AGENDA

Village of Hoffman Estates
Second Meeting of the Month
Village Board of Trustees

1900 Hassell Road
Hoffman Estates, IL 60169
847/882-9100

Board Room **December 14, 2009**

Immediately Following Public Works & Utilities Committee

1. **CALL TO ORDER/ROLL CALL**

2. **PLEDGE OF ALLEGIANCE TO THE FLAG**

3. **RECOGNITION OF AUDIENCE**

4. **CONSENT AGENDA/OMNIBUS VOTE (Roll Call Vote)**
(All items under the Consent Agenda are considered to be routine in nature and will be enacted by one motion. There will be no separate discussion of these items unless a Trustee so requests. In that event, the discussion will be the first item of business after approval of the Consent Agenda).

   A. Approval of Agenda
   B. Approval of Minutes – December 7, 2009 ***(deferral requested)***
   C. Approval of the schedule of bills for December 14, 2009: $635,482.36.

5. **REPORTS**
   A. **President's Report**
      1) Proclamation(s)
         -- Dennis Jones Day (35 Years Service)
         -- Marion Graczyk Day (30 Years Service)
         -- Ted Bos Day (25 Years Service)
         -- Richard Russo Day (25 Years Service)
         -- Shelley Walenga Day (20 Years Service)
         -- David Eggers Day (15 Years Service)
         -- Michael Barber Day (10 Years Service)
         -- Kathryn Cawley Day (10 Years Service)
         -- Scott Reichel Day (10 Years Service)
         -- Matthew Teipel Day (10 Years Service)
   B. **Trustee Comments**
   C. **Village Manager's Report**
   D. **Village Clerk's Report**

6. **PLAN COMMISSION/ZONING BOARD OF APPEALS REPORTS**
   A. **PLAN COMMISSION (Chairman Stanton)**
      1) Request by W2001 VHE Realty, LLC, and Rubina Realty Corporation for preliminary and final plat of resubdivision of Lot 2 and 3 of Poplar Creek Crossing subdivision, with 3 conditions (see packets).

Voting: 4 Ayes, 2 Nays, 5 Absent
Motion carried.

6. **PLAN COMMISSION/ZONING BOARD OF APPEALS REPORTS-Continued**

2) Request by W2001 VHE Realty, LLC for site plan amendment to the Poplar Creek Crossing Shopping Center, with 3 conditions (see packets).

Voting: 4 Ayes, 2 Nays, 5 Absent
Motion carried.

3) Request by W2001 VHE Realty, LLC for site plan amendment to the Citibank development at the Poplar Creek Crossing Shopping Center, with 3 conditions (see packets).

Voting: 4 Ayes, 2 Nays, 5 Absent
Motion carried.

4) Request by W2001 VHE Realty, LLC for site plan amendment to the Fifth Third Bank development at the Poplar Creek Crossing Shopping Center, with 3 conditions (see packets).

Voting: 4 Ayes, 2 Nays, 5 Absent
Motion carried.

5) Request by W2001 VHE Realty, LLC for site plan amendment to the Buffalo Wild Wings restaurant at the Poplar Creek Crossing Shopping Center, with 3 conditions (see packets).

Voting: 4 Ayes, 2 Nays, 5 Absent
Motion carried.

B. **ZONING BOARD OF APPEALS (Chairman Weaver)**

1) Request by W2001 VHE Realty, LLC, for a four foot, eleven inch (4'11") setback variation from Section 9-8-3-B-5-d of the Zoning Code to permit a fifteen foot, one inch (15'1") side yard setback along the south property line instead of the minimum required twenty foot (20') setback, with 1 condition (see packets).

Voting: 7 Ayes
Motion carried.

2) Request by the Village of Hoffman Estates (lessor) and The Everest Group/Sprint, Clearwire (lessee), for a special use under Sections 9-5-9-D and 9-3-9-A to permit the installation of two (2) microwave dishes and associated equipment to be no greater than 133 feet high on a Village water tank at 4690 Olmstead Drive, with 4 conditions (see packets).

Voting: 7 Ayes
Motion carried.
(Immediate authorization to apply for permits is requested)

3) Request by the Village of Hoffman Estates (lessor) and The Everest Group/Sprint, Clearwire (lessee), for a special use under Sections 9-3-9-A and 9-8-2-C-6 to permit the installation of two (2) microwave dishes and associated equipment to be no greater than 106 feet high on a Village water tank at 95 Aster Lane, with 4 conditions (see packets).

Voting: 5 Ayes, 2 Nays
Motion carried.
(Immediate authorization to apply for permits is requested)

6. **PLAN COMMISSION/ZONING BOARD OF APPEALS REPORTS-Continued**

4) Request by the Village of Hoffman Estates (lessor) and The Everest Group/Sprint, Clearwire (lessee), for a special use under Sections 9-3-9-A and 9-5-7-C-4 to permit the installation of two (2) microwave dishes and associated equipment to be no greater than 134 feet high on a Village water tank at 3990 Huntington Bouleverd, with 4 conditions (see packets).

Voting: 7 Ayes
Motion carried.
(Immediate authorization to apply for permits is requested)

7. **ADDITIONAL BUSINESS** *(All other new business; those items not recommended by a majority of the Committee)*

A. Request Board approval to cede 2009 Bond Cap to the Assist First Time Homebuyer Down Payment Assistance Program.

B. Request Board approval of the 2010 property and casualty and workers' compensation excess insurance program renewal.

C. Request Board approval of agreements for Pace Bus Route 554 service with:
   1) Pace Suburban Bus for a local share of Route 554 in an amount not to exceed $23,104.27 in 2010; and
   2) Elgin, Streamwood, Hanover Park, and Schaumburg for local agency participation in Route 554 in 2010.

D. Request Board approval of a time extension to the temporary moratorium on the enforcement of regulations in Section 9-3-8-K-5 of the Zoning Code to allow certain temporary business signs to e displayed during depressed economic conditions.

E. Request Board approval of the adoption of the Community Development Block Grant (CDBG) Consolidated Annual Performance and Evaluation Report (CAPER) for Program Year 3.

F. Request Board authorization for an EDA contract for Prairie Stone Entertainment District regulatory/wayfinding signs in an amount not to exceed $8,952.75.

G. Request Board approval of a Resolution creating the Tartan Day Commission of the Village of Hoffman Estates (increase in membership).

H. Request Board approval of a Resolution terminating Agreement with the Northeastern Illinois Regional Crime Laboratory.

I. Request Board approval to extend the Fire Department Entry Level Eligibility Roster for a period of one (1) year.

J. Request Board approval to extend the automatic ticket writer contract with Advanced Public Safety, Deerfield Beach, FL and place the project on hold.

7. **ADDITIONAL BUSINESS - Continued**

K. Request Board approval of Agreement between the Village of Hoffman Estates and James H. Norris for the period January 1, 2010 through December 31, 2010.

8. **ADJOURNMENT** – ***Executive Session -- Litigation (5 ILCS 120/2-(c)-(11))***

The Village of Hoffman Estates complies with the Americans with Disabilities Act (ADA). For accessibility assistance, call the ADA Coordinator at 847/882-9100.

VILLAGE OF HOFFMAN ESTATES
ZONING BOARD OF APPEALS

FINDING OF FACT

DATE OF PUBLIC HEARING: December 8, 2009

DATE OF PRESENTATION TO VILLAGE BOARD: December 14, 2009

PETITION: Hearing held at the request of W2001 VHE Realty, LLC to consider variations from the Zoning Code to permit a setback variation for the existing Citibank facility on the property known as 2550 N. Sutton Road in the Poplar Creek Crossing Shopping Cent.

DISTRICT IN WHICH PROPERTY IS LOCATED: C-MU, Commercial Mixed-Use

ZONING CODE SECTION(S) FOR VARIATION(S): 9-8-3-B-5-d

FINDING-OF-FACT: The Zoning Board of Appeals (ZBA) found that the Standards for a Variation (9-1-15-C) were met.

MOTION: Request to grant W2001 VHE Realty, LLC at 2550 N. Sutton Road, ***a 4'11" setback variation from Section 9-8-3-B-5-d of the Zoning Code to permit a 15'1" side yard setback along the south property line instead of the minimum required 20' setback.*** **The following condition shall apply:**

> **This variation approval shall be subject to all conditions of the preliminary and final Plat of Resubdivision and site plan amendment approval for the Citibank portion of the Poplar Creek Crossing Shopping Center property.**

RECOMMENDATION: The Zoning Board of Appeals (ZBA) recommends approval of this request.

The petitioner is requesting a side yard setback variation for the existing Citibank building at 2550 N. Sutton Road. The existing drive-thru canopy is 15'1" from the south property line. A 20' setback is required. The canopy overhang encroaches into the 20' setback. The site plan for the Citibank building was approved by the Village Board in 2006. The setback encroachment was missed during the site plan review process. The setback encroachment was discovered by staff while reviewing the petitioner's request for a resubdivision of the Poplar Creek Crossing Shopping Center property. The need for a setback variation is not caused by the petitioner's request for a resubdivision of the property.

The petitioner stated that they agreed to the recommended condition with the understanding that the setback variation is necessary and would like it to be approved whether the resubdivision of the property is approved or not. The petitioner does not want the variation approval to be contingent upon the approval of the resubdivision request. The recommended condition of approval states that the variation approval be subject to all conditions of approval of the

preliminary and final Plat of Resubdivision and site plan amendment approval for the Citibank portion of the property.

AUDIENCE COMMENTS

None.

VOTE:
7 Ayes
0 Nays
0 Absent

MOTION PASSED

ZONING BOARD OF APPEALS
Chairman William Weaver
Vice-Chairman Ronald Jehlik
Denise Wilson
Michael Ciffone
Masoom Ali
Donna Boomgarden
Michael Gaeta

*** IMMEDIATE AUTHORIZATION TO APPLY FOR PERMITS IS NOT REQUESTED ***

THIS VARIATION WILL EXPIRE UNLESS ACTED UPON WITHIN ONE (1) YEAR OF VILLAGE BOARD APPROVAL

FINDING OF FACT WRITTEN BY DEVELOPMENT SERVICES STAFF

VILLAGE OF HOFFMAN ESTATES

Memo

TO: William Weaver, Zoning Board of Appeals Chairman

FROM: Brian S. Portz, Associate Planner BSP

RE: **2550 N. SUTTON ROAD - SETBACK VARIATION FOR CITIBANK BUILDING ON THE POPLAR CREEK CROSSING SHOPPING CENTER PROPERTY**

DATE: **December 2, 2009**

HEARING DATE: December 8, 2009

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1. REQUEST SUMMARY

Request by W2001 VHE Realty, LLC to consider approval of setback variations for the Citibank building on the Poplar Creek Crossing Shopping Center property.

The Plan Commission considered a preliminary and final plat of resubdivision and site plan amendment for the shopping center property on December 2, 2009. The Plan Commission recommended approval of the preliminary and final Plat of Resubdivision and approval of a site plan amendment for the shopping center property, the Fifth Third bank lot, the Buffalo Wild Wings lot and the Citibank lot. The Plan Commission recommendation will be considered by the Village Board concurrently with the Zoning Board of Appeals recommendation.

2. BACKGROUND

The Poplar Creek Crossing Shopping Center received final Village Board site plan approval in April 2005. The approval included a Target store and several mid-sized retail tenants, several small tenant retail buildings, and conceptual building pad sites for a freestanding restaurant and two banks. Subsequently, final site plan approval was granted by the Village Board for a Claim Jumper restaurant, Citibank, Fifth Third Bank, and a Buffalo Wild Wings restaurant.

The shopping center is currently subdivided into three lots that contain the Target store and its parking lot, the rest of the retail buildings and parking lots, and a vacant 1.7 acre lot (south of the shopping center) that was retained by the previous property owner for future development. The entire shopping center is designed with common access, parking, detention, etc. There are access drives to the site from Sutton Road, Higgins Road, and Old Sutton Road.

As part of the development, two "future development sites" were proposed on the overall site plan. One site is located on the north side of the property and the other is located on the south side of the property. The site on the north side of the property was developed as a Fifth Third Bank and the site on the south side of the property was developed as a Citibank. These two properties are part of the shopping center property, but somewhat act as stand alone properties with their own parking areas.

3. PROPOSAL

The petitioner is proposing to resubdivide the existing 30.67 acre site into five separate lots to permit the sale of the Fifth Third Bank, Citibank, and Buffalo Wild Wings as separate lots. To accomplish this, new property lines will be drawn around the Fifth Third Bank, Citibank and Buffalo Wild Wings properties. Through the review of the resubdivision request, it was discovered that the existing Citibank drive-thru canopy encroaches into the required setback area along the south property line. The canopy is located 15'1" from the south property line instead of the required 20'.

4. SITE CONDITIONS

a) The subject site is zoned C-MU, Commercial Mixed Use District.

b) The surrounding properties to the south and west are zoned EDA, Economic Development Area District. To the north is a vacant property also zoned C-MU, Commercial Mixed Use District. East of the property, across Route 59, is vacant property that is zoned O-3, Office and Research Tollway District and B-2, Business District.

5. APPLICABLE REQUIREMENTS

Setback Variation

Section 9-8-3-B-5-d (p. CD9:126.4) states that the minimum side yard setback shall be 20 feet. This section includes an exception requiring no side yard setback for common or abutting walls. There are no common or abutting walls in this situation.

6. ADJACENT OWNER COMMENTS

Standard notification letters have been mailed and as of this writing, no comments have been received.

7. VARIATION HISTORY

Subject Site

No relevant variations

Similar In the Village

Ordinance No. 4096-2009 was granted to National City Bank on Algonquin Road to permit a 2.95 foot variation of the 30 foot setback requirement along Algonquin Road to construct an accessory bank teller canopy.

8. ENGINEERING/TRANSPORTATION COMMENTS

No comments

9. DEVELOPMENT SERVICES COMMENTS

Planning staff analyzed the plat of resubdivision request to determine if the new property line locations will cause any building encroachments into the front, side or rear yard setbacks. This analysis determined that the location of the proposed property lines on the Fifth Third Bank and Buffalo Wild Wings lots will not require setback variations. All setback requirements will be met on those two properties. On the Citibank property, the new property line locations on the east, west and north sides will not require any setback variations, but it was noted that a setback variation would be necessary on the south side because the existing drive-thru canopy was already encroaching into the 20' side yard setback area.

The need for a variation along the south property line of the Citibank lot is not due the petitioner's request to resubdivide the property. The encroachment already exists because the south property line existed in its current location when the building and canopy were originally constructed. This was an omission that occurred at the time of original development and now a variation is being requested to correct this omission.

10. MOTION

Should the Zoning Board of Appeals find that the Standards for a Variation are met, the following motion is provided:

A 4'11" setback variation from Section 9-8-3-B-5-d of the Zoning Code to permit a 15'1" side yard setback along the south property line instead of the minimum required 20' setback, subject to the following condition.

> This variation approval shall be subject to all conditions of the preliminary and final Plat of Resubdivision and site plan amendment approval for the Citibank portion of the Poplar Creek Crossing Shopping Center property.

cc: M. Koplin, A. Janura, D. O'Malley, D. Plass, Petitioner

VILLAGE OF HOFFMAN ESTATES
ZONING BOARD OF APPEALS
REQUEST FOR NON-RESIDENTIAL VARIATION HEARING

FOR VILLAGE USE ONLY

Hearing Fee $ 400.00 Date Paid 10/27/09 Received By P. Moore

Hearing Date: 12/8/09 Time: 7:30pm Legal Published 11/23/09

Receipt Number 30324 Check No. 10517 Zoning District C-MU

Front Yard Setback, Side Yard Setback, Rear Yard Setback, Height, or Other Variation	Present Condition	Required	Proposed
side yard	15'1"	20'	15'1"

PLEASE PRINT OR TYPE

1. Name of Property Owner(s)* W2001 VHE Realty, LLC

E-Mail Address peggy.kral@archon.com Fax #: (312) 629-7850

Owner's Address 71 S Wacker, Ste 2110 Phone (312) 629-7825

City Chicago State IL Zip 60606

Subject Property's Address (if different): Citibank, 2550 New Sutton Road, Hoffman Estates, Illinois (Poplar Creek Shopping Center)

2. Person applying if other than owner:*

Name _____ Company Archon Group _____

E-Mail Address _____ Fax #: _____

Address _____ Phone _____

City _____ State _____ Zip _____

3. Property Index Number (PIN) 01-33-301-003-0000

*** If "owner" is an entity other than an individual(s), then an Economic Disclosure Statement must also be filed.**

RECEIVED
SEP 14 2009
PLANNING DIVISION

4. Is the applicant the original owner? Yes Did the condition that instituted this request for a variation exist at the time the applicant purchased this property? If yes, please describe.

No

5. Describe the improvement that needs a variation and the reasons a variation would be appropriate using the Standards for Variation (attached) as a guide. (e.g. An addition requires a 5-foot front yard setback variation. A hardship was caused by a street-widening project that reduced the front yard by 10 feet.)

The improvement that needs a variation is the canopy over the Citibank drive-through facility. The canopy encroaches 4.84 feet into the south yard. The Village Zoning Code allows, for a roof, a 2-feet encroachment into a side yard. See attached response to Question 5 for more detail.

6. Describe existing construction materials and proposed materials indicating if proposed construction will match or blend with the existing structure.

Construction materials are existing and include brick, spandrel glass, cast stone, steel and composite metal panels. No new construction is proposed.

7. Estimated Total Project Cost N/A

8. Will the proposed construction require removal/relocation of trees, driveway apron, utilities, other? If yes, please describe.

N/A

9. An Immediate Authorization to Apply for Permits allows the Code Enforcement Division to begin the building permit review process prior to the adoption of the Ordinance by the Village Board. The Immediate Authorization makes it possible for you to expedite the plan review process by approximately two weeks. Contact the Code Enforcement Division at 847/781-2631 to discuss the building permit application and review process.

Please check one of the following

☐ Yes, I request Immediate Authorization to Apply for Permits upon approval of my application by the Village Board, allowing me to begin the building permit review process prior to adoption of the Ordinance approving my variation.

Or

☒ No, I do not request Immediate Authorization to Apply for Permits.

10. I, the undersigned, certify the information and submissions provided accurately represent the current conditions and proposed improvement(s) needing a variation.

Owner's Signature Steve Smith

Name (Please Print) Stephen M Lipsland

Applicant's Signature Peggy Kral

Name (Please Print) PEGGY KRAL

VILLAGE OF HOFFMAN ESTATES
ZONING BOARD OF APPEALS
REQUEST FOR NON-RESIDENTIAL VARIATION HEARING

RESPONSE TO QUESTION 5

W2001 VHE Realty, LLC (the "***Applicant***") currently owns the property commonly known as Poplar Creek Crossing Shopping Center (the "***Property***"). On April 4, 2005, the Village approved a plat of subdivision for the shopping center. Pursuant to the plat, the Target store and its adjacent parking are located in Lot 1 of the subdivision, while the entire remainder of the shopping center is located in Lot 2 and Lot 3. Now, the Applicant desires to resubdivide the Property to create four new lots within what is currently Lot 2 (the "***Resubdivision***").

This Resubdivision will accommodate the sale of the land under the Citibank, Fifth Third Bank, and Buffalo Wild Wings buildings. As Village staff interprets the Village's Zoning Code, these new lots can be created only if (i) the newly created lots (and improvements thereon) will comply with the Village's zoning requirements applicable to the C-MU District, or (ii) the Village approves zoning variations.

The four proposed lots (and the improvements thereon) comply with all applicable use, density, height, setback, and other zoning requirements, except for one side yard requirement for one lot: the south side yard for Citibank.

Citibank operates a walk-in and drive through banking facility ("***Citibank***") on proposed Lot 3 of the Resubdivision ("***Proposed Lot 3***"). Citibank's operations have included three drive through Automated Teller Machines (the "***ATMs***"), which are covered by a canopy (the "***Canopy***"), on the south side of Proposed Lot 3. The Canopy has existed as it currently stands since its construction in early 2007.

The Canopy is interpreted by staff to be part of the principal Citibank building as opposed to being an accessory building. As such, it is subject to the 20-foot side yard requirement for principal buildings within the C-MU district (Zoning Code § 9-8-3-B-5-d), rather than the 3-foot side yard requirement applicable to accessory buildings. (Zoning Code § 9-3-6-D). While the footprint of the Canopy on the ground conforms with all of the Village side yard requirements, the overhang on the Canopy encroaches into the side yard by between 4.69 and 4.84 feet, as shown on the plat of survey for Proposed Lot 3. Thus, the actual side yard provided is 15.16 feet. The first 2 feet of the eave of the Canopy are a permitted encroachment within the side yard. (See Zoning Code § 9-2-1). Therefore, the encroachment for which a variation is necessary is 2.84 feet.

The Applicant respectfully requests that the Zoning Board of Appeals recommend, and the Village Board of Trustees grant, a variation of the 20-foot side yard setback regulation in the Zoning Code for the Canopy (the "***Requested Variation***") because of the practical difficulties with, and particular hardships caused by, conforming to the regulations. For the reasons stated below: 1) the Property cannot yield a reasonable return if permitted to be used only under the conditions allowed by the applicable zoning regulations; 2) the Applicant's hardship is due to unique circumstances; and 3) the Requested Variation, if granted, will not alter the essential character of the locality.

1. Reasonable Return

The Property cannot yield a reasonable return if the Canopy is subjected to the 20-foot side yard regulation. A drive-through facility of three or more lanes is a virtual necessity for a suburban branch bank. The facility is subordinate to and serves the branch bank building and contributes to the convenience or necessity of the bank's patrons. As such, one might argue that the Canopy over the drive-through facility is more appropriately characterized as an "accessory building" rather than part of the principal building. (See Zoning Code § 9-2-1 (definition of "accessory building")). Whether or not it strictly satisfies the definition of "accessory building," the Canopy serves an accessory function and, if one were "starting from scratch," it would be more reasonable to apply the 3-foot side yard applicable to accessory buildings than it would the 20-foot general C-MU side yard requirement. (See Zoning Code § 9-3-6-D (3-foot side yard for accessory buildings).

Nevertheless, even if the Canopy is part of the principal building and the 20-foot requirement applies, a variation is appropriate in this case. A drive-through facility "eats up" a lot of ground without resulting in much bulk. To illustrate, a drive-through facility typically projects at least 40 feet from the side of a bank building. However, except for its Canopy and supports, the facility at issue here is open air and does not block a significant amount of air and sunlight.

Illinois' Zoning Enabling Act begins with the words: "To the end that ***adequate light, pure air,*** and safety from fire and other dangers may be secured . . . ." 65 ILCS 5/11-13-1 (emphasis added). While these are important goals, they are not advanced when the 20-foot side yard requirement is applied to the Canopy. The Canopy, which encroaches less than 5 feet into the side yard, certainly blocks less air and sunlight than would a walled building addition that extends out to satisfies the side yard requirement. Further, the entire banking facility is a relatively low impact land use. The building itself is less than 4,700 square feet and, as mentioned above, the drive-through facility is open air, except for the Canopy and its supports.

As a result, the 20-foot side yard, when applied to this situation, is unreasonable and denies the Applicant a reasonable use of, and return, on its property. The minor variation requested is appropriate.

2. Unique Circumstances

The Applicant's hardship is due to unique circumstances and the conditions upon which the Requested Variation is based would not be applicable, generally, to other property within the same zoning classification. This Requested Variation is very specifically applicable only to an open canopy covering drive-through ATM facilities. Furthermore, the Canopy's current encroachment within the setback is minor, and the footprint of the Canopy falls within the Zoning Regulations.

3. Essential Character

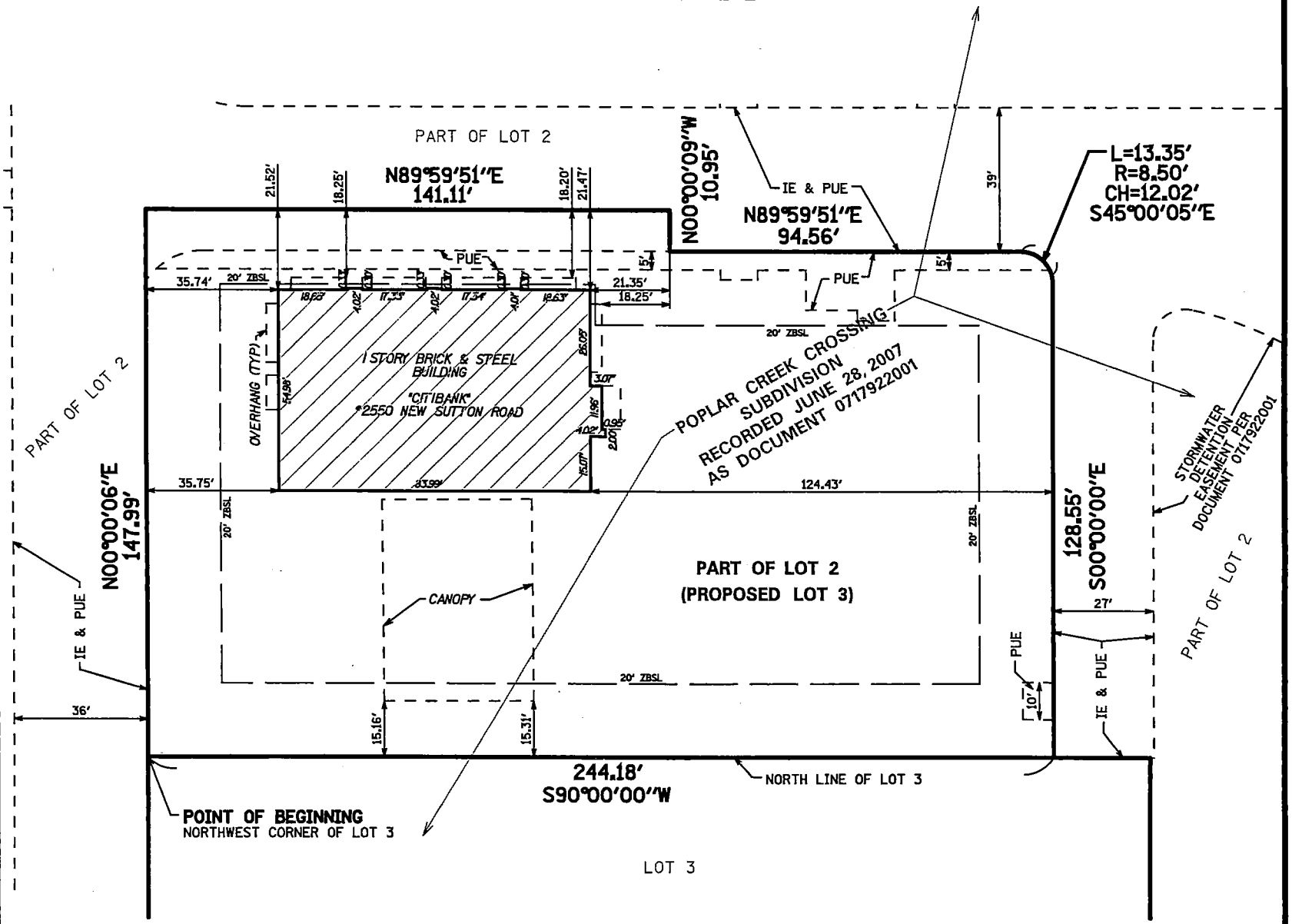
The Requested Variation, if granted, will not alter the essential character of the locality. Because of the commercial nature of the location and the Canopy's minimal encroachment into the side yard, the Requested Variation will not be detrimental to the public welfare or injurious to the other property or improvements in the neighborhood in which the Property is located. Furthermore, well established landscaping along the south lot line of Proposed Lot 3 mitigates any impact that exists for neighbors to the south.

The Requested Variation will not impair an adequate supply of light and air to the adjacent property, or substantially increase the congestion in the public streets, increase the danger of fires, endanger the public safety, or substantially diminish or impair property values in the neighborhood. Because the Canopy is an open structure, light or air are not substantially obstructed.

As an aside, Citibank has been operating with the existing Canopy since March 5, 2007 with no complaints from surrounding neighbors. Unlike most variations granted by municipalities, any impacts resulting from the granting of the Requested Variation have already been determined, and no uncertainty regarding outcomes or unintended consequences remains.

As a result of the foregoing, the Applicant respectfully requests the Zoning Board of Appeals recommend approval of the Requested Variation

EXHIBIT



34,993 SQUARE FEET (0.803 ACRES)

DATE: 08/12/09

JOB NO: 6052

FILENAME: 6052EXB-03

CONSULTING ENGINEERS
SITE DEVELOPMENT ENGINEERS
LAND SURVEYORS

9575 W. Higgins Road, Suite 700,
Rosemont, Illinois 60018
Phone: (847) 696-4060 Fax: (847) 696-4065

SPACECO INC.

N

SCALE: 1" = 40'

HOFFMAN ESTATES

GROWING TO GREATNESS

November 20, 2009

To All Interested Parties:

Please be advised that the Village of Hoffman Estates will conduct public reviews at the request of W2001 VHE Realty, LLC for to consider approvals for a plat of resubdivision, site plan amendment, and variations on the property commonly known as the Poplar Creek Crossing Shopping Center and generally located at the southwest corner of Higgins Road and Sutton Road.

Two separate public reviews will be held for this property.

- The Plan Commission will conduct a public meeting to consider a plat of resubdivision of Lot 2 and 3 of the Poplar Creek Crossing subdivision and also a site plan amendment for the Poplar Creek Crossing Shopping Center, Citibank (2550 N. Sutton Road), Fifth Third Bank (4653 W. Higgins Road), and Buffalo Wild Wings (2540 N. Sutton Road). **The meeting will be conducted at 8:00 p.m. on Wednesday, December 2, 2009 in the Helen Wozniak Council Chambers of the Village Hall, 1900 Hassell Road.**

- The Zoning Board of Appeals will conduct a public hearing to consider variations from the Zoning Code to permit a setback variation for the existing Citibank facility on the property known as 2550 N. Sutton Road. **The hearing will be conducted at 7:30 p.m. on Tuesday, December 8, 2009 in the Helen Wozniak Council Chambers of the Village Hall, 1900 Hassell Road.**

A map designating the subject site is included on the back of this letter. We welcome your attendance and/or testimony in the subject reviews. Appropriate time will be available for questions/comments from interested parties.

Plans for this proposal are available for your review at the Village Hall, Monday through Friday from 8:30 a.m. to 5:00 p.m. Should you wish to review the plans or would like additional information prior to the public meetings, please contact me at (847)781-2670. Should it become necessary to continue either of these meetings to an additional date, it will be announced at the conclusion of testimony on December 2nd and/or December 8th. No further notification of these reviews will be sent.

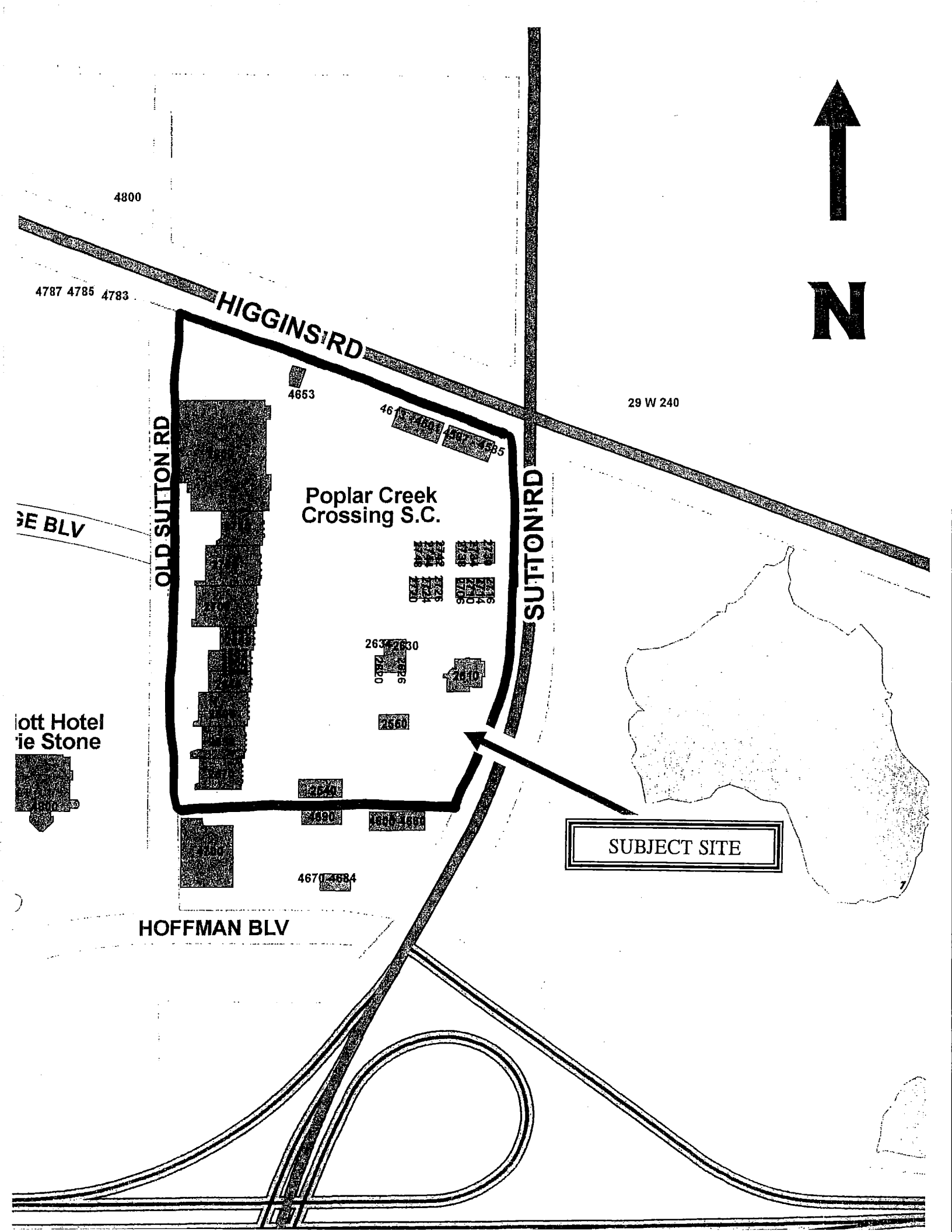
Sincerely,

Brian Portz, Associate Planner
Department of Development Services

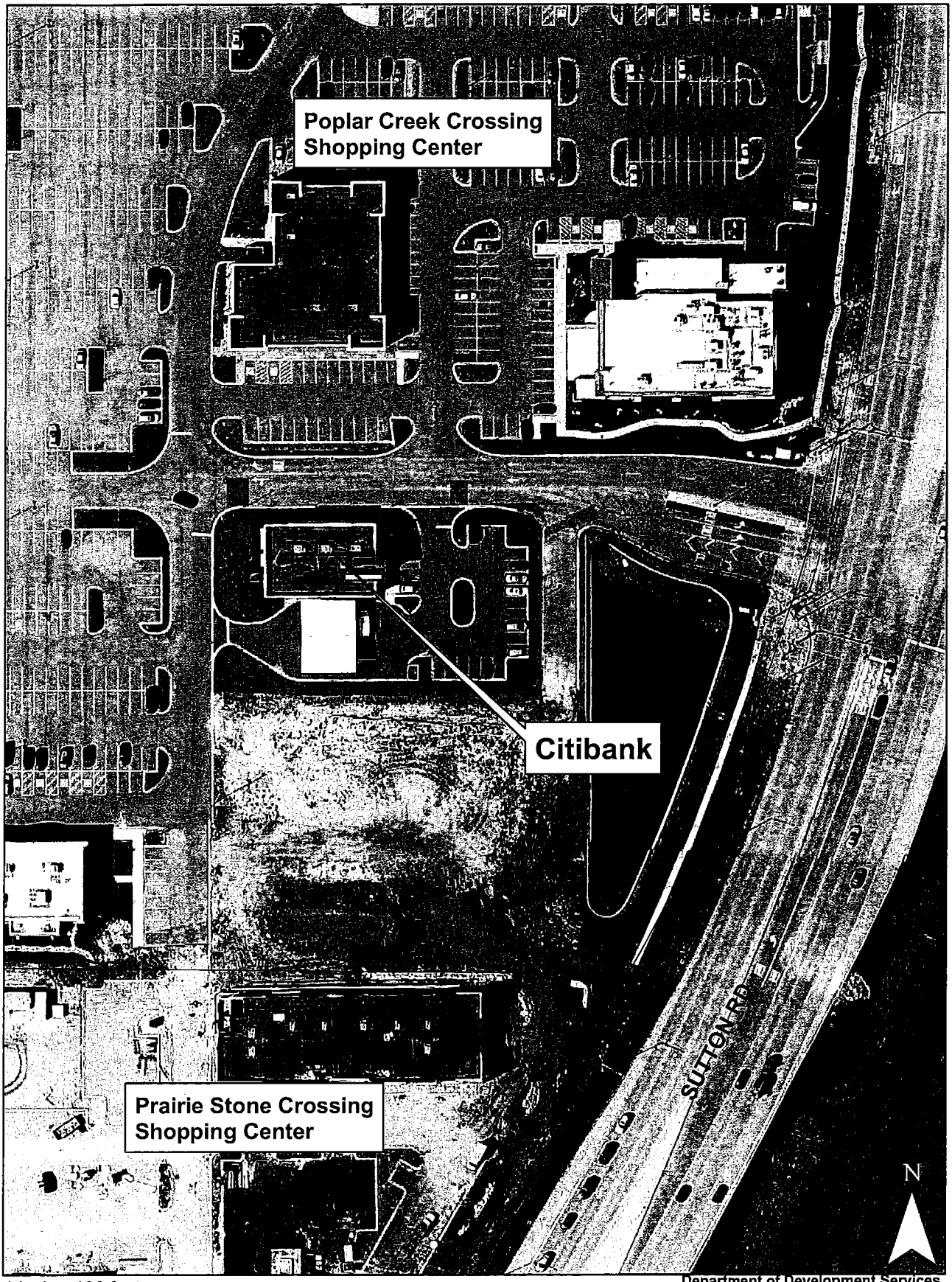
BP/pm

1900 Hassell Road
Hoffman Estates, Illinois 60169
www.hoffmanestates.org

Phone: 847-882-9100
Fax: 847-843-4822


4800
4787 4785 4783
HIGGINS RD
4653
29 W 240
OLD SUTTON RD
SUTTON RD
Poplar Creek
Crossing S.C.
GE BLV
2630
2560
2540
4690
4670-4684
HOFFMAN BLV
SUBJECT SITE
N

Citibank - 2550 N. Sutton Road



1 inch = 100 feet

Department of Development Services
Planning Division
December 2009

VILLAGE OF HOFFMAN ESTATES

Memo

TO: President & Board of Trustees

FROM: Gary Stanton, Plan Commission Chairman

RE: **REQUEST BY W2001 VHE REALTY, LLC, AND RUBINA REALTY CORPORATION FOR:**

A. PRELIMINARY AND FINAL PLAT OF RESUBDIVISION OF LOT 2 AND 3 OF POPLAR CREEK CROSSING SUBDIVISION

REQUEST BY W2001 VHE REALTY, LLC, FOR:

B. SITE PLAN AMENDMENT TO THE POPLAR CREEK CROSSING SHOPPING CENTER; AND

C. SITE PLAN AMENDMENT TO THE CITIBANK DEVELOPMENT AT THE POPLAR CREEK CROSSING SHOPPING CENTER; AND

D. SITE PLAN AMENDMENT TO THE FIFTH THIRD BANK DEVELOPMENT AT THE POPLAR CREEK CROSSING SHOPPING CENTER; AND

E. SITE PLAN AMENDMENT TO THE BUFFALO WILD WINGS RESTAURANT AT THE POPLAR CREEK CROSSING SHOPPING CENTER

FINDING OF FACT

DATE: December 11, 2009

Plan Commission Hearing Date: December 2, 2009
P.C. #2009020, #2009023, #2009024, and #2009025

REQUEST

Request by W2001 VHE Realty, LLC and Rubina Realty Corporation for:

A. Preliminary and final plat of resubdivision of Lot 2 and 3 of Poplar Creek Crossing Subdivision.

Request by W2001 VHE Realty, LLC for:

B. Site plan amendment to the Poplar Creek Crossing Shopping Center.

C. Site plan amendment to the Citibank development at the Poplar Creek Crossing Shopping Center.

D. Site plan amendment to the Fifth Third Bank development at the Poplar Creek Crossing Shopping Center.

E. Site plan amendment to the Buffalo Wild Wings restaurant at the Poplar Creek Crossing Shopping Center.

BACKGROUND

The Poplar Creek Crossing Shopping Center received final Village Board site plan approval in April 2005. The approval included a Target store and several mid-sized retail tenants, several small tenant retail buildings, and conceptual building pad sites for a freestanding restaurant and two banks. Subsequently, final site plan approval was granted by the Village Board for a Claim Jumper restaurant, Citibank, Fifth Third Bank, and a Buffalo Wild Wings restaurant.

The shopping center is currently subdivided into three lots that contain the Target store and its parking lot, the rest of the retail buildings and parking lots, and a vacant 1.7 acre lot (south of the shopping center) that was retained by the previous property owner for future development. The entire shopping center is designed with common access, parking, detention, etc. There are access drives located on Sutton Road, Higgins Road, and Old Sutton Road.

As part of the development, two "future development sites" were proposed on the overall site plan. One site is located on the north side of the property and the other is located on the south side of the property. The site on the north side of the property was developed as a Fifth Third Bank and the site on the south side of the property was developed as a Citibank. These two properties are part of the shopping center property, but somewhat act as "standalone" properties with their own parking areas. The Buffalo Wild Wings, on the other hand, is located on the south side of the main shopping center parking lot and shares parking with other businesses in this area of the property.

PETITIONER PROPOSAL

Plat of Resubdivision

The petitioner is proposing to resubdivide the existing 30.67 acre site into five separate lots to permit the sale of the Fifth Third Bank, Citibank, and Buffalo Wild Wings as separate lots. The Target store lot with its associated parking will not be changed with this proposed resubdivision. The proposed lots will be resubdivided as follows:

Lot Number	Acres	Land Use
Lot 1	26.7	All in-line retail buildings, along with the smaller retail buildings in front along Route 59
Lot 2	1.2	Fifth Third Bank and its parking lot
Lot 3	0.803	Citibank and its parking lot
Lot 4	0.47	Buffalo Wild Wings
Lot 5	1.38	Vacant land

When the plat of resubdivision was surveyed and drawn up by the engineering consultant, errors in the original plat of subdivision were discovered that consist of gaps and/or overlaps of the property lines. The errors consist of improper placement of property lines along the north, east, and south sides of the property. For example, the east property line was incorrectly drawn 4-5 feet to the east into the right of way of Route 59 on the original subdivision plat. The same type of error was noted along the north and south property lines. The plat of resubdivison will correct these errors. Because the property lines will have to move in toward the shopping center, the public utility easements and building setback lines will also have to be moved and rededicated. The Target property lines are not affected by these errors.

Due to the building setback lines moving closer to the buildings along the north and east sides of the property, the existing buildings were checked to ensure that they did not now encroach into those new setback locations. This setback analysis noted that none of the buildings will encroach into the new setback location, therefore, setback variations are not required.

Ongoing Maintenance of Shared Portions of the Overall Site

On this site, there are shared areas (driveways, parking, landscaping, lighting, etc.) that will be used by all the property owners on the lot. A private Operation and Easement Agreement that outlines the responsibilities for maintenance of the common areas exists between Target Corporation and the owners of the Poplar Creek Crossing Shopping Center. The new owner(s) of the Fifth Third Bank property, Citibank property, and Buffalo Wild Wings property will become a party to this agreement. The Village is not a party to this agreement.

The Village's main concern with the resubdivision of this property is to be able to enforce property maintenance violations upon any owner within the larger property. It is critical that the Village have a mechanism in place to quickly have violations corrected. Past experience has shown that without these conditions in place, the Village has to invest significant time trying to negotiate between property owners to have a simple problem fixed. For example, if there is a pothole on the internal driveway that connects to Route 59, the Village needs to have the authority to cite the owner of the Citibank property for the violation even though the violation is not actually on their property. In this example, the owner of the Citibank property relies on the driveway from Route 59 to provide access to their site. If there is a property maintenance violation on the remainder of the property, then the site plan for Citibank will not be in compliance with its site plan approval because that approval is reliant upon the larger property being in compliance with Village code. A condition of approval is proposed to address this issue. The Village Board recently approved a similar condition for the Saddle Room property resubdivision.

Poplar Creek Crossing Site Plan Amendment

The requested plat of resubdivision will require a site plan amendment to the Poplar Creek Crossing site. This site plan amendment will not involve construction of any buildings on the site. It is merely an amendment to the approved site plan to permit the resubdivision of the property and to allow for exceptions to the C-MU Design Guidelines and Standards that will be required as a result of this resubdivision. The property is zoned C-MU and is governed by the C-MU Design Guidelines and Standards. The waivers are necessary because of the location of the newly created property lines. The exceptions requested generally pertain to perimeter landscaping requirements in the Design Guidelines.

Because many of the new property lines around the Citibank lot, the Fifth Third Bank lot, and the Buffalo Wild Wings lot will traverse through drive aisles in the parking lot, the C-MU Design Guidelines and Standards pertaining to landscaping buffers will not be met, specifically, the C-MU Design Guidelines and Standards Section 2.10.1 that requires a 7 foot perimeter landscape buffer between abutting outlots within the same C-MU development.

The adjustment of the east property line to correct the original platting error will require an exception from the C-MU Design Guidelines and Standards pertaining perimeter landscaping buffers required adjacent to public road rights of way. The property line adjustment will result in a 15 foot landscape buffer instead of the required 20 feet. This 15 foot buffer is located from the Caribou Coffee drive-thru lane to the east property line. A 2 foot exception was approved with the Caribou drive-thru lane approval to permit an 18 foot landscape buffer at this location. There are other portions of the parking lot along the east property line that will encroach into the 20 foot landscape buffer with the adjusted property lines. These landscape buffer range in width from 16 feet to 19 feet. There are no parking lot encroachments into the landscape buffer on the north side of the property.

Citibank Site Plan Amendment

The Citibank portion of the property will be subdivided into its own lot with this proposed resubdivision. The parking lot for the Citibank building will be contained within the new lot.

Because this property will now have property lines on all four sides (instead of just one property line on the south side), the lot is considered to be a stand alone lot according to the C-MU Design Guidelines and Standards; therefore, the proposed lot was analyzed to see if it met the C-MU Design Guidelines and Standards. The following information was found in this analysis.

The proposed north property line for the Citibank property will partly traverse through the drive aisle on the north side of the building. Because of this, the C-MU Design Guidelines and Standards landscaping buffer requirement will not be met. A 7 foot landscape buffer is required along all property lines. This cannot be met on the north side of the building, therefore, an exception from the Design Guidelines is required for the north property line. A condition of approval has been recommended pertaining to this exception. The other three sides of the lot will meet Design Guidelines requirements pertaining to perimeter landscaping.

