z*G-h* q-z)
4. P-antenna column - the value of 10000 means that this tower section was not used on this tower or the tower section is the base section.)
5. The tower height is shown in analysis height until you get down to the actual first tower section used in this tower.

Maximum Antenna Wind Load and Wind Area:
(Ref. this sheet and the previous 2 sheets.)

Allow. antenna Wind Load (lb): **409**
Allow. antenna Area (sq. ft.): **16.4** (w/ appurtenance force coefficient = 1.3)
Allow. antenna Area (sq. ft.): **15.2** (w/ appurtenance force coefficient = 1.4, i.e. all flat members)
Allow. antenna Area (sq. ft.): **26.6** (w/ appurtenance force coefficient = 0.8, i.e. all round members)

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Tower Section No. 5 - Analysis

Tower Model: HDX-538

Shear (lb):	590
Lift Cable Force (lb):	523
Face Width (in):	13.94

Moment (ft-lb):	9442
Panel Height (in):	15
Lap length (ft):	4
Lap X Braced? Y=1, N=2	1

Lap shear (lbs): 2361

Web Analysis:	
Dia. (in):	0.375
F-y (psi):	36000
Area(in^2):	0.110
L (in):	15.09
r (in):	0.094
K:	0.8
KL/r:	128.8
C-c:	126.1
Actual f-a (psi):	3337
Allow. F-a (psi):	12002
Web CSI:	**0.28**
Weld size (in):	0.188
Weld L (in):	0.5
Act. weld 'f' (lb/in):	737
Allow. weld 'F' (lb/in):	3722
Weld CSI:	**0.20**

Web Analysis - Lap Area	
Dia. (in):	0.375
F-y (psi):	36000
Area (in^2):	0.110
L (in):	15.09
r (in):	0.094
K:	0.6
KL/r	96.6
C-c:	126.1
Actual f-a (psi):	8349
Allow. F-a (psi):	17868
Web CSI:	**0.47**
Weld size (in):	0.188
Weld L (in):	0.5
Act. weld 'f' (lb/in):	1844
Allow weld 'F' (lb/in):	3722
Weld CSI:	**0.50**

Leg Analysis:	
Dia. (in):	1.05
Thk. (in):	0.14322
F-y (psi):	50000
Area(in^2):	0.408
L (in):	15
r (in):	0.325
K:	0.9
KL/r:	41.6
C-c:	107.0
Leg Comp. load (lb):	9560
Actual f-a (psi):	23433
Allow F-a (psi):	34136
Leg CSI:	**0.69**

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Tower Section No. 6 - Analysis

Tower Model: HDX-538

Shear (lb):	895
Lift Cable Force (lb):	1045
Face Width (in):	16.68

Moment (ft-lb):	25400
Panel Height (in):	15
Lap length (ft):	4
Lap X Braced? Y=1, N=2	1

Web Analysis:

Dia. (in):	0.4375
F-y (psi):	36000
Area(in^2):	0.150
L (in):	17.58
r (in):	0.109
K:	0.8
KL/r:	128.6
C-c:	126.1
Actual f-a (psi):	3622
Allow. F-a (psi):	12036
Web CSI:	**0.30**
Weld size (in):	0.25
Weld L (in):	0.625
Act. weld 'f' (lb/in):	871
Allow. weld 'F' (lb/in):	4950
Weld CSI:	**0.18**

Web Analysis - Lap Area

Dia. (in):	0.4375
F-y (psi):	36000
Area (in^2):	0.150
L (in):	17.58
r (in):	0.109
K:	0.6
KL/r	96.5
C-c:	126.1
Actual f-a (psi):	6590
Allow. F-a (psi):	17891
Web CSI:	**0.37**
Weld size (in):	0.25
Weld L (in):	0.625
Act. weld 'f' (lb/in):	1585
Allow weld 'F' (lb/in):	4950
Weld CSI:	**0.32**

Lap shear (lbs): 2361

Leg Analysis:

Dia. (in):	1.315
Thk. (in):	0.16647
F-y (psi):	50000
Area(in^2):	0.601
L (in):	15
r (in):	0.410
K:	0.9
KL/r:	32.9
C-c:	107.0
Leg Comp. load (lb):	21449
Actual f-a (psi):	35709
Allow F-a (psi):	35709
Leg CSI:	**1.00**

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Tower Base Connection

Tower Model: HDX-538

Shear (lbs):	895	Leg Comp. (lbs):	21449		
Moment (ft-lbs):	25400	Leg Tension (lbs):	20753		
Lift Cable force (lbs):	1045	Leg O.D. (in):	1.315		
Face width (in):	16.68				
Tab Plate to Leg:		C.L. bolt to leg (in):	1.25		
Plate width (in):	2.5	Bolt dia. (in):	0.75 (A325N)		
Plate height (in):	7	No. of bolts:	3		
Plate Thkn. (in):	0.375	Dist. between bolts:	2		
Bolt force (lbs):	12480	Weld tab to leg:	Weld size (in):	0.1875	
Allow. bolt shr. (lbs):	12370	Moment (in-lbs):	40914		
Br'g check	OK	Weld S-x (in^2):	16.333		
Bolt CSI:	1.01	Weld stress (lbs/in):	2955		
		Allow Stress (lbs/in):	3712	Weld CSI:	0.80
Tab Plate to Base:		KL/r:	17		
Plate F-y (psi):	36000	F-a (psi):	27726	f-a (psi):	9805
Plate width (in):	3.5	P-allow (lb):	60651	F-e (psi):	540116
Plate height (in):	7.75	Moment (in-lbs):	21451	Sx (in^3):	1.276
Plate Thkn. (in):	0.625	h/t:	5.6		
Bolt ecc. (in):	0.9375	F-b(psi):	31680		
Shear ecc. (in):	4.5	Plate CSI:	0.98		
Distance from first bolt to base plate:	2.5				
Weld tab to base:	Weld size (in):	0.3125			
Weld S-x (in^2):	4.083	Moment (in-lbs):	20798		
Weld stress (lbs/in):	5893				
Allow Stress (lbs/in):	6187	Weld CSI:	0.95		

Base Plate Assembly:

Top Plate:		Bot. Plate:	
W (in):	3.500	W (in):	3.500
L (in):	5.750	L (in):	5.750
Thkn. (in):	0.375	Thkn. (in):	0.500

Concrete bearing:	f-c (psi):	2000	
f-p (psi):	1066		
F-p (psi):	1867	CSI:	0.57

Combined Plate Properties:

Top Plate:		Bot. Plate:			
Area:	1.3125	Area:	1.7500	Centroid:	0.438
Y-bar (in):	0.6875	Y-bar (in):	0.2500	I (in^4):	0.195
				C (in):	0.438

Moment - from comp (in-lbs):		15417
f-b (psi):		34519
F-b (psi):		36000
	CSI:	0.96

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Anchor Bolt Anchorage

Tower Model: HDX-538

ACI 318-05 App. D Tension Anchorage Calculations - Cast in Place Straight Anchors

All units are pounds and inches unless noted otherwise. Date: 12/22/2009

Anchorage Description: 1-1" dia, F1554 Grd. 36 or A-307 anchor rods

Concrete f-c' (psi):	2500	Is this in a moderate or High Seismic area	1.00	Factored Req'd Tens. Load (lb):	27118 (LRFD value)
Embedment:	21	AND do the loads include seismic loads? (Yes = 0.75, No = 1.0) ACI D.3.3 doesn't require this if loads don't include seismic.			

h-ef: 17.08 If embedment x 1.5 is > 3 of the edge distances then use h-ef = the largest of the 3 edge distances / 1.5 App. D Section D5.2.3.

Anchor Input:

No. of Anchors n:	1
Anchor dia:	1
No. of threads / in:	8
Anchor f-y (psi):	36000
Anchor f-u (psi):	60000
phi:	0.75

phi = 0.65 if material used is not ductile

Edge Distances:

c-a1:	25.63
c-a2:	22.38
c-a3:	10.25
c-a4:	37.75

Steel Strength of Anchor in Tension (ACI D5.1)

A-se:	0.606	Effective anchor area (in^2)
N-sa:	36345	

Concrete Breakout Strength of Anchor in Tension (ACI D5.2)

N-b:	84731	ACI D5.2.2
N-cb:	61105	

Anchor Pullout Strength (ACI D5.3)

N-p:	30020
N-pn:	42028

Concrete Side-Face Blowout, Tension

N-sb:	79953	Note: If Ca1 is >0.4"h-ef then blowout does not occur.

Anchor Design Strength - LRFD

Steel:	27258
Breakout:	42774
Pullout:	29420
Blowout:	55967

(Note: If supplemental reinforcement is provided then the concrete strength limit does not apply, App. D D.4.2.1.)