Fifth Third Bank Site Plan Amendment

The Fifth Third Bank portion of the property will be subdivided into its own lot with this proposed resubdivision. The parking lot for the Fifth Third Bank building will be contained within the new lot.

Because this property will now have property lines on all four sides (instead of just one property line on the north side), the lot is considered to be a stand alone lot according to the C-MU Design Guidelines and Standards; therefore, the proposed lot was analyzed to see if it met the C-MU Design Guidelines and Standards. The following information was found in this analysis.

The C-MU Design Guidelines and Standards require one shade tree for each 40 linear feet of perimeter landscape buffer. Based on the 1,065 linear feet for the lot, 27 shade trees would be required. Fourteen shade trees were planted on the site with the original site plan approval; therefore, an exception of 13 shade trees is required. A condition of approval has been recommended pertaining to this exception.

The proposed west and south property lines for the Fifth Third Bank property will traverse through the center of the drive aisles on the south and west sides of the property. Because of this, the C-MU Design Guidelines and Standards landscaping buffer requirement will not be met along the south and west sides. A 7 foot landscape buffer is required along all property lines. This cannot be met on the south and west sides of the property, therefore, an exception from the Design Guidelines is required for the south and west property lines. The north and east sides of the lot will meet Design Guidelines requirements.

Buffalo Wild Wings Site Plan Amendment

The Buffalo Wild Wings portion of the property will be subdivided into its own lot with this proposed resubdivision. The Buffalo Wild Wings site plan was originally approved with a shared parking concept. The restaurant shares parking with Office Max, PetSmart, and part of Michael's. The proposed property lines will be drawn such that there will only be five parking spaces on the newly create Buffalo Wild Wings lot. Through the Operation and Easement Agreement for the site, Buffalo Wild Wings will still have access to the rest of the parking spaces that the original site plan approval allowed them to use. Nothing will change as a result of this proposed resubdivision - only new lot lines will be created. The use of the parking lot will remain the same.

Because this property will now have property lines on all four sides (instead of just one property line on the south side), the lot is considered to be a stand alone lot according to the C-MU Design Guidelines and Standards; therefore, the proposed lot was analyzed to see if it met the C-MU Design Guidelines and Standards. The following information was found in this analysis.

The C-MU Design Guidelines and Standards require one shade tree for each 40 linear feet of perimeter landscape buffer. Based on the 586 linear feet for the lot, 15 shade trees would be required. Eight shade trees were planted on the site with the original site plan approval; therefore, an exception of seven shade trees is required. A condition of approval has been recommended pertaining to this exception.

The proposed north, east, and west property lines for the Buffalo Wild Wings property will traverse through the drive aisles on the north side of the building and through the parking spaces on the west side of the property. Also, on the east side of the property, the proposed property line will be located directly adjacent to a sidewalk. Because of this, the C-MU Design Guidelines and Standards landscaping buffer requirement will not be met along the north, east, and west sides. A 7 foot landscape buffer is required along all property lines. This cannot be met on the north, east, and west sides of the property; therefore, an exception from the Design Guidelines is required for the north, east, and west property lines. A condition of approval has been recommended pertaining to this exception. The south side of the lot will meet Design Guidelines requirements.

Development Services Comments

When the site plans were originally approved for the Poplar Creek Crossing Shopping Center and each of the future development sites (Fifth Third Bank, Citibank, and Buffalo Wild Wings), it was with the understanding that this property would be subdivided into three separate lots - the Target lot, the Poplar Creek Crossing lot, and the vacant lot on the southeast corner of the site. It was understood that the Poplar Creek Crossing lot, which contains most of the Center's buildings, would act as one cohesive property with single ownership. At the time of site plan approval for each development, the individual sites (Fifth Third Bank, Citibank, and Buffalo Wild Wings) were designed to meet Village code requirements for landscaping, etc. with the idea that this entire site acted as one large development, not separate developments on the site. With this in mind, the landscaping on each individual site was designed to coordinate with the rest of the overall site. If the shopping center property were subdivided into individual lots when the site plan for this site was originally approved, each outlot would have been required to have additional landscaping, as required by Village code. When new lot lines are drawn after a site has been approved and planted with the approved landscaping, the landscaping requirements usually cannot be met, therefore, exceptions to the landscaping requirements are required.

PLAN COMMISSION DISCUSSION

On December 2, 2009, the Plan Commission met to hear a request by W2001 VHE Realty, LLC and Rubina Realty Corporation for a preliminary and final plat of resubdivision of Lot 2 and 3 of Poplar Creek Crossing subdivision. At the same time, W2001 VHE Realty, LLC had four additional requests for site plan amendments to 1) Poplar Creek Crossing Shopping Center, 2) Citibank development at the Poplar Creek Crossing Shopping Center, 3) Fifth Third Bank development at the Poplar Creek Crossing Shopping Center, and 4) Buffalo Wild Wings Restaurant at the Poplar Creek Crossing Shopping Center.

The Plan Commission learned that the Poplar Creek Crossing Shopping Center is currently subdivided into three lots. The petitioner proposed resubdividing the existing 30.67 acre site into four separate lots to permit the sale of the Fifth Third Bank, Citibank, and Buffalo Wild Wings lots. The petitioner indicated to the Plan Commission there were agreements in place for the sale of the lots to both Fifth Third Bank and Citibank. No agreement, as yet, has been made between the petitioner and a prospective buyer of the Buffalo Wild Wings lot. The current Buffalo Wild Wings lease (20 years, with approximately 17 years left) would stay in place for the new owner of the lot.

The Plan Commission's major concern regarding the petitioner's requests were in relation to each of the three lots expected to be sold did not meet some of the C-MU Design Guidelines and Standards. If the lots came before the Plan Commission for approval on their own, they would not have met some of the C-MU Design Guidelines and Standards for landscaping. The Buffalo Wild Wings lot will only have five parking spaces on the lot itself. The petitioner did indicate that it had access agreements in place regarding all the parking that would allow owners of any of the lots to park on each other's lots in perpetuity.

Village staff voiced a concern when questioned regarding the enforcement of property maintenance violations. Staff indicated that it was essential the Village have a mechanism in place to quickly have violations corrected. The petitioner indicated that it would have agreements in place between all the parties regarding maintenance responsibilities. The petitioner also agreed to the revision of the first two conditions, as presented to the Plan Commission on December 2, 2009, by Village staff.

In conjunction with the maintenance issue, the petitioner was asked how the sale of the lots would affect the snow removal. The petitioner indicated the service they have now would remain in effect for all lots.

After all questions and concerns were voiced, the Plan Commission voted 4-2 in favor of all of the petitioner's requests.

AUDIENCE PARTICIPATION

None.

RECOMMENDATION

A. Approval of a request by W2001 VHE Realty, LLC. and Rubina Realty Corporation for preliminary and final plat of resubdivision of Lot 2 and 3 of Poplar Creek Crossing Subdivision, subject following conditions:

1. Each lot within Poplar Creek Crossing Resubdivision #1, with the exception of lot 5, shall be responsible for the maintenance of all shared areas within the resubdivision, including, but not limited to, parking lot/drive aisle pavement, exterior lighting, landscaping, sidewalks, etc. Site plan approvals on lots 1, 2, 3, and 4 shall only be in compliance if all site improvements within the resubdivision are in compliance with Village code. Any property covered by this condition shall be considered to be in violation of their site plan approval so long as a violation exists on any portion of the lots covered by this condition.

2. Petitioner W2001 VHE Realty, LLC and the successor owners of lots 2, 3, and 4 shall maintain valid agreements to be legally binding upon the owners of lots 1, 2, 3, and 4. The agreement(s) shall address shared maintenance, parking, lighting, landscaping, signs, and access issues, and give each lot owner the authority to correct violations on any other property within the resubdivision. Each site plan approval on lot 1, 2, 3, and 4 shall only be valid if the agreement(s) are in place.

3. Approval of Poplar Creek Crossing resubdivision #1 shall be subject to setback variation approval on the Citibank lot.

B. Approval of a request by W2001 VHE Realty, LLC for a site plan amendment to the Poplar Creek Crossing Shopping Center, subject to the following conditions:

1. Each lot within Poplar Creek Crossing Resubdivision #1, with the exception of lot 5, shall be responsible for the maintenance of all shared areas within the resubdivision, including, but not limited to, parking lot/drive aisle pavement, exterior lighting, landscaping, sidewalks, etc. Site plan approvals on lots 1, 2, 3, and 4 shall only be in compliance if all site improvements within the resubdivision are in compliance with Village code. Any property covered by this condition shall be considered to be in violation of their site plan approval so long as a violation exists on any portion of the lots covered by this condition.

2. The following exceptions are granted for the Poplar Creek Crossing property only:

   a. An exception is granted to Section 2.10.1 of the C-MU Design Guidelines and Standards which pertains to the perimeter landscaping requirement, specifically, the requirement of a 7 foot landscape buffer between Lot 1 and the proposed Lot 2, 3, and 4. A 0 foot landscape buffer is granted due to the property lines traversing through the existing drive aisles and parking lots on the property.

   b. An exception is granted to Section 2.10.1 of the C-MU Design Guidelines and Standards pertaining to the perimeter landscaping requirement of 20 feet abutting a public road right of way. A minimum 15 foot landscape buffer is granted along the east side along Route 59.

3. All conditions of approval of the original site plan approval for the Poplar Creek Crossing Shopping Center shall remain in effect.

C. Approval of a request by W2001 VHE Realty, LLC for a site plan amendment to the Citibank development at the Poplar Creek Crossing Shopping Center, subject to the following conditions:

1. Each lot within Poplar Creek Crossing Resubdivision #1, with the exception of lot 5, shall be responsible for the maintenance of all shared areas within the resubdivision, including, but not limited to, parking lot/drive aisle pavement, exterior lighting, landscaping, sidewalks, etc. Site plan approvals on lots 1, 2, 3, and 4 shall only be in compliance if all site improvements within the resubdivision are in compliance with Village code. Any property covered by this condition shall be considered to be in violation of their site plan approval so long as a violation exists on any portion of the lots covered by this condition.

2. The following exception is granted for the Citibank property only:

   a. An exception is granted to Section 2.10.1 of the C-MU Design Guidelines and Standards which pertains to the perimeter landscaping requirement, specifically, the requirement of a 7 foot landscape buffer on the north side of the building. A 0 foot landscape buffer is granted due to the property line traversing through the existing drive aisle north of the building.

3. All conditions of approval of the original site plan approval for Citibank shall remain in effect.

D. Approval of a request by W2001 VHE Realty, LLC for a site plan amendment to the Fifth Third Bank development at the Poplar Creek Crossing Shopping Center, subject to the following conditions:

1. Each lot within Poplar Creek Crossing Resubdivision #1, with the exception of lot 5, shall be responsible for the maintenance of all shared areas within the resubdivision, including, but not limited to, parking lot/drive aisle pavement, exterior lighting, landscaping, sidewalks, etc. Site plan approvals on lots 1, 2, 3, and 4 shall only be in compliance if all site improvements within the resubdivision are in compliance with Village code. Any property covered by this condition shall be considered to be in violation of their site plan approval so long as a violation exists on any portion of the lots covered by this condition.

2. The following exceptions are granted for the Fifth Third Bank property only:

   a. An exception is granted to Section 2.10.1 of the C-MU Design Guidelines and Standards which pertains to the perimeter landscaping requirement, specifically, the requirement of a 7 foot landscape buffer on the west and south sides of the property. A 0 foot landscape buffer is granted due to the property line traversing through the existing drive aisle west and south of the building.

   b. An exception is granted to Section 2.10.2 of the C-MU Design Guidelines and Standards which pertains to the perimeter shade tree requirement, specifically the requirement of one shade tree for each 40 linear feet of perimeter landscape buffer. Based on the 1,065 linear feet, 27 shade trees would be required. Fourteen shade trees were planted on the site, therefore, an exception of 13 shade trees is granted.

3. All conditions of approval of the original site plan approval for Fifth Third Bank shall remain in effect.

E. Approval of a request by W2001 VHE Realty, LLC for a site plan amendment to the Buffalo Wild Wings restaurant at the Poplar Creek Crossing Shopping Center, subject to the following conditions:

1. Each lot within Poplar Creek Crossing Resubdivision #1, with the exception of lot 5, shall be responsible for the maintenance of all shared areas within the resubdivision, including, but not limited to, parking lot/drive aisle pavement, exterior lighting, landscaping, sidewalks, etc. Site plan approvals on lots 1, 2, 3, and 4 shall only be in compliance if all site improvements within the resubdivision are in compliance with Village code. Any property covered by this condition shall be considered to be in violation of their site plan approval so long as a violation exists on any portion of the lots covered by this condition.

2. The following exceptions are granted for the Buffalo Wild Wings property only:

    a. An exception is granted to Section 2.10.1 of the C-MU Design Guidelines and Standards which pertains to the perimeter landscaping requirement, specifically, the requirement of a 7 foot landscape buffer on the north, west and east sides of the building. A 0 foot landscape buffer is granted due to the property line traversing through the existing drive aisle north of the building, through the parking spaces on the west side of the building, and through a sidewalk on the east side of the building.

    b. An exception is granted to Section 2.10.2 of the C-MU Design Guidelines and Standards which pertains to the perimeter shade tree requirement, specifically the requirement of one shade tree for each 40 linear feet of perimeter landscape buffer. Based on the 586 linear feet of the perimeter of the proposed lot, 15 shade trees would be required. Eight shade trees are planted on the site, therefore, an exception of seven shade trees is granted.

3. All conditions of approval of the original site plan approval for the Buffalo Wild Wings shall remain in effect.

cc: J. Norris, M. Koplin, P. Gugliotta, M. Hankey, G. Salavitch, D. Plass, S. Neil, B. Skowronski, Petitioner

VILLAGE OF HOFFMAN ESTATES
ZONING BOARD OF APPEALS

FINDING OF FACT

DATE OF PUBLIC HEARING(S): December 8, 2009

DATE OF PRESENTATION TO VILLAGE BOARD: December 14, 2009

PETITION: Hearing held at the request of the Village of Hoffman Estates (Lessor) and The Everest Group/Sprint, Clearwire (Lessee) to consider a special use under the Zoning Code to permit the installation of communication antennas and associated equipment to be located in an existing shelter on the property located at 4690 Olmstead Drive.

DISTRICT IN WHICH PROPERTY IS LOCATED: R-9, Planned Development District Subzone F-2

ZONING CODE SECTION(S) FOR SPECIAL USE: 9-5-9-D-9 and 9-3-9-A

FINDING-OF-FACT: The ZBA found that the Standards for a Special Use (Section 9-1-18) were met.

MOTION: Request to grant the Village of Hoffman Estates (Lessor) and The Everest Group/Sprint, Clearwire (Lessee), ***a special use under Sections 9-5-9-D-9 and 9-3-9-A to permit the installation of two (2) microwave dishes and associated equipment to be no greater than one hundred and thirty three (133) feet high on a Village water tank at 4690 Olmstead Drive.***

The following conditions shall apply:

1. **This special use shall be subject to approval of the final lease agreement with the Village of Hoffman Estates.**
2. **No advertising shall be allowed on the equipment or structures.**
3. **The petitioner shall pay all costs associated with the third party review and inspections, as required by the Village's Public Works Department policy.**
4. **Should the operation of these microwave dishes cease for a period of six (6) months, the dishes and associated equipment shall be removed per Zoning Code Section 9-1-18-L.**

The petitioner was agreeable to the above listed conditions.

RECOMMENDATION: The Zoning Board of Appeals (ZBA) recommends approval of this request.

The petitioner, Mr. Faber representing Sprint-Clearwire, requested a special use to install two microwave dish antennas on the water tank. The dishes operate under a different radio band from the existing cellular antennas and are used to carry the increased volumes of data (video

and internet) common in modern cell phones. The Zoning Board confirmed that the structural report was completed and was accepted by the Village. The Zoning Board confirmed that each dish weighs approximately 45 pounds including the mounting equipment. The Zoning Board recommended approval of the request.

AUDIENCE COMMENTS

For the benefit of the audience, Chairman Weaver read the following into the record: The Federal Communications Act of 1996 expressly pre-empts local governments from regulating the placement, construction or modification of personal wireless services on the basis of environmental or health issues. Such concerns cannot be discussed or used as a basis of the decision whether to grant a special use.

Alice Kot, of 4695 Olmstead, inquired when the installation would occur and Mr. Faber replied that the installation takes typically 1-2 days and occurs during the daytime, and not during inclement weather. Ms. Kot inquired about the difference between these new dishes and the existing cellular antennas, and Mr. Faber replied that microwave dishes have been in use since the 1950s and these dishes will be used to transmit data between dishes at different sites, unlike the panel antennas that provide voice coverage. The new dishes will not increase the geographic coverage area, but will improve existing coverage. The dishes and equipment will not create noise onto surrounding properties.

VOTE:
7 Ayes
0 Nays
0 Absent

ZONING BOARD OF APPEALS
Chairman William Weaver
Vice-Chairman Ronald Jehlik
Denise Wilson
Michael Ciffone
Masoom Ali
Donna Boomgarden
Michael Gaeta

*** IMMEDIATE AUTHORIZATION TO APPLY FOR PERMITS IS REQUESTED ***

THIS SPECIAL USE WILL EXPIRE UNLESS ACTED UPON WITHIN ONE (1) YEAR OF VILLAGE BOARD APPROVAL

FINDING OF FACT WRITTEN BY DEVELOPMENT SERVICES STAFF

VILLAGE OF HOFFMAN ESTATES

Memo

TO: William Weaver, Zoning Board of Appeals Chairman

FROM: Josh Edwards, Assistant Planner

RE: **SPRINT-CLEARWIRE COMMUNICATIONS - 4690 OLMSTEAD DRIVE - SPECIAL USE - COMMUNICATION ANTENNAS AND ASSOCIATED EQUIPMENT**

DATE: December 3, 2009

HEARING DATE: December 8, 2009

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1. REQUEST SUMMARY

Request by Village of Hoffman Estates (owner) and Sprint-Clearwire Communications (lessee) for a special use to permit the installation of two microwave dishes and associated equipment on a Village owned water tank at 4690 Olmstead Drive.

2. BACKGROUND

The existing water tank at 4690 Olmstead Drive currently contains communication antennas installed by Sprint, Verizon, T-Mobile, and Cricket. One set of existing antennas is mounted on the neck of the structure at a height of 70 feet and the other sets are mounted on top of the tank at 130, 138, and 145 feet. The equipment for the existing antennas is located near the base of the tank in two adjacent shelters to the north (Cricket and T-Mobile), in a shelter to the northeast (Verizon), and in a shelter to the west (Sprint).

3. PETITIONER PROPOSAL

The petitioner is proposing to install two, 30 inch high microwave dishes at 133 feet above grade on top of the bulb of the water tank. The installation requires a special use approval. The two dishes would be attached to the existing array of Sprint cellular antennas located at 130 feet high, which includes 9 antennas.

The function of the new dishes is to support and upgrade the Sprint network with voice and data transmission as an alternative to installing miles of underground fiber optic wires throughout the coverage area.

No separate building or equipment is proposed on the ground. The new equipment for the dishes would be installed entirely within the existing brick equipment shelter located west of the water tank. Wiring would be installed underground between the shelter and water tank; and within the water tank to the antenna array.

4. SITE CONDITIONS

The subject property is zoned R-9 Planned Development District (Subzone F-2 Business). The properties to the south are zoned R-9 (Subzone "D" and contains townhomes). The properties to the east across Olmstead Drive are zoned R-9 (Subzones "C" and "D" and contains single family homes. The properties to the north and northwest are zoned R-9 (Subzone F-2 Business and contains the Rose Plaza Shopping Center and commercial outbuildings including a bank and daycare).

5. APPLICABLE REQUIREMENTS

a) Section 9-5-9-D-9 (p. CD9:87) regarding antennas and communication towers in the R-9 District refers to Section 9-3-9.

b) Section 9-3-9-A (p. CD9:58) states that the total antenna height of any communications tower, antenna or combination thereof of any height over 45 feet upon Village owned or leased facilities shall be permitted only as a special use.

6. ADJACENT OWNER COMMENTS

Standard notification letters have been mailed and as of this writing no comments have been received.

7. RELEVANT SPECIAL USE HISTORY

Subject Property

a) Ordinance No. 4067-2008 was granted to allow Cricket Communications to install 3 antennas at a height of 138 feet.

b) Ordinance No. 3265-2001 was granted to allow Voicestream Wireless (T-Mobile) to install 12 antennas at a height of 145 feet. The existing black wrought iron fence around the water tank site was constructed at this time, which replaced a chain link fence.

c) Ordinance No. 2978-1998 was granted to allow Sprint PCS to install 9 antennas. This ordinance was replaced by Ordinance No. 3023-1998, which was granted to allow Sprint PCS to install 9 antennas at a height of 130 feet.

d) Emergency radio dispatch antennas as part of the Northwest Central Dispatch System were installed on the water tank in 1998, which did not require a special use.

e) Ordinance No. 2910-1997 was granted to allow Ameritech (Verizon Wireless) to install 9 antennas at a height of 70 feet. This ordinance was replaced by Ordinance No. 3670-2004, which was granted to allow Verizon Wireless to install 12 antennas at a height of 116 feet. The existing Verizon Wireless antennas are currently installed at 70 feet.

Similar Properties

Over the past decade various communication antennas have been installed on all 6 water tanks throughout the Village.

8. PUBLIC WORKS COMMENTS

A thorough structural analysis and engineering review is required prior to the zoning review for Village owned water tanks. A structural analysis prepared by a licensed engineer on behalf of the petitioner has been reviewed by Public Works and the Village's third party engineering consultants. The structural analysis concluded that the installation will have no adverse impact on the water tank. Public Works has accepted the report.

9. IMMEDIATE AUTHORIZATION TO APPLY FOR PERMIT(S)

The petitioner has requested an Immediate Authorization to Apply for Permit(s).

10. DEVELOPMENT SERVICES COMMENTS

The proposal to install dishes onto a water tank rather than erecting a separate antenna tower will minimize visual clutter. The proposed dishes are designed to upgrade the existing antennas. The height and shape of the water tank and the relatively small size of the two dishes will reduce the visibility of the dishes from surrounding properties. The dish is smaller than standard cellular antenna arrays and is comparable in size to a residential television satellite dish and no more aesthetically obtrusive.

The equipment on the ground supporting the new dishes will be located entirely within an existing brick equipment shelter.

The existing special use approval and lease for the existing 9 antennas will stay in effect. A new lease will be required for this new installation.

The Federal Telecommunications Act of 1996 expressly preempts local governments from regulating the placement, construction, or modification of personal wireless services on the basis of environmental or health concerns. Such concerns cannot be discussed or used as a basis of the decision whether to grant a special use.

11. MOTION

Should the Zoning Board find that the Standards for a Special Use are met, the following motion is provided with conditions:

A special use under Sections 9-5-9-D-9 and 9-3-9-A to permit the installation of two (2) microwave dishes and associated equipment to be no greater than one hundred and thirty three (133) feet high on a Village water tank at 4690 Olmstead Drive.

The following conditions shall apply:

1. ***This special use shall be subject to approval of the final lease agreement with the Village of Hoffman Estates.***
2. ***No advertising shall be allowed on the equipment or structures.***
3. ***The petitioner shall pay all costs associated with the third party review and inspections, as required by the Village's Public Works Department policy.***
4. ***Should the operation of these microwave dishes cease for a period of six (6) months, the dishes and associated equipment shall be removed per Zoning Code Section 9-1-18-L.***

cc: Corporation Counsel, D. O'Malley, D. Plass, R. Norton, Petitioner

CHI5444

VILLAGE OF HOFFMAN ESTATES
ZONING BOARD OF APPEALS

REQUEST FOR SPECIAL USE HEARING

FOR VILLAGE USE ONLY

Hearing Fee $ 400.00 Date Paid 7/8/09 Received By P. Moore

Hearing Date: 12/8/09 Time: 7:30 pm Legal Published 11/23/09

Receipt Number 293400 Check No. 104883 Zoning District R-9, F-2

PLEASE PRINT OR TYPE

1. Name of Property Owner(s)* Village of Hoffman Estates

E-Mail Address joshua.edwards@hoffmanestates.org Fax 847-490-6868

Owner's Address 1900 Hassell Road Phone 847-882-9100

City Hoffman Estates State IL Zip 60169

Subject Property's Address (if different than #1): 4690 Olmstead

2. Person applying if other than owner:*

Name Will Faber Company The Everest Group/ Sprint, Clearwire

E-Mail Address wfaber85@gmail.com. Fax 773/409-5426

Address 7013 W. 111th St. Phone 773-987-5299

City Worth State IL Zip 60482

3. Property Index Number (PIN) 02-19-119-052-8001

5. Please describe the proposed use, or attach a letter.

Addition of 2 dish antennas to existing telecommunications facility

*** If "owner" is an entity other than an individual(s), then an Economic Disclosure Statement must also be filed.**

6. **An Immediate Authorization to Apply for Permits** allows the Code Enforcement Division to begin the building permit review process prior to the adoption of the Ordinance by the Village Board. The Immediate Authorization makes it possible for you to expedite the plan review process by approximately two weeks. Contact the Code Enforcement Division at 847/781-2631 to discuss the building permit application and review process.

Please check one of the following

☒ Yes, I request Immediate Authorization to Apply for Permits upon approval of my application by the Village Board, allowing me to begin the building permit review process prior to adoption of the Ordinance approving my special use.

Or

☐ No, I do not request Immediate Authorization to Apply for Permits.

7. I, the undersigned, certify the information and submissions provided accurately represent the current conditions and proposed improvement(s) requiring a special use.

Owner's Signature_____

Name (Please Print)_____

Applicant's Signature_____

Name (Please Print) William Fok

All requests for a hearing must be accompanied by the items required according to the nature of the request. All fees must be paid before Zoning Board can hear any case. Any additional fees must be paid before any findings or reports are given to the Village Board.

THE EVEREST GROUP
Representing Sprint/ Clearwire

7013 W 111th St
Worth, IL 60482

773-987-5299

wfaber85@gmail.com

July 8, 2009
Village of Hoffman Estates
1900 Hassell Road
Hoffman Estates, IL 60169

This application for a special use permit on behalf of Sprint/ Clearwire is for the purpose of installing two additional antennas and two lines of associated coaxial cable on the water tank at 4690 Olmstead Drive. The purpose of the communications system upgrade is to facilitate wireless backhaul coverage over the existing Sprint telecommunications network. Effectively, the current T1 system will be replaced with wireless connections between individual communication sites and the central switch. The new antenna will make this linkage possible, thereby lowering costs to consumers and increasing the reliability and robustness of the existing and future data network.

Sincerely yours,

Will Faber

The Everest Group

DEPARTMENT OF PUBLIC WORKS

Memo

TO: Don Plass, Director of Code Enforcement

FROM: Kenneth Hari, Director of Public Works

RE: **CLEARWIRE ANTENNA INSTALLATION**

DATE: October 27, 2009

☐ Urgent	☒ For Review	☐ Please Comment	☐ Please Reply	☒ Enclosure(s)

I have reviewed the proposed projects, including the upgrade load evaluations report issued by Robert Wozniak and the plan review completed by SEH, and concluded that the installation will have no adverse impact on the respective tower located at Olmstead Drive. Accordingly, a construction permit may be issued for the Olmstead Drive facility subject to the following:

- ***Before construction may begin, the installation contractor must attend a pre-construction meeting with Public Works Staff.***
- ***During construction, the tower site at ground level must be clean at all times with no equipment or construction materials stored on site at any time.***

In accordance with the above, an antenna installation permit(s) may be released.

Kenneth Hari, Director of Public Works

Dir/Corr09/ClearwireAntennaInstall 102709

cc: w/o Attachments
Joseph Nebel, Superintendent of Operations
Haileng Xiao, Superintendent of Water & Sewer
Josh Edwards, Planner

HOFFMAN ESTATES

GROWING TO GREATNESS

November 25, 2009

To All Interested Parties:

Please be advised the Zoning Board of Appeals of the Village of Hoffman Estates will conduct a public hearing at the request of The Everest Group/Sprint, Clearwire (Lessee) and the Village of Hoffman Estates (Owner) to consider a special use under the Zoning Code to permit the installation of two dish antennas and associated equipment to be located in an existing shelter on the property located at 4690 Olmstead Drive.

The hearing will be held in the Municipal Building, 1900 Hassell Road, Hoffman Estates, Illinois, **Tuesday, December 8, 2009 at 7:30 p.m.**

A map designating the subject site is included on the back of this letter. Appropriate time will be available for questions/comments from interested parties. Should you wish any additional information, please feel free to contact the Planning Division at 847/781-2660. Material is available at the office for review.

Should it become necessary to continue this hearing to an additional date, it will be announced at the conclusion of testimony at the hearings. No further notification of this review will be sent.

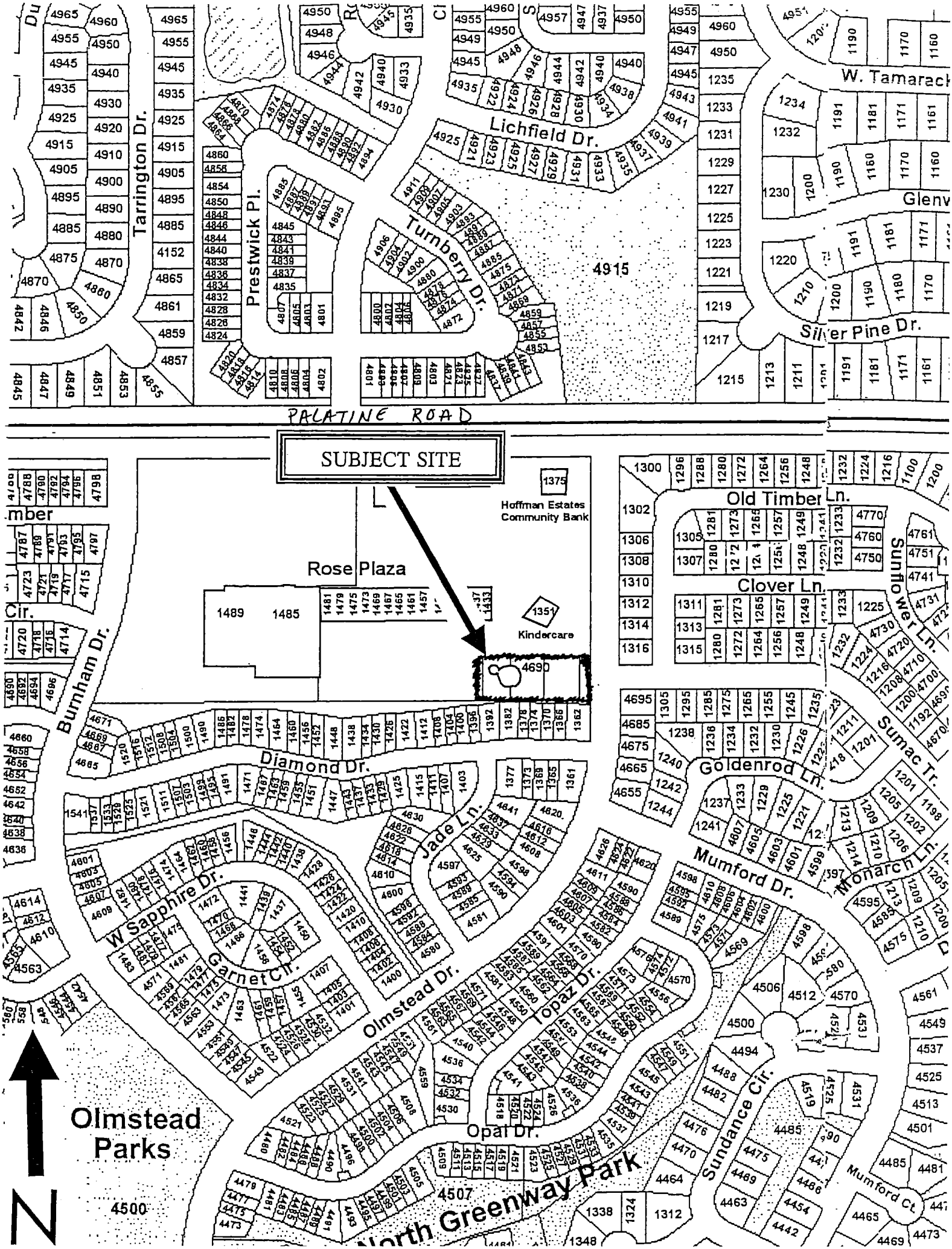
Sincerely,

Josh Edwards, Assistant Planner
Department of Development Services

JE/pm

1900 Hassell Road
Hoffman Estates, Illinois 60169
www.hoffmanestates.org

Phone: 847-882-9100
Fax: 847-843-4822


SUBJECT SITE
Hoffman Estates Community Bank
Rose Plaza
Kindercare
Tarrington Dr.
Prestwick Pl.
Turnberry Dr.
Lichfield Dr.
W. Tamarack
Glenv
Silver Pine Dr.
PALATINE ROAD
Old Timber Ln.
Clover Ln.
Sunflower Ln.
Sumac Tr.
Goldenrod Ln.
Mumford Dr.
Monarch Ln.
Burnham Dr.
Diamond Dr.
Jade Ln.
W Sapphire Dr.
Garnet Cir.
Olmstead Dr.
Topaz Dr.
Opal Dr.
Sundance Cir.
Mumford Ct.
Olmstead Parks
North Greenway Park
4915
4507
4500
N

Structural Report

Prepared for: Clear Wireless LLC.

Existing 125 ft. Pedisphere

Clearwire Site No. IL-CHI5444A (IL7171)
Hoffman Estates 5
4690 Olmstead Drive
Hoffman Estates, Cook Co., IL 30195

May 19, 2009

5/19/09

Abraham J. Rokach S.E.
Illinois SE License No. 081-04073
Expires 11/30/2010

I certify that this report was prepared by me, or under my direct supervision and control, and, to the best of my knowledge and belief, complies with the requirements of the applicable building code.

Fullerton
Engineering Consultants

9700 West Higgins Road, Suite 800, Rosemont, IL 60018
Phone: (847) 292 0200 Fax: (847) 292 0205

Project Summary

Scope:

Structural analysis of existing 125 ft. water tower under proposed antenna configuration.

Design Criteria:

1. International Building Code, 2006 Edition
2. AWWA-D100-05
3. TIA/EIA-222-F 1996

New Equipment Loads:

Antenna:	(1) - 2 ft. Dish @ centerline 131' AGL (1) - 2.5 ft. Dish @ centerline 131' AGL (2) - 2" Diameter Innerduct w/ cables

Design Loads:

Basic Wind Speed	76 mph (fastest mile) / 90 mph (3-second gust), for appurtenance, per TIA/EIA-222-F 1996. 100 mph (fastest mile) / 120 mph (3-second gust), for water tower structure, per ANSI/AWWA D100-96.

Reference:

Water Tower Drawing, by CB&I, contract no. 871774, dated 1978.

Conclusion:

The structural analysis shows that new dish antenna installation will increase the stresses on the existing water tank. The structural analysis shows that the existing water tank is **adequate** for new loads. However, the anchor bolts are slightly overstressed, but still **acceptable** by engineering judgment.

Structural Analysis on Existing Water Tank

Wind Speed

Effective Wind Speed for Water Tank Supports (AWWA-D100-05)	$V_{eff} := 100mph$
Wind Speed For Antennas (TIA-EIA-222-F)	$V_{app} := 76mph$

Material Properties

Material	**(36 ksi)**
Modulus of Elasticity	$E := 29000ksi$

Shape Coefficient for Water Tank Structure

Effective Area Coeffiecient (Flat)	$C_{d\_flat} := 1$
Effective Area Coeffiecient (Cylindrical)	$C_{d\_cyl} := 0.6$
Effective Area Coeffiecient (Sphere)	$C_{d\_sphere} := 0.5$

Water Tank Dimensions

Water Tank

Tank Capacity		$Vol := 500000gal$
Average Tank Diameter		$d_{tank} := 55.5ft$
Tank Height		$h_{tank} := 37.5ft$
Top of Roof		$H_{roof} := 123ft$
Top of Capacity Level		$H_{TCL} := 115.4ft$
Bottom of Capacity Level		$H_{BCL} := 77.9ft$
Mean Height of Water Tank	$H_{mean} := \frac{H_{TCL} + H_{BCL}}{2}$	$H_{mean} = 96.65ft$

Shaft

Diameter of Shaft		$d_{inner} := 10ft$
Shaft Wall Thickness		$t_{shaft} := 1.2035in$
Inner Diameter of Shaft	$d_{shaft} := d_{inner} + 2 \cdot t_{shaft}$	$d_{shaft} = 10.2ft$
Length of Shaft		$L_{shaft} := 49.5ft$

Bell

Height of Bell	$h_{bell} := 22ft$
Diameter of Bell	$d_{bell} := 23.5ft$

Bolt Circle

Diameter of Bolt Circle	$d_{circle} := 24.6ft$
Number of Bolts	$N_{bolt} := 14$
Diameter of Bolts	$d_{bolt} := 1.5in$

Shaft Properties

Radius of Gyration

$$r_{shaft} := \sqrt{\frac{d_{shaft}^2 + d_{inner}^2}{4}} \qquad r_{shaft} = 85.71 \cdot in$$

Slenderness Ratio

$$KL_r := \frac{K \cdot L_{shaft}}{r_{shaft}} \qquad KL_r = 13.86$$

Elastic Section Modulus

$$S_{shaft} := \frac{\pi \cdot \left(d_{shaft}^4 - d_{inner}^4\right)}{32 \cdot d_{shaft}} \qquad S_{shaft} = 13750.5 \cdot in^3$$

Gross Area

$$A_{g\_shaft} := \pi \cdot d_{inner} \cdot t_{shaft} \qquad A_{g\_shaft} = 453.71 \cdot in^2$$

Radius to Thickness Ratio

$$R_{shaft} := \frac{d_{shaft}}{2} \qquad \frac{t_{shaft}}{R_{shaft}} = 0.0197$$

Wind Load on Structures

Wind Pressure

Flat

$$P_{flat} := 30 \cdot C_{d\_flat} \cdot \left(\frac{V_{eff}}{100mph}\right)^2 \cdot psf \qquad P_{flat} = 30 \cdot psf$$

Cylindrical

$$P_{cyl} := 30 \cdot C_{d\_cyl} \cdot \left(\frac{V_{eff}}{100mph}\right)^2 \cdot psf \qquad P_{cyl} = 18 \cdot psf$$

Sphere

$$P_{sphere} := 30 \cdot C_{d\_sphere} \cdot \left(\frac{V_{eff}}{100mph}\right)^2 \cdot psf \qquad P_{sphere} = 15 \cdot psf$$

Wind Projected Area

Tank

$$A_{tank} := \frac{\pi \cdot d_{tank}^2}{4} \qquad A_{tank} = 2419.22\,ft^2$$

Shaft

$$A_{shaft} := L_{shaft} \cdot d_{shaft} \qquad A_{shaft} = 504.93\,ft^2$$

Bell

$$A_{bell} := \frac{d_{shaft} + d_{bell}}{2} \cdot h_{bell} \qquad A_{bell} = 370.71\,ft^2$$

Wind Load

Tank $F_{tank} := A_{tank} \cdot P_{sphere}$ $F_{tank} = 36.29 \cdot kip$

Shaft $F_{shaft} := A_{shaft} \cdot P_{cyl}$ $F_{shaft} = 9.09 \cdot kip$

Bell $F_{bell} := A_{bell} \cdot P_{cyl}$ $F_{bell} = 6.67 \cdot kip$

Antenna Load Summary

$$Carrier = \begin{pmatrix} \text{"Carrier 1"} \\ \text{"Cricket"} \\ \text{"Sprint 1"} \\ \text{"Sprint 2"} \\ \text{"Clearwire 1"} \\ \text{"Clearwire 2"} \\ \text{"Carrier 2"} \end{pmatrix} \quad Elev\_Ant = \begin{pmatrix} 141.5 \\ 134 \\ 128 \\ 128 \\ 131 \\ 131 \\ 65 \end{pmatrix} ft \quad Num\_Ant = \begin{pmatrix} 9 \\ 6 \\ 6 \\ 3 \\ 1 \\ 1 \\ 12 \end{pmatrix} \quad Num\_Cable = \begin{pmatrix} 9 \\ 6 \\ 6 \\ 3 \\ 1 \\ 1 \\ 12 \end{pmatrix}$$

$$Antenna = \begin{pmatrix} \text{"6 ft. Panel Antennas"} \\ \text{"KMW HB-X-AW-19-65-00T"} \\ \text{"RFS APL199016-42TO"} \\ \text{"KMW HB-X-WM-17-65-00T"} \\ \text{"2 ft. Dish"} \\ \text{"2.5 ft. Dish"} \\ \text{"6 ft. Panel Antennas"} \end{pmatrix} \quad Height = \begin{pmatrix} 72 \\ 72 \\ 72 \\ 44.8 \\ 24 \\ 30 \\ 72 \end{pmatrix} \cdot in \quad Width = \begin{pmatrix} 8 \\ 6.2 \\ 5 \\ 6.14 \\ 24 \\ 30 \\ 8 \end{pmatrix} \cdot in \quad Depth = \begin{pmatrix} 4 \\ 6.2 \\ 4 \\ 6.14 \\ 6 \\ 8 \\ 4 \end{pmatrix} \cdot in \quad Weight = \begin{pmatrix} 32 \\ 32 \\ 12 \\ 25 \\ 15 \\ 32 \\ 32 \end{pmatrix} lb$$

$$Mount = \begin{pmatrix} \text{"Mini Monopole"} \\ \text{"Pre-Fabricated Sectorized Mounts"} \\ \text{"Pod Mount"} \\ \text{"None"} \\ \text{"Single Water Tank Mount"} \\ \text{"Single Water Tank Mount"} \\ \text{"Pre-Fabricated Sectorized Mounts"} \end{pmatrix} \quad Num\_Mnt = \begin{pmatrix} 1 \\ 3 \\ 1 \\ 1 \\ 1 \\ 1 \\ 3 \end{pmatrix} \quad A\_Mnt = \begin{pmatrix} 16 \\ 4 \\ 20 \\ 0 \\ 3 \\ 3 \\ 4 \end{pmatrix} ft^2 \quad Wt\_Mnt = \begin{pmatrix} 1532 \\ 500 \\ 3000 \\ 0 \\ 80 \\ 80 \\ 500 \end{pmatrix} lb$$

Force Coefficient on Appurtenance

$Ca(As, F) :=$

$Ca \leftarrow 0$

if $F = 1$

$Ca \leftarrow 1.4$ if $As < 7$

$Ca \leftarrow 2.0$ if $As > 25$

$Ca \leftarrow 1.4 + \frac{(As - 7)}{18} \cdot 0.6$ otherwise

otherwise

$Ca \leftarrow 0.8$ if $As < 7$

$Ca \leftarrow 1.2$ if $As > 25$

$Ca \leftarrow 0.8 + \frac{(As - 7)}{18} \cdot 0.4$ otherwise

Ca

Wind Pressure on Appurtenance

$$P\_Ant := \left| \begin{array}{l} \text{for } i \in 1..N \\ \quad Kz_i \leftarrow \left(\frac{Elev\_Ant_i}{33ft}\right)^{0.2857} \\ \quad qz_i \leftarrow \left[0.00256 \cdot Kz \cdot \left(\frac{V_{app}}{mph}\right)^2\right] \cdot psf \\ \quad Gh_i \leftarrow 0.65 + \frac{0.6}{\left(\frac{Elev\_Ant_i}{33ft}\right)^{0.1429}} \\ \quad P \leftarrow qz_i \cdot Gh_i \\ P \end{array} \right.$$

$$P\_Ant = \begin{pmatrix} 26.77 \\ 26.36 \\ 26.02 \\ 26.02 \\ 26.19 \\ 26.19 \\ 21.44 \end{pmatrix} psf$$

New Appurtenance

$C := 1$

Antenna 1

$Carrier_C$ = "Carrier 1"

$n := 1$ $F := 1$

Model / Quantity

$Antenna_n$ = "6 ft. Panel Antennas"

$Elev\_Ant_n = 141.5\,ft$

Dimension

$Height_n = 72 \cdot in$ $Width_n = 8 \cdot in$ $Depth_n = 4 \cdot in$ $Weight_n = 32\,lb$

Number of Antennas & Cables

$Num\_Ant_n = 9$ $Num\_Cable_n = 9$

Aspect Ratio & Force Coefficient

$As := \frac{Height_n}{Width_n}$ $As = 9$ $CA := Ca(As, F)$ $CA = 1.47$

Area / Antenna:

$A\_ant_n := CA\,Height_n \cdot Width_n$ $A\_ant_n = 5.87\,ft^2$

Platform

Model & Quantity

$Mount_C$ = "Mini Monopole"

$Num\_Mnt_C = 1$

$Wt\_Mnt_C = 1532\,lb$ $A\_Mnt_C = 16\,ft^2$

New Appurtenance Load

Total Area of Appurtenance

$$A\_app_C := \sum_{i=1}^{1} \left(Num\_Ant_i \cdot A\_ant_i + Num\_Mnt_i \cdot A\_Mnt_i\right) \quad A\_app_C = 68.8\,ft^2$$

Total Weight of Appurtenance

$$W\_app_C := \sum_{i=1}^{1} \left(Num\_Ant_i \cdot Weight_i + Num\_Mnt_i \cdot Wt\_Mnt_i\right) \quad W\_app_C = 1820\,lb$$

Existing Appurtenance

$C := 2$

Antenna 2

$Carrier_C = "Cricket"$

$n := 2$ $F := 0$

Model

$Antenna_n = "KMW HB-X-AW-19-65-00T"$

$Elev\_Ant_n = 134\,ft$

Dimension

$Height_n = 72 \cdot in$ $Width_n = 6.2 \cdot in$ $Depth_n = 6.2 \cdot in$ $Weight_n = 32\,lb$

Number of Antennas & Cables

$Num\_Ant_n = 6$ $Num\_Cable_n = 6$

Aspect Ratio:

$As := \frac{Height_n}{Width_n}$ $As = 11.61$

Force Coeffiecient

$CA := Ca(As, F)$ $CA = 0.9$

Area / Antenna:

$A\_ant_n := CA\, Height_n \cdot Width_n$ $A\_ant_n = 2.8\,ft^2$

Platform

Model & Quantity

$Mount_C = "Pre-Fabricated Sectorized Mounts"$ $Num\_Mnt_C = 3$

$Wt\_Mnt_C = 500\,lb$ $A\_Mnt_C = 4\,ft^2$

Existing Appurtenance Load

Total Area of Appurtenance

$$A\_app_C := \sum_{i=2}^{2} \left(Num\_Ant_i \cdot A\_ant_i + Num\_Mnt_i \cdot A\_Mnt_i\right)$$ $A\_app_C = 28.79\,ft^2$