Concrete Breakout Input: (Tension)

A-Nco:	2626.6	Projected breakout area of single anchor
A-Nc:	1722.0	Proj'd breakout area of anchor group (For a single anchor use A-Nco value) (If have more than two anchors need to hand input A-Nc)
ecc:	0	Eccentricity of tension load - anchor groups only
AdjF-ec,N:	1.000	(ACI D5.2.4) for anchor groups loaded eccentrically
AdjF-ed,N:	0.880	(ACI D5.2.5) for edge effects
AdfF-c,N:	1.25	(ACI D5.2.6) Assumed cracked at service load levels Can use 1.25 if is uncracked
phi:	0.7	Use 0.75 if supplemental reinforcement is provided Use 0.70 is supplemental reinforcement is not provided

Concrete Pullout Input:

A-head:	1.501	Area of anchor bolt head (Input 0 if plate washer is used)
Plate w:	0.00	Width of plate washer at embed end of anchor
Plate L:	0.00	Length of plate washer at embed end of anchor
A-pl:	1.501	Area of plate washer minus rod area (Plate thkn's must be >= 0.5 * bolt dia.)
AdfF-c,P:	1.4	Assumed cracked at service load levels Can used 1.4 if is uncracked
phi:	0.7	Use 0.75 if supplemental reinforcement is provided Use 0.70 is supplemental reinforcement is not provided

Side Face Blowout Input

Spacing:	0.00	Min. distance between multiple anchors (input 0 for one anchor)
c2:	22.38	Edge distance perp. To c-min.
c-min:	10.250	Min. edge distance considering all fasteners
AdjF1:	0.796	Factor for single anchor if c2 < 3(c-min)
AdjF2:	1.000	Factor for multiple anchors if c-min < .4(h-ef) and anchor spacing is < 6(c-min)
phi:	0.7	Use 0.75 if supplemental reinforcement is provided Use 0.70 is supplemental reinforcement is not provided

LRFD Design Strength:	**27258 Lbs**
ASD Design Strength:	**19470 Lbs**
Design Controlled By:	Steel Tension
Min. center to center of anchor spacing (in):	4 ACI D.8.1
Min. edge distance is same as min. cover per ACI 7.7.	

Notes:

1. For normal weight concrete only.
2. Anchors shall be either a headed bolt or have nuts and a bearing plate at the embed end as indicated above.
3. ACI Section D.5.2.3 is not included in this spreadsheet. (i.e. End of wall applications are not covered.)
4. If the design is controlled by concrete failure (i.e. non-ductile failure) then the Design Strengths controlled by concrete must be at least 2.5 times the factored forces transmitted by the attachment. (2006 IBC 1908.1.16) Alternatively, the steel anchor "or the attachment that the anchor is connecting to the structure shall be designed so that the attachment will undergo ductile yielding at a load level corresponding to anchor forces no greater than the design strength of the anchors" determined above. If "Steel Tension" controlled above then the connection is considered ductile and no further adjustments etc. are required. (Also see note 6.)
5. Any supplemental reinforcing shall have f-y = 60,000 psi min.
6. Per ACI D.3.3 if anchor design does not include seismic loads then the design does not have to be controlled by steel ductility.

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Foundation Design

Tower Model: HDX-538

Tower Reactions:

Moment (ft-lbs):	25400
Shear (lbs):	895
Lift Cable Force (lbs):	1045
Modification Factor:	1.3
(Req'd by EIA-F 3.1.16.1)	
Tower Face Width(in):	16.68
Distance from ground to top of concrete (ft):	0.667
Square ft'g width (ft):	4
Footing depth (ft):	7
H (ft):	29.05
S-1:	467

(Increased S1 by 2x per IBC 1804.3.1 for isolated footing not adversely affected by 1/2" motion at ground surface.)

A:	1.031
Depth req'd (ft):	**6.3**

Check concrete tensile stress: (neglect outer 2" of footing)

S-x (in^3):	14197
f-t (psi):	53
F-t (psi):	138
CSI:	**0.39**

Foundation Design Reactions:

Moment (ft-lbs):	33796
Shear (lbs):	1164
Lift Cable Force (lbs):	1359
Concrete f-c' (psi):	2500

Soil Design Parameters:

Allow. Lateral bearing (psf/ft):	100
Allow. Soil bearing (psf):	1500

Design is for non-constained condition per IBC reqmt's.

Allow. bearing (psf): **3300** Increased 20% for ea.
Act. bearing (psf): **1115** ft. of depth

Max. Moment in Footing (ft-lbs): 39320

CSI is < 1.0 therefore reinforcing is not req'd. Use minimal reinforcing.

rho:	0.0018
A-s req'd (sq. in.):	4.15
Rebar dia (in):	0.875
No. of bars provided:	8
A-s provided (sq. in.):	4.81 OK

Anchor Bolt Anchorage Design Load:

Anchorage Tension Design Force (lbs): 27118 (LRFD level force)

(See Anchor Bolt Anchorage page for anchorage design)

Summary:

Use foundation 4 ft. square by 7 ft. deep (below undisturbed soil).

Reinforce foundation with 8 #7 vertical bars (total) with #3 ties at 12" on center, and 3 ties in the top 5". Use 1 vertical bar at each corner of the foundation and one bar at the middle of each face of the fdn.

Use 1" dia. ASTM F1554 Gd. 36 or ASTM A-36 galvanized anchor bolts, 27" long.

Total of 3 anchor rods,one near each tower leg with a minimum embedment of 21". Use heavy hex nuts.

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HDX-538 FOUNDATION

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Foundation has been designed to accommodate the following loads:

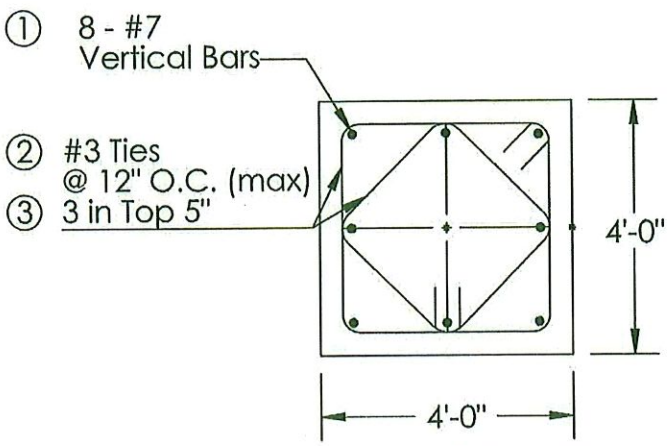
Overturning Moment = 33.801ft - kips
Base Shear = 1.16 kips
Structure Weight = 1.40 kips

Soil and Concrete Design Parameters.

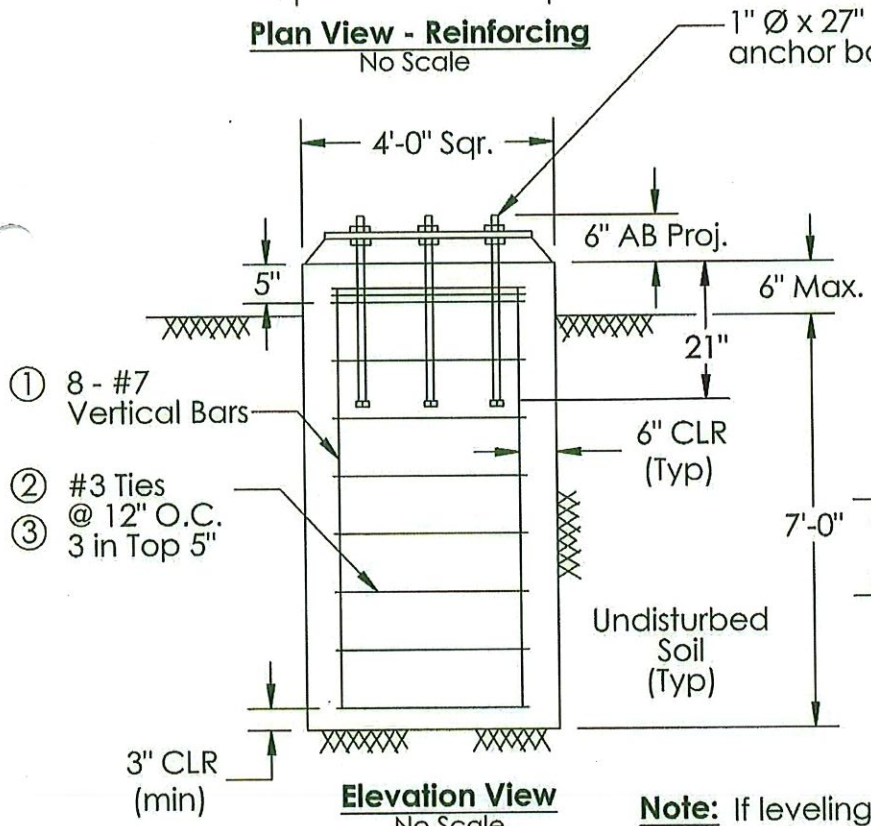
Allowable Foundation Pressure 1500 psf
(Increases based on depth)