Total Weight of Appurtenance

$$W\_app_C := \sum_{i=2}^{2} \left(Num\_Ant_i \cdot Weight_i + Num\_Mnt_i \cdot Wt\_Mnt_i\right)$$ $W\_app_C = 1692\,lb$

Existing Appurtenance

$C := 3$

Antenna 3

$Carrier_C = "Sprint 1"$

$n := 3$ $F := 1$

Model / Quantity

$Antenna_n = "RFS APL199016-42TO"$

$Elev\_Ant_n = 128\,ft$

Dimension

$Height_n = 72 \cdot in$ $Width_n = 5 \cdot in$ $Depth_n = 4 \cdot in$ $Weight_n = 12\,lb$

Number of Antennas & Cables

$Num\_Ant_n = 6$ $Num\_Cable_n = 6$

Aspect Ratio & Force Coefficient

$As := \frac{Height_n}{Width_n}$ $As = 14.4$ $CA := Ca(As, F)$ $CA = 1.65$

Area / Antenna:

$A\_ant_n := CA\, Height_n \cdot Width_n$ $A\_ant_n = 4.12\,ft^2$

Platform

Model & Quantity

$Mount_C = "Pod Mount"$ $Num\_Mnt_C = 1$

$Wt\_Mnt_C = 3000\,lb$ $A\_Mnt_C = 20\,ft^2$

Existing Appurtenance Load

Total Area of Appurtenance $A\_app_C := \sum_{i=3}^{3} (Num\_Ant_i \cdot A\_ant_i + Num\_Mnt_i \cdot A\_Mnt_i)$ $A\_app_C = 44.7\,ft^2$

Total Weight of Appurtenance $W\_app_C := \sum_{i=3}^{3} (Num\_Ant_i \cdot Weight_i + Num\_Mnt_i \cdot Wt\_Mnt_i)$ $W\_app_C = 3072\,lb$

Existing Appurtenance $C := 4$

Antenna 4 $Carrier_C = "Sprint\ 2"$ $n := 4$ $F := 0$

Model / Quantity $Antenna_n = "KMW\ HB-X-WM-17-65-00T"$ $Elev\_Ant_n = 128\,ft$

Dimension $Height_n = 44.8 \cdot in$ $Width_n = 6.14 \cdot in$ $Depth_n = 6.14 \cdot in$ $Weight_n = 25\,lb$

Number of Antennas & Cables $Num\_Ant_n = 3$ $Num\_Cable_n = 3$

Aspect Ratio & Force Coefficient $As := \frac{Height_n}{Width_n}$ $As = 7.3$ $CA := Ca(As, F)$ $CA = 0.81$

Area / Antenna: $A\_ant_n := CA\,Height_n \cdot Width_n$ $A\_ant_n = 1.54\,ft^2$

Platform

Model & Quantity $Mount_C = "None"$ $Num\_Mnt_C = 1$

$Wt\_Mnt_C = 0\,lb$ $A\_Mnt_C = 0\,ft^2$

Existing Appurtenance Load

Total Area of Appurtenance $A\_app_C := \sum_{i=4}^{4} (Num\_Ant_i \cdot A\_ant_i + Num\_Mnt_i \cdot A\_Mnt_i)$ $A\_app_C = 4.62\,ft^2$

Total Weight of Appurtenance $W\_app_C := \sum_{i=4}^{4} (Num\_Ant_i \cdot Weight_i + Num\_Mnt_i \cdot Wt\_Mnt_i)$ $W\_app_C = 75\,lb$

Existing Appurtenance $C := 5$

Antenna 5 $Carrier_C = "Clearwire\ 1"$ $n := 5$ $F := 1$

Model / Quantity $Antenna_n = "2\ ft.\ Dish"$ $Elev\_Ant_n = 131\,ft$

Dimension $Height_n = 24 \cdot in$ $Width_n = 24 \cdot in$ $Depth_n = 6 \cdot in$ $Weight_n = 15\,lb$

Number of Antennas & Cables $Num\_Ant_n = 1$ $Num\_Cable_n = 1$

Aspect Ratio & Force Coefficient $As := \frac{Height_n}{Width_n}$ $As = 1$ $CA := Ca(As, F)$ $CA = 1.4$

Area / Antenna: $A\_ant_n := CA\,Height_n \cdot Width_n$ $A\_ant_n = 5.6\,ft^2$

Platform

Model & Quantity $Mount_C = "Single\ Water\ Tank\ Mount"$ $Num\_Mnt_C = 1$

$Wt\_Mnt_C = 80\,lb$ $A\_Mnt_C = 3\,ft^2$

Existing Appurtenance Load

Total Area of Appurtenance $A\_app_C := \sum_{i=5}^{5} (Num\_Ant_i \cdot A\_ant_i + Num\_Mnt_i \cdot A\_Mnt_i)$ $A\_app_C = 8.6\,ft^2$

Total Weight of Appurtenance $W\_app_C := \sum_{i=5}^{5} (Num\_Ant_i \cdot Weight_i + Num\_Mnt_i \cdot Wt\_Mnt_i)$ $W\_app_C = 95\,lb$

Existing Appurtenance

$C := 6$

Antenna 6 $Carrier_C = "Clearwire\ 2"$ $n := 6$ $F := 1$

Model / Quantity $Antenna_n = "2.5\ ft.\ Dish"$ $Elev\_Ant_n = 131\,ft$

Dimension $Height_n = 30 \cdot in$ $Width_n = 30 \cdot in$ $Depth_n = 8 \cdot in$ $Weight_n = 32\,lb$

Number of Antennas & Cables $Num\_Ant_n = 1$ $Num\_Cable_n = 1$

Aspect Ratio & Force Coefficient $As := \frac{Height_n}{Width_n}$ $As = 1$ $CA := Ca(As, F)$ $CA = 1.4$

Area / Antenna: $A\_ant_n := CA\,Height_n \cdot Width_n$ $A\_ant_n = 8.75\,ft^2$

Platform

Model & Quantity $Mount_C = "Single\ Water\ Tank\ Mount"$ $Num\_Mnt_C = 1$

$Wt\_Mnt_C = 80\,lb$ $A\_Mnt_C = 3\,ft^2$

Existing Appurtenance Load

Total Area of Appurtenance $A\_app_C := \sum_{i=6}^{6} (Num\_Ant_i \cdot A\_ant_i + Num\_Mnt_i \cdot A\_Mnt_i)$ $A\_app_C = 11.75\,ft^2$

Total Weight of Appurtenance $W\_app_C := \sum_{i=6}^{6} (Num\_Ant_i \cdot Weight_i + Num\_Mnt_i \cdot Wt\_Mnt_i)$ $W\_app_C = 112\,lb$

Existing Appurtenance

$C := 7$

Antenna 7

$Carrier_C = "Carrier\ 2"$

$n := 7$ $F := 1$

Model / Quantity

$Antenna_n = "6\ ft.\ Panel\ Antennas"$ $Elev\_Ant_n = 65\,ft$

Dimension

$Height_n = 72 \cdot in$ $Width_n = 8 \cdot in$ $Depth_n = 4 \cdot in$ $Weight_n = 32\,lb$

Number of Antennas & Cables

$Num\_Ant_n = 12$ $Num\_Cable_n = 12$

Aspect Ratio & Force Coefficient

$As := \frac{Height_n}{Width_n}$ $As = 9$ $CA := Ca(As, F)$ $CA = 1.47$

Area / Antenna:

$A\_ant_n := CA\,Height_n \cdot Width_n$ $A\_ant_n = 5.87\,ft^2$

Platform

Model & Quantity

$Mount_C = "Pre\text{-}Fabricated\ Sectorized\ Mounts"$ $Num\_Mnt_C = 3$

$Wt\_Mnt_C = 500\,lb$ $A\_Mnt_C = 4\,ft^2$

Existing Appurtenance Load

Total Area of Appurtenance

$$A\_app_C := \sum_{i=7}^{7} \left(Num\_Ant_i \cdot A\_ant_i + Num\_Mnt_i \cdot A\_Mnt_i\right) \quad A\_app_C = 82.4\,ft^2$$

Total Weight of Appurtenance

$$W\_app_C := \sum_{i=7}^{7} \left(Num\_Ant_i \cdot Weight_i + Num\_Mnt_i \cdot Wt\_Mnt_i\right) \quad W\_app_C = 1884\,lb$$

Summary of Loads

Appurtenance Wind Load & Weight

$$Carrier = \begin{pmatrix} \text{"Carrier 1"} \\ \text{"Cricket"} \\ \text{"Sprint 1"} \\ \text{"Sprint 2"} \\ \text{"Clearwire 1"} \\ \text{"Clearwire 2"} \\ \text{"Carrier 2"} \end{pmatrix}$$

$$F\_Ant := \left| \begin{array}{l} \text{for } i \in 1..C \\ \quad F_i \leftarrow A\_app_i \cdot P\_Ant_i \\ F \end{array} \right.$$

$$F\_Ant = \begin{pmatrix} 1.84 \\ 0.76 \\ 1.16 \\ 0.12 \\ 0.23 \\ 0.31 \\ 1.77 \end{pmatrix} kip \qquad W\_app = \begin{pmatrix} 1820 \\ 1692 \\ 3072 \\ 75 \\ 95 \\ 112 \\ 1884 \end{pmatrix} lb$$

Total Antenna Wind Load

$$F\_Ant_{total} := \sum_{i=1}^{C} F\_Ant_i \qquad F\_Ant_{total} = 6.18 \cdot kip$$

Total Weight of Appurtenance

$$W\_App_{total} := \sum_{i=1}^{C} W\_app_i \qquad W\_App_{total} = 8.75 \cdot kip$$

Structure

Wind Load

$F_{tank} = 36.29 \cdot kip$

$F_{shaft} = 9.09 \cdot kip$

$F_{bell} = 6.67 \cdot kip$

Weight

$W_{water} := 62.4pcf \cdot Vol \qquad W_{water} = 4170.83 \cdot kip$

$W_{structure} := 10\% \cdot W_{water} \qquad W_{structure} = 417.08 \cdot kip$

Overturning Moment right above the Bell

$M_{tank} := F_{tank} \cdot (H_{mean} - h_{bell}) \qquad M_{tank} = 2708.92 \cdot kip \cdot ft$

$M_{shaft} := F_{shaft} \cdot \frac{L_{shaft}}{2} \qquad M_{shaft} = 224.95 \cdot kip \cdot ft$

$M\_Ant\_bell_1 := F\_Ant_1 \cdot (Elev\_Ant_1 - h_{bell}) \qquad M\_Ant\_bell_1 = 220.13 \cdot kip \cdot ft$

$M\_Ant\_bell_2 := F\_Ant_2 \cdot (Elev\_Ant_2 - h_{bell}) \qquad M\_Ant\_bell_2 = 84.99 \cdot kip \cdot ft$

$M\_Ant\_bell_3 := F\_Ant_3 \cdot (Elev\_Ant_3 - h_{bell}) \qquad M\_Ant\_bell_3 = 123.28 \cdot kip \cdot ft$

$M\_Ant\_bell_4 := F\_Ant_4 \cdot (Elev\_Ant_4 - h_{bell}) \qquad M\_Ant\_bell_4 = 12.75 \cdot kip \cdot ft$

$M\_Ant\_bell_5 := F\_Ant_5 \cdot (Elev\_Ant_5 - h_{bell}) \qquad M\_Ant\_bell_5 = 24.55 \cdot kip \cdot ft$

$M\_Ant\_bell_6 := F\_Ant_6 \cdot (Elev\_Ant_6 - h_{bell}) \qquad M\_Ant\_bell_6 = 33.54 \cdot kip \cdot ft$

$M\_Ant\_bell_7 := F\_Ant_7 \cdot (Elev\_Ant_7 - h_{bell}) \qquad M\_Ant\_bell_7 = 75.96 \cdot kip \cdot ft$

Total Overturning Moment

$$M_{total\_bell} := M_{tank} + M_{shaft} + \sum_{i=1}^{C} M\_Ant\_bell_i \qquad M_{total\_bell} = 3509.08 \cdot kip \cdot ft$$

Overturning Moment at Anchor Bolts Level

$M_{tank} := F_{tank} \cdot H_{mean}$ $M_{tank} = 3507.27 \cdot kip \cdot ft$

$M_{shaft} := F_{shaft} \cdot \left(\frac{L_{shaft}}{2} + h_{bell} \right)$ $M_{shaft} = 424.9 \cdot kip \cdot ft$

$M_{bell} := F_{bell} \cdot \frac{h_{bell}}{2}$ $M_{bell} = 73.4 \cdot kip \cdot ft$

$M\_Ant\_anch_1 := F\_Ant_1 \cdot Elev\_Ant_1$ $M\_Ant\_anch_1 = 260.66 \cdot kip \cdot f$

$M\_Ant\_anch_2 := F\_Ant_2 \cdot Elev\_Ant_2$ $M\_Ant\_anch_2 = 101.69 \cdot kip \cdot f$

$M\_Ant\_anch_3 := F\_Ant_3 \cdot Elev\_Ant_3$ $M\_Ant\_anch_3 = 148.87 \cdot kip \cdot f$

$M\_Ant\_anch_4 := F\_Ant_4 \cdot Elev\_Ant_4$ $M\_Ant\_anch_4 = 15.39 \cdot kip \cdot ft$

$M\_Ant\_anch_5 := F\_Ant_5 \cdot Elev\_Ant_5$ $M\_Ant\_anch_5 = 29.51 \cdot kip \cdot ft$

$M\_Ant\_anch_6 := F\_Ant_6 \cdot Elev\_Ant_6$ $M\_Ant\_anch_6 = 40.31 \cdot kip \cdot ft$

$M\_Ant\_anch_7 := F\_Ant_7 \cdot Elev\_Ant_7$ $M\_Ant\_anch_7 = 114.83 \cdot kip \cdot f$

Total Overturning Moment $M_{total\_anchor} := M_{tank} + M_{shaft} + M_{bell} + \sum_{i=1}^{C} M\_Ant\_anch_i$ $M_{total\_anchor} = 4716.82 \cdot kip \cdot ft$

Allowable Stresses on Shaft

Allowable Local Buckling Stress per AWWA-D100-96 Class II Material $F_L := 18ksi$

Slenderness Reduction Factor

$$K_\psi := \begin{| } C_c \leftarrow \sqrt{\frac{\pi^2 \cdot E}{F_L}} \\ K \leftarrow 1 - \frac{1}{2} \cdot \left(\frac{KL_r}{C_c} \right)^2 \text{ if } 25 < KL_r \le C_c \\ K \leftarrow \frac{1}{2} \cdot \left(\frac{KL_r}{C_c} \right)^2 \text{ if } KL_r > C_c \\ K \leftarrow 1 \text{ if } KL_r \le 25 \\ K \end{|}$$

$K_\psi = 1$

Allowable Axial Stress $F_{a\_shaft} := F_L \cdot K_\psi$ $F_{a\_shaft} = 18 \cdot ksi$

Allowable Shear Stress $F_{v\_shaft} := F_L$ $F_{v\_shaft} = 18 \cdot ksi$

Allowable Bending Stress $F_{b\_shaft} := F_L$ $F_{b\_shaft} = 18 \cdot ksi$

Stress Analysis

Shear Stress

$$f_{v\_shaft} := \frac{F_{tank} + F_{shaft} + F\_Ant_{total}}{A_{g\_shaft}}$$

$f_{v\_shaft} = 0.11 \cdot ksi$

$f_{v\_shaft} < F_{v\_shaft} = 1$

CHECK = "Shaft is adequate for shear loads"

Axial Stress

$$f_{a\_shaft} := \frac{W_{water} + W_{structure} + W\_App_{total}}{A_{g\_shaft}}$$

$f_{a\_shaft} = 10.13 \cdot ksi$

$f_{a\_shaft} < F_{a\_shaft} = 1$

CHECK = "Shaft is adequate for axial loads"

Bending Stress

$M_{total} := M_{total\_bell}$

$M_{total} = 3509.08 \cdot kip \cdot ft$

$$f_{b\_shaft} := \frac{M_{total}}{S_{shaft}}$$

$f_{b\_shaft} = 3.06 \cdot ksi$

$f_{b\_shaft} < F_{b\_shaft} = 1$

CHECK = "Shaft is adequate for bending"

Combined Stresses (Increased by 1.33 for wind)

$$Stress := \frac{f_{a\_shaft}}{1.33F_{a\_shaft}} + \frac{f_{b\_shaft}}{1.33F_{b\_shaft}}$$

$Stress = 55.11 \cdot \%$

Load Increases Due to Antennas

Incease in Lateral Load

$$\%V := \frac{F\_Ant_{total}}{F_{tank} + F_{shaft} + F_{bell}}$$

$\%V = 11.88 \cdot \%$

Incease in Axial Load

$$\%P := \frac{W\_App_{total}}{W_{water} + W_{structure}}$$

$\%P = 0.19 \cdot \%$

Incease in Moment Load

$$\%M := \frac{\sum_{i=1}^{C} M\_Ant\_anch_i}{M_{tank} + M_{shaft}}$$

$\%M = 18.09 \cdot \%$

Check Anchor Bolts

Diameter of Bolts & Number of Bolts $d_{bolt} = 1.5 \cdot in$ $N_{bolt} = 14$

Cross Section Area $Ag_{bolt} := \frac{\pi \cdot d_{bolt}^2}{4}$ $Ag_{bolt} = 1.77 \cdot in^2$

Diameter of Bolt Circle $d_{circle} = 24.6\,ft$

Allowable Strength on Anchor Bolt (AWWA-D100-05) $F_{t.bolt} := 31.25ksi$

Moment of Intertia

$$I_{bolt} := \left| \begin{array}{l} I_{total} \leftarrow 0in^4 \\ \text{for } i \in 1 .. N_{bolt} \\ \quad \left| \begin{array}{l} d_i \leftarrow \frac{d_{circle}}{2} \cdot \sin\left[\frac{360deg}{N_{bolt}} \cdot (i-1)\right] \\ I_i \leftarrow Ag_{bolt} \cdot (d_i)^2 \\ I_{total} \leftarrow I_{total} + I_i \end{array} \right. \\ I_{total} \end{array} \right.$$

$I_{bolt} = 269490.31 \cdot in^4$

Section Modulus of Bolt Configuration $S_{bolt} := \frac{I_{bolt}}{d_{circle}}$ $S_{bolt} = 912.91 \cdot in^3$

Overturning Moment at Anchor Bolt Level $M_{total} := M_{total\_anchor}$ $M_{total} = 4716.82 \cdot kip \cdot ft$

Stresses on Anchor Bolts due to Bending $f_b := \frac{M_{total}}{S_{bolt}}$ $f_b = 62 \cdot ksi$

Stresses on Anchor Bolts due to Axial Loads $f_t := \frac{W_{structure} + W\_App_{total}}{N_{bolt} \cdot Ag_{bolt}}$ $f_t = 17.21 \cdot ksi$

Uplift are possible to occur $T := f_b - f_t$ $T = 44.79 \cdot ksi$

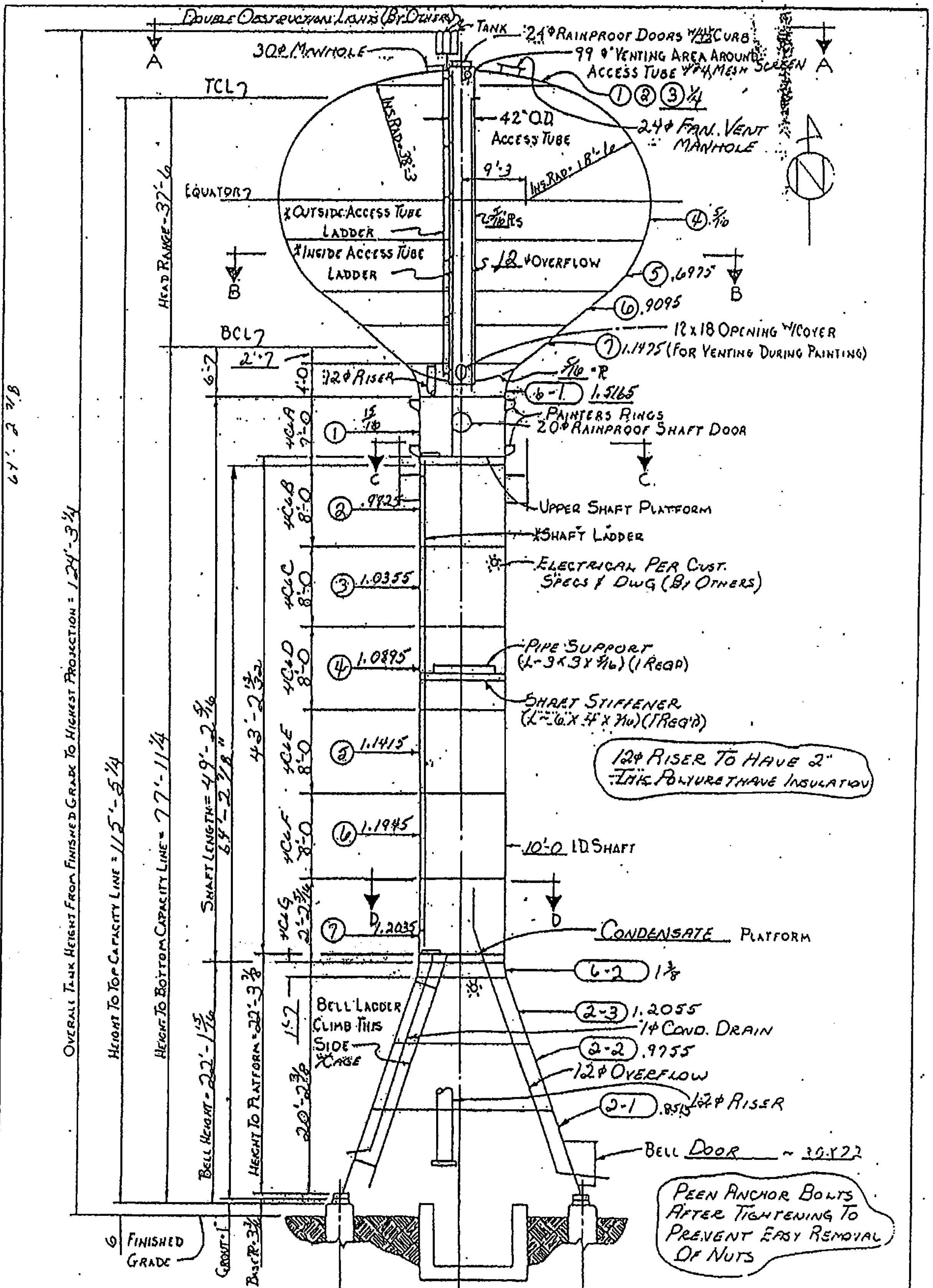
Allowable Tension Stress $F_t := 1.33 \cdot F_{t.bolt}$ $F_t = 41.56 \cdot ksi$

CHECK = "Make Changes!" $\frac{T}{F_t} = 107.76\,\%$

Conclusions

(2) New dish antennas will be installed on the existing antenna mount, by extending the support pipe of existing installation.

Further structural analysis shows that existing water tower structure is still **adequate** for new loads. Stresses above the bell and possibility of uplift are checked. Anchor bolts are slightly overtressed, but still **acceptable** by engineering judgment.



SECTIONAL ELEVATION
(NOT DRAWN TO SCALE)

FOREMAN NOTE: GROUT UNDER BASE PLATE BEFORE FILLING TANK WITH WATER. FILL SPACE BETWEEN ANCHOR BOLT AND HOLE IN BASE PLATE WITH GROUT TO AVOID WATER POCKETS.

~ NOTE ~
DETAILS IN ELEVATION HAVE BEEN ROTATED INTO PLANE OF PROJECTION. SEE VIEWS AT RIGHT & DWG. #20 FOR TRUE ORIENTATION.

CONT # 81774

6

SHEET INDEX

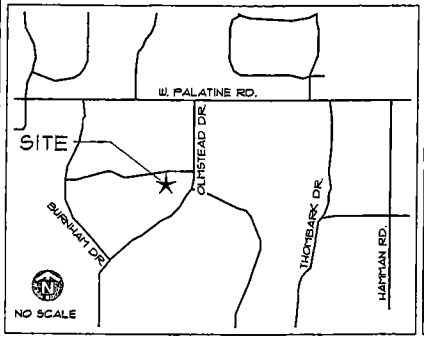
NO.	DESCRIPTION
T-1	TITLE SHEET
C-1	SITE PLAN
C-2	ENLARGED SITE PLAN
C-3	SHELTER/ANTENNA PLAN
C-4	SITE ELEVATION & DETAILS
C-5	DETAILS
E-1	SINGLE LINE & NOTES

DRIVING DIRECTIONS

DEPART FROM CLEARWIRE OFFICE:
5600 N. RIVER RD. ROSEMONT, IL 60018

DEPART ON N RIVER RD (NORTH). ROAD NAME CHANGES TO DES PLAINES RIVER RD/ N RIVER RD. TURN LEFT (WEST) ONTO SR-72/ W HIGGINS RD. TURN RIGHT ONTO RAMP I-90. MERGE ONTO I-90/ NORTHWEST TOLLWAY. TURN RIGHT ONTO RAMP ROSELLE RD. KEEP RIGHT TO STAY ON RAMP PALATINE. BEAR RIGHT (NORTH) ONTO (N) ROSELLE RD. TURN LEFT (WEST) ONTO (W) PALATINE RD. TURN LEFT (SOUTH) ONTO OLMSTEAD DR ARRIVE AT SITE.

VICINITY MAP



clear w•reless LLC®

a Nevada limited liability company, a Sprint affiliate

SITE NAME

HOFFMAN ESTATES 5

SITE NUMBER

IL-CHI5444

SITE ADDRESS

4690 OLMSTEAD DRIVE
HOFFMAN ESTATES, IL 60195

PROJECT TYPE

BACKHAUL PROJECT

PROJECT TEAM

clear w•reless LLC®
a Nevada limited liability company, a Sprint affiliate
5600 N. RIVER RD.
SUITE 300
ROSEMONT, IL 60018
(847) 318-3000
APPLICANT

EVEREST GROUP
THE EVEREST GROUP, LLC
7013 W. 111TH ST.
WORTH, IL 60482
TEL: (708) 923-1363
REAL ESTATE

Fullerton Engineering Consultants
9700 W. HIGGINS RD.
SUITE 800
ROSEMONT, ILLINOIS 60018
TEL: 847-292-0200
FAX: 847-292-0205
ENGINEER/STRUCTURAL

- HANDICAP ACCESS REQUIREMENTS ARE NOT REQUIRED
- FACILITY IS UNMANNED AND NOT FOR HUMAN HABITATION
- FACILITY HAS NO PLUMBING OR REFRIGERANTS
- THIS FACILITY SHALL MEET OR EXCEED ALL FAA AND FCC REGULATORY REQUIREMENTS
- ALL WORK MUST CONFORM TO CLEARWIRE "CLEARWIRE CONSTRUCTION INSTALLATION GUIDE - WIMAX"

SCOPE OF WORK:

- NEW CLEARWIRE BACKHAUL DISH ANTENNAS INSTALLED ON EXISTING WATER TANK.
- NEW CLEARWIRE BACKHAUL EQUIPMENT INSTALLED INSIDE EXISTING SHELTER.

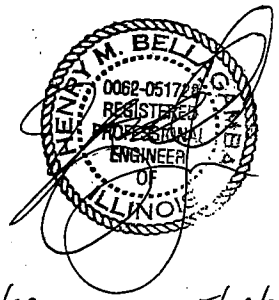
PROJECT SUMMARY

SITE NAME:	HOFFMAN ESTATES 5
SITE NO:	IL-CHI5444
SPRINT HOST NO:	IL1171
SITE ADDRESS:	4690 OLMSTEAD DRIVE HOFFMAN ESTATES, IL 60195
COUNTY:	COOK
LANDLORD ADDRESS:	CITY OF HOFFMAN ESTATES
SITE COORDINATES (FROM CLEARVISION):	
LATITUDE:	N 42.1091° (NAD 83)
LONGITUDE:	W 88.1136° (NAD 83)
ZONING:	-
JURISDICTION:	-
BUILDING CODE:	INTERNATIONAL BUILDING CODE 2003 EDITION
ELECTRICAL CODE:	NATIONAL ELECTRICAL CODE 2005 EDITION

ENGINEER'S LICENSE

I CERTIFY THAT THESE DRAWING WERE PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND CONTROL, AND TO THE BEST OF MY KNOWLEDGE AND BELIEF COMPLY WITH THE REQUIREMENTS OF THE INTERNATIONAL BUILDING CODE, 2003 EDITION

LICENSED ENGINEER - STATE OF ILLINOIS



EXPIRES: 11/30/09 SIGNED: 5/29/09

APPROVALS

CLEARWIRE CONST.		DATE
CLEARWIRE RF		DATE
CLEARWIRE OPS		DATE
LANDLORD		DATE

DRAWING SCALED TO 11"x17"

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FAX: 847-292-0205
DESIGN FIRM NO. 184-002458

CHECKED BY:	JP	
APPROVED BY:	MB	
#	DATE	DESCRIPTION	INT.
	03/24/09	90% REVIEW	RA
	05/13/09	FINAL	SG

DATE SIGNED: _____

SITE NAME
HOFFMAN ESTATES 5

SITE NO.
IL-CHI5444

SITE ADDRESS
4690 OLMSTEAD DRIVE
HOFFMAN ESTATES, IL 60195

SHEET NAME
TITLE SHEET

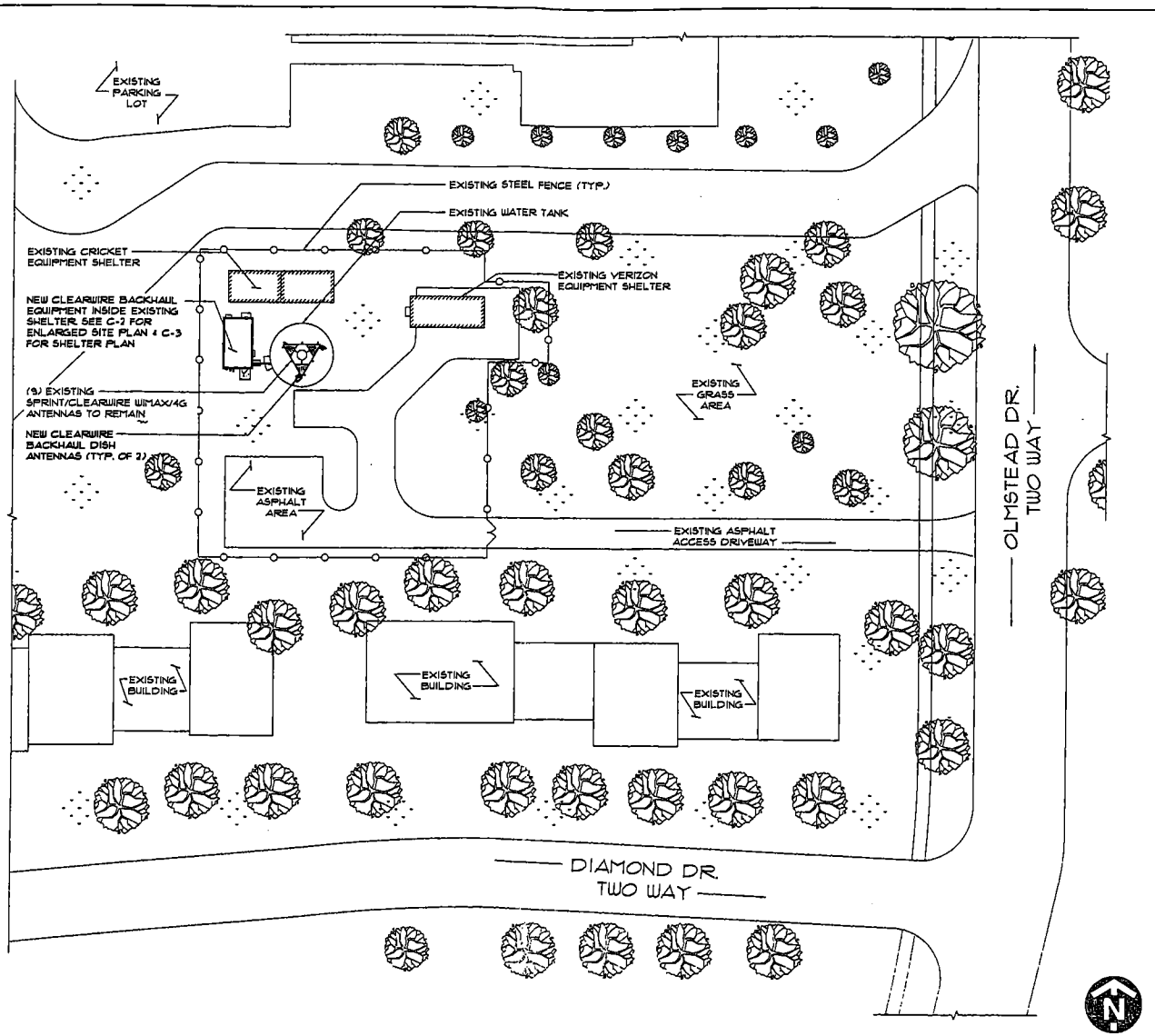
SHEET NUMBER
T-1

ABBREVIATIONS

A/C	AIR CONDITIONER
AFF	ABOVE FINISHED FLOOR
AGL	ABOVE GRADE LEVEL
AMSL	ABOVE MEAN SEA LEVEL
APPROX	APPROXIMATE
AWG	AMERICAN WIRE GAUGE
BLDG	BUILDING
BTS	BASE TRANSMISSION STATION
CAB	CABINET
COL	COLUMN
CONC	CONCRETE
CND	CONDUIT
DWG	DRAWING
FT	FOOT (FEET)
EGB	EQUIPMENT GROUND BAR
ELEC	ELECTRICAL
ELEV	ELEVATION
EMT	ELECTRICAL METALLIC TUBING
EQUIP	EQUIPMENT
(E)	EXISTING
FND	FOUNDATION
GALV	GALVANIZED
GND	GROUND
GPS	GLOBAL POSITIONING SYSTEM
IN	INCH(ES)
LB (#)	POUND(S)
MAX	MAXIMUM
MFR	MANUFACTURER
MGB	MASTER GROUND BAR
MIN	MINIMUM
(N)	NEW
NEC	NATIONAL ELECTRICAL CODE
NOM	NOMINAL
NTS	NOT TO SCALE
OE/OT	OVERHEAD ELECTRIC/TELCO
POS	POSITION
RGS	RIGID GALVANIZED STEEL
SF	SQUARE FOOT
STL	STEEL
T & B	TOP & BOTTOM
T/	TOP
TBD	TO BE DETERMINED
TYP	TYPICAL
UE/UT	UNDERGROUND ELECTRIC/TELCO
UNO	UNLESS NOTED OTHERWISE
VIF	VERIFY IN FIELD
W/	WITH
XFMR	TRANSFORMER

SYMBOLS

- ℄ CENTERLINE
- ℙ PLATE
- REVISION
- WORK POINT
- UTILITY POLE
- BRICK
- COMPRESSED STONE
- CONCRETE
- EARTH
- GRAVEL
- MASONRY
- STEEL
- CENTERLINE
- PROPERTY LINE
- LEASE LINE
- EASEMENT LINE
- CHAIN LINK FENCE
- WOOD FENCE
- UE — BELOW GRADE ELECTRIC
- UT — BELOW GRADE TELEPHONE
- OE/OT — OVERHEAD ELECTRIC/TELEPHONE
- SECTION REFERENCE (A / S-1)



SITE PLAN

SCALE: 1" = 40'-0" | 1

clear wireless LLC
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APPROVED BY:	MB	
#	DATE	DESCRIPTION	INT.
	03/24/09	90% REVIEW	RA
	05/29/09	FINAL	SG

HENRY M. BELLAS 0062-051728 REGISTERED PROFESSIONAL ENGINEER OF ILLINOIS

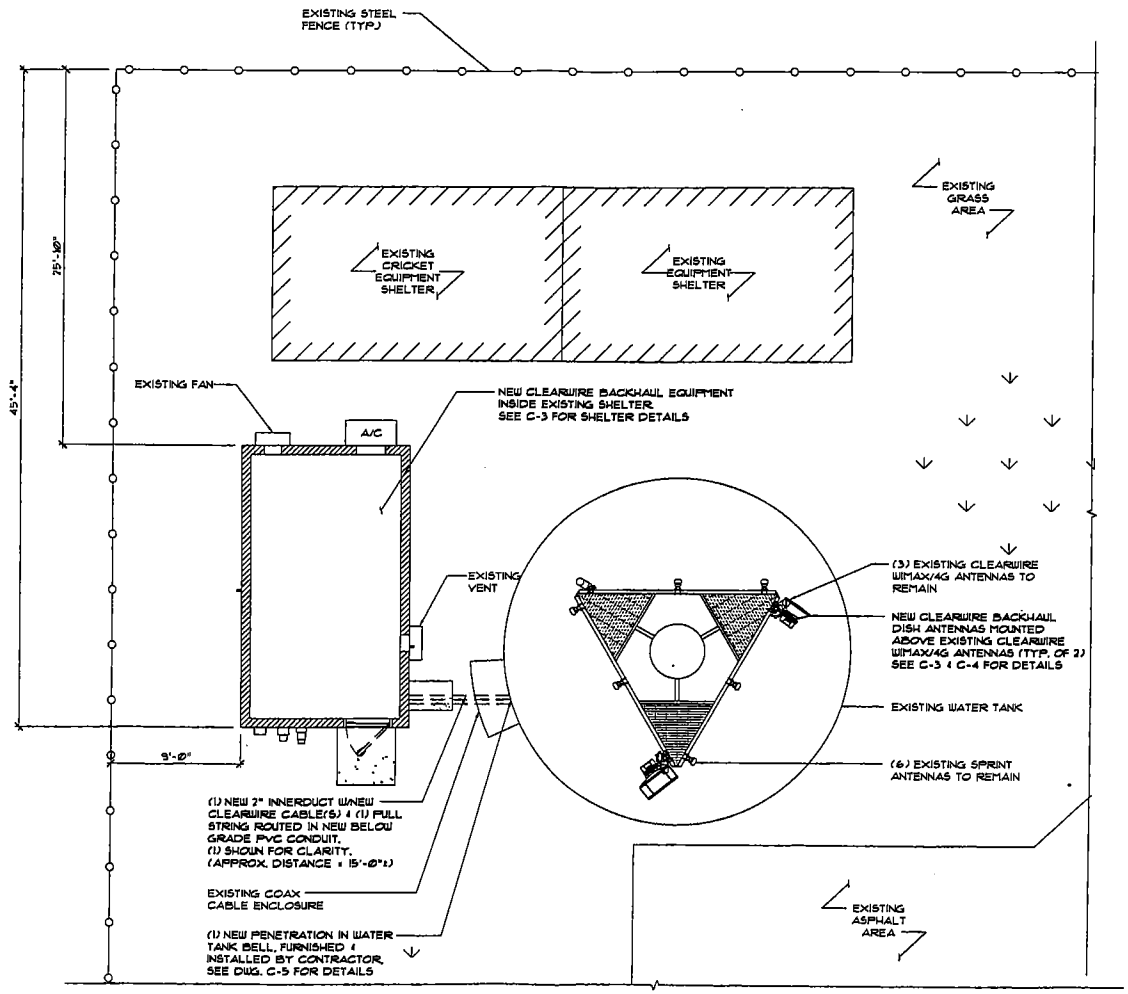
SITE NAME
HOFFMAN ESTATES 5

SITE NO.
IL-CHI5444

SITE ADDRESS
4630 OLMSTEAD DRIVE
HOFFMAN ESTATES, IL 60135

SHEET NAME
SITE PLAN

SHEET NUMBER
C-1



ENLARGED SITE PLAN

SCALE: 1/8" = 1'-0"

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	03/24/09	90% REVIEW	RA
	05/29/09	FINAL	SG

ANTHONY M. BELL
062-051728
REGISTERED
PROFESSIONAL
ENGINEER
OF
ILLINOIS
DATE SIGNED

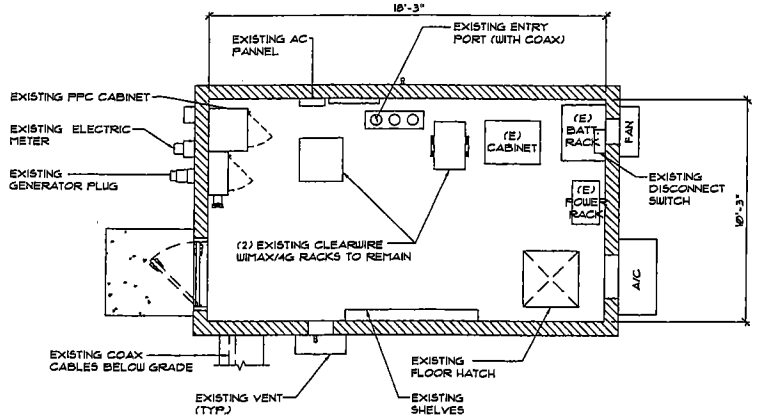
SITE NAME
HOFFMAN ESTATES 5

SITE NO.
IL-CHI5444

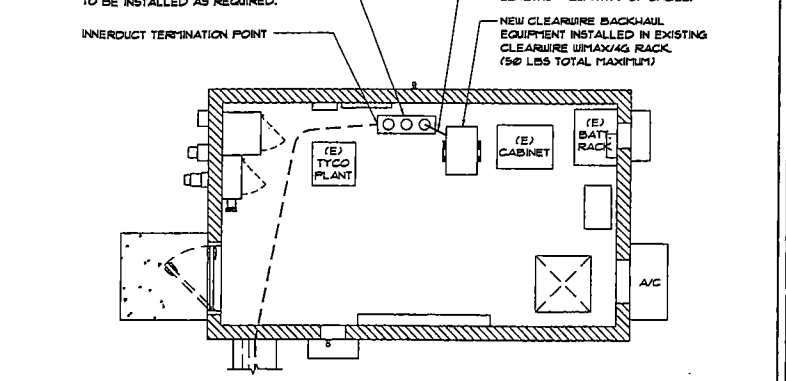
SITE ADDRESS
4630 OLMSTEAD DRIVE
HOFFMAN ESTATES, IL 60195

SHEET NAME
ENLARGED SITE PLAN

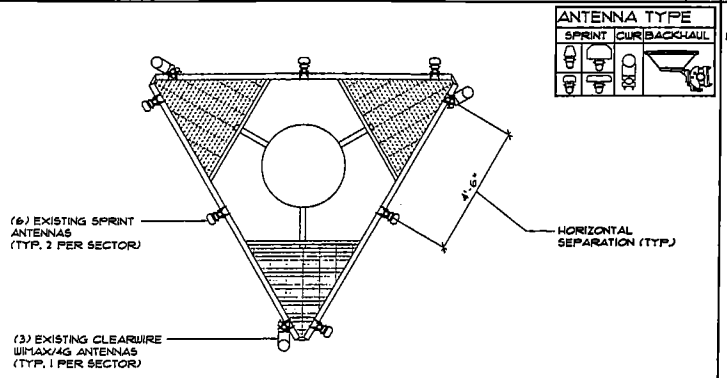
SHEET NUMBER
C-2



EXISTING SHELTER PLAN — SCALE: 3/16" = 1'-0" | 1



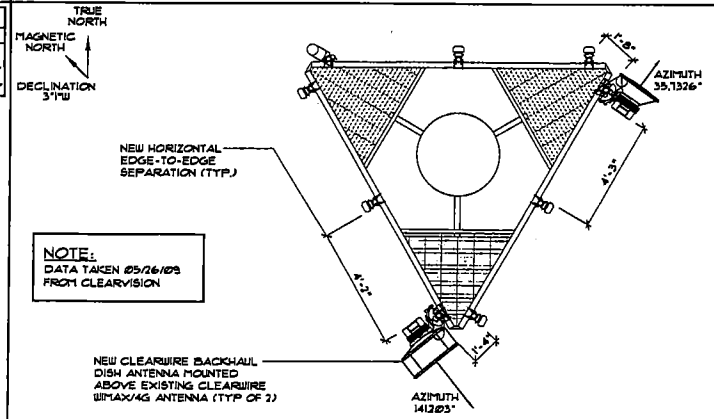
NEW SHELTER PLAN — SCALE: 3/16" = 1'-0" | 2



SECTOR	1	2	3
CLEARWIRE AZIMUTH PER SPRINT SITERRA- SEE NOTE	60°	180°	300°

NOTE:
CONTRACTOR IS REQUIRED TO DISMANTLE EXISTING CLEARWIRE ANTENNA FOR NEW MOUNTING PIPE INSTALLATION. CONTRACTOR SHALL FIELD VERIFY CLEARWIRE ANTENNA AZIMUTH & REPLACE TO EXISTING AZIMUTH.

EXISTING ANTENNA CONFIGURATION/BACKHAUL SCHEDULE — SCALE: 3/16" = 1'-0" | 3



NOTE:
DATA TAKEN 05/26/09 FROM CLEARVISION

ANTENNA AZIMUTH	ANTENNA MODEL	SIZE (NOM) (IN)	ANTENNA MOUNT HEIGHT (FT)	DISTANCE (MILES)	RECEIVING SITE NUMBER	RADIO MODEL
35.1326°	VHLP2-18	24"	131'	2.001	IL-CHI5258	AIRPAIR HP
141.2103°	VHLP2.5-18	30"	131'	2.455	IL-CHI5354	AIRPAIR HP

NEW ANTENNA CONFIGUATION/BACKHAUL SCHEDULE — SCALE: 3/16" = 1'-0" | 4

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APPROVED BY:	MB

#	DATE	DESCRIPTION	INT.
	03/24/09	90% REVIEW	RA
	05/29/09	FINAL	SG

HENRY M. BELLACK
0062-054728
REGISTERED PROFESSIONAL ENGINEER OF ILLINOIS
DATE SIGNED

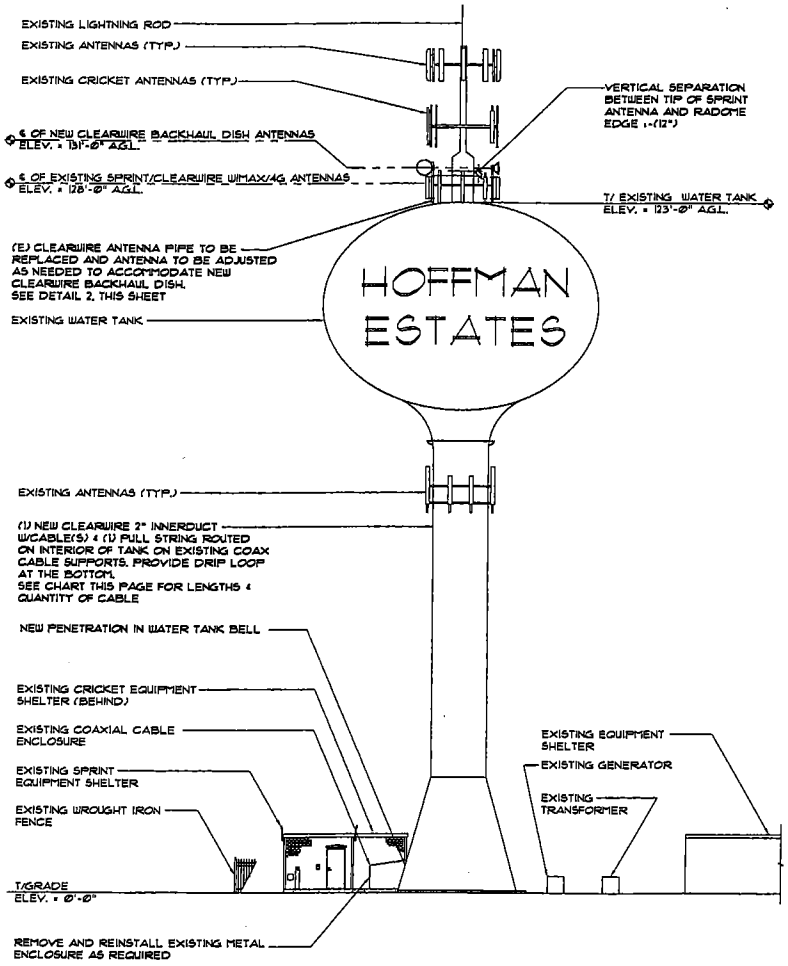
SITE NAME
HOFFMAN ESTATES 5

SITE NO.
IL-CHI5444

SITE ADDRESS
4690 OLMSTEAD DRIVE
HOFFMAN ESTATES, IL 60195

SHEET NAME
SHELTER/ ANTENNA PLAN

SHEET NUMBER
C-3



ELEVATION SCALE: NTS | 1

ANTENNA NOTES:

1. THE SIZE, HEIGHT, AND DIRECTION OF THE ANTENNA SHALL BE ADJUSTED TO MEET SYSTEM REQUIREMENTS.
2. CONTRACTOR SHALL VERIFY HEIGHT OF ANTENNA WITH CLEARWIRE REPRESENTATIVE.
3. ALL ANTENNA AZIMUTH TO BE FROM TRUE NORTH.

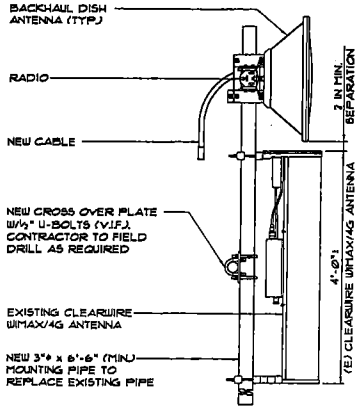
STRUCTURAL NOTES:

1. STRUCTURAL CALCULATION PREPARED BY FULLERTON ENGINEERING CONSULTANTS. CONTRACTOR TO COORDINATE WITH CLEARWIRE REPRESENTATIVE TO OBTAIN A COPY.
2. CONTRACTOR TO REFER TO TOWER STRUCTURAL CALCULATIONS FOR ADDITIONAL LOADS. NO ERECTION OR MODIFICATION OF TOWER SHALL BE MADE WITHOUT APPROVAL OF STRUCTURAL ENGINEER.

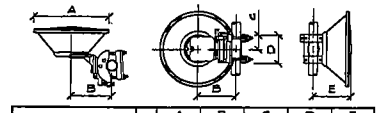
BACKHAUL CABLE SCHEDULE

ANTENNA TYPE	AZIMUTH	QTY.	ESTIMATED LENGTH	RADIO MODEL	TYPE	SIZE
DISH	35.7326°	1	x 180' = 180 FT.	AIRPAIR HP	SFX500	1/2" ø
DISH	141.203°	1	x 180' = 180 FT.	AIRPAIR HP	SFX500	1/2" ø
		TOTAL:	360 FT.	OF	SFX500	1/2" ø

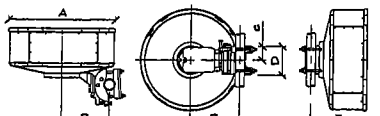
NOTES:
1. ACTUAL LENGTHS SHALL BE DETERMINED PER SITE CONDITION BY THE CONTRACTOR.
2. THE CONTRACTOR SHALL VERIFY THE ACTUAL LENGTHS BEFORE INSTALLATION.



DISH SUPPORT DETAIL SCALE: N.T.S. | 2



24" DISH	A	B	C	D	E
IN.	26.10	14.10	2.00	5.60	13.20



30" DISH	A	B	C	D	E
IN.	32.0	13.7	3.60	7.20	19.10

NOTE: RADIO NOT SHOWN FOR CLARITY

BACKHAUL ANTENNA DETAIL SCALE: N.T.S. | 3

clear wireless LLC
a Nevada limited liability company, a Sprint affiliate
5600 N. RIVER RD.
SUITE 300
ROSEMONT, IL 60018
(847) 318-3000

Fullerton Engineering Consultants
9700 W HIGGINS RD.
SUITE 800
ROSEMONT, ILLINOIS 60018
TEL: 847-292-0200
FAX: 847-292-0205
DESIGN FIRM NO. 184-002498

CHECKED BY:	JP
APPROVED BY:	MB

#	DATE	DESCRIPTION	INT.
	03/24/09	90% REVIEW	RA
	05/29/09	FINAL	SG

JERRY M. BELLAIG
0062-051128
REGISTERED PROFESSIONAL ENGINEER OF ILLINOIS
DATE SIGNED

SITE NAME
HOFFMAN ESTATES 5

SITE NO.
IL-CHI5444

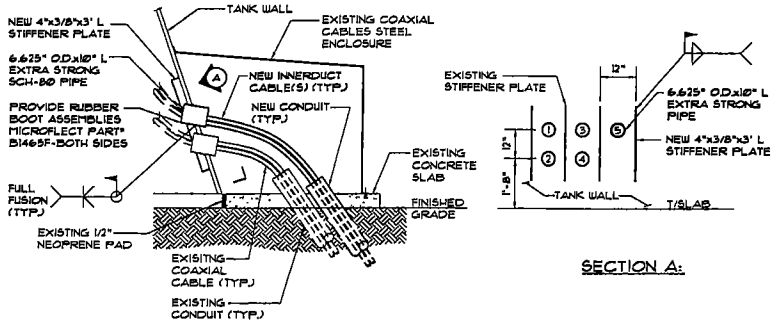
SITE ADDRESS
4690 OLMSTEAD DRIVE
HOFFMAN ESTATES, IL 60195

SHEET NAME
SITE ELEVATION & DETAILS

SHEET NUMBER
C-4

NOTES:

1) REDUCE TANK CONTENTS BY 50% OR MORE BEFORE CUTTING SHELL FOR PENETRATIONS.
2) WELD STIFF. 12'S BEFORE ANY PENETRATION
3) CUT SLEEVE HOLE ONE & WELD PIPE SLEEVE IN PLACE
4) CUT SLEEVE HOLE #2 & WELD PIPE SLEEVE IN PLACE
5) REPEAT SEQUENCE FOR ALL HOLES



SECTION A:

BELL/PEDESTAL PLATE PENETRATION

SCALE: N.T.S. | 1

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a Sprint affiliate
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SUITE 800
ROSEMONT, ILLINOIS 60018
TEL: 847-292-0200
FAX: 847-292-0205
DESIGN FIRM NO. 184-002458

CHECKED BY:	JP	
APPROVED BY:	MB	
#	DATE	DESCRIPTION	INT.
	03/24/09	90% REVIEW	RA
	05/29/09	FINAL	SG

JERRY M. BELL
062-057283
REGISTERED PROFESSIONAL ENGINEER OF ILLINOIS
DATE SIGNED

SITE NAME
HOFFMAN ESTATES 5

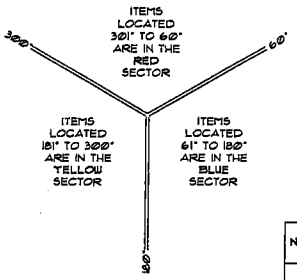
SITE NO.
IL-CHI5444

SITE ADDRESS
4690 OLMSTEAD DRIVE
HOFFMAN ESTATES, IL 60195

SHEET NAME
DETAILS

SHEET NUMBER
C-5

NOTES COLOR CODING:



1. THE EQUIPAGE OF THE RFUS (DAP HEADS) MUST FOLLOW THE MOTOROLA COLOR ASSIGNMENT OF RED/BLUE/YELLOW REGARDLESS OF THE ACTUAL ANTENNA ORIENTATION. (FOR EXAMPLE, THE FIRST EQUIPPED SECTOR IS RED, BUT IN A SITUATION WHERE THE RED SECTOR IS NOT EQUIPPED WITH AN RFU, THE FIRST RFU (DAP HEAD) MUST BE LABELED RED EVEN IF IT LIES WITHIN THE BLUE SECTOR BASED ON ANTENNA ORIENTATION. ANY MICROWAVE ANTENNAS MUST BE LABELED BASED ON THE ORIENTATION. IN SUCH CASE THERE WOULD BE AN RFU (DAP HEAD) LABELED RED AND MICROWAVE ANTENNA(S) LABELED BLUE WITHIN THE BLUE SECTOR LOCATED BETWEEN 61 AND 180 DEGREES.)
2. THE CONTRACTOR SHALL USE SECTOR APPROPRIATE COLORED TAPE TO DENOTE THE ANTENNA AND MICROWAVE DISHES. TAPE SHOULD BE WRAPPED AROUND THE TOP AND BOTTOM OF THE SUPPORT PIPE AS DEPICTED IN THE TABLE ABOVE.

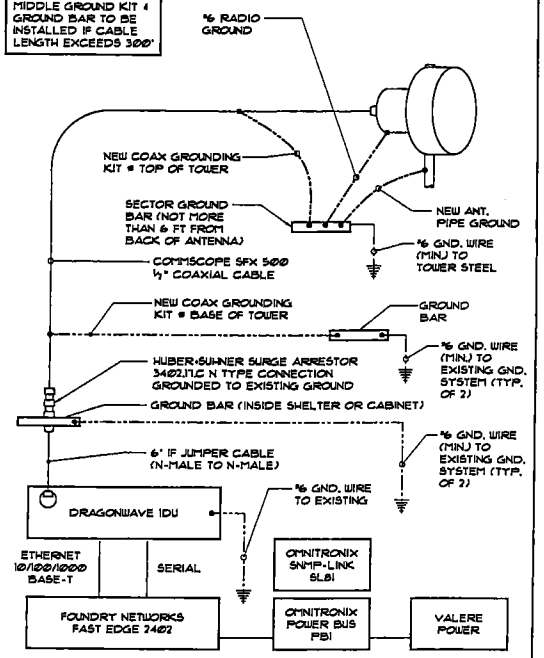
No.	SECTOR DEGREE RANGE	MARKING METHOD COLOR BANDS	MARKING METHOD NUMBER OF BANDS
1	301°-60°	RED	SMALLEST NUMBER WILL BE LABELED "R1". THE NEXT LARGER NUMBER WILL BE LABELED "R2"
2	61°-180°	BLUE	SMALLEST NUMBER WILL BE LABELED "B1". THE NEXT LARGER NUMBER WILL BE LABELED "B2"
3	181°-300°	YELLOW	SMALLEST NUMBER WILL BE LABELED "T1". THE NEXT LARGER NUMBER WILL BE LABELED "T2"

ANTENNA INSTALLATION NOTES

1. ANTENNA INSTALLATION SHALL BE CONDUCTED BY FIELD CREWS EXPERIENCED IN THE ASSEMBLY AND ERECTION OF RADIO ANTENNAS, TRANSMISSION LINES, AND SUPPORT STRUCTURES.
2. CONTRACT COMPANIES AND THEIR EMPLOYEES SHALL OBSERVE AND PRACTICE ALL O.S.H.A. SAFETY GUIDELINES WHILE PERFORMING SERVICE FOR CLEARWIRE.
3. CONTRACT COMPANIES AND THEIR EMPLOYEES SHALL OBSERVE AND PRACTICE ALL O.S.H.A. SAFETY GUIDELINES WHILE PERFORMING SERVICE FOR CLEARWIRE.
4. CONTRACTOR SHALL PERFORM A SAFETY INSPECTION PRIOR TO COMMENCING ALL WORK ACTIVITIES AT A CLEARWIRE, LEASED OR OWNED SITE. CLEARWIRE, SHOULD BE IMMEDIATELY NOTIFIED OF SAFETY HAZARD(S) FOUND DURING THE INSPECTION THAT COULD CAUSE DAMAGE TO PROPERTY. ALL WORK SHALL BE HALTED UNTIL SUCH TIME THE REPORTED SAFETY HAZARD IS CORRECTED. THE SAFETY HAZARD, IF POSSIBLE, SHOULD BE CORRECTED BY THE CONTRACTOR WHILE ON SITE. AFTER THE CONTRACTOR HAS NOTIFIED CLEARWIRE TO PERFORM THE CORRECTION.

DISH COLOR CODING NOTES

NOTE:
MIDDLE GROUND KIT & GROUND BAR TO BE INSTALLED IF CABLE LENGTH EXCEEDS 300'



AIRPAIR SINGLE LINE DIAGRAM

NOT USED

GROUNDING NOTES

1. ALL BASE TRANSCEIVER SITE EQUIPMENT SHALL BE GROUNDED IN ACCORDANCE WITH THE LATEST EDITIONS OF THE NATIONAL ELECTRICAL CODE (NEC), LIGHTNING PROTECTION CODE (NFPA 780) AND CLEARWIRE STANDARDS.
2. THE ELECTRICAL SERVICE TO THE SITE SHALL BE GROUNDED AT THE SERVICE DISCONNECTING MEANS AS REQUIRED IN ARTICLE 250 OF THE NATIONAL ELECTRICAL CODE AND IN ACCORDANCE WITH ANY LOCAL CODE.
3. ALL UNDERGROUND (BELOW GRADE) GROUNDING CONNECTIONS SHALL BE MADE BY THE EXOTHERMIC PROCESS (MECHANICAL LUG ATTACHMENTS BELOW GRADE ARE NOT ACCEPTABLE.) CONNECTIONS SHALL INCLUDE ALL CABLE TO CABLE SPLICES (TEES, Xs, ETC.), ALL CABLE CONNECTIONS TO GROUND RODS, GROUND ROD SPLICES, AND LIGHTNING PROTECTION SYSTEM AS INDICATED. ALL MATERIALS USED (MOLDS, WELDING METAL, TOOLS, ETC.) SHALL BE INSTALLED PER MANUFACTURER'S RECOMMENDATION AND PROCEDURES.
4. ALL GROUNDING AND BONDING CONDUCTORS THAT ARE CONNECTED ABOVE GRADE OR INTERIOR TO A BUILDING SHALL BE CONNECTED USING TWO HOLE CRIMP TYPE (COMPRESSION) CONNECTIONS FOR #2 AND #6 AWG INSULATED COPPER CONDUCTOR.
5. ALL GROUNDING CONNECTIONS, INTERIOR AND EXTERIOR, MADE THROUGHOUT THIS DOCUMENT SHALL BE MADE USING AN ANTI-OXIDATION COMPOUND. THE ANTI-OXIDATION COMPOUND SHALL BE THOMAS AND BETTS KOPR-SHIELD (TM OF JET LUBE INC.) OR APPROVED EQUAL. COAT ALL WIRES BEFORE CONNECTING.
6. ALL CONNECTIONS SHALL BE MADE TO BARE METAL. ALL PAINTED SURFACES SHALL BE FIELD INSPECTED AND MODIFIED TO ENSURE PROPER CONTACT. PRIOR TO EXOTHERMICALLY CONNECTING, GALVANIZING SHALL BE REMOVED BY GRINDING SURFACE TO BARE METAL. "SLAG" FROM EXOTHERMIC CONNECTION MUST BE REMOVED AND SHALL BE SPRAYED WITH COLD GALVANIZE AFTER COMPLETION.
7. FERROUS METAL CLIPS WHICH COMPLETELY SURROUND THE GROUNDING CONDUCTOR SHALL NOT BE USED. CLIPS OF THE FOLLOWING MATERIALS AND TYPES MAY BE USED TO SUPPORT GROUNDING CONDUCTORS.
   PLASTIC CLIPS
   STAINLESS STEEL CLIPS WHICH DO NOT COMPLETELY SURROUND THE GROUNDING CONDUCTOR.
   FERROUS METAL CLIPS WHICH DO NOT COMPLETELY SURROUND THE GROUNDING CONDUCTOR.
8. ALL HARDWARE, BOLTS, NUTS, WASHERS AND LOCK WASHERS SHALL BE 18-8 STAINLESS STEEL. EVERY CONNECTION SHALL BE BOLT-FLAT WASHER-BUSS-LUG-FLAT WASHER-LOCK WASHER-NUT IN THAT EXACT ORDER, WITH NUT FACING OUTWARD. BACK-TO-BACK LUGGING, BOLT-FLAT WASHER-LUG-FLAT WASHER-LUG-BUSS-LUG-FLAT WASHER-LOCK WASHER-NUT, IN THAT EXACT ORDER IS ACCEPTED WHERE NECESSARY TO CONNECT MANY LUGS TO A BUSS BAR. STACKING OF LUGS, BUSS-LUG-LUG, IS NOT ACCEPTABLE.

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DESIGN FIRM NO. 184-001498

CHECKED BY:	JP	
APPROVED BY:	MB	
#	DATE	DESCRIPTION	INT.
	03/24/09	90% REVIEW	RA
	05/29/09	FINAL	SG

HENRY M. BELLA 0062-061728 REGISTERED PROFESSIONAL ENGINEER OF ILLINOIS

SITE NAME: HOFFMAN ESTATES 5

SITE NO.: IL-CHI5444

SITE ADDRESS: 4630 OLMSTEAD DRIVE HOFFMAN ESTATES, IL 60195

SHEET NAME: SINGLE LINE & NOTES

SHEET NUMBER: E-1

VILLAGE OF HOFFMAN ESTATES
ZONING BOARD OF APPEALS

FINDING OF FACT

DATE OF PUBLIC HEARING: November 17 and December 8, 2009

DATE OF PRESENTATION TO VILLAGE BOARD: December 14, 2009

PETITION: Hearing held at the request of the Village of Hoffman Estates (Lessor) and The Everest Group/Sprint, Clearwire (Lessee) to consider a special use under the Zoning Code to permit the installation of communication antennas and accompanying equipment on the property located at 95 Aster Lane.

DISTRICT IN WHICH PROPERTY IS LOCATED: B-2, Community Business District

ZONING CODE SECTION(S) FOR SPECIAL USE: 9-3-9-A and 9-8-2-C-6

FINDING-OF-FACT: The Zoning Board of Appeals (ZBA) found that the Standards for a Special Use (Section 9-1-18-I) were met.

MOTION: Request to grant the Village of Hoffman Estates (Lessor) and The Everest Group/Sprint, Clearwire (Lessee), ***a special use under Sections 9-3-9-A and 9-8-2-C-6 to permit the installation of two (2) microwave dishes and associated equipment to be no greater than one hundred and six (106) feet high on a Village water tank located at 95 Aster Lane.*** The following conditions shall apply:

1. This special use shall be subject to approval of the final lease agreement with the Village of Hoffman Estates.
2. No advertising shall be allowed on the equipment or structures.
3. The petitioner shall pay all costs associated with the third party review and inspections, as required by the Village's Public Works Department policy.
4. Should the operation of these microwave dishes cease for a period of six (6) months, the dishes and associated equipment shall be removed per Zoning Code Section 9-1-18-L.

The petitioner was agreeable to the above listed conditions.

RECOMMENDATION: The Zoning Board of Appeals (ZBA) recommends approval of this request.

The petitioner, Mr. Faber representing Sprint-Clearwire, requested a special use to install two microwave dish antennas on the water tank. The dishes operate under a different radio band from the existing cellular antennas and are used to carry the increased volumes of data (video and internet) common in modern cell phones. The Zoning Board confirmed that the structural report was completed and was accepted by the Village. The Zoning Board confirmed that each

dish weighs approximately 45 pounds including the mounting equipment. Zoning Board members noted that there are over 40 existing antennas on the water tank, including public and private installations, and questioned whether the water tank was becoming overly cluttered with communications equipment. The concern was not related to the structural integrity of the installation, but was related to aesthetics. However, the water tank is a tall, existing structure that has been used for this purpose and is less aesthetically offensive than a new monopole cell tower. The Zoning Board recommended approval of the request.

AUDIENCE COMMENTS

None.

VOTE:
5 Ayes
2 Nays (Ciffone, Gaeta)
0 Absent

ZONING BOARD OF APPEALS
Chairman William Weaver
Vice-Chairman Ronald Jehlik
Denise Wilson
Michael Ciffone
Masoom Ali
Donna Boomgarden
Michael Gaeta

THIS SPECIAL USE WILL EXPIRE UNLESS ACTED UPON WITHIN ONE (1) YEAR OF VILLAGE BOARD APPROVAL

***AN IMMEDIATE AUTHORIZATION TO APPLY FOR PERMITS* IS REQUESTED**

FINDING OF FACT WRITTEN BY DEVELOPMENT SERVICES STAFF

VILLAGE OF HOFFMAN ESTATES

Memo

TO: William Weaver, Zoning Board of Appeals Chairman

FROM: Josh Edwards, Assistant Planner JAE

RE: **SPRINT-CLEARWIRE COMMUNICATIONS – 95 ASTER LANE – SPECIAL USE – COMMUNICATION ANTENNAS AND ASSOCIATED EQUIPMENT**

DATE: December 3, 2009

HEARING DATE: December 8, 2009

---

1. REQUEST SUMMARY

Request by Village of Hoffman Estates (owner) and Sprint-Clearwire Communications (lessee) for a special use to permit the installation of two microwave dishes and associated equipment on a Village owned water tank at 95 Aster Lane.

2. BACKGROUND

The existing water tank at 95 Aster Lane currently contains communication antennas installed by Sprint, Nextel (Sprint), T-Mobile, Verizon, JAWA, the Village of Schaumburg, and the Village of Hoffman Estates. The equipment for the existing antennas is located near the base of the tank in shelters and equipment cabinets. The existing Sprint ground equipment is located within a masonry shelter in equipment cabinets near the base of the water tank.

3. PETITIONER PROPOSAL

The petitioner is proposing to install two, 26 inch high microwave dishes at 106 feet above grade on the support structure of the water tank. The installation requires a special use approval. The two dishes would be attached near the existing Sprint (originally approved as Nextel) cellular antennas centered at 100 feet high.

The function of the new dishes is to support and upgrade the Sprint network with voice and data transmission as an alternative to installing miles of underground fiber optic wires throughout the coverage area.

No separate building or equipment is proposed on the ground. The new equipment for the dishes would be installed entirely within the existing equipment shelter located northeast of the water tank. Wiring would be installed underground between the shelter and water tank; and cables would be run on existing cable supports on the water tank to the dishes.

4. SITE CONDITIONS

The subject property is zoned B-2, Community Business District. The surrounding properties to the north, south, and west are zoned B-2, Community Business District. Adjacent to the south is the Hoffman Plaza shopping center. To the east is the Parcel A neighborhood zoned R-2, One Family Residential District. The site is accessed from Aster Lane, which connects with the rear service aisle behind Hoffman Plaza.

5. APPLICABLE REQUIREMENTS

a) Section 9-8-2-C-6 (p. CD9:124) states that public utility and public service uses shall be permitted in the B-2 District subject to the issuance of a special use permit in accordance with the provisions of Section 9-1-18.

b) Section 9-3-9-A (p. CD9:58) states that the total antenna height of any communications tower, antenna or combination thereof of any height over 45 feet upon Village owned or leased facilities shall be permitted only as a special use.

6. ADJACENT OWNER COMMENTS

Standard notification letters have been mailed and as of this writing no comments have been received.

7. RELEVANT SPECIAL USE HISTORY

Subject Property

a) Ordinance No. 3939-2007 – The Village Board approved a special use for the Village of Schaumburg to install two (2) antennas at 158 feet above grade.

b) Ordinance No. 3894-2006 – The Village Board approved a special use for T-Mobile to install nine (9) antennas at 158 feet above grade.

c) Ordinance No. 3670-2004 – The Village Board approved a special use for Verizon Wireless (formerly Ameritech) to replace eight (8) existing antennas (originally approved by Ordinance 1825-1987) with twelve (12) antennas at 116 feet above

grade. A proposal has recently been approved to lower the Verizon antennas on the water tank, which did not require an amendment to the special use.

d) Ordinance No. 3119-1999 – The Village Board approved a special use for Nextel to install nine (9) antennas at 100 feet above grade.

e) Ordinance No. 2974-1998 – The Village Board approved a special use for Sprint PCS to install nine (9) antennas at 88 feet above grade.

f) Ordinance No. 1543-1984 – The Village Board approved a special use for JAWA to install two antennas on the top of the tank with two repeaters and an uninterruptible power supply.

g) Ordinance No. 1361-1982 – The Village Board approved a special use for the Village of Hoffman Estates to install antennas for police personnel communications systems.

Similar Properties

Over the past decade various communication antennas have been installed on all 6 water tanks throughout the Village.

8. PUBLIC WORKS COMMENTS

A thorough structural analysis and engineering review is required prior to the zoning review for Village owned water tanks. A structural analysis prepared by a licensed engineer on behalf of the petitioner has been reviewed by Public Works and the Village's third party engineering consultants. The structural analysis concluded that the installation will have no adverse impact on the water tank. Public Works has accepted the report.

9. IMMEDIATE AUTHORIZATION TO APPLY FOR PERMIT(S)

The petitioner has requested an Immediate Authorization to Apply for Permit(s).

10. DEVELOPMENT SERVICES COMMENTS

The proposal to install dishes onto a water tank rather than erecting a separate antenna tower will minimize visual clutter. The proposed dishes are designed to upgrade the existing antennas. The height above grade and the relatively small size of the two dishes will reduce the visibility of the dishes from surrounding properties. The dish is smaller than standard cellular antenna arrays and is comparable in size to a residential television satellite dish and no more aesthetically obtrusive.

The equipment on the ground supporting the new dishes will be located entirely within an existing brick equipment shelter.

The existing special use approvals and leases for the existing Sprint and Nextel antennas will stay in effect. A new lease will be required for this new installation.

The Federal Telecommunications Act of 1996 expressly preempts local governments from regulating the placement, construction, or modification of personal wireless services on the basis of environmental or health concerns. Such concerns cannot be discussed or used as a basis of the decision whether to grant a special use.

11. MOTION

Should the Zoning Board find that the Standards for a Special Use are met, the following motion is provided with conditions:

A special use under Sections 9-3-9-A and 9-8-2-C-6 to permit the installation of two (2) microwave dishes and associated equipment to be no greater than one hundred and six (106) feet high on a Village water tank at 95 Aster Lane.

The following conditions shall apply:

1. ***This special use shall be subject to approval of the final lease agreement with the Village of Hoffman Estates.***
2. ***No advertising shall be allowed on the equipment or structures.***
3. ***The petitioner shall pay all costs associated with the third party review and inspections, as required by the Village's Public Works Department policy.***
4. ***Should the operation of these microwave dishes cease for a period of six (6) months, the dishes and associated equipment shall be removed per Zoning Code Section 9-1-18-L.***

cc: Corporation Counsel, D. O'Malley, D. Plass, R. Norton, Petitioner

CHI 5290

VILLAGE OF HOFFMAN ESTATES
ZONING BOARD OF APPEALS

REQUEST FOR SPECIAL USE HEARING

FOR VILLAGE USE ONLY

Hearing Fee $ 400.00 Date Paid 7/8/09 Received By D. Moore

Hearing Date: 12/8/09 Time: 7:30 pm Legal Published _____

Receipt Number 293408 Check No. 104882 Zoning District B-2

PLEASE PRINT OR TYPE

1. Name of Property Owner(s)* Village of Hoffman Estates

E-Mail Address joshua.edwards@hoffmanestates.org Fax 847-490-6868

Owner's Address 1900 Hassell Road Phone 847-882-9100

City Hoffman Estates State IL Zip 60169

Subject Property's Address (if different than #1): 95 Aster Lane

2. Person applying if other than owner:*

Name Will Faber Company The Everest Group/ Sprint, Clearwire

E-Mail Address wfaber85@gmail.com Fax 773/409-5426

Address 7013 W. 111th St. Phone 773-987-5299

City Worth State IL Zip 60482

3. Property Index Number (PIN) 07-15-200-026-0000

5. Please describe the proposed use, or attach a letter.

Addition of 2 dish antennas to existing telecommunications facility

*** If "owner" is an entity other than an individual(s), then an Economic Disclosure Statement must also be filed.**

6. **An Immediate Authorization to Apply for Permits** allows the Code Enforcement Division to begin the building permit review process prior to the adoption of the Ordinance by the Village Board. The Immediate Authorization makes it possible for you to expedite the plan review process by approximately two weeks. Contact the Code Enforcement Division at 847/781-2631 to discuss the building permit application and review process.

Please check one of the following

☑ Yes, I request Immediate Authorization to Apply for Permits upon approval of my application by the Village Board, allowing me to begin the building permit review process prior to adoption of the Ordinance approving my special use.

Or

☐ No, I do not request Immediate Authorization to Apply for Permits.

7. I, the undersigned, certify the information and submissions provided accurately represent the current conditions and proposed improvement(s) requiring a special use.

Owner's Signature_____

Name (Please Print)_____

Applicant's Signature_____

Name (Please Print) William Abe

All requests for a hearing must be accompanied by the items required according to the nature of the request. All fees must be paid before Zoning Board can hear any case. Any additional fees must be paid before any findings or reports are given to the Village Board.

EXHIBIT A

DESCRIPTION OF LAND

to the Agreement dated October 11, 1999, by and between Village of Hoffman Estates, and Illinois municipal corporation, as Lessor, and Nextel West Corp., a Delaware corporation, d/b/a Nextel Communications, as Lessee.

The Land is described and/or depicted as follows:

LEGAL DESCRIPTION:

As recorded per document no. 934546, in volume 1874, page 274, in Cook County.

That part of LOT FOURTEEN (14) in Block One (1) in Hoffman Estates 1, described as follows: Commencing at the Northeast corner of said LOT Fourteen (14); thence South along the East line of said Lot Fourteen (14) a distance of 200 feet and thence West along a line perpendicular to said East Line of Lot Fourteen (14), a distance of 217 feet, for a place beginning; thence South from said place of beginning along a line perpendicular to the last described course a distance 150 feet; thence East along a line perpendicular to the last described course, a distance of 150 feet; thence North along a line perpendicular to the last described course, a distance of 150 feet; thence West along a line perpendicular to the last described course, a distance of 150 feet more or less to the place of beginning.

and commonly known as: 95 Aster, Hoffman Estates, IL 60195
P.I.N. #: 07-15-200-026

THE EVEREST GROUP
Representing Sprint/ Clearwire

7013 W 111th St
Worth, IL 60482

773-987-5299

wfaber85@gmail.com

July 8, 2009
Village of Hoffman Estates
1900 Hassell Road
Hoffman Estates, IL 60169

This application for a special use permit on behalf of Sprint/ Clearwire is for the purpose of installing two additional antennas and two lines of associated coaxial cable on the water tank at 95 Aster Lane. The purpose of the communications system upgrade is to facilitate wireless backhaul coverage over the existing Sprint telecommunications network. Effectively, the current T1 system will be replaced with wireless connections between individual communication sites and the central switch. The new antenna will make this linkage possible, thereby lowering costs to consumers and increasing the reliability and robustness of the existing and future data network.

Sincerely yours,

Will Faber

The Everest Group

HOFFMAN ESTATES

GROWING TO GREATNESS

November 5, 2009

To All Interested Parties:

Please be advised the Zoning Board of Appeals of the Village of Hoffman Estates will conduct a public hearing at the request of the Village of Hoffman Estates (Lessor) and The Everest Group/Sprint, Clearwire (Lessee) to consider a special use under the Zoning Code to permit the installation of communication antennas and accompanying equipment on the property located at 95 Aster Lane.

The hearing will be held in the Municipal Building, 1900 Hassell Road, Hoffman Estates, Illinois, **Tuesday, November 17, 2009 at 7:30 p.m.**

A map designating the subject site is included on the back of this letter. Appropriate time will be available for questions/comments from interested parties. Should you wish any additional information, please feel free to contact the Planning Division at 847/781-2660. Material is available at the office for review.

Should it become necessary to continue this hearing to an additional date, it will be announced at the conclusion of testimony at the hearings. No further notification of this review will be sent.

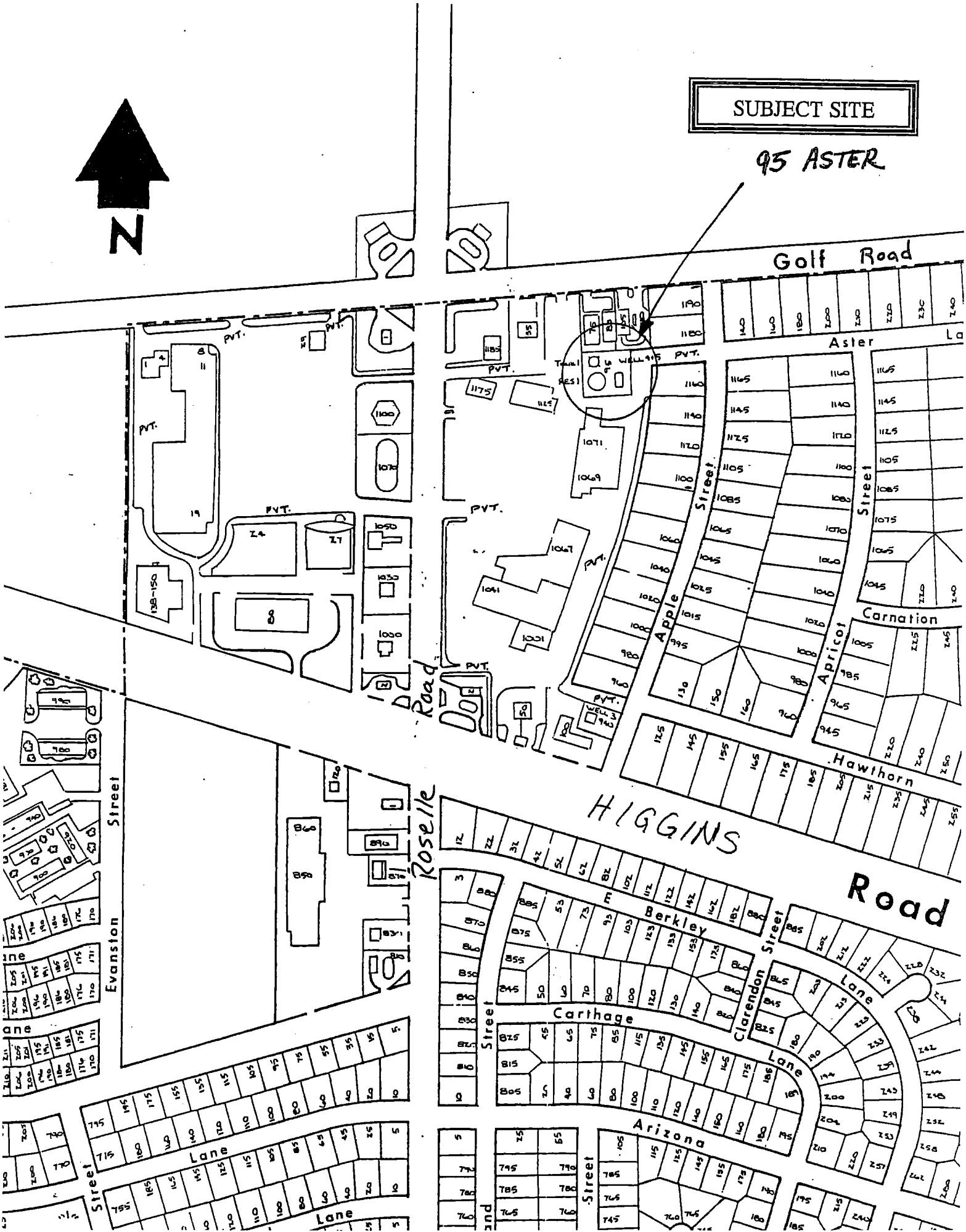
Sincerely,

Josh Edwards, Assistant Planner
Department of Development Services

JE/pm

1900 Hassell Road
Hoffman Estates, Illinois 60169
www.hoffmanestates.org

Phone: 847-882-9100
Fax: 847-843-4822


SUBJECT SITE
95 ASTER
N
Golf Road
Aster
Apple Street
Apricot Street
Carnation
Hawthorn
HIGGINS Road
Roselle Road
Evanston Street
Berkley
Carthage
Clarendon Street
Arizona
Lane
PVT.

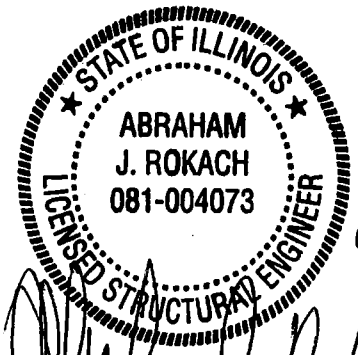
Structural Report

Prepared for: Clear Wireless LLC.

Existing 176' Water Tower

Clearwire Site No. IL-CHI5290 (IL3093)
Golf Center
95 Aster Lane
Hoffman Estates, Cook Co., IL 60169

June 1, 2009



6/1/09

Abraham J. Rokach
Illinois SE License No. 081-004073
Expires 11/30/2010

I certify that this report was prepared by me, or under my direct supervision and control, and, to the best of my knowledge and belief, complies with the requirements of the applicable building code.

Fullerton
Engineering Consultants

9700 West Higgins Road, Suite 800, Rosemont, IL 60018
Phone: (847) 292 0200 Fax: (847) 292 0205

Table of Contents

Summary

The Water Tower has been checked with the new antenna loads and is found to be **adequate** in all areas.

The maximum increase in column stress is about 4.07%, whish is acceptable by engineering judgment. The maximum rod stress is 8.26 ksi, which is less than the allowable of 18 ksi x 1.33 (wind allowable) = 24 ksi. The maximum strut stress is 0.74 ksi, whish is less than the allowable of 3.98 ksi.

Per perimeter pier, the uplift will be increased by 18.6%. The uplift of 103 kips per perimeter is less than the uplift resistance of 124 kips. Therefore the foundation of the tank is adequate for the additional uplift.

The existing (2) 2" dia. anchor bolts per pier will see an increase in stress of 18.6% and are still adequate.

Project Summary

Project: Clearwire Site No. IL-CHI5290 / Hoffman Estates Water Tower
95 Aster Lane
Hoffman Estates, IL 60196

Owner: City of Hoffman Estates

Scope:

1. Water Tank Structural Analysis for Additional Loads due to New Clearwire Dishes.

Design Criteria:

1. International Building Code 2003.
2. TIA/EIA-222-F 1996 (Antennas & Antenna Supporting Structure).
3. ANSI/AWWA D100-96 (Welded Steel Tanks for Water Storage).
4. AISC ASD 9TH Edition.
5. ACI-318-89.

New Equipment Loads:

(1) VHLP2-23 Dish
(1) VHLP2-18 Dish
(2) 1/2" Diameter Cable

Design Load:

- Basic Wind Speed for :

Antennas & Antenna Mounts - 75 mph Fastest Mile / 90 mph (3-second gust) (TIA/EIA-222-F 1996)
Water Tank Structure - 100 mph Fastest Mile / 120 mph (3-second gust) (ANSI/AWWA D100-96)

Reference:

Drawings of the Existing Water Tank : See Appendix A

Geotechnical report : N / A

Existing Water Tank Structural Analysis

Water Tank Data & Properties:

Shape Coefficient for Water Tank Structure

Effective Area Coeffiecient (Flat) $C_{d\_flat} := 1$

Effective Area Coeffiecient (Cylindrical) $C_{d\_cyl} := 0.6$

Effective Area Coeffiecient (Sphere) $C_{d\_sphere} := 0.5$

Wind Speed

Effective Wind Speed for Water Tank Structure (AWWA-D100-96) $V_{eff\_wt} := 100mph$

Water Tank Dimensions

Water Tank

Tank Capacity $Vol := 100000gal$

Tank Diameter $d_{tank} := 28.0ft$

All Elevations are from Top Existing Grade

Top of Water Tank $H_{top} := 176ft$

Top of Capacity Level $H_{TCL} := 170ft$

Bottom of Capacity Level $H_{BCL} := 154ft$

Mean Height of Water Tank $H_{mean} := \frac{H_{TCL} + H_{BCL}}{2}$ $H_{mean} = 162\,ft$

Bottom of Water Tank $H_{bot} := 148ft$

Water Tank Supporting Structure Dimensions

Number of Legs $N_{leg} := 4$

Number of Panels $N_{panel} := 4$

Center Column Outer Diameter $OD_{cen} := 48in$

Center Column Height $H_{cen} := 148ft$

Perimeter Column Inner Diameter $OD_{leg} := 22in$

Perimeter Column Height $H_{leg} := 154ft$

Water Tank Foundation Dimensions

Weight of Concrete per Perimeter Pier $W_{leg.pier} := 19.93kip$

Weight of Earth per Perimeter Pier $W_{leg.soil} := 3.475kip$

Number of Anchor Bolts per Perimeter Pier $N_{leg.bolt} := 2$

Diameter of Anchor Bolts & Threads per Inch $n_{trd} := 6 \cdot in^{-1}$ $D_{bolt} := 2in$

Minimum Root Area of Each Bolt $A_{bolt} := 0.7854 \cdot \left(D_{bolt} - \frac{1.3}{n_{trd}}\right)^2$ $A_{bolt} = 5 \cdot in^2$

Material Properties

Modulus of Elasticity $E := 29000ksi$

Density of Steel $Density = 490pcf$

Wind Load on Water Tank Structure:

Wind Pressure

$Pressure := 30psf$

Flat	$P_{flat} := Pressure \cdot C_{d\_flat} \cdot \left(\frac{V_{eff\_wt}}{100mph}\right)^2$	$P_{flat} = 30 \cdot psf$
Cylindrical	$P_{cyl} := Pressure \cdot C_{d\_cyl} \cdot \left(\frac{V_{eff\_wt}}{100mph}\right)^2$	$P_{cyl} = 18 \cdot psf$
Sphere	$P_{sphere} := Pressure \cdot C_{d\_sphere} \cdot \left(\frac{V_{eff\_wt}}{100mph}\right)^2$	$P_{sphere} = 15 \cdot psf$

Wind Load, Wind Projected Area & Elevation of Centroid Above Foundation

Water Tank Top	$A_{top} := 16256in^2$	$A_{top} = 112.89\,ft^2$
	$y_{top} := 2064in$	$y_{top} = 172\,ft$
	$F_{top} := A_{top} \cdot P_{sphere}$	$F_{top} = 1.69 \cdot kip$
Water Tank Middle	$A_{mid} := 64512in^2$	$A_{mid} = 448\,ft^2$
	$y_{mid} := 1953.6in$	$y_{mid} = 162.8\,ft$
	$F_{mid} := A_{mid} \cdot P_{cyl}$	$F_{mid} = 8.06 \cdot kip$
Water Tank Bottom	$A_{bot} := 16256in^2$	$A_{bot} = 112.89\,ft^2$
	$y_{bot} := 1833.6in$	$y_{bot} = 152.8\,ft$
	$F_{bot} := A_{bot} \cdot P_{sphere}$	$F_{bot} = 1.69 \cdot kip$
Water Tank Handrail & Balcony	$A_{rail} := 10\% \cdot (A_{top} + A_{mid} + A_{bot})$	$A_{rail} = 67.38\,ft^2$
	$y_{rail} := 156.8ft$	$y_{rail} = 156.8\,ft$
	$F_{rail} := A_{rail} \cdot P_{cyl}$	$F_{rail} = 1.21 \cdot kip$
Water Tank Perimeter Leg	$A_{leg} := N_{leg} \cdot OD_{leg}$	$A_{leg} = 7.33 \cdot \frac{ft^2}{ft}$
	$F_{leg} := A_{leg} \cdot P_{cyl}$	$F_{leg} = 132 \cdot plf$
Water Tank Perimeter Leg	$A_{cen} := OD_{cen}$	$A_{cen} = 4 \cdot \frac{ft^2}{ft}$
	$F_{cen} := A_{cen} \cdot P_{cyl}$	$F_{cen} = 72 \cdot plf$
Water Tank Rods & Struts	$F_{rod.strut} := 10\% \cdot (F_{cen} + F_{leg})$	$F_{rod.strut} = 20.4 \cdot plf$

Snow Load on Balcony:

Snow Load	$SL := 25psf$	$SL = 25 \cdot psf$
Inside Diameter	$ID_{Balcony} := 28ft$	$ID_{Balcony} = 28\,ft$
Outside Diameter	$OD_{Balcony} := 30.5ft$	$OD_{Balcony} = 30.5\,ft$
Area of balcony	$A_{Balcony} := \frac{\pi \cdot \left(OD_{Balcony}^{2} - ID_{Balcony}^{2}\right)}{4}$	$A_{Balcony} = 114.86\,ft^{2}$
Weight of Snow	$W_{Snow} := A_{Balcony} \cdot SL$	$W_{Snow} = 2.87 \cdot kip$

Dead Load from Water Tank Structure & Contained Water:

Unit Weight of Water	$Unit\_w = 62.43 \cdot pcf$	
Weight of Water	$W_{water} := Unit\_w \cdot Vol$	$W_{water} = 834.54 \cdot kip$
Weight of Structure	$W_{structure} := 10\% \cdot W_{water}$	$W_{structure} = 83.45 \cdot kip$
Weight of Water (Central Pier)	$W_{cen.water} := 19\% \cdot W_{water}$	$W_{cen.water} = 158.56 \cdot kip$
Weight of Structure (Central Pier)	$W_{cen.structure} := 19\% \cdot W_{structure}$	$W_{cen.structure} = 15.86 \cdot kip$
Weight of Water (Perimeter Pier)	$W_{leg.water} := \frac{100\% - 19\%}{N_{leg}} \cdot W_{water}$	$W_{leg.water} = 168.99 \cdot kip$
Weight of Structure (Perimeter Pier)	$W_{leg.structure} := \frac{100\% - 19\%}{N_{leg}} \cdot W_{structure} + \frac{W_{Snow}}{N_{leg}}$	$W_{leg.structure} = 17.62 \cdot kip$

Wind Load on Existing Appurtenances:

Aspect Ratio of Members > 25:

Use $C_{aF} := 2.0$ For Flat Members

Use $C_{aR} := 1.2$ For Round Members

Existing Standard Post to Balcony Ladder:

Diameter Step(s)		$d_{step} := 1in$
Size Step Step(s) - Length		$l_{step} := 2ft$
Size Step(s) - Width		$w_{step} := 1ft$
Distance between Steps		$dist_{step} := 12in$
Number of Step(s) (Conservatively Full Length)	$n_{step} := ceil\left(\frac{y_{rail}}{dist_{step}}\right)$	$n_{step} = 157$
Weight of Steps	$Volume_{step} := \frac{\pi \cdot d_{step}^{2}}{4} \cdot (2 \cdot w_{step} + l_{step})$	$Volume_{step} = 0.02 \cdot ft^{3}$
$Density = 490 \cdot pcf$	$Weight_{step} := Density \cdot Volume_{step} \cdot ft^{-1}$	$Weight_{step} = 10.69 \cdot plf$
Wind Load on Step Irons	$Area_{step} := l_{step} \cdot w_{step}$	$Area_{step} = 2ft^{2}$
$pressure := 20psf$	$Wind_{step} := C_{aR} \cdot pressure \cdot Area_{step} \cdot ft^{-1}$	$Wind_{step} = 48 \cdot plf$

Wind Load on Existing Antennas & Equipment :

Wind Pressure @ Antenna Mount Level

- Calculate Wind Loads at Antenna Frame Based on TIA-EIA-222. Use Current Edition "F" For TIA / EIA Standard

$F_c = q_z \cdot G_H \cdot (\Sigma C_a \cdot A_c)$ Wind Velocity $v := 75$ mph. Height of Antenna from ground $z_{SL} := 79ft$ max.