Lateral Bearing Pressure 100 psf/ft
(Increases based on depth)

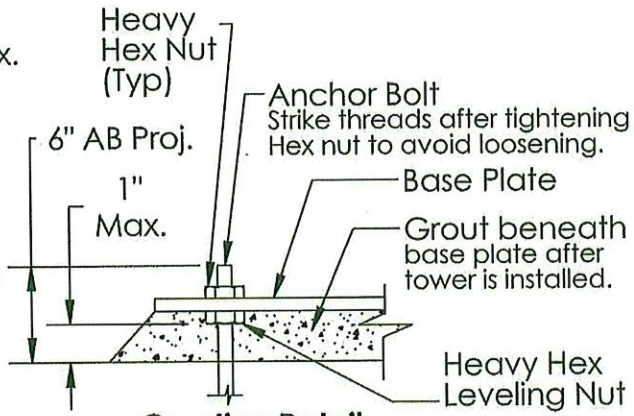
Concrete fc'= 2500 psi min. @ 28 days.



Plan View - Reinforcing
No Scale

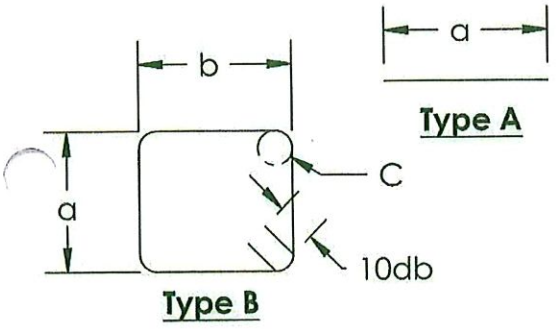


Elevation View
No Scale



Grouting Detail
Extreme care should be taken to assure that all leveling nuts are level with respect to each other prior to installation of tower.

Note: If leveling nuts are not used, grout is not required, and reduce AB projection to 4".