Elevation Coefficient $K_z := \left(\frac{z_{SL}}{33ft}\right)^{\frac{2}{7}}$ $K_z = 1.28$

Velocity Pressure $q_z := 0.00256 K_z \cdot v^2 \cdot psf$ $q_z = 18.48 \cdot psf$

Gust Response Factor $G_H := 0.65 + \frac{0.6}{\left(\frac{z_{SL}}{33ft}\right)^{\frac{1}{7}}}$ $G_H = 1.18$

Check that wind pressure (product of velocity pressure and gust response factor) is greater than or equal to 20 psf. If wind pressure is less than 20 psf, use 20 psf, If not use actual. $Pressure := if(G_H \cdot q_z < 20psf, 20psf, G_H \cdot q_z)$

$Pressure = 21.8 \cdot psf$

Antennas Properties For A ll Sectors

Number of Sectors $sector_{SL} := 3$ $Elev\_Ant := z_{SL}$ $Elev\_Ant = 79\,ft$

Antennas per Sector $n_{Ant.SL} := 2$ $ANTENNA_{SL} \equiv$ "CSS-XS4-65-R"

Antennas Properties $Length_{SL} \equiv 4ft$ $Width_{SL} \equiv 6.7in$ $Depth_{SL} \equiv 4.1in$ $W_{A.SL} \equiv 15lb$

Mounting Brackets $W_{mountSL} \equiv 30lb$

Aspect Ratio of Antennas $A_{spect.SL} := \frac{Length_{SL}}{Width_{SL}}$ $A_{spect.SL} = 7.16$

$$C_{aA.SL} := \left| C_{aA.SL} \leftarrow \begin{cases} 1.4 & \text{if } A_{spect.SL} < 7 \\ 2.0 & \text{if } A_{spect.SL} > 25 \\ 1.4 + \frac{A_{spect.SL} - 7}{30} & \text{otherwise} \end{cases} \right| C_{aA.SL}$$

Therefore Use $C_{aA.SL} = 1.41$ **for Antennas**

Wind Pressure on Antennas	$WL_{A.SL} := Pressure \cdot C_{aA.SL}$	$WL_{A.SL} = 31 \cdot psf$
Wind Pressure on Flat Members	$WL_F := Pressure \cdot C_{aF}$	$WL_F = 44 \cdot psf$
Wind Pressure on Round Members	$WL_R := Pressure \cdot C_{aR}$	$WL_R = 26 \cdot psf$

For Each Cable :		$h_{c.cab} := 2in$
Number of Cables	$N_{CAB.SL} := sector_{SL} \cdot n_{Ant.SL}$	$N_{CAB.SL} = 6$
Weight of Cable (for 1 5/8" Coaxial Cable)		$Weight_{cableSL} := 1plf$
Length of Cable	$L_{CAB.SL} := z_{SL}$	$L_{CAB.SL} = 79 \cdot ft$
Wind Load per Foot of Cable	$F_{CABSL.ft} := WL_R \cdot h_{c.cab}$	$F_{CABSL.ft} = 4.36 \cdot plf$
Dead Load per Foot of Cable	$W_{CABSL.ft} := Weight_{cableSL}$	$W_{CABSL.ft} = 1 \cdot plf$
Total Wind Load :	$F_{CAB.SL} := N_{CAB.SL} \cdot F_{CABSL.ft} \cdot L_{CAB.SL}$	$F_{CAB.SL} = 2066.54 \cdot lb$
Total Dead Load :	$W_{CAB.SL} := N_{CAB.SL} \cdot W_{CABSL.ft} \cdot L_{CAB.SL}$	$W_{CAB.SL} = 474 \cdot lb$
For Each Antenna :	$ANTENNA_{SL} = "CSS-XS4-65-R"$	
Area of Each Antenna	$A_{cA.SL} := Width_{SL} \cdot Length_{SL}$	$A_{cA.SL} = 2.23 ft^2$
Wind Load for Each Antenna	$F_{cA.SL} := WL_{A.SL} \cdot A_{cA.SL}$	$F_{cA.SL} = 68.42 lb$
Dead Load Each Antenna	$DL_{A.SL} := W_{A.SL} + W_{mountSL}$	$DL_{A.SL} = 45 lb$
Total Wind Load	$F_{ANT.SL} := n_{Ant.SL} \cdot sector_{SL} \cdot F_{cA.SL}$	$F_{ANT.SL} = 410.55 lb$
Total Dead Load	$W_{ANT.SL} := n_{Ant.SL} \cdot sector_{SL} \cdot DL_{A.SL}$	$W_{ANT.SL} = 270 lb$
For Each Antenna Mounting Pipe	$i := 6$ $pipe_i = "SW 2" STD Dia"$	$n_{AMP.SL} := 9$
$L_{AMP.SL} := 6.0ft$	$S_{AMP} := S_{pipe_i}$ $OD_{AMP} := OD_{pipe_i}$	$I_{AMP} := I_{pipe_i}$
Area of Each Pipe	$A_{AMP.SL} := OD_{AMP} \cdot L_{AMP.SL}$	$A_{AMP.SL} = 1.19 ft^2$
Wind Load for Each Pipe	$WL_{AMP.SL} := WL_R \cdot A_{AMP.SL}$	$WL_{AMP.SL} = 31.06 \cdot lb$
Dead load for Each Pipe	$DL_{AMP.SL} := Weight_{pipe_i} \cdot L_{AMP.SL}$	$DL_{AMP.SL} = 21.90 \cdot lb$
Total Wind Load	$F_{AMP.SL} := n_{AMP.SL} \cdot WL_{AMP.SL}$	$F_{AMP.SL} = 279.57 lb$
Total Dead Load	$W_{AMP.SL} := n_{AMP.SL} \cdot DL_{AMP.SL}$	$W_{AMP.SL} = 197.1 \cdot lb$
Total Loading For Existing Antennas and Mounting Pipes (Other Carriers)		
Total Wind Load	$F_{app.SL} := F_{ANT.SL} + F_{AMP.SL}$	$F_{app.SL} = 690.12 lb$
Total Dead Load	$W_{app.SL} := W_{ANT.SL} + W_{AMP.SL}$	$W_{app.SL} = 467.1 lb$

Wind Load on Existing Antennas & Equipment:

Wind Pressure @ Antenna Mount Level

- Calculate Wind Loads at Antenna Frame Based on TIA-EIA-222. Use Current Edition "F" For TIA / EIA Standard

$F_c = q_z \cdot G_H \cdot (\Sigma C_a \cdot A_c)$ Wind Velocity $v := 75$ mph. Height of Antenna from ground $z := 100ft$ max.

Elevation Coefficient $K_z := \left(\frac{z}{33ft}\right)^{\frac{2}{7}}$ $K_z = 1.37$

Velocity Pressure $q_z := 0.00256 K_z \cdot v^2 \cdot psf$ $q_z = 19.77 \cdot psf$

Gust Response Factor $G_H := 0.65 + \frac{0.6}{\left(\frac{z}{33ft}\right)^{\frac{1}{7}}}$ $G_H = 1.16$

Check that wind pressure (product of velocity pressure and gust response factor) is greater than or equal to 20 psf. If wind pressure is less than 20 psf, use 20 psf, If not use actual. $Pressure := if(G_H \cdot q_z < 20psf, 20psf, G_H \cdot q_z)$

$Pressure = 22.97 \cdot psf$

Antennas Properties For A ll Sectors

Number of Sectors sector := 3 $Elev\_Ant := z$ $Elev\_Ant = 100\,ft$

Antennas per Sector $n_{Ant} := 1$ ANTENNA ≡ "HB-X-WM-17-65-00T"

Antennas Properties Length ≡ 48.0in Diameter ≡ 7.32in $W_A \equiv 30.0lb$

Mounting Brackets $W_{mount} \equiv 15lb$

Aspect Ratio of Antennas $A_{spect} := \frac{Length}{Diameter}$ $A_{spect} = 6.56$

$$C_{aA} := \left| C_{aA} \leftarrow \begin{cases} 0.8 & \text{if } A_{spect} < 7 \\ 1.2 & \text{if } A_{spect} > 25 \\ 0.8 + \frac{A_{spect} - 7}{30} & \text{otherwise} \end{cases} \right| C_{aA}$$

Therefore Use $C_{aA} = 0.8$ **for Antennas**

Wind Pressure on Antennas	$WL_A := Pressure \cdot C_{aA}$	$WL_A = 18 \cdot psf$
Wind Pressure on Flat Members	$WL_F := Pressure \cdot C_{aF}$	$WL_F = 46 \cdot psf$
Wind Pressure on Round Members	$WL_R := Pressure \cdot C_{aR}$	$WL_R = 28 \cdot psf$

For Each Cable :

$h_{c.cab} := 2in$

Number of Cables	$N_{CAB} := sector \cdot n_{Ant}$	$N_{CAB} = 3$
Weight of Cable (for 1 5/8" Coaxial Cable)		$Weight_{cable} := 1plf$
Length of Cable	$L_{CAB} := z$	$L_{CAB} = 100 \cdot ft$
Wind Load per Foot of Cable	$F_{CAB.ft} := WL_R \cdot h_{c.cab}$	$F_{CAB.ft} = 4.59 \cdot plf$
Dead Load per Foot of Cable	$W_{CAB.ft} := Weight_{cable}$	$W_{CAB.ft} = 1 \cdot plf$
Total Wind Load :	$F_{CAB} := N_{CAB} \cdot F_{CAB.ft} \cdot L_{CAB}$	$F_{CAB} = 1378.26 \cdot lb$
Total Dead Load :	$W_{CAB} := N_{CAB} \cdot W_{CAB.ft} \cdot L_{CAB}$	$W_{CAB} = 300 \cdot lb$

For Each Antenna : ANTENNA = "HB-X-WM-17-65-00T"

Area of Each Antenna	$A_{cA} := Diameter \cdot Length$	$A_{cA} = 2.44 ft^2$
Wind Load for Each Antenna	$F_{cA} := WL_A \cdot A_{cA}$	$F_{cA} = 44.84 lb$
Dead Load for Each Antenna	$DL_A := W_A + W_{mount}$	$DL_A = 45 lb$
Total Wind Load	$F_{ANT} := n_{Ant} \cdot sector \cdot F_{cA}$	$F_{ANT} = 134.52 lb$
Total Dead Load	$W_{ANT} := n_{Ant} \cdot sector \cdot DL_A$	$W_{ANT} = 135 lb$

For Each Antenna Mounting Pipe

$j := 6$ $\quad pipe_j = "SW\ 2"\ STD\ Dia"$ $\quad n_{AMP} := 3$

$L_{AMP} := 7.0ft$ $\quad S_{AMP} := S_{pipe_j}$ $\quad OD_{AMP} := OD_{pipe_j}$ $\quad I_{AMP} := I_{pipe_j}$

Area of Each Pipe	$A_{AMP} := OD_{AMP} \cdot L_{AMP}$	$A_{AMP} = 1.39 ft^2$
Wind Load for Each Pipe	$WL_{AMP} := WL_R \cdot A_{AMP}$	$WL_{AMP} = 38.19 \cdot lb$
Dead Load for Each Pipe	$DL_{AMP} := L_{AMP} \cdot Weight_{pipe_j}$	$DL_{AMP} = 25.55 \cdot lb$
Total Wind Load	$F_{AMP} := n_{AMP} \cdot WL_{AMP}$	$F_{AMP} = 114.57 lb$
Total Dead Load	$W_{AMP} := n_{AMP} \cdot DL_{AMP}$	$W_{AMP} = 76.65 \cdot lb$

Total Loading For Existing Antennas and Mounting Pipes (4G)

Total Wind Load	$F_{app} := F_{ANT} + F_{AMP}$	$F_{app} = 249.09 lb$
Total Dead Load	$W_{app} := W_{ANT} + W_{AMP}$	$W_{app} = 211.65 lb$

Wind Load on Existing Antennas & Equipment:

Wind Pressure @ Antenna Mount Level

- Calculate Wind Loads at Antenna Frame Based on TIA-EIA-222. Use Current Edition "F" For TIA / EIA Standard

$F_c = q_z \cdot G_H \cdot (\Sigma C_a \cdot A_c)$ Wind Velocity $v := 75$ mph. Height of Antenna from ground $z_{SN} := 100\text{ft}$ max.

Elevation Coefficient $K_z := \left(\frac{z_{SN}}{33\text{ft}}\right)^{\frac{2}{7}}$ $K_z = 1.37$

Velocity Pressure $q_z := 0.00256 K_z \cdot v^2 \cdot \text{psf}$ $q_z = 19.77 \cdot \text{psf}$

Gust Response Factor $G_H := 0.65 + \frac{0.6}{\left(\frac{z_{SN}}{33\text{ft}}\right)^{\frac{1}{7}}}$ $G_H = 1.16$

Check that wind pressure (product of velocity pressure and gust response factor) is greater than or equal to 20 psf. If wind pressure is less than 20 psf, use 20 psf, If not use actual. $Pressure := if(G_H \cdot q_z < 20\text{psf}, 20\text{psf}, G_H \cdot q_z)$

$Pressure = 22.97 \cdot \text{psf}$

Antennas Properties For A ll Sectors

Number of Sectors $sector_{SN} := 3$ $Elev\_Ant_{SN} := z$ $Elev\_Ant_{SN} = 100\,\text{ft}$

Antennas per Sector $n_{Ant.SN} := 2$ $ANTENNA_{SN} \equiv$ "RR90-11-XXXBL"

Antennas Properties $Length_{SN} \equiv 48.0\text{in}$ $Width_{SN} \equiv 12\text{in}$ $Depth_{SN} \equiv 7\text{in}$ $W_{A.SN} \equiv 18.0\text{lb}$

Mounting Brackets $W_{mount.SN} \equiv 15\text{lb}$

Aspect Ratio of Antennas $A_{spect.SN} := \frac{Length_{SN}}{Width_{SN}}$ $A_{spect.SN} = 4$

$$C_{aA.SN} := \begin{| C_{aA.SN} \leftarrow \begin{| 1.4 \text{ if } A_{spect.SN} < 7 \\ 2.0 \text{ if } A_{spect.SN} > 25 \\ 1.4 + \frac{A_{spect.SN} - 7}{30} \text{ otherwise} \end{| \\ C_{aA.SN} \end{|$$

Therefore Use $C_{aA.SN} = 1.4$ **for Antennas**

Wind Pressure on Antennas	$WL_{A.SN} := Pressure \cdot C_{aA.SN}$	$WL_A = 18 \cdot \text{psf}$
Wind Pressure on Flat Members	$WL_F := Pressure \cdot C_{aF}$	$WL_F = 46 \cdot \text{psf}$
Wind Pressure on Round Members	$WL_R := Pressure \cdot C_{aR}$	$WL_R = 28 \cdot \text{psf}$

For Each Cable :		$h_{c.cab} := 2in$
Number of Cables	$N_{CABSN} := sector_{SN} \cdot n_{Ant.SN}$	$N_{CABSN} = 6$
Weight of Cable (for 1 5/8" Coaxial Cable)		$Weight_{CABSN} := 1plf$
Length of Cable	$L_{CABSN} := z_{SN}$	$L_{CABSN} = 100 \cdot ft$
Wind Load per Foot of Cable	$F_{CABSN.ft} := WL_R \cdot h_{c.cab}$	$F_{CABSN.ft} = 4.59 \cdot plf$
Dead Load per Foot of Cable	$W_{CABSN.ft} := Weight_{CABSN}$	$W_{CABSN.ft} = 1 \cdot plf$
Total Wind Load :	$F_{CABSN} := N_{CABSN} \cdot F_{CABSN.ft} \cdot L_{CABSN}$	$F_{CABSN} = 2756.51 \cdot lb$
Total Dead Load :	$W_{CABSN} := N_{CABSN} \cdot W_{CABSN.ft} \cdot L_{CABSN}$	$W_{CABSN} = 600 \cdot lb$
For Each Antenna :	$ANTENNA_{SN}$ = "RR90-11-XXXBL"	
Area of Each Antenna	$A_{cA.SN} := Width_{SN} \cdot Length_{SN}$	$A_{cA.SN} = 4 ft^2$
Wind Load for Each Antenna	$F_{cA.SN} := WL_{A.SN} \cdot A_{cA.SN}$	$F_{cA.SN} = 128.64 lb$
Dead Load for Each Antenna	$DL_{A.SN} := W_{A.SN} + W_{mount.SN}$	$DL_{A.SN} = 33 lb$
Total Wind Load	$F_{ANT.SN} := n_{Ant.SN} \cdot sector_{SN} \cdot F_{cA.SN}$	$F_{ANT.SN} = 771.82 lb$
Total Dead Load	$W_{ANT.SN} := n_{Ant.SN} \cdot sector_{SN} \cdot DL_{A.SN}$	$W_{ANT.SN} = 198 lb$
For Each Antenna Mounting Pipe	$j := 6$ $pipe_j$ = "SW 2" STD Dia"	$n_{AMP.SN} := 6$
$L_{AMP.SN} := 6.0ft$	$S_{AMP.SN} := S_{pipe_j}$ $OD_{AMP.SN} := OD_{pipe_j}$	$I_{AMP.SN} := I_{pipe_j}$
Area of Each Pipe	$A_{AMP.SN} := OD_{AMP.SN} \cdot L_{AMP.SN}$	$A_{AMP.SN} = 1.19 ft^2$
Wind Load for Each Pipe	$WL_{AMP.SN} := WL_R \cdot A_{AMP.SN}$	$WL_{AMP.SN} = 32.73 lb$
Dead Load for Each Pipe	$DL_{AMP.SN} := Weight_{pipe_j} \cdot L_{AMP.SN}$	$DL_{AMP.SN} = 21.90 \cdot lb$
Total Wind Load	$F_{AMP.SN} := n_{AMP.SN} \cdot WL_{AMP.SN}$	$F_{AMP.SN} = 196.4 lb$
Total Dead Load	$W_{AMP.SN} := n_{AMP.SN} \cdot DL_{AMP.SN}$	$W_{AMP.SN} = 131.4 lb$
For Each Horizontal Pipe	$j := 8$ $pipe_j$ = "SW 3" STD Dia"	$n_{HP.SN} := 4$
$L_{HP.SN} := 10.0ft$	$S_{HP.SN} := S_{pipe_j}$ $OD_{HP.SN} := OD_{pipe_j}$	$I_{HP.SN} := I_{pipe_j}$
Area of Each Pipe	$A_{HP.SN} := OD_{HP.SN} \cdot L_{HP.SN}$	$A_{HP.SN} = 2.92 ft^2$
Wind Load for Each Pipe	$WL_{HP.SN} := WL_R \cdot A_{HP.SN}$	$WL_{HP.SN} = 80.40 lb$
Dead Load for Each Pipe	$DL_{HP.SN} := Weight_{pipe_j} \cdot L_{HP.SN}$	$DL_{HP.SN} = 75.80 \cdot lb$
Total Wind Load	$F_{HP.SN} := n_{HP.SN} \cdot WL_{HP.SN}$	$F_{HP.SN} = 321.59 lb$
Total Dead Load	$W_{HP.SN} := n_{HP.SN} \cdot DL_{HP.SN}$	$W_{HP.SN} = 303.2 lb$

Total Loading For Existing Antennas and Mounting Pipes (Sprint/Nextel)

Total Wind Load	$F_{app.SN} := F_{ANT.SN} + F_{AMP.SN} + F_{HP.SN}$	$F_{app.SN} = 1289.82 lb$
Total Dead Load	$W_{app.SN} := W_{ANT.SN} + W_{AMP.SN} + W_{HP.SN}$	$W_{app.SN} = 632.6 lb$

Wind Load on New Dish Antenna:

Wind Pressure @ Antenna Mount Level

- Calculate Wind Loads at Antenna Frame Based on TIA-EIA-222. Use Current Edition "F" For TIA / EIA Standard

$F_c = q_z \cdot G_H \cdot (\Sigma C_a \cdot A_c)$ Wind Velocity $v := 75$ mph. Height of Antenna from ground $z_{Dish} := 112.0ft$ max.

Elevation Coefficient $K_z := \left(\frac{z_{Dish}}{33ft}\right)^{\frac{2}{7}}$ $K_z = 1.42$

Velocity Pressure $q_z := 0.00256 K_z \cdot v^2 \cdot psf$ $q_z = 20.42 \cdot psf$

Gust Response Factor $G_H := 0.65 + \frac{0.6}{\left(\frac{z_{Dish}}{33ft}\right)^{\frac{1}{7}}}$ $G_H = 1.15$

Check that wind pressure (product of velocity pressure and gust response factor) is greater than or equal to 20 psf. If wind pressure is less than 20 psf, use 20 psf, If not use actual. $Pressure := if(G_H \cdot q_z < 20psf, 20psf, G_H \cdot q_z)$

$Pressure = 23.56 \cdot psf$

Antennas Properties For A ll Sectors

Number of Sectors $sector_{Dish1} := 2$ $Elev\_Ant := z_{Dish}$ $Elev\_Ant = 112\,ft$

Antennas per Sector $n_{AntDish1} := 1$ $ANTENNA_{Dish1} \equiv$ "VHLP2-23"

Antennas Properties $Diameter_{Dish1} \equiv 26in$ $W_{ADish1} \equiv 14.0lb$

Mounting Brackets $W_{Dishmount1} \equiv 11.5lb$

Aspect Ratio of Antennas $A_{spectDish1} := 1$ $A_{spectDish1} = 1$ For flat members

$C_{aADish1} :=$ | $C_{aADish1} \leftarrow$ | 1.4 if $A_{spectDish1} < 7$ | 2.0 if $A_{spectDish1} > 25$ | $1.4 + \frac{A_{spectDish1} - 7}{30}$ otherwise | $C_{aADish1}$

Therefore Use $C_{aADish1} = 1.4$ **for Dish Antenna**

Wind Pressure on Dish 1 $WL_{ADish1} := Pressure \cdot C_{aADish1}$ $WL_{ADish1} = 33 \cdot psf$

Coaxial Cable Properties For All Sectors Routed Outside

$h_{c.cab} := 1in$

Number of Cables	$N_{CABDish} := sector_{SN} \cdot n_{Ant.SN}$	$N_{CABDish} := 2$
Weight of Cable (for 1/2" Coaxial Cable)		$Weight_{CABDish} := 0.25plf$
Length of Cable	$L_{CABDish} := z_{Dish}$	$L_{CABDish} = 112 \cdot ft$
Wind Load per Foot of Cable	$F_{CABDish.ft} := WL_R \cdot h_{c.cab}$	$F_{CABDish.ft} = 2.3 \cdot plf$
Dead Load per Foot of Cable	$W_{CABDish.ft} := Weight_{CABDish}$	$W_{CABDish.ft} = 0.25 \cdot plf$
Total Wind Load :	$F_{CABDish} := N_{CABDish} \cdot F_{CABDish.ft} \cdot L_{CABDish}$	$F_{CABDish} = 514.55 \cdot lb$
Total Dead Load :	$W_{CABDish} := N_{CABDish} \cdot W_{CABDish.ft} \cdot L_{CABDish}$	$W_{CABDish} = 56 \cdot lb$

For Dish 1 : $ANTENNA_{Dish1} = "VHLP2-23"$

Area of Each Dish	$A_{cADish1} := \pi \left(\frac{Diameter_{Dish1}}{2} \right)^2$	$A_{cADish1} = 3.69 ft^2$
Wind Load for Each Dish	$F_{cADish1} := WL_{ADish1} \cdot A_{cADish1}$	$F_{cADish1} = 121.61 lb$
Dead Load for Each Dish	$DL_{ADish1} := W_{ADish1} + W_{Dishmount1}$	$DL_{ADish1} = 25.5 lb$
Total Wind Load	$F_{ANTDish1} := n_{AntDish1} \cdot sector_{Dish1} \cdot F_{cADish1}$	$F_{ANTDish1} = 243.21 lb$
Total Dead Load	$W_{Dish1} := n_{AntDish1} \cdot sector_{Dish1} \cdot DL_{ADish1}$	$W_{Dish1} = 51 lb$

Total Loading For Proposed Dishes and Mounting Pipes (Clearwire)

Total Wind Load	$F_{appDish} := F_{ANTDish1}$	$F_{appDish} = 243.21 lb$
Total Dead Load	$W_{appDish} := W_{Dish1}$	$W_{appDish} = 51 lb$

New dish is to be mounted on existing mounting pipe with existing antenna, therefore, calculations to determine wind force on mounting frame are shown in previous existing antenna calculations.

Wind Load on Existing Antennas & Equipment:

Wind Pressure @ Antenna Mount Level

- Calculate Wind Loads at Antenna Frame Based on TIA-EIA-222. Use Current Edition "F" For TIA / EIA Standard

$F_c = q_z \cdot G_H \cdot (\Sigma C_a \cdot A_c)$ Wind Velocity $v := 75$ mph. Height of Antenna from ground $z_3 := 117ft$ max.

Elevation Coefficient $K_z := \left(\frac{z_3}{33ft}\right)^{\frac{2}{7}}$ $K_z = 1.44$

Velocity Pressure $q_z := 0.00256 K_z \cdot v^2 \cdot psf$ $q_z = 20.67 \cdot psf$

Gust Response Factor $G_H := 0.65 + \frac{0.6}{\left(\frac{z_3}{33ft}\right)^{\frac{1}{7}}}$ $G_H = 1.15$

Check that wind pressure (product of velocity pressure and gust response factor) is greater than or equal to 20 psf. If wind pressure is less than 20 psf, use 20 psf, If not use actual. $Pressure := if(G_H \cdot q_z < 20psf, 20psf, G_H \cdot q_z)$

$Pressure = 23.79 \cdot psf$

Antennas Properties For A ll Sectors

Number of Sectors $sector_3 := 3$ $Elev\_Ant := z_3$ $Elev\_Ant = 117ft$

Antennas per Sector $n_{Ant3} := 4$ ANTENNA ≡ "Panel Antenna"

Antennas Properties Length ≡ 66in Width ≡ 8in Depth ≡ 6in $W_{A3} \equiv 30.0lb$

Mounting Brackets $W_{mount3} \equiv 15lb$

Aspect Ratio of Antennas $A_{spect} := \frac{Length}{Width}$ $A_{spect} = 8.25$

$C_{aA} :=$ $C_{aA} \leftarrow$ 1.4 if $A_{spect} < 7$; 2.0 if $A_{spect} > 25$; $1.4 + \frac{A_{spect} - 7}{30}$ otherwise; C_{aA}

Therefore Use $C_{aA} = 1.44$ **for Antennas**

Wind Pressure on Antennas	$WL_{A3} := Pressure \cdot C_{aA}$	$WL_{A3} = 34 \cdot psf$
Wind Pressure on Flat Members	$WL_F := Pressure \cdot C_{aF}$	$WL_F = 48 \cdot psf$
Wind Pressure on Round Members	$WL_R := Pressure \cdot C_{aR}$	$WL_R = 29 \cdot psf$

For Each Cable :

$h_{c.cab} := 2in$

Number of Cables	$N_{CAB} := sector \cdot n_{Ant3}$	$N_{CAB} = 12$
Weight of Cable (for 1 5/8" Coaxial Cable)		$Weight_{cable} := 1plf$
Length of Cable	$L_{CAB3} := z_3$	$L_{CAB3} = 117 \cdot ft$
Wind Load per Foot of Cable	$F_{CAB3.ft} := WL_R \cdot h_{c.cab}$	$F_{CAB3.ft} = 4.76 \cdot plf$
Dead Load per Foot of Cable	$W_{CAB3.ft} := Weight_{cable}$	$W_{CAB3.ft} = 1 \cdot plf$
Total Wind Load	$F_{CAB3} := N_{CAB} \cdot F_{CAB3.ft} \cdot L_{CAB3}$	$F_{CAB3} = 6680.24 \cdot lb$
Total Dead Load	$W_{CAB3} := N_{CAB} \cdot W_{CAB3.ft} \cdot L_{CAB3}$	$W_{CAB3} = 1404 \cdot lb$

For Each Antenna : ANTENNA = "Panel Antenna"

Area of Each Antenna	$A_{cA3} := Width \cdot Length$	$A_{cA3} = 3.67 ft^2$
Wind Load for Each Antenna	$F_{cA3} := WL_{A3} \cdot A_{cA3}$	$F_{cA3} = 125.76 lb$
Dead Load for Each Antenna	$DL_{A3} := W_{A3} + W_{mount3}$	$DL_{A3} = 45 lb$
Total Wind Load	$F_{ANT3} := n_{Ant3} \cdot sector_3 \cdot F_{cA3}$	$F_{ANT3} = 1509.08 lb$
Total Dead Load	$W_{ANT3} := n_{Ant3} \cdot sector_3 \cdot DL_{A3}$	$W_{ANT3} = 540 lb$

For Each Antenna Mounting Pipe $j := 6$ $pipe_j = "SW\ 2"\ STD\ Dia"$ $n_{AMP} := 12$

$L_{AMP} := 7.0ft$ $S_{AMP} := S_{pipe_j}$ $OD_{AMP} := OD_{pipe_j}$ $I_{AMP} := I_{pipe_j}$

Area of Each Pipe	$A_{AMP3} := OD_{AMP} \cdot L_{AMP}$	$A_{AMP3} = 1.39 ft^2$
Wind Load for Each Pipe	$WL_{AMP3} := WL_R \cdot A_{AMP3}$	$WL_{AMP3} = 39.55 \cdot lb$
Dead Load for Each Pipe	$DL_{AMP3} := L_{AMP} \cdot Weight_{pipe_j}$	$DL_{AMP3} = 25.55 \cdot lb$
Total Wind Load	$F_{AMP3} := n_{AMP} \cdot WL_{AMP3}$	$F_{AMP3} = 474.61 lb$
Total Dead Load	$W_{AMP3} := n_{AMP} \cdot DL_{AMP3}$	$W_{AMP3} = 306.6 \cdot lb$

Total Loading For Existing Antennas and Mounting Pipes (Other Carriers)

Total Wind Load	$F_{app3} := F_{ANT3} + F_{AMP3}$	$F_{app3} = 1983.69 lb$
Total Dead Load	$W_{app3} := W_{ANT3} + W_{AMP3}$	$W_{app3} = 846.6 lb$

Wind Load on Existing Antennas & Equipment:

Wind Pressure @ Antenna Mount Level

- Calculate Wind Loads at Antenna Frame Based on TIA-EIA-222. Use Current Edition "F" For TIA / EIA Standard

$F_c = q_z \cdot G_H \cdot (\Sigma C_a \cdot A_c)$ Wind Velocity $v := 75$ mph. Height of Antenna from ground $z_4 := 156.8ft$ max.

Elevation Coefficient $K_z := \left(\frac{z_4}{33ft}\right)^{\frac{2}{7}}$ $K_z = 1.56$

Velocity Pressure $q_z := 0.00256 K_z \cdot v^2 \cdot psf$ $q_z = 22.48 \cdot psf$

Gust Response Factor $G_H := 0.65 + \frac{0.6}{\left(\frac{z_4}{33ft}\right)^{\frac{1}{7}}}$ $G_H = 1.13$

Check that wind pressure (product of velocity pressure and gust response factor) is greater than or equal to 20 psf. If wind pressure is less than 20 psf, use 20 psf, If not use actual. $Pressure := if(G_H \cdot q_z < 20psf, 20psf, G_H \cdot q_z)$

$Pressure = 25.4 \cdot psf$

Antennas Properties For A II Sectors

Number of Sectors	$sector_4 := 3$	$Elev\_Ant_4 := z_4$		$Elev\_Ant_4 = 156.8\,ft$
Antennas per Sector	$n_{Ant4} := 2$	$ANTENNA_4 \equiv$ "RR90-11-XXXBL"		
Antennas Properties	$Length_4 \equiv 48.0in$	$Width_4 \equiv 12in$	$Depth_4 \equiv 7in$	$W_{A4} \equiv 18lb$
Mounting Brackets				$W_{mount4} \equiv 15lb$

Aspect Ratio of Antennas $A_{spect.4} := \frac{Length_4}{Width_4}$ $A_{spect.4} = 4$

$$C_{aA.4} := \left| C_{aA.4} \leftarrow \begin{cases} 1.4 & \text{if } A_{spect.4} < 7 \\ 2.0 & \text{if } A_{spect.4} > 25 \\ 1.4 + \frac{A_{spect.4} - 7}{30} & \text{otherwise} \end{cases} \right| C_{aA.4}$$

Therefore Use $C_{aA.4} = 1.4$ **for Antennas**

Wind Pressure on Antennas	$WL_{A.4} := Pressure \cdot C_{aA.4}$	$WL_{A.4} = 36 \cdot psf$
Wind Pressure on Flat Members	$WL_F := Pressure \cdot C_{aF}$	$WL_F = 51 \cdot psf$
Wind Pressure on Round Members	$WL_R := Pressure \cdot C_{aR}$	$WL_R = 30 \cdot psf$

For Each Cable :		$h_{c.cab} := 2in$
Number of Cables	$N_{CAB4} := sector_4 \cdot n_{Ant4}$	$N_{CAB4} = 6$
Weight of Cable (for 1 5/8" Coaxial Cable)		$Weight_{CAB4} := 1plf$
Length of Cable	$L_{CAB4} := z_4$	$L_{CAB4} = 156.8 \cdot ft$
Wind Load per Foot of Cable	$F_{CAB4.ft} := WL_R \cdot h_{c.cab}$	$F_{CAB4.ft} = 5.08 \cdot plf$
Dead Load per Foot of Cable	$W_{CAB4.ft} := Weight_{CAB4}$	$W_{CAB4.ft} = 1 \cdot plf$
Total Wind Load :	$F_{CAB4} := N_{CAB4} \cdot F_{CAB4.ft} \cdot L_{CAB4}$	$F_{CAB4} = 4780.16 \cdot lb$
Total Dead Load :	$W_{CAB4} := N_{CAB4} \cdot W_{CAB4.ft} \cdot L_{CAB4}$	$W_{CAB4} = 940.8 \cdot lb$
For Each Antenna :	$ANTENNA_4$ = "RR90-11-XXXBL"	
Area of Each Antenna	$A_{cA.4} := Width_4 \cdot Length_4$	$A_{cA.4} = 4\,ft^2$
Wind Load for Each Antenna	$F_{cA.4} := WL_{A.4} \cdot A_{cA.4}$	$F_{cA.4} = 142.27\,lb$
Dead Load for Each Antenna	$DL_{A.4} := W_{A4} + W_{mount4}$	$DL_{A.4} = 33\,lb$
Total Wind Load	$F_{ANT.4} := n_{Ant4} \cdot sector_4 \cdot F_{cA.4}$	$F_{ANT.4} = 853.6\,lb$
Total Dead Load	$W_{ANT.4} := n_{Ant4} \cdot sector_4 \cdot DL_{A.4}$	$W_{ANT.4} = 198\,lb$

For Each Antenna Mounting Pipe $j := 6$ $pipe_j$ = "SW 2" STD Dia" $n_{AMP.4} := 6$

$L_{AMP.4} := 7.0ft$ $S_{AMP.4} := S_{pipe_j}$ $OD_{AMP.4} := OD_{pipe_j}$ $I_{AMP.4} := I_{pipe_j}$

Area of Each Pipe	$A_{AMP.4} := OD_{AMP.4} \cdot L_{AMP.4}$	$A_{AMP.4} = 1.39\,ft^2$
Wind Load for Each Pipe	$WL_{AMP.4} := WL_R \cdot A_{AMP.4}$	$WL_{AMP.4} = 42.24\,lb$
Dead Load for Each Pipe	$DL_{AMP.4} := Weight_{pipe_j} \cdot L_{AMP.4}$	$DL_{AMP.4} = 25.55 \cdot lb$
Total Wind Load	$F_{AMP.4} := n_{AMP.4} \cdot WL_{AMP.4}$	$F_{AMP.4} = 253.41\,lb$
Total Dead Load	$W_{AMP.4} := n_{AMP.4} \cdot DL_{AMP.4}$	$W_{AMP.4} = 153.3\,lb$

Total Loading For Existing Antennas and Mounting Pipes (Other Carriers)

Total Wind Load	$F_{app.4} := F_{ANT.4} + F_{AMP.4}$	$F_{app.4} = 1107.01\,lb$
Total Dead Load	$W_{app.4} := W_{ANT.4} + W_{AMP.4}$	$W_{app.4} = 351.3\,lb$

Structural Adequacy Check For Additional Loads Due To New Equipment

Existing Water Tank - Panel 1 (Top Elevation):

$AGL_{P0} := 154.8ft$

Bending Moment

From Water Tank Top	$M_{top} := F_{top} \cdot (y_{top} - AGL_{P0})$	$M_{top} = 29.13 \cdot kip \cdot ft$
From Water Tank Mid	$M_{mid} := F_{mid} \cdot (y_{mid} - AGL_{P0})$	$M_{mid} = 64.51 \cdot kip \cdot ft$
From Water Tank Rail	$M_{rail} := F_{rail} \cdot (y_{rail} - AGL_{P0})$	$M_{rail} = 2.43 \cdot kip \cdot ft$
From Existing Appurtenances	$M_{app.Ex} := F_{app.4} \cdot (z_4 - AGL_{P0})$	$M_{app.Ex} = 2.21 \cdot kip \cdot ft$
From Existing Cables	$M_{CAB.Ex} := 0.5F_{CAB4.ft} \cdot (z_4 - AGL_{P0})^2$	$M_{CAB.Ex} = 0.01 \cdot kip \cdot ft$
Total Moment w/o Equipment	$M_{0\_tank} := M_{top} + M_{mid} + M_{rail}$	$M_{0\_tank} = 96.06 \cdot kip \cdot ft$
Total Moment with Equipment	$M_{0\_total} := M_{0\_tank} + M_{app.Ex} + M_{CAB.Ex}$	$M_{0\_total} = 98.29 \cdot kip \cdot ft$
Increase in Bending Moment	$\Delta M_0 := \frac{M_{0\_total} - M_{0\_tank}}{M_{0\_tank}}$	$\Delta M_0 = 2.32 \cdot \%$

Existing Water Tank - Panel 1 (Top Elevation):

$AGL_{P0} = 154.8\ ft$

Shear Force

From Water Tank Top	$V_{top} := F_{top}$	$V_{top} = 1.69 \cdot kip$
From Water Tank Mid	$V_{mid} := F_{mid}$	$V_{mid} = 8.06 \cdot kip$
From Water Tank Rail	$V_{rail} := F_{rail}$	$V_{rail} = 1.21 \cdot kip$
From Existing Appurtenances	$V_{app.Ex} := F_{app.4}$	$V_{app.Ex} = 1.11 \cdot kip$
From Existing Cables	$V_{CAB.Ex} := F_{CAB4.ft} \cdot (z_4 - AGL_{P0})$	$V_{CAB.Ex} = 0.01 \cdot kip$
Total Shear Force w/o Equipment	$V_{0\_tank} := V_{top} + V_{mid} + V_{rail}$	$V_{0\_tank} = 10.97 \cdot kip$
Total Shear Force with Equipment	$V_{0\_total} := V_{0\_tank} + V_{app.Ex} + V_{CAB.Ex}$	$V_{0\_total} = 12.09 \cdot kip$
Increase in Shear Force	$\Delta V_0 := \frac{V_{0\_total} - V_{0\_tank}}{V_{0\_tank}}$	$\Delta V_0 = 10.18 \cdot \%$

Existing Water Tank - Panel 1 (Top Elevation):

$AGL_{P0} = 154.8 \cdot ft$

Axial Force

From Water Tank /Water/	$P_{water} := W_{water}$	$P_{water} = 834.54 \cdot kip$
From Water Tank Structure	$P_{structure} := \frac{H_{top} - AGL_{P0}}{H_{top}} \cdot W_{structure}$	$P_{structure} = 10.05 \cdot kip$
From Existing Appurtenances	$P_{app.Ex} := W_{app.4}$	$P_{app.Ex} = 0.35 \cdot kip$
From Existing Cables	$P_{CAB.Ex} := W_{CAB4.ft} \cdot (z_4 - AGL_{P0})$	$P_{CAB.Ex} = 0 \cdot kip$
Total Axial Force w/o Equipment	$P_{0\_tank} := P_{water} + P_{structure}$	$P_{0\_tank} = 844.59 \cdot kip$
Total Axial Force with Equipment	$P_{0\_total} := P_{0\_tank} + P_{app.Ex} + P_{CAB.Ex}$	$P_{0\_total} = 844.95 \cdot kip$
Increase in Axial Force	$\Delta P_0 := \frac{P_{0\_total} - P_{0\_tank}}{P_{0\_tank}}$	$\Delta P_0 = 0.04 \cdot \%$

Existing Water Tank - Panel 1 (Bottom Elevation) & Panel 2 (Top Elevation):

$AGL_{P2} := 117ft$

Bending Moment

From Water Tank Top	$M_{top} := F_{top} \cdot (y_{top} - AGL_{P2})$	$M_{top} = 93.13 \cdot kip \cdot ft$
From Water Tank Mid	$M_{mid} := F_{mid} \cdot (y_{mid} - AGL_{P2})$	$M_{mid} = 369.33 \cdot kip \cdot ft$
From Water Tank Bottom	$M_{bot} := F_{bot} \cdot (y_{bot} - AGL_{P2})$	$M_{bot} = 60.62 \cdot kip \cdot ft$
From Water Tank Rail	$M_{rail} := F_{rail} \cdot (y_{rail} - AGL_{P2})$	$M_{rail} = 48.27 \cdot kip \cdot ft$
From Water Tank Perimeter Leg	$M_{leg} := 0.5\left[F_{leg} \cdot (y_{rail} - AGL_{P2})^2\right]$	$M_{leg} = 104.55 \cdot kip \cdot ft$
From Water Tank Center Leg	$M_{Cleg} := 0.5\left[F_{cen} \cdot (y_{rail} - AGL_{P2})^2\right]$	$M_{Cleg} = 57.03 \cdot kip \cdot ft$
From Water Tank Ladder	$M_{step} := 0.5\left[Wind_{step} \cdot (y_{rail} - AGL_{P2})^2\right]$	$M_{step} = 38.02 \cdot kip \cdot ft$
From Existing Appurtenances	$M_{app.Ex} := F_{app.4} \cdot (z_4 - AGL_{P2})$	$M_{app.Ex} = 44.06 \cdot kip \cdot ft$
From Existing Cables	$M_{CAB.Ex} := 0.5\left[F_{CAB4.ft} \cdot (z_4 - AGL_{P2})^2\right]$	$M_{CAB.Ex} = 4.02 \cdot kip \cdot ft$
Total Moment w/o Equipment	$M_{1\_tank} := M_{top} + M_{mid} + M_{bot} \ldots + M_{rail} + M_{leg} + M_{Cleg} + M_{step}$	$M_{1\_tank} = 770.94 \cdot kip \cdot ft$
Total Moment with Equipment	$M_{1\_total} := M_{1\_tank} + M_{app.Ex} + M_{CAB.Ex}$	$M_{1\_total} = 819.03 \cdot kip \cdot ft$
Increase in Bending Moment	$\Delta M_1 := \frac{M_{1\_total} - M_{1\_tank}}{M_{1\_tank}}$	$\Delta M_1 = 6.24 \cdot \%$

Existing Water Tank - Panel 1 (Bottom Elevation) & Panel 2 (Top Elevation): $AGL_{P2} = 117\,ft$

Shear Force

From Water Tank Top	$V_{top} := F_{top}$	$V_{top} = 1.69 \cdot kip$
From Water Tank Mid	$V_{mid} := F_{mid}$	$V_{mid} = 8.06 \cdot kip$
From Water Tank Bottom	$V_{bot} := F_{bot}$	$V_{bot} = 1.69 \cdot kip$
From Water Tank Rail	$V_{rail} := F_{rail}$	$V_{rail} = 1.21 \cdot kip$
From Water Tank Perimeter Leg	$V_{Pleg} := F_{leg} \cdot (y_{rail} - AGL_{P2})$	$V_{Pleg} = 5.25 \cdot kip$
From Water Tank Center Leg	$V_{Cleg} := F_{cen} \cdot (y_{rail} - AGL_{P2})$	$V_{Cleg} = 2.87 \cdot kip$
From Water Tank Ladder	$V_{step} := Wind_{step} \cdot (y_{rail} - AGL_{P2})$	$V_{step} = 1.91 \cdot kip$
From Existing Appurtenances	$V_{app.Ex} := F_{app.4}$	$V_{app.Ex} = 1.11 \cdot kip$
From Existing Cables	$V_{CAB.Ex} := F_{CAB4.ft} \cdot (z_4 - AGL_{P2})$	$V_{CAB.Ex} = 0.2 \cdot kip$
Total Shear Force w/o Equipment	$V_{1\_tank} := V_{top} + V_{mid} + V_{bot} \cdots + V_{rail} + V_{Pleg} + V_{Cleg} + V_{step}$	$V_{1\_tank} = 22.69 \cdot kip$
Total Shear Force with Equipment	$V_{1\_total} := V_{1\_tank} + V_{app.Ex} + V_{CAB.Ex}$	$V_{1\_total} = 24 \cdot kip$
Increase in Shear Force	$\Delta V_1 := \frac{V_{1\_total} - V_{1\_tank}}{V_{1\_tank}}$	$\Delta V_1 = 5.77 \cdot \%$