Type A

Type B

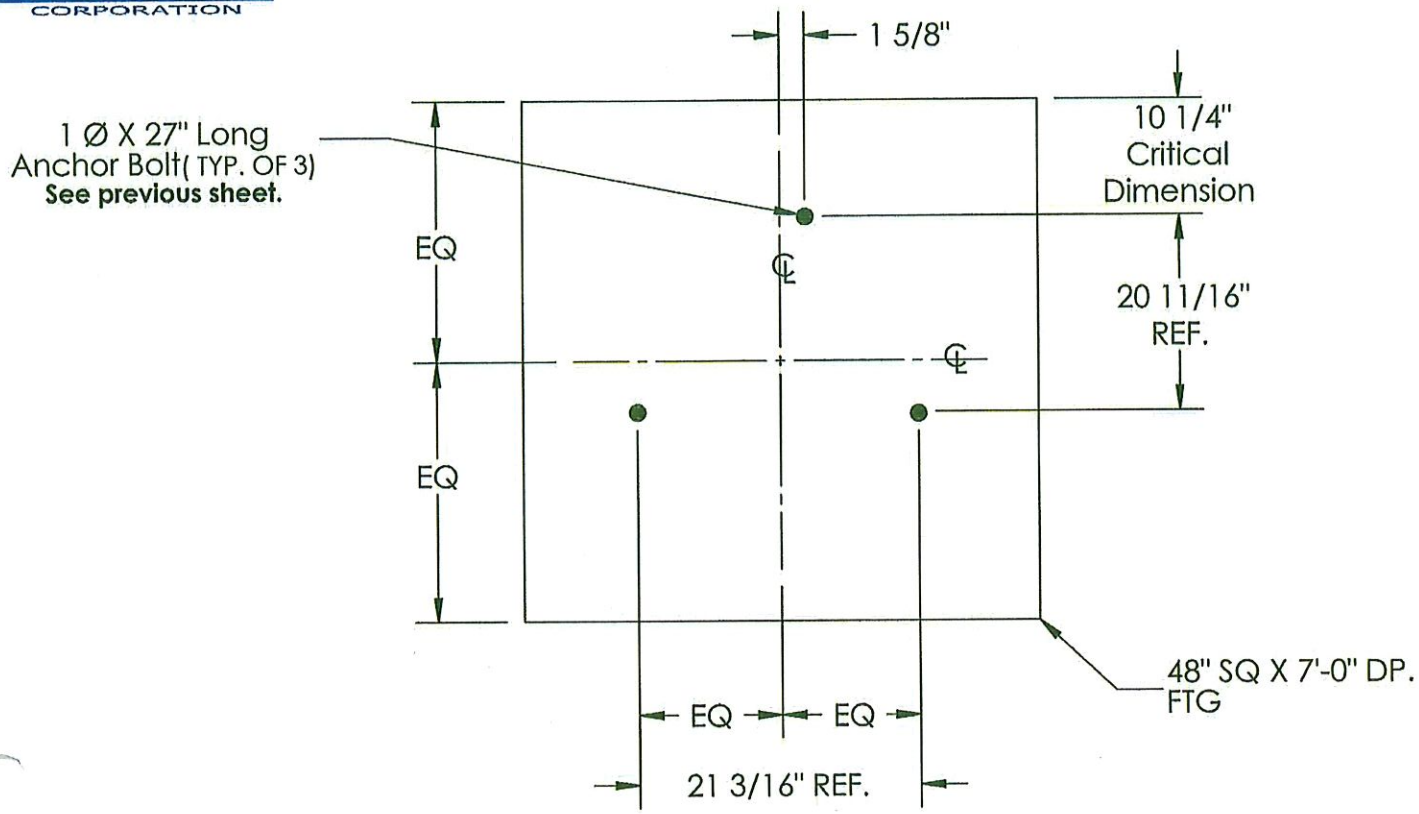
Reinforcement Material List

Sym	Type	Bar Size	Dimensions a	b	c	10db	Qty
①	A	#7	7' - 0" *	---	---	---	8
②	B	#3	3' - 0" *	3' - 0" *	2"	3.75"	11
③	B	#3	2' - 2" *	2' - 2" *	2"	3.75"	11

* = Nominal dimension

HDX-538 FOUNDATION

THIS DOCUMENT CONTAINS PROPRIETARY INFORMATION AND SHALL NOT BE USED OR REPRODUCED OR ITS CONTENTS DISCLOSED, IN WHOLE OR IN PART, WITHOUT THE PRIOR WRITTEN CONSENT OF US TOWER CORPORATION.



Plan View - Anchor Bolt Layout
No Scale

"REF" dimensions are provided for reference only. Use the tower base plate assembly to locate anchor bolts.

Foundation Notes:

1. All concrete shall have a minimum compressive strength of 2500 psi at 28 days unless noted otherwise. All concrete shall conform to the requirements of the International Building Code and the referenced edition of ACI 318. Slump shall not exceed 4-1/2 inches.
2. Reinforcing steel shall be intermediate grade deformed bars conforming to ASTM A-615. No. 4 bars and smaller shall be Grade 40, No. 5 bars and larger shall be Grade 60. All reinforcing details, placement etc. shall conform to the requirements of the International Building Code and ACI 318. No welding allowed.
3. All reinforcing steel, anchor bolts, dowels and other inserts etc. shall be securely anchored in place, in the required positions, prior to pouring concrete.
4. The owner is responsible for verifying the soil at the site provides a minimum safety factor of 2.0 for the soil parameters used for this design.
5. The allowable lateral soil bearing value was doubled as allowed per 2006 IBC section 1805.1 for isolated foundations not adversely affected by a 0.5" motion at the ground surface due to short term lateral loads.
6. The foundation design does not consider the effects of ground water.
7. The contractor is responsible for safe excavations in accordance with all Federal & Local laws and ordinances and OSHA requirements.
8. The contractor is responsible for the correct placement of all anchor bolts. US Tower recommends that the anchor bolts be placed using the tower base plate assembly provided with the tower. (The base plate assembly can be provided before the tower if desired.)
9. The foundation shall be one continuous pour such that cold joints do not develop. The contractor is responsible for verifying adequate concrete coverage is provided for all reinforcement to avoid the potential for rebar corrosion. Concrete shall be consolidated using vibratory methods.
10. The top of the footing shall be troweled level and smooth (or have a broom finish if preferred) in the area of the tower. Water shall be directed away from the tower base and anchor bolts outside of the tower area.
11. See General Notes sheet (earlier in calcs) for additional information & requirements.