Existing Water Tank - Panel 1 (Bottom Elevation) & Panel 2 (Top Elevation): $AGL_{P2} = 117\,ft$

Axial Force

From Water Tank /Water/ $P_{water} := W_{water}$ $P_{water} = 834.54 \cdot kip$

From Water Tank Structure $P_{structure} := \frac{H_{top} - AGL_{P2}}{H_{top}} \cdot W_{structure}$ $P_{structure} = 27.98 \cdot kip$

From Existing Appurtenances $P_{app.Ex} := W_{app.4}$ $P_{app.Ex} = 0.35 \cdot kip$

From Existing Cables $P_{CAB.Ex} := W_{CAB4.ft} \cdot (z_4 - AGL_{P2})$ $P_{CAB.Ex} = 0.04 \cdot kip$

Total Axial Force w/o Equipment $P_{1\_tank} := P_{water} + P_{structure}$ $P_{1\_tank} = 862.52 \cdot kip$

Total Axial Force with Equipment $P_{1\_total} := P_{1\_tank} + P_{app.Ex} + P_{CAB.Ex}$ $P_{1\_total} = 862.91 \cdot kip$

Increase in Axial Force $\Delta P_1 := \frac{P_{1\_total} - P_{1\_tank}}{P_{1\_tank}}$ $\Delta P_1 = 0.05 \cdot \%$

Existing Water Tank - Panel 2 (Bottom Elevation) & Panel 3 (Top Elevation):

$AGL_{P2B} := 78.1ft$

Bending Moment

From Water Tank Top	$M_{top} := F_{top} \cdot (y_{top} - AGL_{P2B})$	$M_{top} = 159 \cdot kip \cdot ft$
From Water Tank Mid	$M_{mid} := F_{mid} \cdot (y_{mid} - AGL_{P2B})$	$M_{mid} = 683.02 \cdot kip \cdot ft$
From Water Tank Bottom	$M_{bot} := F_{bot} \cdot (y_{bot} - AGL_{P2B})$	$M_{bot} = 126.49 \cdot kip \cdot ft$
From Water Tank Rail	$M_{rail} := F_{rail} \cdot (y_{rail} - AGL_{P2B})$	$M_{rail} = 95.45 \cdot kip \cdot ft$
From Water Tank Perimeter Leg	$M_{leg} := 0.5\left[F_{leg} \cdot (y_{rail} - AGL_{P2B})^2\right]$	$M_{leg} = 408.78 \cdot kip \cdot ft$
From Water Tank Center Leg	$M_{Cleg} := 0.5\left[F_{cen} \cdot (y_{rail} - AGL_{P2B})^2\right]$	$M_{Cleg} = 222.97 \cdot kip \cdot ft$
From Water Tank Ladder	$M_{step} := 0.5\left[Wind_{step} \cdot (y_{rail} - AGL_{P2B})^2\right]$	$M_{step} = 148.65 \cdot kip \cdot ft$
From Existing Appurtenances	$M_{app.Ex} := F_{app.4} \cdot (z_4 - AGL_{P2B}) \ldots + F_{app3} \cdot (z_3 - AGL_{P2B}) \ldots + F_{app.SN} \cdot (z_{SN} - AGL_{P2B}) \ldots + F_{app} \cdot (z - AGL_{P2B})$	$M_{app.Ex} = 197.99 \cdot kip \cdot ft$
From Existing Cables	$M_{CAB.Ex} := 0.5\left[\begin{array}{l} F_{CAB4.ft} \cdot (z_4 - AGL_{P2B})^2 \ldots \\ + F_{CAB3.ft} \cdot (z_3 - AGL_{P2B})^2 \ldots \\ + F_{CABSN.ft} \cdot (z_{SN} - AGL_{P2B})^2 \ldots \\ + F_{CAB.ft} \cdot (z - AGL_{P2B})^2 \end{array}\right]$	$M_{CAB.Ex} = 21.54 \cdot kip \cdot ft$
From New Appurtenance	$M_{appDish} := F_{appDish} \cdot (z_{Dish} - AGL_{P2B})$	$M_{appDish} = 8.24 \cdot kip \cdot ft$
From New Cables	$M_{CABDish} := 0.5\left[F_{CABDish.ft} \cdot (z_{Dish} - AGL_{P2B})^2\right]$	$M_{CABDish} = 1.32 \cdot kip \cdot ft$
Total Moment w/o Equipment	$M_{2\_tank} := M_{top} + M_{mid} + M_{bot} \ldots + M_{rail} + M_{leg} + M_{Cleg} + M_{step}$	$M_{2\_tank} = 1844.37 \cdot kip \cdot ft$
Total Moment with Equipment	$M_{2\_total} := M_{2\_tank} \ldots + M_{app.Ex} + M_{appDish} + M_{CABDish} + M_{CAB.Ex}$	$M_{2\_total} = 2073.46 \cdot kip \cdot ft$
Increase in Bending Moment	$\Delta M_2 := \frac{M_{2\_total} - M_{2\_tank}}{M_{2\_tank}}$	$\Delta M_2 = 12.42 \cdot \%$

Existing Water Tank - Panel 2 (Bottom Elevation) & Panel 3 (Top Elevation): $AGL_{P2B} = 78.1\,ft$

Shear Force

From Water Tank Top	$V_{top} := F_{top}$	$V_{top} = 1.69 \cdot kip$
From Water Tank Mid	$V_{mid} := F_{mid}$	$V_{mid} = 8.06 \cdot kip$
From Water Tank Bottom	$V_{bot} := F_{bot}$	$V_{bot} = 1.69 \cdot kip$
From Water Tank Rail	$V_{rail} := F_{rail}$	$V_{rail} = 1.21 \cdot kip$
From Water Tank Perimeter Leg	$V_{Pleg} := F_{leg} \cdot (y_{rail} - AGL_{P2B})$	$V_{Pleg} = 10.39 \cdot kip$
From Water Tank Center Leg	$V_{Cleg} := F_{cen} \cdot (y_{rail} - AGL_{P2B})$	$V_{Cleg} = 5.67 \cdot kip$
From Water Tank Ladder	$V_{step} := Wind_{step} \cdot (y_{rail} - AGL_{P2B})$	$V_{step} = 3.78 \cdot kip$
From Existing Appurtenances	$V_{app.Ex} := F_{app.4} + F_{app3} + F_{app.SN} + F_{app}$	$V_{app.Ex} = 4.63 \cdot kip$
From Existing Cables	$V_{CAB.Ex} := F_{CAB4.ft} \cdot (z_4 - AGL_{P2B}) \ldots + F_{CAB3.ft} \cdot (z_3 - AGL_{P2B}) \ldots + F_{CABSN.ft} \cdot (z_{SN} - AGL_{P2B}) \ldots + F_{CAB.ft} \cdot (z - AGL_{P2B})$	$V_{CAB.Ex} = 0.79 \cdot kip$
From New Appurtenance	$V_{appDish} := F_{appDish}$	$V_{appDish} = 0.24 \cdot kip$
From New Cable	$V_{CABDish} := F_{CABDish.ft} \cdot (z_{Dish} - AGL_{P2B})$	$V_{CABDish} = 0.08 \cdot kip$
Total Shear Force w/o Equipment	$V_{2\_tank} := V_{top} + V_{mid} + V_{bot} \ldots + V_{rail} + V_{Pleg} + V_{Cleg} + V_{step}$	$V_{2\_tank} = 32.5 \cdot kip$
Total Shear Force with Equipment	$V_{2\_total} := V_{2\_tank} \ldots + V_{app.Ex} + V_{appDish} + V_{CABDish} + V_{CAB.Ex}$	$V_{2\_total} = 38.23 \cdot kip$
Increase in Shear Force	$\Delta V_2 := \frac{V_{2\_total} - V_{2\_tank}}{V_{2\_tank}}$	$\Delta V_2 = 17.65 \cdot \%$

Existing Water Tank - Panel 2 (Bottom Elevation) & Panel 3 (Top Elevation): $AGL_{P2B} = 78.1\,ft$

Axial Force

From Water Tank /Water/ $P_{water} := W_{water}$ $P_{water} = 834.54 \cdot kip$

From Water Tank Structure $P_{structure} := \frac{H_{top} - AGL_{P2B}}{H_{top}} \cdot W_{structure}$ $P_{structure} = 46.42 \cdot kip$

From Existing Appurtenances $P_{app.Ex} := W_{app.4} + W_{app3} + W_{app.SN} + W_{app}$ $P_{app.Ex} = 2.04 \cdot kip$

From Existing Cables $P_{CAB.Ex} := W_{CAB4.ft} \cdot (z_4 - AGL_{P2B}) \ldots + W_{CAB3.ft} \cdot (z_3 - AGL_{P2B}) \ldots + W_{CABSN.ft} \cdot (z_{SN} - AGL_{P2B}) \ldots + W_{CAB.ft} \cdot (z - AGL_{P2B})$ $P_{CAB.Ex} = 0.16 \cdot kip$

From New Appurtenance $P_{appDish} := W_{appDish}$ $P_{appDish} = 0.05 \cdot kip$

From New Cable $P_{CABDish} := W_{CABDish.ft} \cdot (z_{Dish} - AGL_{P2B})$ $P_{CABDish} = 0.01 \cdot kip$

Total Axial Force w/o Equipment $P_{2\_tank} := P_{water} + P_{structure}$ $P_{2\_tank} = 880.96 \cdot kip$

Total Axial Force with Equipment $P_{2\_total} := P_{2\_tank} \ldots + P_{app.Ex} + P_{appDish} + P_{CABDish} + P_{CAB.Ex}$ $P_{2\_total} = 883.22 \cdot kip$

Increase in Axial Force $\Delta P_2 := \frac{P_{2\_total} - P_{2\_tank}}{P_{2\_tank}}$ $\Delta P_2 = 0.26 \cdot \%$

Existing Water Tank - Panel 3 (Bottom Elevation) & Panel 4 (Top Elevation): $AGL_{P3B} := 39.2ft$

Bending Moment

From Water Tank Top: $M_{top} := F_{top} \cdot (y_{top} - AGL_{P3B})$ — $M_{top} = 224.87 \cdot kip \cdot ft$

From Water Tank Mid: $M_{mid} := F_{mid} \cdot (y_{mid} - AGL_{P3B})$ — $M_{mid} = 996.71 \cdot kip \cdot ft$

From Water Tank Bottom: $M_{bot} := F_{bot} \cdot (y_{bot} - AGL_{P3B})$ — $M_{bot} = 192.36 \cdot kip \cdot ft$

From Water Tank Rail: $M_{rail} := F_{rail} \cdot (y_{rail} - AGL_{P3B})$ — $M_{rail} = 142.63 \cdot kip \cdot ft$

From Water Tank Perimeter Leg: $M_{leg} := 0.5\left[F_{leg} \cdot (y_{rail} - AGL_{P3B})^2\right]$ — $M_{leg} = 912.76 \cdot kip \cdot ft$

From Water Tank Center Leg: $M_{Cleg} := 0.5\left[F_{cen} \cdot (y_{rail} - AGL_{P3B})^2\right]$ — $M_{Cleg} = 497.87 \cdot kip \cdot ft$

From Water Tank Ladder: $M_{step} := 0.5\left[Wind_{step} \cdot (y_{rail} - AGL_{P3B})^2\right]$ — $M_{step} = 331.91 \cdot kip \cdot ft$

From Existing Appurtenances:

$$M_{app.Ex} := F_{app.4} \cdot (z_4 - AGL_{P3B}) \ldots + F_{app3} \cdot (z_3 - AGL_{P3B}) \ldots + F_{app.SN} \cdot (z_{SN} - AGL_{P3B}) \ldots + F_{app} \cdot (z - AGL_{P3B})$$

$M_{app.Ex} = 378.08 \cdot kip \cdot ft$

From Existing Cables:

$$M_{CAB.Ex} := 0.5\left[\begin{array}{l} F_{CAB4.ft} \cdot (z_4 - AGL_{P3B})^2 \ldots \\ + F_{CAB3.ft} \cdot (z_3 - AGL_{P3B})^2 \ldots \\ + F_{CABSN.ft} \cdot (z_{SN} - AGL_{P3B})^2 \ldots \\ + F_{CAB.ft} \cdot (z - AGL_{P3B})^2 \end{array}\right]$$

$M_{CAB.Ex} = 66.52 \cdot kip \cdot ft$

From New Appurtenance: $M_{appDish} := F_{appDish} \cdot (z_{Dish} - AGL_{P3B})$ — $M_{appDish} = 17.71 \cdot kip \cdot ft$

From New Cables: $M_{CABDish} := 0.5\left[F_{CABDish.ft} \cdot (z_{Dish} - AGL_{P3B})^2\right]$ — $M_{CABDish} = 6.09 \cdot kip \cdot ft$

Total Moment w/o Equipment:

$$M_{3\_tank} := M_{top} + M_{mid} + M_{bot} \ldots + M_{rail} + M_{leg} + M_{Cleg} + M_{step}$$

$M_{3\_tank} = 3299.12 \cdot kip \cdot ft$

Total Moment with Equipment:

$$M_{3\_total} := M_{3\_tank} \ldots + M_{app.Ex} + M_{appDish} + M_{CABDish} + M_{CAB.Ex}$$

$M_{3\_total} = 3767.51 \cdot kip \cdot ft$

Increase in Bending Moment: $\Delta M_3 := \dfrac{M_{3\_total} - M_{3\_tank}}{M_{3\_tank}}$ — $\Delta M_3 = 14.2 \cdot \%$

Existing Water Tank - Panel 3 (Bottom Elevation) & Panel 4 (Top Elevation): $AGL_{P3B} = 39.2\,ft$

Shear Force

From Water Tank Top	$V_{top} := F_{top}$	$V_{top} = 1.69 \cdot kip$
From Water Tank Mid	$V_{mid} := F_{mid}$	$V_{mid} = 8.06 \cdot kip$
From Water Tank Bottom	$V_{bot} := F_{bot}$	$V_{bot} = 1.69 \cdot kip$
From Water Tank Rail	$V_{rail} := F_{rail}$	$V_{rail} = 1.21 \cdot kip$
From Water Tank Perimeter Leg	$V_{Pleg} := F_{leg} \cdot (y_{rail} - AGL_{P3B})$	$V_{Pleg} = 15.52 \cdot kip$
From Water Tank Center Leg	$V_{Cleg} := F_{cen} \cdot (y_{rail} - AGL_{P3B})$	$V_{Cleg} = 8.47 \cdot kip$
From Water Tank Ladder	$V_{step} := Wind_{step} \cdot (y_{rail} - AGL_{P3B})$	$V_{step} = 5.64 \cdot kip$
From Existing Appurtenances	$V_{app.Ex} := F_{app.4} + F_{app3} + F_{app.SN} + F_{app}$	$V_{app.Ex} = 4.63 \cdot kip$
From Existing Cables	$V_{CAB.Ex} := F_{CAB4.ft} \cdot (z_4 - AGL_{P3B}) \ldots + F_{CAB3.ft} \cdot (z_3 - AGL_{P3B}) \ldots + F_{CABSN.ft} \cdot (z_{SN} - AGL_{P3B}) \ldots + F_{CAB.ft} \cdot (z - AGL_{P3B})$	$V_{CAB.Ex} = 1.53 \cdot kip$
From New Appurtenance	$V_{appDish} := F_{appDish}$	$V_{appDish} = 0.24 \cdot kip$
From New Cable	$V_{CABDish} := F_{CABDish.ft} \cdot (z_{Dish} - AGL_{P3B})$	$V_{CABDish} = 0.17 \cdot kip$
Total Shear Force w/o Equipment	$V_{3\_tank} := V_{top} + V_{mid} + V_{bot} \ldots + V_{rail} + V_{Pleg} + V_{Cleg} + V_{step}$	$V_{3\_tank} = 42.3 \cdot kip$
Total Shear Force with Equipment	$V_{3\_total} := V_{3\_tank} \ldots + V_{app.Ex} + V_{appDish} + V_{CABDish} + V_{CAB.Ex}$	$V_{3\_total} = 48.87 \cdot kip$
Increase in Shear Force	$\Delta V_3 := \frac{V_{3\_total} - V_{3\_tank}}{V_{3\_tank}}$	$\Delta V_3 = 15.52 \cdot \%$

Existing Water Tank - Panel 3 (Bottom Elevation) & Panel 4 (Top Elevation): $AGL_{P3B} = 39.2\,ft$

Axial Force

From Water Tank /Water/ $P_{water} := W_{water}$ $P_{water} = 834.54 \cdot kip$

From Water Tank Structure $P_{structure} := \frac{H_{top} - AGL_{P3B}}{H_{top}} \cdot W_{structure}$ $P_{structure} = 64.87 \cdot kip$

From Existing Appurtenances $P_{app.Ex} := W_{app.4} + W_{app3} + W_{app.SN} + W_{app}$ $P_{app.Ex} = 2.04 \cdot kip$

From Existing Cables $P_{CAB.Ex} := W_{CAB4.ft} \cdot (z_4 - AGL_{P3B}) \ldots + W_{CAB3.ft} \cdot (z_3 - AGL_{P3B}) \ldots + W_{CABSN.ft} \cdot (z_{SN} - AGL_{P3B}) \ldots + W_{CAB.ft} \cdot (z - AGL_{P3B})$ $P_{CAB.Ex} = 0.32 \cdot kip$

From New Appurtenance $P_{appDish} := W_{appDish}$ $P_{appDish} = 0.05 \cdot kip$

From New Cable $P_{CABDish} := W_{CABDish.ft} \cdot (z_{Dish} - AGL_{P3B})$ $P_{CABDish} = 0.02 \cdot kip$

Total Axial Force w/o Equipment $P_{3\_tank} := P_{water} + P_{structure}$ $P_{3\_tank} = 899.41 \cdot kip$

Total Axial Force with Equipment $P_{3\_total} := P_{3\_tank} \ldots + P_{app.Ex} + P_{appDish} + P_{CABDish} + P_{CAB.Ex}$ $P_{3\_total} = 901.84 \cdot kip$

Increase in Axial Force $\Delta P_3 := \frac{P_{3\_total} - P_{3\_tank}}{P_{3\_tank}}$ $\Delta P_3 = 0.27 \cdot \%$

Existing Water Tank - Panel 4 (Bottom Elevation):

$AGL_{P4B} := 0.5ft$

Bending Moment

From Water Tank Top	$M_{top} := F_{top} \cdot (y_{top} - AGL_{P4B})$	$M_{top} = 290.41 \cdot kip \cdot ft$
From Water Tank Mid	$M_{mid} := F_{mid} \cdot (y_{mid} - AGL_{P4B})$	$M_{mid} = 1308.79 \cdot kip \cdot ft$
From Water Tank Bottom	$M_{bot} := F_{bot} \cdot (y_{bot} - AGL_{P4B})$	$M_{bot} = 257.89 \cdot kip \cdot ft$
From Water Tank Rail	$M_{rail} := F_{rail} \cdot (y_{rail} - AGL_{P4B})$	$M_{rail} = 189.56 \cdot kip \cdot ft$
From Water Tank Perimeter Leg	$M_{leg} := 0.5\left[F_{leg} \cdot (y_{rail} - AGL_{P4B})^2\right]$	$M_{leg} = 1612.36 \cdot kip \cdot ft$
From Water Tank Center Leg	$M_{Cleg} := 0.5\left[F_{cen} \cdot (y_{rail} - AGL_{P4B})^2\right]$	$M_{Cleg} = 879.47 \cdot kip \cdot ft$
From Water Tank Ladder	$M_{step} := 0.5\left[Wind_{step} \cdot (y_{rail} - AGL_{P4B})^2\right]$	$M_{step} = 586.31 \cdot kip \cdot ft$
From Existing Appurtenances	$M_{app.Ex} := F_{app.4} \cdot (z_4 - AGL_{P4B}) \ldots + F_{app3} \cdot (z_3 - AGL_{P4B}) \ldots + F_{app.SN} \cdot (z_{SN} - AGL_{P4B}) \ldots + F_{app} \cdot (z - AGL_{P4B}) \ldots + F_{app.SL} \cdot (z_{SL} - AGL_{P4B})$	$M_{app.Ex} = 611.42 \cdot kip \cdot ft$
From Existing Cables	$M_{CAB.Ex} := 0.5\left[F_{CAB4.ft} \cdot (z_4 - AGL_{P4B})^2 \ldots + F_{CAB3.ft} \cdot (z_3 - AGL_{P4B})^2 \ldots + F_{CABSN.ft} \cdot (z_{SN} - AGL_{P4B})^2 \ldots + F_{CAB.ft} \cdot (z - AGL_{P4B})^2 \ldots + F_{CABSL.ft} \cdot (z_{SL} - AGL_{P4B})^2\right]$	$M_{CAB.Ex} = 153.27 \cdot kip \cdot ft$
From New Appurtenance	$M_{appDish} := F_{appDish} \cdot (z_{Dish} - AGL_{P4B})$	$M_{appDish} = 27.12 \cdot kip \cdot ft$
From New Cables	$M_{CABDish} := 0.5\left[F_{CABDish.ft} \cdot (z_{Dish} - AGL_{P4B})^2\right]$	$M_{CABDish} = 14.28 \cdot kip \cdot ft$
Total Moment w/o Equipment	$M_{4\_tank} := M_{top} + M_{mid} + M_{bot} \ldots + M_{rail} + M_{leg} + M_{Cleg} + M_{step}$	$M_{4\_tank} = 5124.79 \cdot kip \cdot ft$
Total Moment with Equipment	$M_{4\_total} := M_{4\_tank} \ldots + M_{app.Ex} + M_{appDish} + M_{CABDish} + M_{CAB.Ex}$	$M_{4\_total} = 5930.88 \cdot kip \cdot ft$
Increase in Bending Moment	$\Delta M_4 := \frac{M_{4\_total} - M_{4\_tank}}{M_{4\_tank}}$	$\Delta M_4 = 15.73 \cdot \%$

Existing Water Tank - Panel 4 (Bottom Elevation): $AGL_{P4B} = 0.5\,ft$

Shear Force

From Water Tank Top	$V_{top} := F_{top}$	$V_{top} = 1.69 \cdot kip$
From Water Tank Mid	$V_{mid} := F_{mid}$	$V_{mid} = 8.06 \cdot kip$
From Water Tank Bottom	$V_{bot} := F_{bot}$	$V_{bot} = 1.69 \cdot kip$
From Water Tank Rail	$V_{rail} := F_{rail}$	$V_{rail} = 1.21 \cdot kip$
From Water Tank Perimeter Leg	$V_{Pleg} := F_{leg} \cdot (y_{rail} - AGL_{P4B})$	$V_{Pleg} = 20.63 \cdot kip$
From Water Tank Center Leg	$V_{Cleg} := F_{cen} \cdot (y_{rail} - AGL_{P4B})$	$V_{Cleg} = 11.25 \cdot kip$
From Water Tank Ladder	$V_{step} := Wind_{step} \cdot (y_{rail} - AGL_{P4B})$	$V_{step} = 7.5 \cdot kip$
From Existing Appurtenances	$V_{app.Ex} := F_{app.4} + F_{app3} + F_{app.SN} + F_{app} + F_{app.SL}$	$V_{app.Ex} = 5.32 \cdot kip$
From Existing Cables	$V_{CAB.Ex} := F_{CAB4.ft} \cdot (z_4 - AGL_{P4B}) \ldots + F_{CAB3.ft} \cdot (z_3 - AGL_{P4B}) \ldots + F_{CABSN.ft} \cdot (z_{SN} - AGL_{P4B}) \ldots + F_{CAB.ft} \cdot (z - AGL_{P4B}) \ldots + F_{CABSL.ft} \cdot (z_{SL} - AGL_{P4B})$	$V_{CAB.Ex} = 2.6 \cdot kip$
From New Appurtenance	$V_{appDish} := F_{appDish}$	$V_{appDish} = 0.24 \cdot kip$
From New Cable	$V_{CABDish} := F_{CABDish.ft} \cdot (z_{Dish} - AGL_{P4B})$	$V_{CABDish} = 0.26 \cdot kip$
Total Shear Force w/o Equipment	$V_{4\_tank} := V_{top} + V_{mid} + V_{bot} \ldots + V_{rail} + V_{Pleg} + V_{Cleg} + V_{step}$	$V_{4\_tank} = 52.05 \cdot kip$
Total Shear Force with Equipment	$V_{4\_total} := V_{4\_tank} \ldots + V_{app.Ex} + V_{appDish} + V_{CABDish} + V_{CAB.Ex}$	$V_{4\_total} = 60.48 \cdot kip$
Increase in Shear Force	$\Delta V_4 := \frac{V_{4\_total} - V_{4\_tank}}{V_{4\_tank}}$	$\Delta V_4 = 16.18 \cdot \%$

Existing Water Tank - Panel 4 (Bottom Elevation): $AGL_{P4B} = 0.5\,ft$

Axial Force

From Water Tank /Water/ $P_{water} := W_{water}$ $P_{water} = 834.54 \cdot kip$

From Water Tank Structure $P_{structure} := \frac{H_{top} - AGL_{P4B}}{H_{top}} \cdot W_{structure}$ $P_{structure} = 83.22 \cdot kip$

From Existing Appurtenances $P_{app.Ex} := W_{app.4} + W_{app3} + W_{app.SN} \ldots + W_{app} + W_{app.SL}$ $P_{app.Ex} = 2.51 \cdot kip$

From Existing Cables $P_{CAB.Ex} := W_{CAB4.ft} \cdot (z_4 - AGL_{P4B}) \ldots + W_{CAB3.ft} \cdot (z_3 - AGL_{P4B}) \ldots + W_{CABSN.ft} \cdot (z_{SN} - AGL_{P4B}) \ldots + W_{CAB.ft} \cdot (z - AGL_{P4B}) \ldots + W_{CABSL.ft} \cdot (z_{SL} - AGL_{P4B})$ $P_{CAB.Ex} = 0.55 \cdot kip$

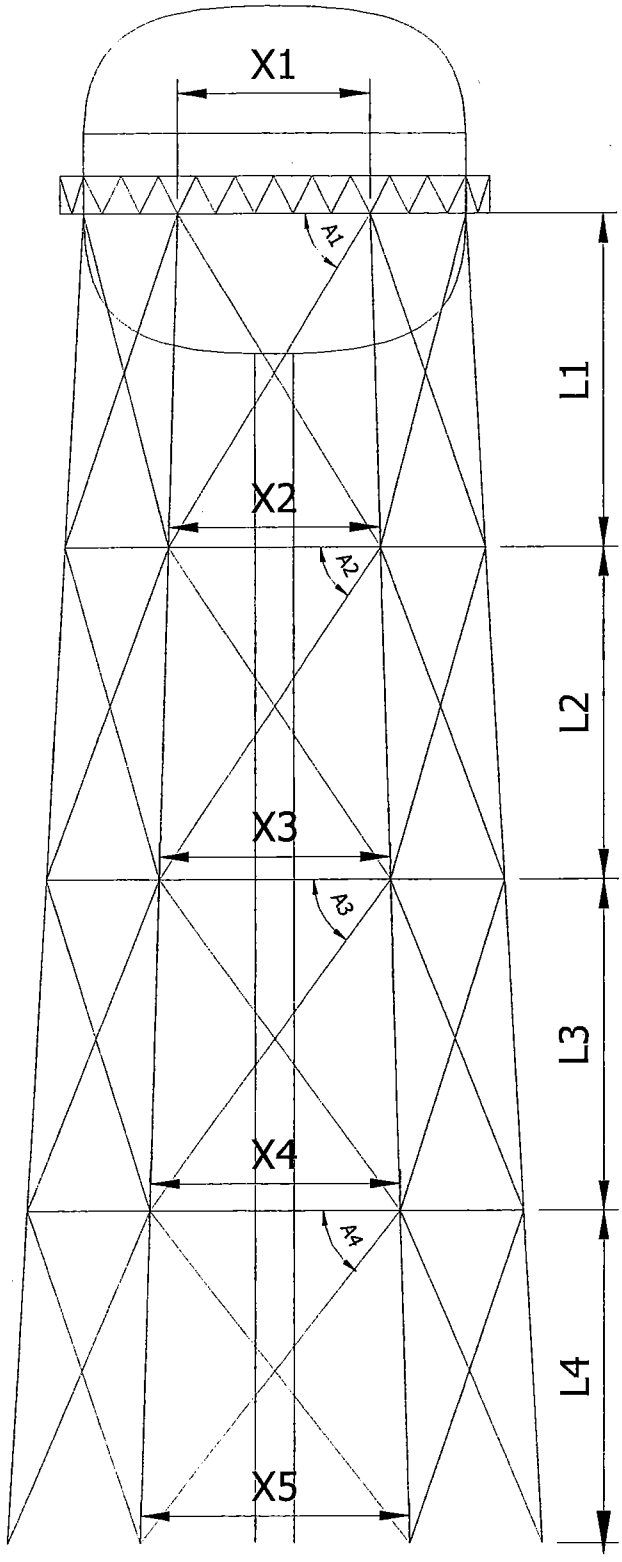
From New Appurtenance $P_{appDish} := W_{appDish}$ $P_{appDish} = 0.05 \cdot kip$

From New Cable $P_{CABDish} := W_{CABDish.ft} \cdot (z_{Dish} - AGL_{P4B})$ $P_{CABDish} = 0.03 \cdot kip$

Total Axial Force w/o Equipment $P_{4\_tank} := P_{water} + P_{structure}$ $P_{4\_tank} = 917.76 \cdot kip$

Total Axial Force with Equipment $P_{4\_total} := P_{4\_tank} \ldots + P_{app.Ex} + P_{appDish} + P_{CABDish} + P_{CAB.Ex}$ $P_{4\_total} = 920.9 \cdot kip$

Increase in Axial Force $\Delta P_4 := \frac{P_{4\_total} - P_{4\_tank}}{P_{4\_tank}}$ $\Delta P_4 = 0.34 \cdot \%$



WATER TANK ELEVATION

PANEL 1 LENGTH	$L_1 := 37.8ft$
PANEL 2 LENGTH	$L_2 := 38.92ft$
PANEL 3 LENGTH	$L_3 := 38.92ft$
PANEL 3 LENGTH	$L_4 := 39.2ft$
PANEL WIDTH	$X_1 := 28ft$
PANEL WIDTH	$X_2 := 32.725ft$
PANEL WIDTH	$X_3 := 37.591ft$
PANEL WIDTH	$X_4 := 42.457ft$
PANEL WIDTH	$X_5 := 47.35ft$
BRACE ANGLE	$A1 := 51deg$
BRACE ANGLE	$A2 := 48deg$
BRACE ANGLE	$A3 := 44deg$
BRACE ANGLE	$A4 := 41deg$

PANEL 1 DATA

COLUMN OUTER DIA.	$D_{o1} := OD_{leg}$	$D_{o1} = 22 \cdot in$
COLUMN THICKNESS.		$T_{leg} := .25in$
COLUMN INNER DIA.	$D_{i1} := D_{o1} - 2 \cdot T_{leg}$	$D_{i1} = 21.5 \cdot in$
ROD DIA.		$D_{rod1} := 1.125in$
STRUT DESCRIPTION		W8x24
STRUT AREA		$A_{strut1} := 7.08in^2$

PANEL 1 ANALYSIS

$N_{leg} = 4$ $\underset{\sim}{n} := N_{leg}$ $n = 4$ - number of sides $\phi := \frac{180°}{n}$ $\phi = 45 \cdot °$

$M_{top1} := M_{0\_tank}$ $M_{top1} = 96.06 \cdot kip \cdot ft$

$M_{topA1} := M_{0\_total}$ $M_{topA1} = 98.29 \cdot kip \cdot ft$

$M_{bot1} := M_{1\_tank}$ $M_{bot1} = 770.94 \cdot kip \cdot ft$

$M_{botA1} := M_{1\_total}$ $M_{botA1} = 819.03 \cdot kip \cdot ft$

$$R_{top1} := \max\left(\frac{M_{top1}}{3X_1}, \frac{M_{top1}}{4 \cdot X_1 \cdot \cos(\phi)}\right) \qquad R_{top1} = 1.21 \cdot kip$$

$$R_{topA1} := \max\left(\frac{M_{topA1}}{3X_1}, \frac{M_{topA1}}{4 \cdot X_1 \cdot \cos(\phi)}\right) \qquad R_{topA1} = 1.24 \cdot kip$$

$$R_{bot1} := \max\left(\frac{M_{bot1}}{3X_2}, \frac{M_{bot1}}{4 \cdot X_2 \cdot \cos(\phi)}\right) \qquad R_{bot1} = 8.33 \cdot kip$$

$$R_{botA1} := \max\left(\frac{M_{botA1}}{3X_2}, \frac{M_{botA1}}{4 \cdot X_2 \cdot \cos(\phi)}\right) \qquad R_{botA1} = 8.85 \cdot kip$$

$W_{add.1} := W_{app.4} + W_{CAB4.ft} \cdot (z_4 - AGL_{P2})$ $W_{add.1} = 0.39 \cdot kip$

$$S_{w1} := \frac{R_{bot1}}{0.25\pi \cdot \left(D_{o1}^2 - D_{i1}^2\right)} \qquad S_{w1} = 0.49 \cdot ksi$$

$$S_{wA1} := \frac{R_{botA1}}{0.25\pi \cdot \left(D_{o1}^2 - D_{i1}^2\right)} \qquad S_{wA1} = 0.52 \cdot ksi$$

$$S_{a1} := \frac{W_{leg.water} + W_{leg.structure}}{0.25\pi \cdot \left(D_{o1}^2 - D_{i1}^2\right)} \qquad S_{a1} = 10.92 \cdot ksi$$

$$S_{aA1} := \frac{W_{leg.water} + W_{leg.structure} + W_{add.1}}{0.25\pi \cdot \left(D_{o1}^2 - D_{i1}^2\right)} \qquad S_{aA1} = 10.95 \cdot ksi$$

$S_{c1} := S_{w1} + S_{a1}$ $S_{c1} = 11.41 \cdot ksi$

$S_{cA1} := S_{wA1} + S_{aA1}$ $S_{cA1} = 11.47 \cdot ksi$

$$F_{r1} := \frac{R_{bot1} - R_{top1}}{2 \cdot \sin(A1) \cdot \sin\left(\frac{180}{N_{leg}} \cdot deg\right)}$$ $F_{r1} = 6.47 \cdot kip$

$$F_{rA1} := \frac{R_{botA1} - R_{topA1}}{2 \cdot \sin(A1) \cdot \sin\left(\frac{180}{N_{leg}} \cdot deg\right)}$$ $F_{rA1} = 6.92 \cdot kip$

$$S_{r1} := \frac{F_{r1}}{0.25\pi \cdot D_{rod1}^{\ 2}}$$ $S_{r1} = 6.51 \cdot ksi$

$$S_{rA1} := \frac{F_{rA1}}{0.25\pi \cdot D_{rod1}^{\ 2}}$$ $S_{rA1} = 6.96 \cdot ksi$

$F_{s1} := if(A_{strut1} = 0, 0kip, F_{r1} \cdot \cos(A1))$ $F_{s1} = 4074.72\,lb$

$F_{sA1} := if(A_{strut1} = 0, 0kip, F_{rA1} \cdot \cos(A1))$ $F_{sA1} = 4356.1\,lb$

$$S_{s1} := if\left(A_{strut1} = 0, 0 \cdot ksi, \frac{F_{s1}}{A_{strut1}}\right)$$ $S_{s1} = 0.58 \cdot ksi$

$$S_{sA1} := if\left(A_{strut1} = 0, 0 \cdot ksi, \frac{F_{sA1}}{A_{strut1}}\right)$$ $S_{sA1} = 0.62 \cdot ksi$

$$C1 := \frac{S_{cA1} - S_{c1}}{S_{c1}}$$ $C1 = 0.47 \cdot \%$

$$R1 := \frac{S_{rA1} - S_{r1}}{S_{r1}}$$ $R1 = 6.91 \cdot \%$

$$S1 := \frac{S_{sA1} - S_{s1}}{S_{s1}}$$ $S1 = 6.91 \cdot \%$

Water Tower Strut W8x24 - Combination

Allowable Compressive Stress /ASD 9TH Edition/ : $K := 1.0$ $F_y := 36ksi$ $L := X_2$

$L = 32.73\,ft$

$I := 18.3in^4$ $A := 7.08in^2$ $r := \sqrt{\frac{I}{A}}$

$SR := \frac{K \cdot L}{r}$ Slenderness ratio (SR). $SR = 244$

Column slenderness ratio separating elastic and inelastic buckling (see AISC Specification, Eq. (E2-1)):

$C_c := \sqrt{2 \cdot \frac{\pi^2 \cdot E}{F_y}}$ $C_c = 126.1$

Allowable axial stress (AISC Specification, Eqs. (E2-1) and (E2-2) with SR (Slenderness Ratio) substituted for Kl/r: If SR greater than or equal to C_c use E2-2, if less than C_c use E2-1.

$$F_{1aRod} := \begin{cases} \frac{12 \cdot \pi^2 \cdot E}{23 \cdot SR^2} & \text{if } SR \geq C_c \\ \frac{\left(1 - \frac{SR^2}{2 \cdot C_c^2}\right) \cdot F_y}{\frac{5}{3} + \frac{3 \cdot SR}{8 \cdot C_c} - \frac{SR^3}{8 \cdot C_c^3}} & \text{otherwise} \end{cases}$$

$F_{1aRod} = 2.5 \cdot ksi$

Allowable Compressive Stress (with a 1/3 increase)

$F_{1RodAllow} := F_{1aRod} \cdot \left(1 + \frac{1}{3}\right)$ $F_{1RodAllow} = 3.34 \cdot ksi$

---------- REGIONS ----------

Area: 7.08 sq in
Perimeter: 41.86 in
Bounding box: X: -3.25 -- 3.25 in
Y: -3.965 -- 3.965 in
Centroid: X: 0.00000 in
Y: 0.00000 in
Moments of inertia: X: 82.7 sq in sq in
Y: 18.3 sq in sq in
Product of inertia: XY: 0 sq in sq in
Radii of gyration: X: 3.42 in
Y: 1.61 in
Principal moments (sq in sq in) and X-Y directions about centroid:
I_x: 82.7 along [1 0]
I_y: 18.3 along [0 1]

Water Tower Leg /Column/

COLUMN OUTER DIA. $D_{o1} = 22 \cdot in$ $D_o := D_{o1}$

COLUMN THICKNESS. $T_{leg} = 0.25 \cdot in$

COLUMN INNER DIA. $D_{i1} = 21.5 \cdot in$ $D_i := D_{i1}$

Allowable Compressive Stress /ASD 9TH Edition/ : $K := 1.0$ $F_y := 36ksi$ $L := L_1$

$$I := \frac{\pi \cdot \left(D_o^4 - D_i^4\right)}{64} \qquad I = 1010.26 \cdot in^4$$

$$A := \frac{\pi \cdot \left(D_o^2 - D_i^2\right)}{4} \qquad A = 17.08 \cdot in^2$$

$$r := \sqrt{\frac{I}{A}} \qquad r = 7.69 \cdot in$$

$$SR := \frac{K \cdot L}{r}$$ Slenderness ratio (SR). $SR = 59$

Column slenderness ratio separating elastic and inelastic buckling (see AISC Specification, Eq. (E2-1)):

$$C_c := \sqrt{2 \cdot \frac{\pi^2 \cdot E}{F_y}} \qquad C_c = 126.1$$

Allowable axial stress (AISC Specification, Eqs. (E2-1) and (E2-2) with SR (Slenderness Ratio) substituted for Kl/r: If SR greater than or equal to C_c use E2-2, if less than C_c use E2-1.

$$F_{1a} := \begin{cases} \dfrac{12 \cdot \pi^2 \cdot E}{23 \cdot SR^2} & \text{if } SR \geq C_c \\ \dfrac{\left(1 - \dfrac{SR^2}{2 \cdot C_c^2}\right) \cdot F_y}{\dfrac{5}{3} + \dfrac{3 \cdot SR}{8 \cdot C_c} - \dfrac{SR^3}{8 \cdot C_c^3}} & \text{otherwise} \end{cases} \qquad F_{1a} = 17.53 \cdot ksi$$

Allowable Compressive Stress (with a 1/3 increase)

$$F_{1Allow} := F_{1a} \cdot \left(1 + \frac{1}{3}\right) \qquad F_{1Allow} = 23.37 \cdot ksi$$

COLUMN		WITHOUT ANTENNA	WITH ANTENNA
MOMENT FROM WIND LOAD AT TOP OF PANEL		$M_{top1} = 96.06 \cdot kip \cdot ft$	$M_{topA1} = 98.29 \cdot kip \cdot ft$
COLUMN WIND REACTION AT TOP OF PANEL		$R_{top1} = 1.21 \cdot kip$	$R_{topA1} = 1.24 \cdot kip$
MOMENT FROM WIND LOAD AT BOT. OF PANEL		$M_{bot1} = 770.94 \cdot kip \cdot ft$	$M_{botA1} = 819.03 \cdot kip \cdot ft$
COLUMN WIND REACTION AT BOT. OF PANEL		$R_{bot1} = 8.33 \cdot kip$	$R_{botA1} = 8.85 \cdot kip$
COLUMN STRESS FROM WIND		$S_{w1} = 0.49 \cdot ksi$	$S_{wA1} = 0.52 \cdot ksi$
COLUMN STRESS FROM AXIAL LOAD		$S_{a1} = 10.92 \cdot ksi$	$S_{aA1} = 10.95 \cdot ksi$
TOTAL COLUMN STRESS		$S_{c1} = 11.41 \cdot ksi$	$S_{cA1} = 11.47 \cdot ksi$
BRACING ROD		WITHOUT ANTENNA	WITH ANTENNA
BRACING ROD FORCE		$F_{r1} = 6.47 \cdot kip$	$F_{rA1} = 6.92 \cdot kip$
BRACING ROD STRESS		$S_{r1} = 6.51 \cdot ksi$	$S_{rA1} = 6.96 \cdot ksi$
STRUT		WITHOUT ANTENNA	WITH ANTENNA
STRUT FORCE		$F_{s1} = 4074.72\,lb$	$F_{sA1} = 4356.1\,lb$
STRUT STRESS		$S_{s1} = 82875.7 \cdot psf$	$S_{sA1} = 88598.59 \cdot psf$
PANEL 1 STRESS SUMMARY	% INCREASE		REMARK
COLUMN STRESS	$C1 = 0.47 \cdot \%$	$S_{cA1} = 11.47 \cdot ksi$	LESS THAN 23.37ksi, OK
BRACING ROD STRESS	$R1 = 6.91 \cdot \%$	$S_{rA1} = 6.96 \cdot ksi$	LESS THAN 24ksi, OK
STRUT STRESS	$S1 = 6.91 \cdot \%$	$S_{sA1} = 0.62 \cdot ksi$	LESS THAN 3.34ksi, OK

PANEL 2 DATA

COLUMN OUTER DIA.	$D_{o2} := OD_{leg}$	$D_{o2} = 22 \cdot in$
COLUMN THICKNESS.		$T_{leg} := .25in$
COLUMN INNER DIA.	$D_{i2} := D_{o2} - 2 \cdot T_{leg}$	$D_{i2} = 21.5 \cdot in$
ROD DIA.		$D_{rod2} := 1.25in$
STRUT DESCRIPTION		W8x31
STRUT AREA		$A_{strut2} := 9.12in^2$

PANEL 2 ANALYSIS

$N_{leg} = 4$ $\quad n := N_{leg}$ $\quad n = 4$ - number of sides $\quad \phi := \frac{180°}{n}$ $\quad \phi = 45 \cdot °$

$M_{top2} := M_{1\_tank}$ $\quad M_{top2} = 770.94 \cdot kip \cdot ft$

$M_{topA2} := M_{1\_total}$ $\quad M_{topA2} = 819.03 \cdot kip \cdot ft$

$M_{bot2} := M_{2\_tank}$ $\quad M_{bot2} = 1844.37 \cdot kip \cdot ft$

$M_{botA2} := M_{2\_total}$ $\quad M_{botA2} = 2073.46 \cdot kip \cdot ft$

$$R_{top2} := \max\left(\frac{M_{top2}}{3X_2}, \frac{M_{top2}}{4 \cdot X_2 \cdot \cos(\phi)}\right) \quad R_{top2} = 8.33 \cdot kip$$

$$R_{topA2} := \max\left(\frac{M_{topA2}}{3X_2}, \frac{M_{topA2}}{4 \cdot X_2 \cdot \cos(\phi)}\right) \quad R_{topA2} = 8.85 \cdot kip$$

$$R_{bot2} := \max\left(\frac{M_{bot2}}{3X_3}, \frac{M_{bot2}}{4 \cdot X_3 \cdot \cos(\phi)}\right) \quad R_{bot2} = 17.35 \cdot kip$$

$$R_{botA2} := \max\left(\frac{M_{botA2}}{3X_3}, \frac{M_{botA2}}{4 \cdot X_3 \cdot \cos(\phi)}\right) \quad R_{botA2} = 19.5 \cdot kip$$

$$W_{add.2} := W_{app} + W_{CAB.ft} \cdot (z - AGL_{P2B}) + W_{appDish} \cdots + W_{CABDish.ft} \cdot (z_{Dish} - AGL_{P2B}) + W_{app.SN} \cdots + W_{CABSN.ft} \cdot (z_{SN} - AGL_{P2B}) + W_{app3} \cdots + W_{CAB3.ft} \cdot (z_3 - AGL_{P2B}) + W_{app.4} \cdots + W_{CAB4.ft} \cdot (z_4 - AGL_{P2B})$$

$W_{add.2} = 2.26 \cdot kip$

$$S_{w2} := \frac{R_{bot2}}{0.25\pi \cdot \left(D_{o2}^2 - D_{i2}^2\right)} \quad S_{w2} = 1.02 \cdot ksi$$

$$S_{wA2} := \frac{R_{botA2}}{0.25\pi \cdot \left(D_{o2}^2 - D_{i2}^2\right)} \quad S_{wA2} = 1.14 \cdot ksi$$

$$S_{a2} := \frac{W_{leg.water} + W_{leg.structure}}{0.25\pi \cdot \left(D_{o2}^2 - D_{i2}^2\right)} \quad S_{a2} = 10.92 \cdot ksi$$

$$S_{aA2} := \frac{W_{leg.water} + W_{leg.structure} + W_{add.2}}{0.25\pi \cdot \left(D_{o2}^2 - D_{i2}^2\right)} \quad S_{aA2} = 11.06 \cdot ksi$$

$S_{c2} := S_{w2} + S_{a2}$ $\quad S_{c2} = 11.94 \cdot ksi$

$S_{cA2} := S_{wA2} + S_{aA2}$ $\quad S_{cA2} = 12.2 \cdot ksi$

$$F_{r2} := \frac{R_{bot2} - R_{top2}}{2 \cdot \sin(A2) \cdot \sin\left(\frac{180}{N_{leg}} \cdot deg\right)}$$ $F_{r2} = 8.58 \cdot kip$

$$F_{rA2} := \frac{R_{botA2} - R_{topA2}}{2 \cdot \sin(A2) \cdot \sin\left(\frac{180}{N_{leg}} \cdot deg\right)}$$ $F_{rA2} = 10.14 \cdot kip$

$$S_{r2} := \frac{F_{r2}}{0.25\pi \cdot D_{rod2}^{\ 2}}$$ $S_{r2} = 6.99 \cdot ksi$

$$S_{rA2} := \frac{F_{rA2}}{0.25\pi \cdot D_{rod2}^{\ 2}}$$ $S_{rA2} = 8.26 \cdot ksi$

$F_{s2} := if(A_{strut2} = 0, 0kip, F_{r2} \cdot \cos(A2))$ $F_{s2} = 5741.39\,lb$

$F_{sA2} := if(A_{strut2} = 0, 0kip, F_{rA2} \cdot \cos(A2))$ $F_{sA2} = 6782.49\,lb$

$$S_{s2} := if\left(A_{strut2} = 0, 0 \cdot ksi, \frac{F_{s2}}{A_{strut2}}\right)$$ $S_{s2} = 0.63 \cdot ksi$

$$S_{sA2} := if\left(A_{strut2} = 0, 0 \cdot ksi, \frac{F_{sA2}}{A_{strut2}}\right)$$ $S_{sA2} = 0.74 \cdot ksi$

$$C2 := \frac{S_{cA2} - S_{c2}}{S_{c2}}$$ $C2 = 2.17 \cdot \%$

$$R2 := \frac{S_{rA2} - S_{r2}}{S_{r2}}$$ $R2 = 18.13 \cdot \%$

$$S2 := \frac{S_{sA2} - S_{s2}}{S_{s2}}$$ $S2 = 18.13 \cdot \%$

Water Tower Strut W8x31 - Combination

Allowable Compressive Stress /ASD 9TH Edition/ : $K := 1.0$ $F_y := 36ksi$ $L := X_3$

$L = 37.50\,ft$

$I := 37.1in^4$ $A := 9.12in^2$ $r := \sqrt{\frac{I}{A}}$

$SR := \frac{K \cdot L}{r}$ Slenderness ratio (SR). $SR = 224$

Column slenderness ratio separating elastic and inelastic buckling (see AISC Specification, Eq. (E2-1)):

$C_c := \sqrt{2 \cdot \frac{\pi^2 \cdot E}{F_y}}$ $C_c = 126.1$

Allowable axial stress (AISC Specification, Eqs. (E2-1) and (E2-2) with SR (Slenderness Ratio) substituted for Kl/r: If SR greater than or equal to C_c use E2-2, if less than C_c use E2-1.

$$F_{2aRod} := \begin{cases} \frac{12 \cdot \pi^2 \cdot E}{23 \cdot SR^2} & \text{if } SR \geq C_c \\ \frac{\left(1 - \frac{SR^2}{2 \cdot C_c^2}\right) \cdot F_y}{\frac{5}{3} + \frac{3 \cdot SR}{8 \cdot C_c} - \frac{SR^3}{8 \cdot C_c^3}} & \text{otherwise} \end{cases}$$

$F_{2aRod} = 2.99 \cdot ksi$

Allowable Compressive Stress (with a 1/3 increase)

$F_{2RodAllow} := F_{2aRod} \cdot \left(1 + \frac{1}{3}\right)$ $F_{2RodAllow} = 3.98 \cdot ksi$

---------- REGIONS ----------

Area: 9.12 sq in
Perimeter: 48.in
Bounding box: X: -4 -- 4 in
Y: -4 -- 4 in
Centroid: X: 0.00000 in
Y: 0.00000 in
Moments of inertia: X: 110 sq in sq in
Y: 37.1 sq in sq in
Product of inertia: XY: 0 sq in sq in
Radii of gyration: X: 3.47 in
Y: 2.02 in
Principal moments (sq in sq in) and X-Y directions about centroid:
I_x: 110 along [1 0]
I_y: 37.1 along [0 1]

Water Tower Leg /Column/

COLUMN OUTER DIA. $D_{o2} = 22 \cdot in$ $D_o := D_{o2}$

COLUMN THICKNESS. $T_{leg} = 0.25 \cdot in$

COLUMN INNER DIA. $D_{i2} = 21.5 \cdot in$ $D_i := D_{i2}$

Allowable Compressive Stress /ASD 9TH Edition/ : $K := 1.0$ $F_y := 36ksi$ $L := L_2$

$$I := \frac{\pi \cdot \left(D_o^4 - D_i^4\right)}{64} \qquad I = 1010.26 \cdot in^4$$

$$A := \frac{\pi \cdot \left(D_o^2 - D_i^2\right)}{4} \qquad A = 17.08 \cdot in^2$$

$$r := \sqrt{\frac{I}{A}} \qquad r = 7.69 \cdot in$$

$$SR := \frac{K \cdot L}{r}$$ Slenderness ratio (SR). $SR = 61$

Column slenderness ratio separating elastic and inelastic buckling (see AISC Specification, Eq. (E2-1)):

$$C_c := \sqrt{2 \cdot \frac{\pi^2 \cdot E}{F_y}} \qquad C_c = 126.1$$

Allowable axial stress (AISC Specification, Eqs. (E2-1) and (E2-2) with SR (Slenderness Ratio) substituted for Kl/r: If SR greater than or equal to C_c use E2-2, if less than C_c use E2-1.

$$F_{2a} := \begin{cases} \dfrac{12 \cdot \pi^2 \cdot E}{23 \cdot SR^2} & \text{if } SR \geq C_c \\ \dfrac{\left(1 - \dfrac{SR^2}{2 \cdot C_c^2}\right) \cdot F_y}{\dfrac{5}{3} + \dfrac{3 \cdot SR}{8 \cdot C_c} - \dfrac{SR^3}{8 \cdot C_c^3}} & \text{otherwise} \end{cases} \qquad F_{2a} = 17.36 \cdot ksi$$

Allowable Compressive Stress (with a 1/3 increase)

$$F_{2Allow} := F_{2a} \cdot \left(1 + \frac{1}{3}\right) \qquad F_{2Allow} = 23.15 \cdot ksi$$

COLUMN		WITHOUT ANTENNA	WITH ANTENNA
MOMENT FROM WIND LOAD AT TOP OF PANEL		$M_{top2} = 770.94 \cdot kip \cdot ft$	$M_{topA2} = 819.03 \cdot kip \cdot ft$
COLUMN WIND REACTION AT TOP OF PANEL		$R_{top2} = 8.33 \cdot kip$	$R_{topA2} = 8.85 \cdot kip$
MOMENT FROM WIND LOAD AT BOT. OF PANEL		$M_{bot2} = 1844.37 \cdot kip \cdot ft$	$M_{botA2} = 2073.46 \cdot kip \cdot ft$
COLUMN WIND REACTION AT BOT. OF PANEL		$R_{bot2} = 17.35 \cdot kip$	$R_{botA2} = 19.5 \cdot kip$
COLUMN STRESS FROM WIND		$S_{w2} = 1.02 \cdot ksi$	$S_{wA2} = 1.14 \cdot ksi$
COLUMN STRESS FROM AXIAL LOAD		$S_{a2} = 10.92 \cdot ksi$	$S_{aA2} = 11.06 \cdot ksi$
TOTAL COLUMN STRESS		$S_{c2} = 11.94 \cdot ksi$	$S_{cA2} = 12.2 \cdot ksi$
BRACING ROD		WITHOUT ANTENNA	WITH ANTENNA
BRACING ROD FORCE		$F_{r2} = 8.58 \cdot kip$	$F_{rA2} = 10.14 \cdot kip$
BRACING ROD STRESS		$S_{r2} = 6.99 \cdot ksi$	$S_{rA2} = 8.26 \cdot ksi$
STRUT		WITHOUT ANTENNA	WITH ANTENNA
STRUT FORCE		$F_{s2} = 5741.39\,lb$	$F_{sA2} = 6782.49\,lb$
STRUT STRESS		$S_{s2} = 90653.55 \frac{lb}{ft^2}$	$S_{sA2} = 107091.97 \frac{lb}{ft^2}$
PANEL 2 STRESS SUMMARY	% INCREASE		REMARK
COLUMN STRESS	C2 = 2.17·%	$S_{cA2} = 12.2 \cdot ksi$	LESS THAN 23.15ksi, OK
BRACING ROD STRESS	R2 = 18.13·%	$S_{rA2} = 8.26 \cdot ksi$	LESS THAN 24ksi, OK
STRUT STRESS	S2 = 18.13·%	$S_{sA2} = 0.74 \cdot ksi$	LESS THAN 3.98ksi, OK

PANEL 3 DATA

COLUMN OUTER DIA.	$D_{o3} := OD_{leg}$	$D_{o3} = 22 \cdot in$
COLUMN THICKNESS.		$T_{leg} := 0.25in$
COLUMN INNER DIA.	$D_{i3} := D_{o3} - 2 \cdot T_{leg}$	$D_{i3} = 21.5 \cdot in$
ROD DIA.		$D_{rod3} := 1.375in$
STRUT DESCRIPTION		W10x49
STRUT AREA		$A_{strut3} := 14.4in^2$

PANEL 3 ANALYSIS

$M_{top3} := M_{2\_tank}$ $\quad M_{top3} = 1844.37 \cdot kip \cdot ft$

$M_{topA3} := M_{2\_total}$ $\quad M_{topA3} = 2073.46 \cdot kip \cdot ft$

$M_{bot3} := M_{3\_tank}$ $\quad M_{bot3} = 3299.12 \cdot kip \cdot ft$

$M_{botA3} := M_{3\_total}$ $\quad M_{botA3} = 3767.51 \cdot kip \cdot ft$

$$R_{top3} := \max\left(\frac{M_{top3}}{3X_3}, \frac{M_{top3}}{4 \cdot X_3 \cdot \cos(\phi)}\right) \qquad R_{top3} = 17.35 \cdot kip$$

$$R_{topA3} := \max\left(\frac{M_{topA3}}{3X_3}, \frac{M_{topA3}}{4 \cdot X_3 \cdot \cos(\phi)}\right) \qquad R_{topA3} = 19.5 \cdot kip$$

$$R_{bot3} := \max\left(\frac{M_{bot3}}{3X_4}, \frac{M_{bot3}}{4 \cdot X_4 \cdot \cos(\phi)}\right) \qquad R_{bot3} = 27.47 \cdot kip$$

$$R_{botA3} := \max\left(\frac{M_{botA3}}{3X_4}, \frac{M_{botA3}}{4 \cdot X_4 \cdot \cos(\phi)}\right) \qquad R_{botA3} = 31.37 \cdot kip$$

$$\begin{aligned} W_{add.3} := {} & W_{app} + W_{CAB.ft} \cdot (z - AGL_{P3B}) + W_{appDish} \cdots \\ & + W_{CABDish.ft} \cdot (z_{Dish} - AGL_{P3B}) + W_{app.SN} \cdots \\ & + W_{CABSN.ft} \cdot (z_{SN} - AGL_{P3B}) + W_{app3} \cdots \\ & + W_{CAB3.ft} \cdot (z_3 - AGL_{P3B}) + W_{app.4} \cdots \\ & + W_{CAB4.ft} \cdot (z_4 - AGL_{P3B}) \cdots \\ & + W_{app.SL} + W_{CABSL.ft} \cdot (z_{SL} - AGL_{P3B}) \end{aligned} \qquad W_{add.3} = 2.94 \cdot kip$$

$$S_{w3} := \frac{R_{bot3}}{0.25\pi \cdot \left(D_{o3}^2 - D_{i3}^2\right)} \qquad S_{w3} = 1.61 \cdot ksi$$

$$S_{wA3} := \frac{R_{botA3}}{0.25\pi \cdot \left(D_{o3}^2 - D_{i3}^2\right)} \qquad S_{wA3} = 1.84 \cdot ksi$$

$$S_{a3} := \frac{W_{leg.water} + W_{leg.structure}}{0.25\pi \cdot \left(D_{o3}^2 - D_{i3}^2\right)} \qquad S_{a3} = 10.92 \cdot ksi$$

$$S_{aA3} := \frac{W_{leg.water} + W_{leg.structure} + W_{add.3}}{0.25\pi \cdot \left(D_{o3}^2 - D_{i3}^2\right)} \qquad S_{aA3} = 11.1 \cdot ksi$$

$S_{c3} := S_{w3} + S_{a3}$ $\quad S_{c3} = 12.53 \cdot ksi$

$S_{cA3} := S_{wA3} + S_{aA3}$ $\quad S_{cA3} = 12.93 \cdot ksi$

$$F_{r3} := \frac{R_{bot3} - R_{top3}}{2 \cdot \sin(A3) \cdot \sin\left(\frac{180}{N_{leg}} \cdot deg\right)}$$ $F_{r3} = 10.31 \cdot kip$

$$F_{rA3} := \frac{R_{botA3} - R_{topA3}}{2 \sin(A3) \cdot \sin\left(\frac{180}{N_{leg}} \cdot deg\right)}$$ $F_{rA3} = 12.08 \cdot kip$

$$S_{r3} := \frac{F_{r3}}{0.25\pi \cdot D_{rod3}^{\ 2}}$$ $S_{r3} = 6.94 \cdot ksi$

$$S_{rA3} := \frac{F_{rA3}}{0.25\pi \cdot D_{rod3}^{\ 2}}$$ $S_{rA3} = 8.14 \cdot ksi$

$F_{s3} := \text{if}(A_{strut3} = 0, 0, F_{r3} \cdot \cos(A3))$ $F_{s3} = 7.41 \cdot kip$

$F_{sA3} := \text{if}(A_{strut3} = 0, 0, F_{rA3} \cdot \cos(A3))$ $F_{sA3} = 8.69 \cdot kip$

$$S_{s3} := \text{if}\left(A_{strut3} = 0, 0, \frac{F_{s3}}{A_{strut3}}\right)$$ $S_{s3} = 0.51 \cdot ksi$

$$S_{sA3} := \text{if}\left(A_{strut3} = 0, 0, \frac{F_{sA3}}{A_{strut3}}\right)$$ $S_{sA3} = 0.6 \cdot ksi$

$$C3 := \frac{S_{cA3} - S_{c3}}{S_{c3}}$$ $C3 = 3.19 \cdot \%$

$$R3 := \frac{S_{rA3} - S_{r3}}{S_{r3}}$$ $R3 = 17.24 \cdot \%$

$$S3 := \frac{S_{sA3} - S_{s3}}{S_{s3}}$$ $S3 = 17.24 \cdot \%$

Water Tower Strut W10x49 - Combination

Allowable Compressive Stress /ASD 9TH Edition/ : $K := 1.0$ $F_y := 36ksi$ $L := X_4$

$L = 42.46\,ft$

$I := 93.4in^4$ $A := 14.4in^2$ $r := \sqrt{\frac{I}{A}}$

$SR := \frac{K \cdot L}{r}$ Slenderness ratio (SR). $SR = 200$

Column slenderness ratio separating elastic and inelastic buckling (see AISC Specification, Eq. (E2-1)):

$C_c := \sqrt{2 \cdot \frac{\pi^2 \cdot E}{F_y}}$ $C_c = 126.1$

$$F_{3aRod} := \begin{cases} \frac{12 \cdot \pi^2 \cdot E}{23 \cdot SR^2} & \text{if } SR \geq C_c \\ \frac{\left(1 - \frac{SR^2}{2 \cdot C_c^2}\right) \cdot F_y}{\frac{5}{3} + \frac{3 \cdot SR}{8 \cdot C_c} - \frac{SR^3}{8 \cdot C_c^3}} & \text{otherwise} \end{cases}$$

$F_{3aRod} = 3.73 \cdot ksi$

Allowable axial stress (AISC Specification, Eqs. (E2-1) and (E2-2) with SR (Slenderness Ratio) substituted for Kl/r: If SR greater than or equal to C_c use E2-2, if less than C_c use E2-1.

Allowable Compressive Stress (with a 1/3 increase)

$F_{3RodAllow} := F_{3aRod} \cdot \left(1 + \frac{1}{3}\right)$ $F_{3RodAllow} = 4.98 \cdot ksi$

---------- REGIONS ----------

Area: 9.12 sq in
Perimeter: 48.in
Bounding box: X: -4 -- 4 in
Y: -4 -- 4 in
Centroid: X: 0.00000 in
Y: 0.00000 in
Moments of inertia: X: 110 sq in sq in
Y: 37.1 sq in sq in
Product of inertia: XY: 0 sq in sq in
Radii of gyration: X: 3.47 in
Y: 2.02 in
Principal moments (sq in sq in) and X-Y directions about centroid:
I_x: 110 along [1 0]
I_y: 37.1 along [0 1]

Water Tower Leg /Column/

COLUMN OUTER DIA. $D_{o3} = 22 \cdot in$ $D_o := D_{o3}$

COLUMN THICKNESS. $T_{leg} = 0.25 \cdot in$

COLUMN INNER DIA. $D_{i3} = 21.5 \cdot in$ $D_i := D_{i3}$

Allowable Compressive Stress /ASD 9TH Edition/ : $K := 1.0$ $F_y := 36ksi$ $L := L_3$

$$I := \frac{\pi \cdot \left(D_o^4 - D_i^4\right)}{64} \qquad I = 1010.26 \cdot in^4$$

$$A := \frac{\pi \cdot \left(D_o^2 - D_i^2\right)}{4} \qquad A = 17.08 \cdot in^2$$

$$r := \sqrt{\frac{I}{A}} \qquad r = 7.69 \cdot in$$

$$SR := \frac{K \cdot L}{r}$$ Slenderness ratio (SR). $SR = 61$

Column slenderness ratio separating elastic and inelastic buckling (see AISC Specification, Eq. (E2-1)):

$$C_c := \sqrt{2 \cdot \frac{\pi^2 \cdot E}{F_y}} \qquad C_c = 126.1$$

Allowable axial stress (AISC Specification, Eqs. (E2-1) and (E2-2) with SR (Slenderness Ratio) substituted for Kl/r: If SR greater than or equal to C_c use E2-2, if less than C_c use E2-1.

$$F_{3a} := \begin{cases} \dfrac{12 \cdot \pi^2 \cdot E}{23 \cdot SR^2} & \text{if } SR \geq C_c \\ \dfrac{\left(1 - \dfrac{SR^2}{2 \cdot C_c^2}\right) \cdot F_y}{\dfrac{5}{3} + \dfrac{3 \cdot SR}{8 \cdot C_c} - \dfrac{SR^3}{8 \cdot C_c^3}} & \text{otherwise} \end{cases} \qquad F_{3a} = 17.36 \cdot ksi$$

Allowable Compressive Stress (with a 1/3 increase)

$$F_{3Allow} := F_{3a} \cdot \left(1 + \frac{1}{3}\right) \qquad F_{3Allow} = 23.15 \cdot ksi$$

COLUMN	WITHOUT ANTENNA	WITH ANTENNA
MOMENT FROM WIND LOAD AT TOP OF PANEL	M_{top3} = 1844.37·kip·ft	M_{topA3} = 2073.46·kip·ft
COLUMN WIND REACTION AT TOP OF PANEL	R_{top3} = 17.35·kip	R_{topA3} = 19.5·kip
MOMENT FROM WIND LOAD AT BOT. OF PANEL	M_{bot3} = 3299.12·kip·ft	M_{botA3} = 3767.51·kip·ft
COLUMN WIND REACTION AT BOT. OF PANEL	R_{bot3} = 27.47·kip	R_{botA3} = 31.37·kip
COLUMN STRESS FROM WIND	S_{w3} = 1.61·ksi	S_{wA3} = 1.84·ksi
COLUMN STRESS FROM AXIAL LOAD	S_{a3} = 10.92·ksi	S_{aA3} = 11.1·ksi
TOTAL COLUMN STRESS	S_{c3} = 12.53·ksi	S_{cA3} = 12.93·ksi

BRACING ROD	WITHOUT ANTENNA	WITH ANTENNA
BRACING ROD FORCE	F_{r3} = 10.31·kip	F_{rA3} = 12.08·kip
BRACING ROD STRESS	S_{r3} = 6.94·ksi	S_{rA3} = 8.14·ksi

STRUT	WITHOUT ANTENNA	WITH ANTENNA
STRUT FORCE	F_{s3} = 7.41·kip	F_{sA3} = 8.69·kip
STRUT STRESS	S_{s3} = 0.51·ksi	S_{sA3} = 0.6·ksi

PANEL 3 STRESS SUMMARY	% INCREASE		REMARK
COLUMN STRESS	C3 = 3.19·%	S_{cA3} = 12.93·ksi	LESS THAN 23.15ksi (5%), OK
BRACING ROD STRESS	R3 = 17.24·%	S_{rA3} = 8.14·ksi	LESS THAN 24ksi, OK
STRUT STRESS	S3 = 17.24·%	S_{sA3} = 0.6·ksi	LESS THAN 4.98ksi, OK

PANEL 4 DATA

COLUMN OUTER DIA.	$D_{o4} := OD_{leg}$	$D_{o4} = 22 \cdot in$
COLUMN THICKNESS.		$T_{leg} := .28125in$
COLUMN INNER DIA.	$D_{i4} := D_{o4} - 2 \cdot T_{leg}$	$D_{i4} = 21.44 \cdot in$
ROD DIA.		$D_{rod4} := 1.5in$
STRUT DESCRIPTION		NO STRUT
STRUT AREA		$A_{strut4} := 0in^2$

PANEL 4 ANALYSIS

$M_{top4} := M_{3\_tank}$ $\quad M_{top4} = 3299.12 \cdot kip \cdot ft$

$M_{topA4} := M_{3\_total}$ $\quad M_{topA4} = 3767.51 \cdot kip \cdot ft$

$M_{bot4} := M_{4\_tank}$ $\quad M_{bot4} = 5124.79 \cdot kip \cdot ft$

$M_{botA4} := M_{4\_total}$ $\quad M_{botA4} = 5930.88 \cdot kip \cdot ft$

$$R_{top4} := \max\left(\frac{M_{top4}}{3X_4}, \frac{M_{top4}}{4 \cdot X_4 \cdot \cos(\phi)}\right) \qquad R_{top4} = 27.47 \cdot kip$$

$$R_{topA4} := \max\left(\frac{M_{topA4}}{3X_4}, \frac{M_{topA4}}{4 \cdot X_4 \cdot \cos(\phi)}\right) \qquad R_{topA4} = 31.37 \cdot kip$$

$$R_{bot4} := \max\left(\frac{M_{bot4}}{3X_5}, \frac{M_{bot4}}{4 \cdot X_5 \cdot \cos(\phi)}\right) \qquad R_{bot4} = 38.27 \cdot kip$$

$$R_{botA4} := \max\left(\frac{M_{botA4}}{3X_5}, \frac{M_{botA4}}{4 \cdot X_5 \cdot \cos(\phi)}\right) \qquad R_{botA4} = 44.28 \cdot kip$$

$$\begin{aligned} W_{add.4} := {} & W_{app} + W_{CAB.ft} \cdot (z - AGL_{P4B}) + W_{appDish} \cdots \\ & + W_{CABDish.ft} \cdot (z_{Dish} - AGL_{P4B}) + W_{app.SN} \cdots \\ & + W_{CABSN.ft} \cdot (z_{SN} - AGL_{P4B}) + W_{app3} \cdots \\ & + W_{CAB3.ft} \cdot (z_3 - AGL_{P4B}) + W_{app.4} \cdots \\ & + W_{CAB4.ft} \cdot (z_4 - AGL_{P4B}) \cdots \\ & + W_{app.SL} + W_{CABSL.ft} \cdot (z_{SL} - AGL_{P4B}) \end{aligned} \qquad W_{add.4} = 3.14 \cdot kip$$

$$S_{w4} := \frac{R_{bot4}}{0.25\pi \cdot \left(D_{o4}^2 - D_{i4}^2\right)} \qquad S_{w4} = 1.99 \cdot ksi$$

$$S_{wA4} := \frac{R_{botA4}}{0.25\pi \cdot \left(D_{o4}^2 - D_{i4}^2\right)} \qquad S_{wA4} = 2.31 \cdot ksi$$

$$S_{a4} := \frac{W_{leg.water} + W_{leg.structure}}{0.25\pi \cdot \left(D_{o4}^2 - D_{i4}^2\right)} \qquad S_{a4} = 9.72 \cdot ksi$$

$$S_{aA4} := \frac{W_{leg.water} + W_{leg.structure} + W_{add.4}}{0.25\pi \cdot \left(D_{o4}^2 - D_{i4}^2\right)} \qquad S_{aA4} = 9.89 \cdot ksi$$

$S_{c4} := S_{w4} + S_{a4}$ $\quad S_{c4} = 11.72 \cdot ksi$

$S_{cA4} := S_{wA4} + S_{aA4}$ $\quad S_{cA4} = 12.2 \cdot ksi$

$$F_{r4} := \frac{R_{bot4} - R_{top4}}{2 \cdot \sin(A4) \cdot \sin\left(\frac{180}{N_{leg}} \cdot deg\right)}$$

$F_{r4} = 11.63 \cdot kip$

$$F_{rA4} := \frac{R_{botA4} - R_{topA4}}{2 \sin(A4) \cdot \sin\left(\frac{180}{N_{leg}} \cdot deg\right)}$$

$F_{rA4} = 13.92 \cdot kip$

$$S_{r4} := \frac{F_{r4}}{0.25\pi \cdot D_{rod4}^{\ 2}}$$

$S_{r4} = 6.58 \cdot ksi$

$$S_{rA4} := \frac{F_{rA4}}{0.25\pi \cdot D_{rod4}^{\ 2}}$$

$S_{rA4} = 7.87 \cdot ksi$

$$F_{s4} := if\left(A_{strut4} = 0, 0, F_{r4} \cdot \cos(A4)\right)$$

$F_{s4} = 0 \cdot kip$

$$F_{sA4} := if\left(A_{strut4} = 0, 0, F_{rA4} \cdot \cos(A4)\right)$$

$F_{sA4} = 0 \cdot kip$

$$S_{s4} := if\left(A_{strut4} = 0, 0, \frac{F_{s4}}{A_{strut4}}\right)$$

$S_{s4} = 0 \cdot ksi$

$$S_{sA4} := if\left(A_{strut4} = 0, 0, \frac{F_{sA4}}{A_{strut4}}\right)$$

$S_{sA4} = 0 \cdot ksi$

$$C4 := \frac{S_{cA4} - S_{c4}}{S_{c4}}$$

$C4 = 4.07 \cdot \%$

$$R4 := \frac{S_{rA4} - S_{r4}}{S_{r4}}$$

$R4 = 19.63 \cdot \%$

$$S4 := \frac{S_{sA4} - S_{s4}}{S_{s4}}$$

$S4 = 0 \cdot \%$

Water Tower Leg /Column/

COLUMN OUTER DIA. $D_{o4} = 22 \cdot in$ $D_o := D_{o4}$

COLUMN THICKNESS. $T_{leg} = 0.2813 \cdot in$

COLUMN INNER DIA. $D_{i4} = 21.44 \cdot in$ $D_i := D_{i4}$

Allowable Compressive Stress /ASD 9TH Edition/ : $K := 1.0$ $F_y := 36ksi$ $L := L_4$

$$I := \frac{\pi \cdot \left(D_o^4 - D_i^4\right)}{64} \qquad I = 1131.7 \cdot in^4$$

$$A := \frac{\pi \cdot \left(D_o^2 - D_i^2\right)}{4} \qquad A = 19.19 \cdot in^2$$

$$r := \sqrt{\frac{I}{A}} \qquad r = 7.68 \cdot in$$

$$SR := \frac{K \cdot L}{r}$$ Slenderness ratio (SR). $SR = 61$

Column slenderness ratio separating elastic and inelastic buckling (see AISC Specification, Eq. (E2-1)):

$$C_c := \sqrt{2 \cdot \frac{\pi^2 \cdot E}{F_y}} \qquad C_c = 126.1$$

Allowable axial stress (AISC Specification, Eqs. (E2-1) and (E2-2) with SR (Slenderness Ratio) substituted for Kl/r: If SR greater than or equal to C_c use E2-2, if less than C_c use E2-1.

$$F_{4a} := \begin{cases} \dfrac{12 \cdot \pi^2 \cdot E}{23 \cdot SR^2} & \text{if } SR \geq C_c \\ \dfrac{\left(1 - \dfrac{SR^2}{2 \cdot C_c^2}\right) \cdot F_y}{\dfrac{5}{3} + \dfrac{3 \cdot SR}{8 \cdot C_c} - \dfrac{SR^3}{8 \cdot C_c^3}} & \text{otherwise} \end{cases} \qquad F_{4a} = 17.31 \cdot ksi$$

Allowable Compressive Stress (with a 1/3 increase)

$$F_{4Allow} := F_{4a} \cdot \left(1 + \frac{1}{3}\right) \qquad F_{4Allow} = 23.08 \cdot ksi$$

COLUMN	WITHOUT ANTENNA	WITH ANTENNA
MOMENT FROM WIND LOAD AT TOP OF PANEL	$M_{top4} = 3299.12 \cdot kip \cdot ft$	$M_{topA4} = 3767.51 \cdot kip \cdot ft$
COLUMN WIND REACTION AT TOP OF PANEL	$R_{top4} = 27.47 \cdot kip$	$R_{topA4} = 31.37 \cdot kip$
MOMENT FROM WIND LOAD AT BOT. OF PANEL	$M_{bot4} = 5124.79 \cdot kip \cdot ft$	$M_{botA4} = 5930.88 \cdot kip \cdot ft$
COLUMN WIND REACTION AT BOT. OF PANEL	$R_{bot4} = 38.27 \cdot kip$	$R_{botA4} = 44.28 \cdot kip$
COLUMN STRESS FROM WIND	$S_{w4} = 1.99 \cdot ksi$	$S_{wA4} = 2.31 \cdot ksi$
COLUMN STRESS FROM AXIAL LOAD	$S_{a4} = 9.72 \cdot ksi$	$S_{aA4} = 9.89 \cdot ksi$
TOTAL COLUMN STRESS	$S_{c4} = 11.72 \cdot ksi$	$S_{cA4} = 12.2 \cdot ksi$

BRACING ROD	WITHOUT ANTENNA	WITH ANTENNA
BRACING ROD FORCE	$F_{r4} = 11.63 \cdot kip$	$F_{rA4} = 13.92 \cdot kip$
BRACING ROD STRESS	$S_{r4} = 6.58 \cdot ksi$	$S_{rA4} = 7.87 \cdot ksi$

STRUT	WITHOUT ANTENNA	WITH ANTENNA
STRUT FORCE	$F_{s4} = 0 \cdot kip$	$F_{sA4} = 0 \cdot kip$
STRUT STRESS	$S_{s4} = 0 \cdot ksi$	$S_{sA4} = 0 \cdot ksi$

PANEL 4 STRESS SUMMARY	% INCREASE		REMARK
COLUMN STRESS	C4 = 4.07·%	$S_{cA4} = 12.2 \cdot ksi$	LESS THAN 23.08ksi, OK
BRACING ROD STRESS	R4 = 19.63·%	$S_{rA4} = 7.87 \cdot ksi$	LESS THAN 24ksi, OK
STRUT STRESS	S4 = 0·%	$S_{sA4} = 0 \cdot ksi$	NO STRUT

WATER TANK STRUCTURE ANALYSIS SUMMARY

		AS BUILT	WITH ANTENNA	% INCREASE	COMMENT
PANEL 1	COLUMN STRESS	$S_{c1} = 11.41 \cdot ksi$	$S_{cA1} = 11.47 \cdot ksi$	C1 = 0.47·%	LESS THAN 23.37ksi, OK
	ROD STRESS	$S_{r1} = 6.51 \cdot ksi$	$S_{rA1} = 6.96 \cdot ksi$	R1 = 6.91·%	LESS THAN 24ksi, OK
	STRUT STRESS	$S_{s1} = 0.58 \cdot ksi$	$S_{sA1} = 0.62 \cdot ksi$	S1 = 6.91·%	LESS THAN 3.34ksi, OK
PANEL 2	COLUMN STRESS	$S_{c2} = 11.94 \cdot ksi$	$S_{cA2} = 12.2 \cdot ksi$	C2 = 2.17·%	LESS THAN 23.15ksi, OK
	ROD STRESS	$S_{r2} = 6.99 \cdot ksi$	$S_{rA2} = 8.26 \cdot ksi$	R2 = 18.13·%	LESS THAN 24ksi, OK
	STRUT STRESS	$S_{s2} = 0.63 \cdot ksi$	$S_{sA2} = 0.74 \cdot ksi$	S2 = 18.13·%	LESS THAN 3.98ksi, OK
PANEL 3	COLUMN STRESS	$S_{c3} = 12.53 \cdot ksi$	$S_{cA3} = 12.93 \cdot ksi$	C3 = 3.19·%	LESS THAN 23.15ksi, OK
	ROD STRESS	$S_{r3} = 6.94 \cdot ksi$	$S_{rA3} = 8.14 \cdot ksi$	R3 = 17.24·%	LESS THAN 24ksi, OK
	STRUT STRESS	$S_{s3} = 0.51 \cdot ksi$	$S_{sA3} = 0.6 \cdot ksi$	S3 = 17.24·%	LESS THAN 4.98ksi, OK
PANEL 4	COLUMN STRESS	$S_{c4} = 11.72 \cdot ksi$	$S_{cA4} = 12.2 \cdot ksi$	C4 = 4.07·%	LESS THAN 23.08ksi, OK
	ROD STRESS	$S_{r4} = 6.58 \cdot ksi$	$S_{rA4} = 7.87 \cdot ksi$	R4 = 19.63·%	LESS THAN 24ksi, OK
	STRUT STRESS	$S_{s4} = 0 \cdot ksi$	$S_{sA4} = 0 \cdot ksi$	S4 = 0·%	NO STRUT

Check Existing Anchor Bolts @ Base :

Reactions @ Base:

Outer Diameter of Foundation — $D_{f\_outer} := 47.3542ft$

Maximum Moment — $M_{4\_total} = 5930.88 \cdot kip \cdot ft$

Maximum Shear — $V_{4\_total} = 60 \cdot kip$

Maximum Compression — $P_{4\_total} = 921 \cdot kip$

Maximum Uplift / Per Leg (Orig.) $P_{up} := \frac{4 \cdot M_{4\_tank}}{N_{leg} \cdot D_{f\_outer}} - \frac{P_{structure}}{N_{leg}}$ — $P_{up} = 87.42 \cdot kip$

Maximum Uplift / Per leg $P_{4\_up} := \frac{4 \cdot M_{4\_total}}{N_{leg} \cdot D_{f\_outer}} - \frac{P_{4\_total} - P_{water}}{N_{leg}}$ — $P_{4\_up} = 103.66 \cdot kip$

Increase in Uplift $\%_{up} := 100 \cdot \frac{P_{4\_up} - P_{up}}{P_{up}}$ — $\%_{up} = 18.57$

Number of Anchor Bolts: — $N_{anch\_bolts} := 8$

Diameter of Anchor Bolts: — $D_{anch\_bolts} := D_{bolt}$

Type of Anchor Bolts: 'A36' $F_y := 36ksi$ threads per inch — $n_{tr} := 7$

Overload Coefficient — $k_{wind} := 1.33$

Allowable Tensile Stress - ANSI/AWWA D100-96 (Tab. 4) — $F_{t1} := 15ksi$

Allowable Tensile Stress - ASD 9TH Edition (Tab. I-B) — $F_{t2} := 19.1ksi$

Moment @ Top of Foundation: (Empty Water Tank) $M_{base} := M_{botA4}$ — $M_{base} = 5930.88 \cdot kip \cdot ft$

Axial Load @ Top of Foundation: (Empty Water Tank) $W_{base} := W_{structure}$ — $W_{base} = 83.45 \cdot kip$

Maximum Tension per Bolt: $T_{max} := \frac{P_{4\_up}}{2}$ — $T_{max} = 51.83 \cdot kip$

Tensile Stress Area: $A_{T.S} := 0.7854 \cdot \left(D_{anch\_bolts} - \frac{0.9743 \cdot in}{n_{tr}} \right)^2$ — $A_{T.S} = 2.7195 \cdot in^2$

Maximum Actual Tensile Stress: $f_t := \frac{T_{max}}{A_{T.S}}$ — $f_t = 19.06 \cdot ksi$

Maximum Allowable Tensile Stress: $F_t := 1.33 \cdot \min(F_{t1}, F_{t2})$ — $F_t = 19.95 \cdot ksi$

CHECK := if $f_t \geq 0psi$

"Allowable Tensile Stress > Maximum Actual Tensile Stress OK" if $F_t \geq f_t$

"Allowable Tensile Stress < Maximum Actual Tensile Stress make changes" otherwise

"All Anchor Bolts are in Compression for Empty Water Tank Case - Adequate for Additional Loads" otherwise

CHECK = "Allowable Tensile Stress > Maximum Actual Tensile Stress OK"

Existing Water Tank Foundation - Section 1 (Bottom Foundation):

$\gamma_c := 150pcf$

Total Weight of Concrete Foundation $V_{conc\_found} := 3663360in^3$

$W_{conc\_found} := \gamma_c \cdot V_{conc\_found}$

$W_{conc\_found} = 318 \cdot kip$

Height of Concrete Foundation $H_{conc\_found} := 7.0ft$

Outer Diameter of Foundation $D_{f\_outer} = 47.35\,ft$

Area of Each Foundation $A_{found} := 100ft^2$

Section Modulus of Foundation $S_{found} := 2393ft^3$

Rections @ Bottom of Foundation :

Axial Force w/o Antennas $W_{1\_Tank} := P_{4\_tank} + W_{conc\_found}$ $W_{1\_Tank} = 1235.76 \cdot kip$

Bending Moment w/o Antennas $M_{1\_Tank} := M_{4\_tank} + V_{4\_tank} \cdot H_{conc\_found}$ $M_{1\_Tank} = 5489.15\,ft \cdot kip$

Bearing Pressure w/o Antennas $P_{Tank} := \frac{4 \cdot M_{1\_Tank}}{N_{leg} \cdot D_{f\_outer}} + \frac{W_{1\_Tank}}{N_{leg}}$ $P_{Tank} = 424856.17 \cdot lb$

$BP := \frac{P_{Tank}}{A_{found}}$ $BP = 4248.56 \cdot psf$

Axial Force with Antennas $W_{1\_Total} := P_{4\_total} + W_{conc\_found}$ $W_{1\_Total} = 1238.9 \cdot kip$

Bending Moment with Antennas $M_{1\_Total} := M_{4\_total} + V_{4\_total} \cdot H_{conc\_found}$ $M_{1\_Total} = 6354.2 \cdot kip \cdot ft$

Bearing Pressure with Antennas $P_{Total} := \frac{4 \cdot M_{1\_Total}}{N_{leg} \cdot D_{f\_outer}} + \frac{W_{1\_Total}}{N_{leg}}$ $P_{Total} = 443908.53 \cdot lb$

$BP_A := \frac{P_{Total}}{A_{found}}$ $BP_A = 4439.09 \cdot psf$

Increse in Bearing Pressure $\Delta_{pressure} := \frac{BP_A - BP}{BP}$ $\Delta_{pressure} = 4.48 \cdot \%$

***** By Engineering Judgement Existing Foundation is Adequate For New Antenna Loads *****

Check for Overturning Moment: **(No Water in Tank)** $\gamma_{soil} := 100pcf$ $FOS_{OT} := 1.5$

Overturning Moment $M_{OT} := M_{1\_Total}$ $M_{OT} = 6354.2\,ft\cdot kip$

Volume of Soil $V_{found} := 139ft^3$

Total Weight of Backfilled Soil $W_{soil} := V_{found}\cdot\gamma_{soil}\cdot N_{leg}$ $W_{soil} = 55.6\cdot kip$

Resisting Moment $M_{RS} := 1.33\cdot\left[\left(W_{structure}\right)\cdot 0.5\cdot D_{f\_outer} \cdots + 2\cdot\left(\frac{W_{conc\_found} + W_{soil}}{N_{leg}}\right)\cdot D_{f\_outer}\right]$ $M_{RS} = 14392.88\,ft\cdot kip$

Safety Ratio $R_{safe} := \frac{M_{RS}}{M_{OT}}$ $R_{safe} = 2.27$

CHECK := "Actual Safety Ratio > Factor Of Safety OK" if $R_{safe} \geq FOS_{OT}$
"Actual Safety Ratio < Factor Of Safety make changes" otherwise

CHECK = "Actual Safety Ratio > Factor Of Safety OK"

Check for Uplift: **(No Water in Tank)** $FOS_{UP} := 1$

Check for Uplift - ANSI/AWWA D100-96 (Sec. 12.4.2)

Maximum Tension per Bolt $T_{max} = 51.83\cdot kip$

Number of Bolts $N_{anch\_bolts} = 8$

Weight of Concrete Foundation $W_{conc\_found} = 318\cdot kip$

Maximum Counterweight per Bolt $W_{counter} := 1.33\cdot\left[\frac{\left(W_{conc\_found} + W_{soil}\right)}{N_{anch\_bolts}}\right]$ $W_{counter} = 62.11\cdot kip$

Safety Ratio $R_{safe\_uplift} := \frac{W_{counter}}{T_{max}}$ $R_{safe\_uplift} = 1.2$

CHECK := "Actual Safety Ratio > Factor Of Safety OK" if $R_{safe\_uplift} \geq FOS_{UP}$
"Actual Safety Ratio < Factor Of Safety make changes" otherwise

CHECK = "Actual Safety Ratio > Factor Of Safety OK"

CONCLUSION:

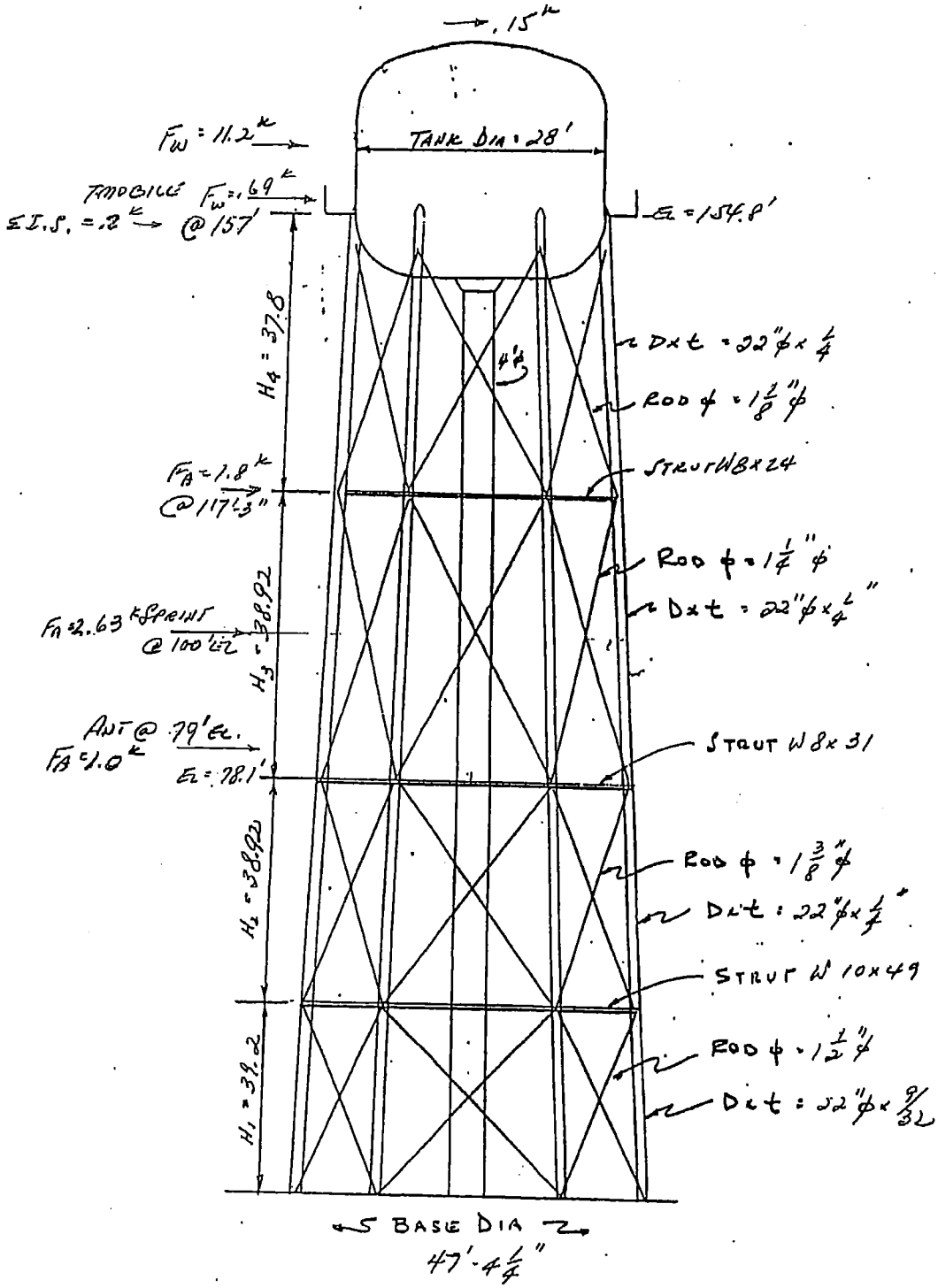
THE MAX. INCREASE IN COLUMN STRESS IS ABOUT 4.07%, WHICH IS ACCEPTABLE BY ENGINEERING JUDGEMENT. THE MAX. ROD STRESS IS 8.26 KSI, WHICH IS LESS THAN THE ALLOWABLE OF 18 KSI x 1.33 (WIND ALLOWABLE) = 24 KSI. THE MAX. STRUT STRESS IS 0.74 KSI, WHICH IS LESS THAN THE ALLOWABLE 3.98 KSI.

PER PERIMETER PIER, THE UPLIFT WILL BE INCREASED BY 18.6%. THE UPLIFT OF 103 KIPS PER PERIMETER PIER IS LESS THAN THE UPLIFT RESISTANCE OF 124 KIPS. THEREFORE THE FOUNDATION OF THE TANK IS ADEQUATE FOR THE ADDITIONAL UPLIFT.

THE EXISTING (2) 2" DIA. ANCHOR BOLTS PER PIER, WILL SEE AN INCREASE IN STRESS OF 18.6% AND ARE STILL ADEQUATE.

Appendix 'A'

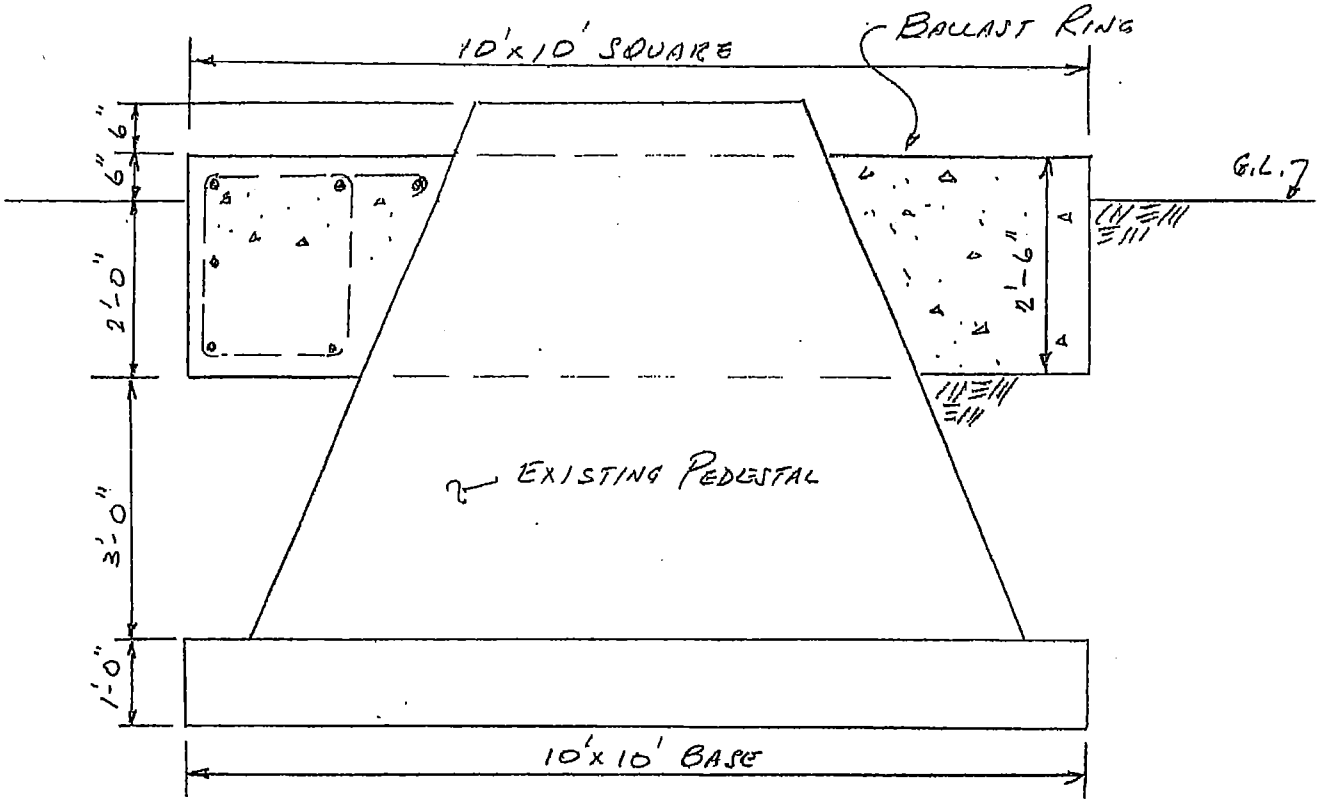
Existing Water Tank Design Drawings & Pictures



100MG ELLIPSOIDAL

COMPUTER MODEL

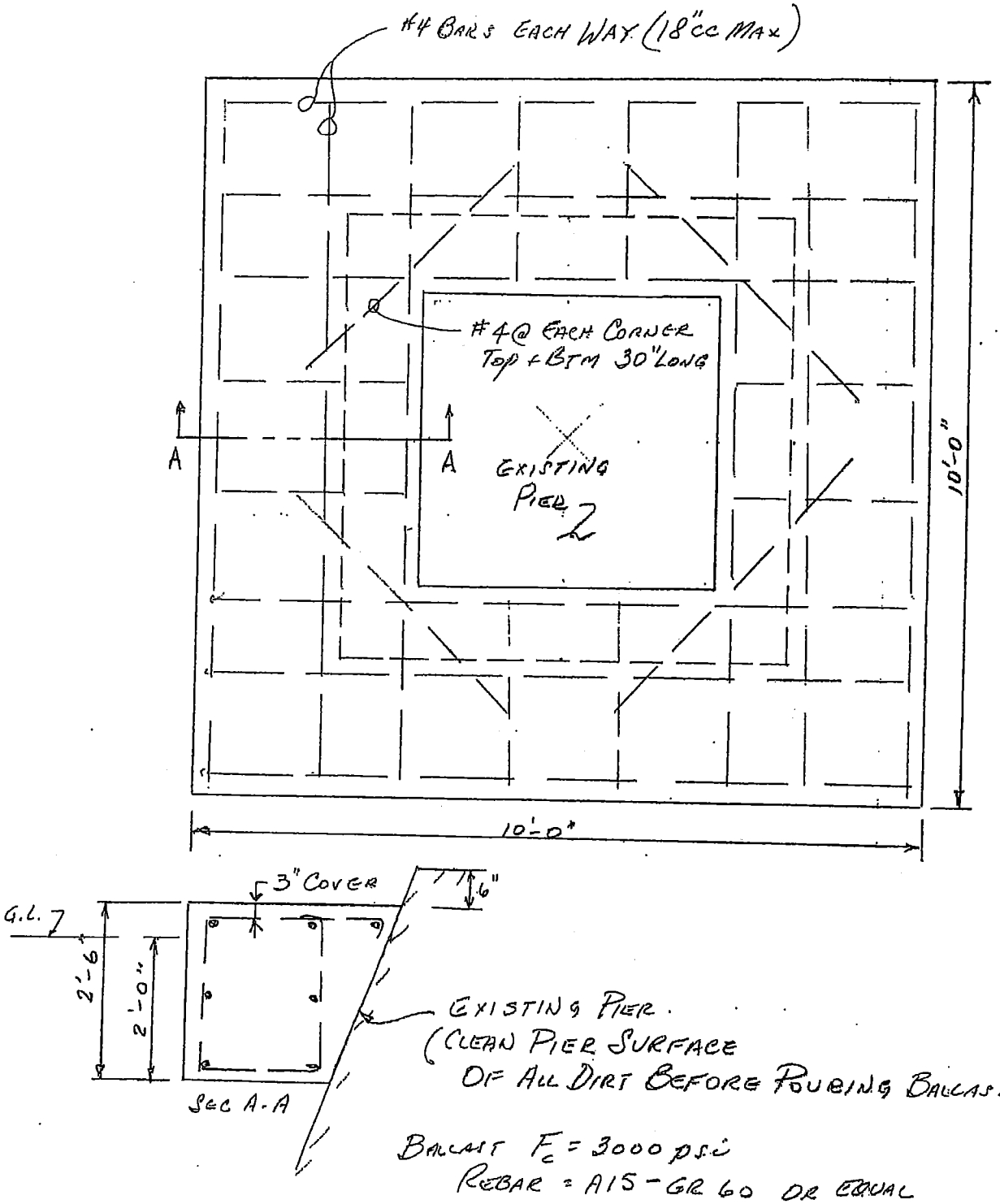
HOFFMAN EST



ELEVATION

SEE SHEET (2) FOR PLAN VIEW

Rev. 5b



BALLAST PLAN VIEW

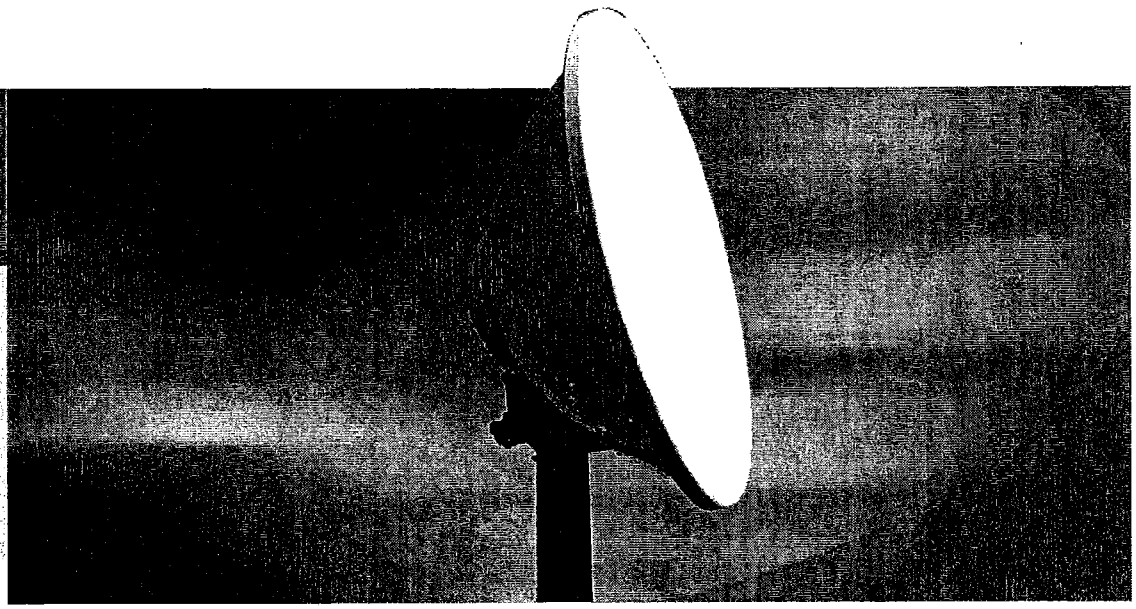
rev 5C

Appendix 'B'

Manufacturer Data Sheets

ANDREW®

PRODUCT SPECIFICATION



ValuLine® III Next Generation Antennas
VHLP2

SPECIFICATIONS

	VHLP2-7W	VHLP2-10W	VHLP2-11	VHLP2-13	VHLP2-15	VHLP2-18	VHLP2-23	VHLP2-26	VHLP2-28	VHLP2-32	VHLP2-38
Frequency Band, GHz	7.125–8.5	10.55–10.68	10.7–11.7	12.70–13.25	14.25–15.35	17.7–19.7	21.2–23.6	24.25–26.5	27.5–29.5	31.8–33.4	37.0–40.0
Bottom Band Gain, dBi	29.5	33.7	34.0	35.6	36.5	38.3	39.8	40.8	41.8	43.4	44.6
Mid Band Gain, dBi	30.7	33.8	34.4	35.8	36.8	38.7	40.4	41.2	42.2	43.7	45.2
Top Band Gain, dBi	31.9	34.3	35.0	36.0	37.2	39.1	41.0	41.8	42.7	44.0	45.8
Beamwidth, degrees	4.7	3.7	3.3	2.7	2.5	2.1	1.7	1.5	1.3	1.0	0.9
Front/Back, dB	57	56	60	62	65	67	66	68	68	61	66
XPD, dB	32	30	30	30	30	30	30	30	30	30	30
Return Loss, dB	17.7	17.7	17.7	17.7	17.7	17.7	17.7	17.7	17.7	17.7	17.7
Regulatory Compliance											
ETSI Class	R1 C3	R1 C2	R1 C3	R1 C3	R2 C3	R2 C3	R3 C3	R4 C3	R4 C3	R5 C3B	R5 C3B
FCC Part 101	N/A	CAT A*	CAT B	N/A	N/A	CAT A	CAT A	CAT A	N/A	N/A	CAT A
Brazil Anatel	N/A	C2	C2	C2	C2	C2	C2	C2	C2	C2	C2
Canada SRSP	N/A	310.5	N/A	312.7B	314.5A	Note 1	Note 2	N/A	N/A	N/A	338.6A
Andrew RPE Number	7075A	7085B, 7086B*	7083A	7004	7008	7012A	7016A	7020A	7024A	7028	7032A

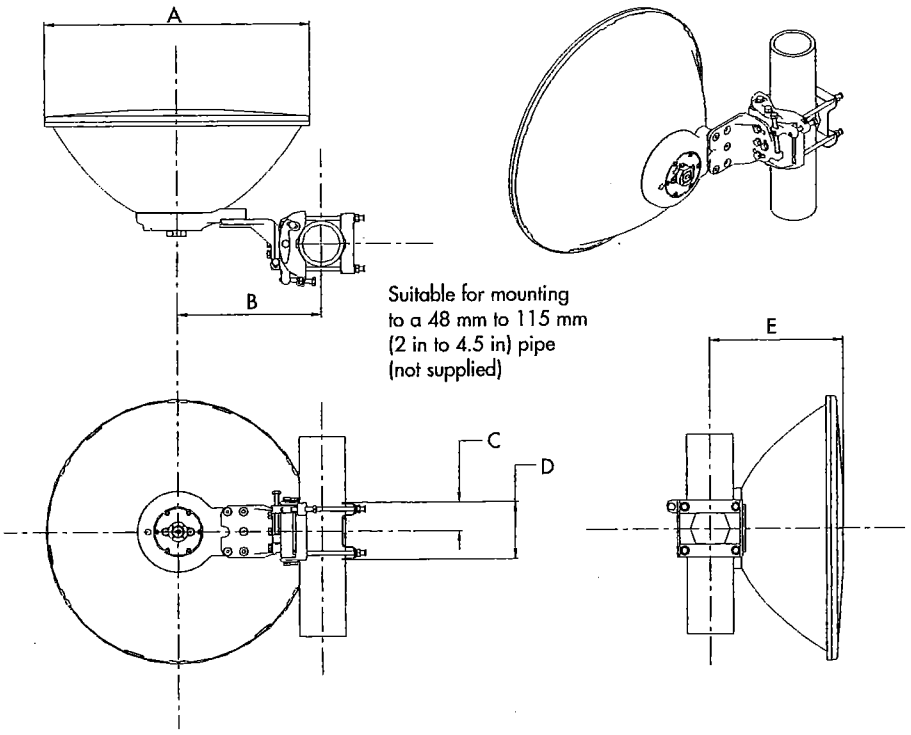
Note 1: Meets Canada SRSP 317.7A, 318.5, 318.8
Note 2: Meets Canada SRSP 312.2A, 321.8B

** Use for FCC band (10.5–10.7 GHz)*

One Company. A World of Solutions.

SPECIFICATIONS

ValuLine® III Next Generation Antennas—VHLP2



Antenna Dimensions, mm (in)

A	663 (26.1)
B	358 (14.1)
C	72 (2.8)
D	143 (5.6)
E	335 (13.2)

Antenna Fine Adjustment

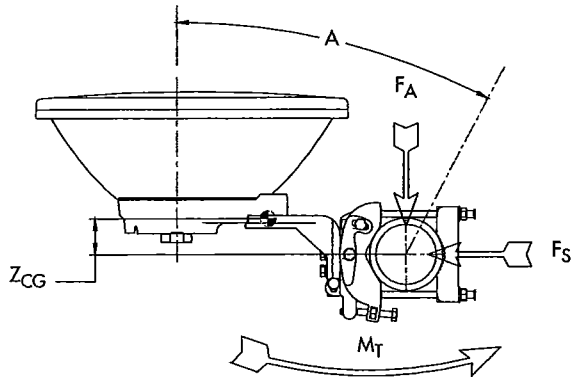
Fine Aximuth	±10°
Fine Elevation	±25°

SPECIFICATIONS

ValuLine® III Next Generation Antennas—VHLP2

Wind Loading

The axial, side, and twisting moment forces stated below are the maximum loads applied to the tower by the antenna at a survival windspeed of 250 km/h (155 mph). They are the result of wind from the most critical direction for each parameter. The individual maximums may not occur simultaneously. All forces are referenced to the antenna mounting pipe.



Axial force	F_A	1066 N (240 lb)
Side force	F_S	496 N (111 lb)
Moment	M_T	382 N-m (282 lb-ft)
Angle A for M_T maximum		0°
Z_{CG}* without ice, mm (in)		125 (4.9)
X_{CG} with 12 mm (1/2 in) radial ice, mm (in)		188 (7.4)

*Z_{CG} is the axial distance from the center of gravity to the mounting pipe.

Antenna Weights Including Mount

Antenna without ice, kg (lb)	12.28 (27)
Antenna with 12 mm (1/2 in) radial ice, kg (lb)	24.7 (54)

Antenna Packed Weights (Gross)

Weight, kg (lb)	19.42 (43)

Packed Antenna Dimensions (Single Unit Pack)

Dimensions, cm (in)	70 x 70 x 56 (27.5 x 27.5 x 22.0)

ANDREW® One Company. A World of Solutions.

Andrew Corporation
3 Westbrook Corporate Center
Suite 900
Westchester, IL 60154 US

Customer Support Center
From North America
Telephone: 1-800-255-1479
Fax: 1-800-349-5444

International
Telephone: +1-708-873-2307
Fax: +1-779-435-8579

Internet: www.andrew.com

Bulletin PA-101028.4-EN (9/07)

SHEET INDEX

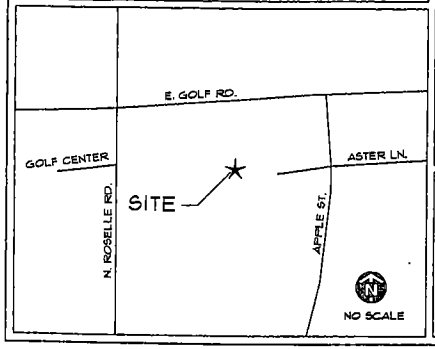
NO.	DESCRIPTION
T-1	TITLE SHEET
C-1	SITE PLAN
C-2	ENLARGED SITE PLAN
C-3	SHELTER/ANTENNA PLAN
C-4	SITE ELEVATION & DETAILS
E-1	SINGLE LINE & NOTES

DRIVING DIRECTIONS

DEPART FROM CLEARWIRE OFFICE:
5600 N. RIVER RD. ROSEMONT, IL 60018

HEAD EAST ON BRYN MAUR AVE TOWARD N RIVER RD. TURN LEFT AT N RIVER RD. TURN LEFT AT DEVON AVE. TAKE THE RAMP ONTO I-90 W (PARTIAL TOLL ROAD) TAKE THE ROSELLE RD EXIT (TOLL ROAD) KEEP LEFT AT THE FORK, FOLLOW SIGNS FOR SCHAUMBURG/HOFFMAN ESTATES (PARTIAL TOLL ROAD) TURN LEFT AT N ROSELL RD. TURN LEFT AT GOLF RD/IL-58. TURN RIGHT AT APPLE ST. TURN LEFT AT ASTER LANE.

VICINITY MAP



clear w'reless LLC®

a Nevada limited liability company, a Sprint affiliate

SITE NAME

GOLF CENTER

SITE NUMBER

IL-CH15290

SITE ADDRESS

95 ASTER LANE
HOFFMAN ESTATES, IL 60169

PROJECT TYPE

BACKHAUL PROJECT

PROJECT TEAM

clear w'reless LLC
a Nevada limited liability company, a Sprint affiliate
5600 N. RIVER RD.
SUITE 300
ROSEMONT, IL 60018
(847) 318-3000
APPLICANT

EVEREST GROUP
THE EVEREST GROUP, LLC
7013 W. 111TH ST.
WORTH, IL 60482
TEL: (708) 923-1363
REAL ESTATE

Fullerton Engineering Consultants
9700 W. HIGGINS RD.
SUITE 800
ROSEMONT, ILLINOIS 60018
TEL: 847-292-0200
FAX: 847-292-0205
ENGINEER/STRUCTURAL

- HANDICAP ACCESS REQUIREMENTS ARE NOT REQUIRED
- FACILITY IS UNMANNED AND NOT FOR HUMAN HABITATION
- FACILITY HAS NO PLUMBING OR REFRIGERANTS
- THIS FACILITY SHALL MEET OR EXCEED ALL FAA AND FCC REGULATORY REQUIREMENTS
- ALL WORK MUST CONFORM TO CLEARWIRE "CLEARWIRE CONSTRUCTION INSTALLATION GUIDE - WIMAX"

SCOPE OF WORK:

- NEW CLEARWIRE BACKHAUL DISH ANTENNAS INSTALLED ON EXISTING WATER TOWER
- NEW CLEARWIRE BACKHAUL EQUIPMENT INSTALLED IN EXISTING SHELTER

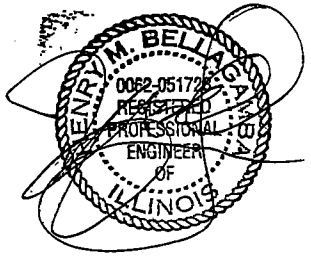
PROJECT SUMMARY

SITE NAME:	GOLF CENTER
SITE NO.:	IL-CH15290
SPRINT HOST NO:	IL3249
SITE ADDRESS:	95 ASTER LANE HOFFMAN ESTATES, IL 60169
COUNTY:	COOK
LANDLORD ADDRESS:	VILLAGE OF HOFFMAN ESTATES 900 HASSELL ROAD HOFFMAN ESTATES, IL 60169 (847) 882-9100
SITE COORDINATES (FROM CLEARVISION):	
LATITUDE:	N 42.04856° (NAD 83)
LONGITUDE:	W -88.07178° (NAD 83)
ZONING:	
JURISDICTION:	
BUILDING CODE:	INTERNATIONAL BUILDING CODE 2003 EDITION
ELECTRICAL CODE:	NATIONAL ELECTRIC CODE 2005 EDITION

ENGINEER'S LICENSE

I CERTIFY THAT THESE DRAWING WERE PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND CONTROL, AND TO THE BEST OF MY KNOWLEDGE AND BELIEF COMPLY WITH THE REQUIREMENTS OF THE INTERNATIONAL BUILDING CODE 2003 EDITION

LICENSED ENGINEER - STATE OF ILLINOIS



EXPIRES: 11/30/09 SIGNED: 5/28/09

APPROVALS

CLEARWIRE CONST.		DATE
CLEARWIRE RF		DATE
CLEARWIRE OPS		DATE
LANDLORD		DATE

DRAWING SCALED TO 11"x17"

clear w'reless LLC
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ROSEMONT, ILLINOIS 60018
TEL: 847-292-0200
FAX: 847-292-0205
DESIGN FIRM NO. 184-002498

CHECKED BY:	JP	
APPROVED BY:	MB	
# DATE	DESCRIPTION	INT.
03/24/09	90% REVIEW	DI
05/28/09	FINAL	SM

DATE SIGNED: _____

SITE NAME
GOLF CENTER

SITE NO.
IL-CH15290

SITE ADDRESS
95 ASTER LANE
HOFFMAN ESTATES, IL 60169

SHEET NAME
TITLE SHEET

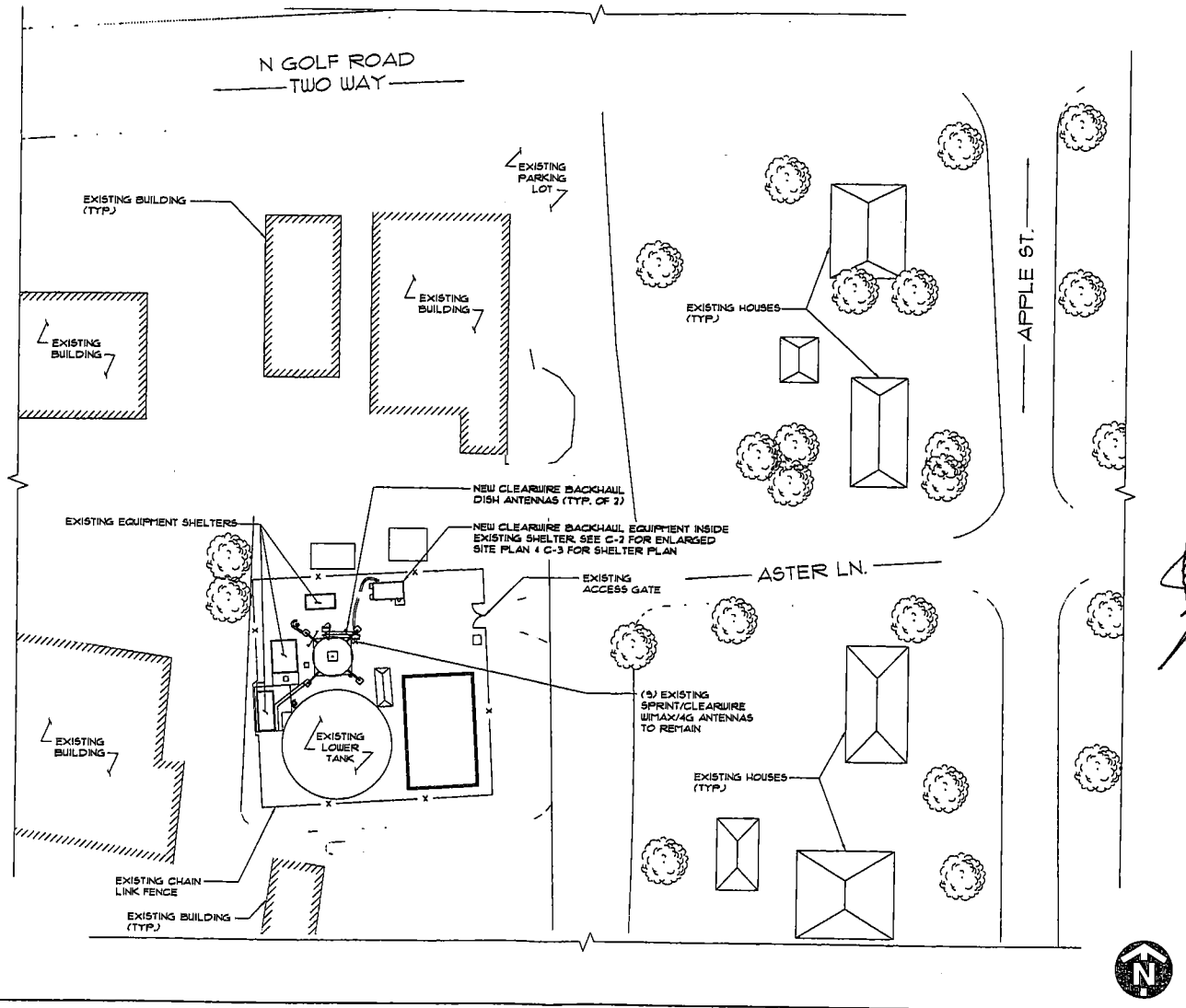
SHEET NUMBER
T-1

ABBREVIATIONS

A/C	AIR CONDITIONER
AFF	ABOVE FINISHED FLOOR
AGL	ABOVE GRADE LEVEL
AMSL	ABOVE MEAN SEA LEVEL
APPROX	APPROXIMATE
AWG	AMERICAN WIRE GAUGE
BLDG	BUILDING
BTS	BASE TRANSMISSION STATION
CAB	CABINET
COL	COLUMN
CONC	CONCRETE
CND	CONDUIT
DWG	DRAWING
FT	FOOT (FEET)
EGB	EQUIPMENT GROUND BAR
ELEC	ELECTRICAL
ELEV	ELEVATION
EMT	ELECTRICAL METALLIC TUBING
EQUIP	EQUIPMENT
(E)	EXISTING
FND	FOUNDATION
GALV	GALVANIZED
GND	GROUND
GPS	GLOBAL POSITIONING SYSTEM
IN	INCH(ES)
LB (#)	POUND(S)
MAX	MAXIMUM
MFR	MANUFACTURER
MGB	MASTER GROUND BAR
MIN	MINIMUM
(N)	NEW
NEC	NATIONAL ELECTRICAL CODE
NOM	NOMINAL
NTS	NOT TO SCALE
OE/OT	OVERHEAD ELECTRIC/TELCO
POS	POSITION
RGS	RIGID GALVANIZED STEEL
SF	SQUARE FOOT
STL	STEEL
T & B	TOP & BOTTOM
T/	TOP
TBD	TO BE DETERMINED
TYP	TYPICAL
UE/UT	UNDERGROUND ELECTRIC/TELCO
UNO	UNLESS NOTED OTHERWISE
VIF	VERIFY IN FIELD
W/	WITH
XFMR	TRANSFORMER

SYMBOLS

- ℄ CENTERLINE
- ℙ PLATE
- REVISION
- WORK POINT
- UTILITY POLE
- BRICK
- COMPRESSED STONE
- CONCRETE
- EARTH
- GRAVEL
- MASONRY
- STEEL
- CENTERLINE
- PROPERTY LINE
- LEASE LINE
- EASEMENT LINE
- CHAIN LINK FENCE
- WOOD FENCE
- UE — BELOW GRADE ELECTRIC
- UT — BELOW GRADE TELEPHONE
- OE/OT — OVERHEAD ELECTRIC/TELEPHONE
- SECTION REFERENCE (L A S-1 / L A A)



SITE PLAN

SCALE: 1" = 70'-0" | 1

clear wireless LLC
a Nevada limited liability company, a Sprint affiliate
5600 N. RIVER RD.
SUITE 300
ROSEMONT, IL 60018
(847) 318-3000

Fullerton Engineering Consultants
9700 W. HIGGINS RD.
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CHECKED BY:	JP
APPROVED BY:	MB

#	DATE	DESCRIPTION	INT.
	03/24/08	90% REVIEW	DZ
	05/15/08	FINAL	SM

LYM M. BELLAGAMBA
062-057728
REGISTERED PROFESSIONAL ENGINEER OF ILLINOIS
PATRICIA

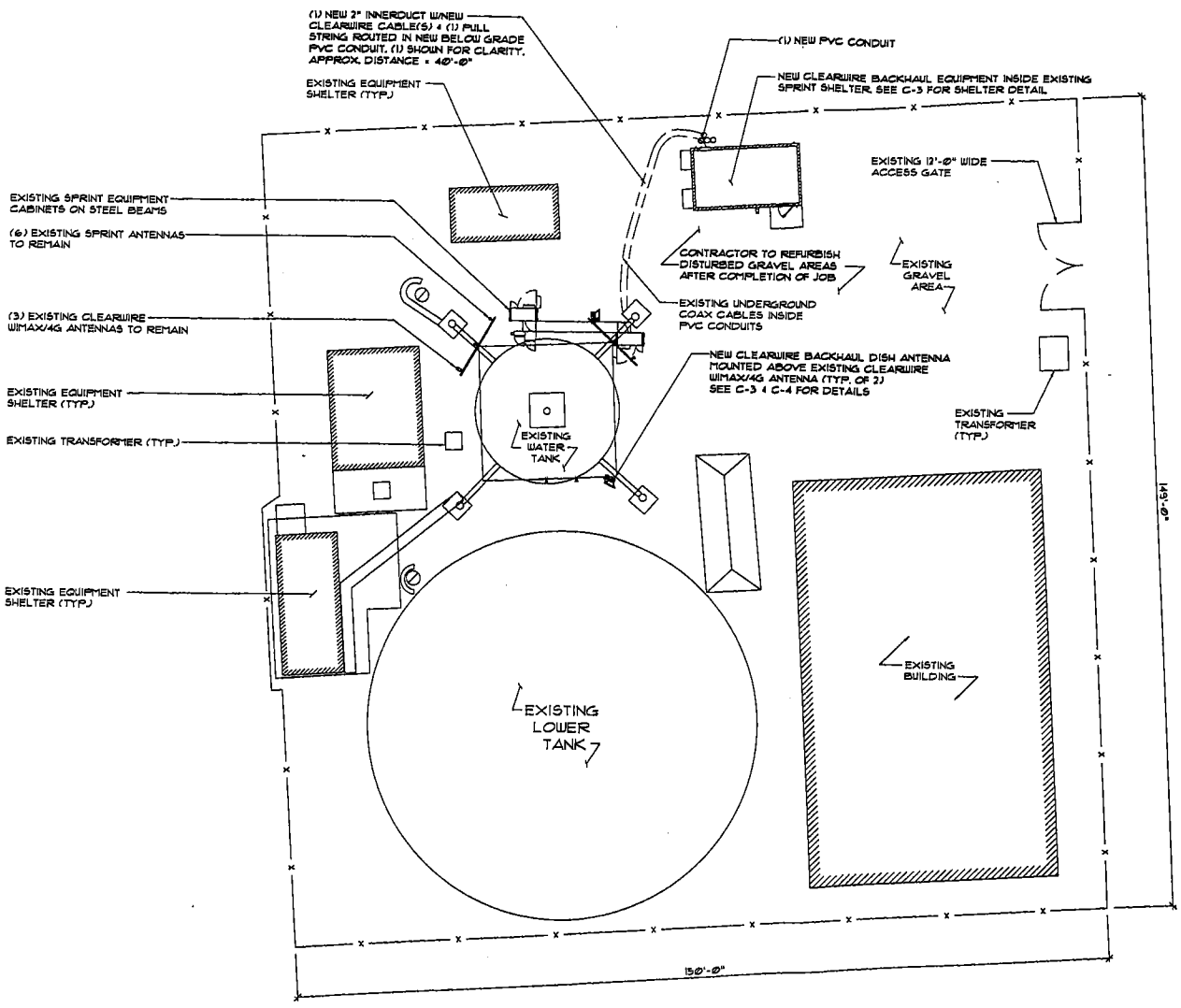
SITE NAME: GOLF CENTER

SITE NO.: IL-CHI5290

SITE ADDRESS: 95 ASTER LANE, HOFFMAN ESTATES, IL 60169

SHEET NAME: SITE PLAN

SHEET NUMBER: C-1



ENLARGED SITE PLAN

SCALE: 1" = 20'-0" | 1

clear wireless LLC
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DESIGN FIRM NO. 184-001458

CHECKED BY:	JP	
APPROVED BY:	MB	
#	DATE	DESCRIPTION	INT.
	03/24/09	90% REVIEW	DZ
	05/28/09	FINAL	SM

ANTHONY M. BELLAGAMBA
062-057728
REGISTERED
PROFESSIONAL
ENGINEER
OF
ILLINOIS
DATE EXPIRES

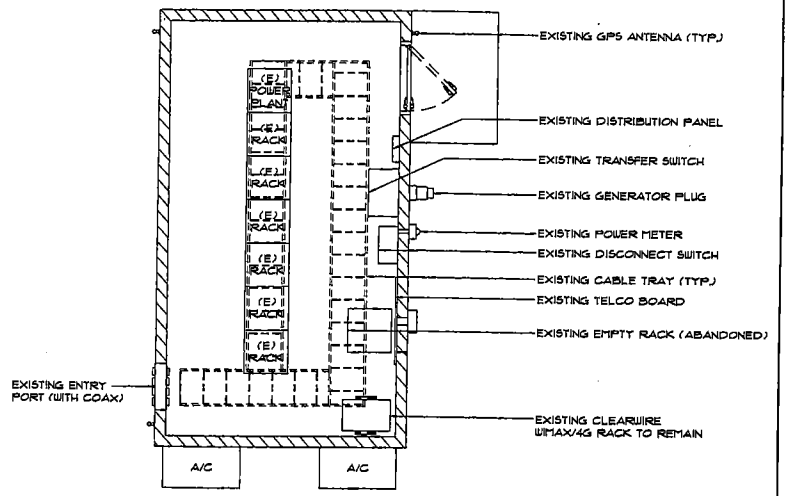
SITE NAME
GOLF CENTER

SITE NO.
IL-CHI5290

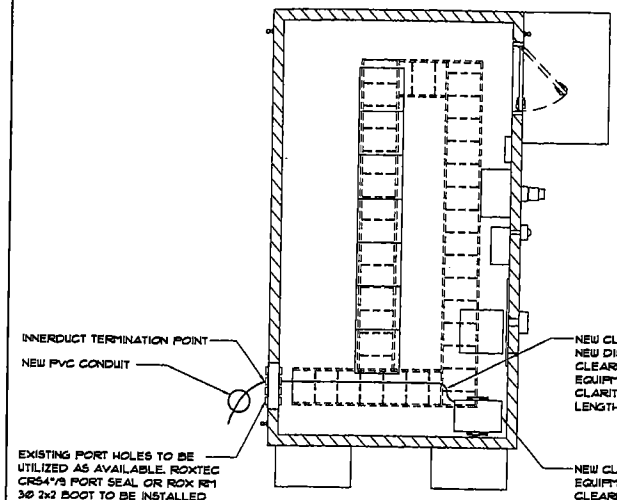
SITE ADDRESS
95 ASTER LANE
HOFFMAN ESTATES, IL 60169

SHEET NAME
ENLARGED SITE PLAN

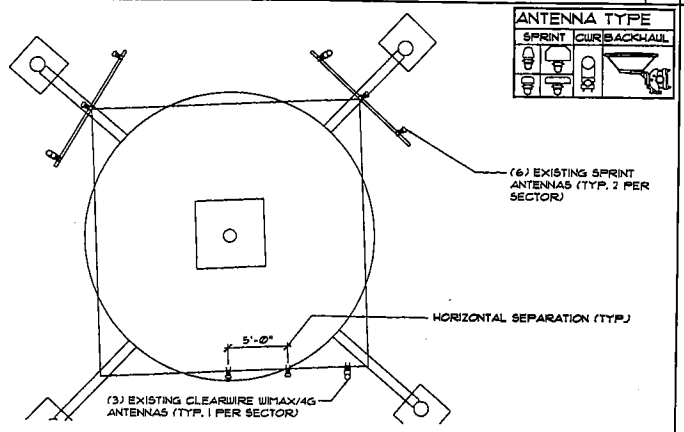
SHEET NUMBER
C-2



EXISTING SHELTER PLAN — SCALE: 3/16" = 1'-0" | 1



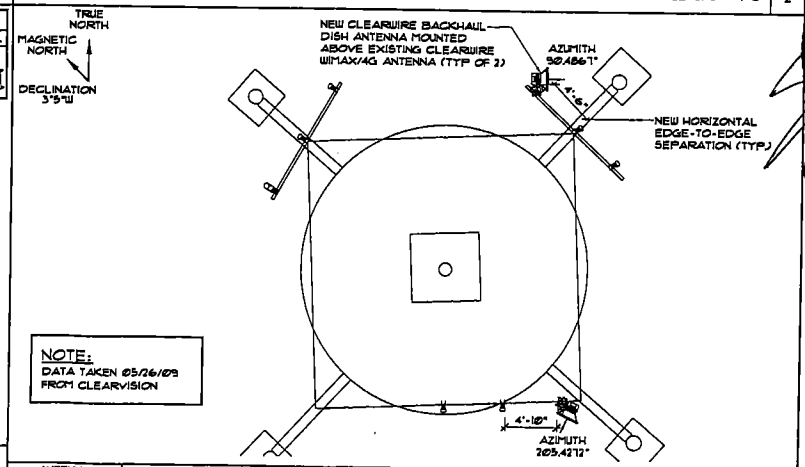
NEW SHELTER PLAN — SCALE: 3/16" = 1'-0" | 2



SECTOR	1	2	3
CLEARWIRE AZIMUTH PER SPRINT SITERRA- SEE NOTE	6Ø°	18Ø°	3ØØ°

NOTE:
CONTRACTOR IS REQUIRED TO DISMANTLE EXISTING CLEARWIRE ANTENNA FOR NEW MOUNTING PIPE INSTALLATION, CONTRACTOR SHALL FIELD VERIFY CLEARWIRE ANTENNA AZIMUTH & REPLACE TO EXISTING AZIMUTH.

EXISTING ANTENNA CONFIGURATION/BACKHAUL SCHEDULE — SCALE: 3/32" = 1'-0" | 3



NOTE:
DATA TAKEN Ø5/26/Ø9 FROM CLEARVISION

ANTENNA AZIMUTH	ANTENNA MODEL	SIZE (NOM) (IN)	ANTENNA MOUNT HEIGHT (FT.)	DISTANCE (MILES)	RECEIVING SITE NUMBER	RADIO MODEL
3Ø.486'1"	VHLP2-18	24"	1Ø4'	2365	IL-CHI5355	AIRPAIR HP
2Ø5.42'12"	VLHP2-23	24"	1Ø4'	153	IL-CHI5384	AIRPAIR HP

NEW ANTENNA CONFIGURATION/BACKHAUL SCHEDULE — SCALE: 3/32" = 1'-0" | 4

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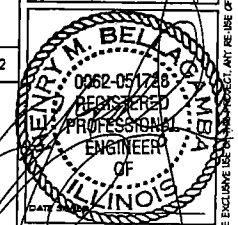
CHECKED BY:	JP
APPROVED BY:	MB

#	DATE	DESCRIPTION	INT.
	Ø3/24/Ø9	90% REVIEW	DZ
	Ø5/18/Ø9	FINAL	SM



SITE NAME
GOLF CENTER

SITE NO.
IL-CHI5290

SITE ADDRESS
55 ASTER LANE
HOFFMAN ESTATES, IL 6Ø169

SHEET NAME
SHELTER/ ANTENNA PLAN

SHEET NUMBER
C-3

ANTENNA NOTES:

1. THE SIZE, HEIGHT, AND DIRECTION OF THE ANTENNA SHALL BE ADJUSTED TO MEET SYSTEM REQUIREMENTS.
2. CONTRACTOR SHALL VERIFY HEIGHT OF ANTENNA WITH CLEARWIRE REPRESENTATIVE.
3. ALL ANTENNA AZIMUTH TO BE FROM TRUE NORTH.

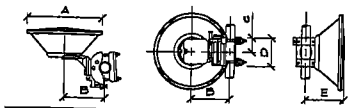
STRUCTURAL NOTES:

1. STRUCTURAL CALCULATION PREPARED BY FULLERTON ENGINEERING CONSULTANTS. CONTRACTOR TO COORDINATE WITH CLEARWIRE REPRESENTATIVE TO OBTAIN A COPY.
2. CONTRACTOR TO REFER TO TOWER STRUCTURAL CALCULATIONS FOR ADDITIONAL LOADS. NO ERECTION OR MODIFICATION OF TOWER SHALL BE MADE WITHOUT APPROVAL OF STRUCTURAL ENGINEER.

BACKHAUL CABLE SCHEDULE

ANTENNA TYPE	AZIMUTH	QTY.	ESTIMATED LENGTH	RADIO MODEL	TYPE	SIZE
DISH	90.4867°	1	x 200 = 200 FT.	AIRFAIR HP	SFX500	1/2" ø
DISH	205.4272°	1	x 240 = 240 FT.	AIRFAIR HP	SFX500	1/2" ø
		TOTAL:	440 FT.	OF	SFX500	1/2" ø

NOTES:
1. ACTUAL LENGTHS SHALL BE DETERMINED PER SITE CONDITION BY THE CONTRACTOR.
2. THE CONTRACTOR SHALL VERIFY THE ACTUAL LENGTHS BEFORE INSTALLATION.

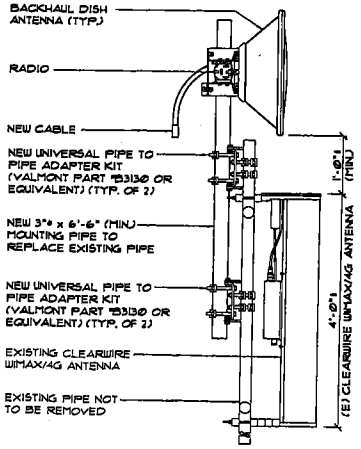


24" DISH		A	B	C	D	E
	IN.	26.10	14.10	2.80	5.60	13.20

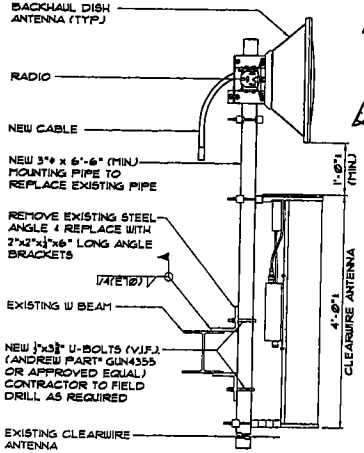
NOTE: RADIO NOT SHOWN FOR CLARITY

BACKHAUL ANTENNA DETAIL

SCALE: N.T.S. | 3



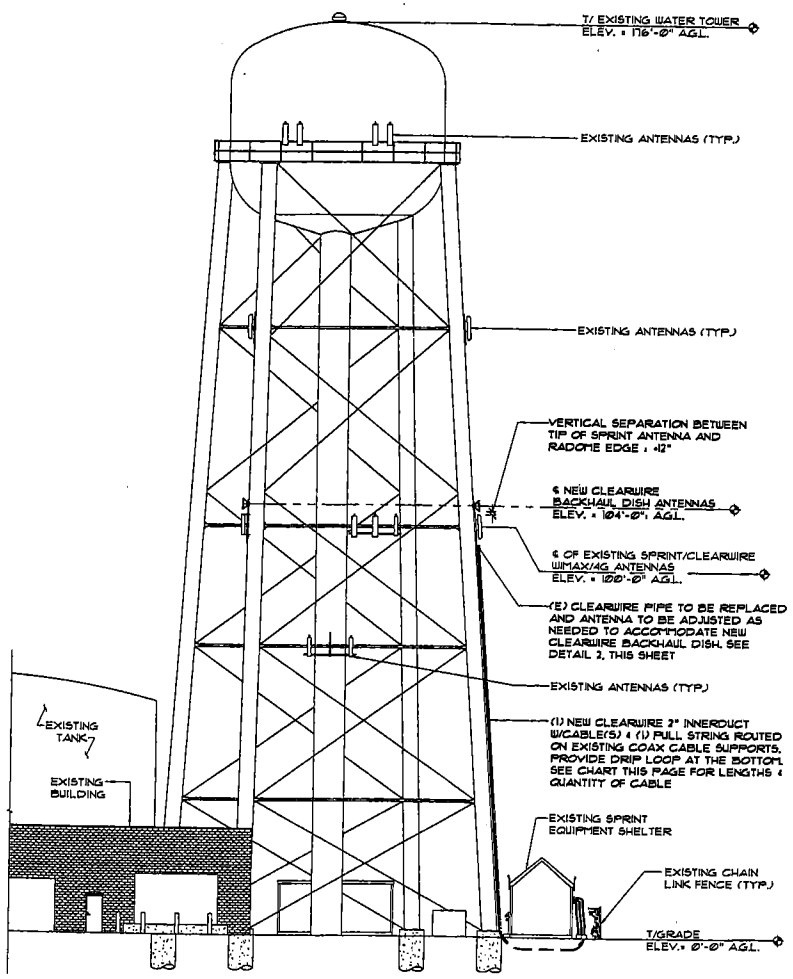
AZIMUTH (90.4867°)



AZIMUTH (205.4272°)

DISH SUPPORT DETAIL

SCALE: N.T.S. | 2



ELEVATION

SCALE: NTS | 1

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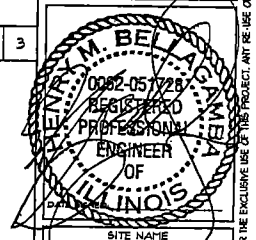
(847) 318-3000

Fullerton Engineering Consultants
9700 W. HIGGINS RD.
SUITE 800
ROSEMONT, ILLINOIS 60018
TEL: 847-292-0200
FAX: 847-292-0205
DESIGN FIRM NO. 184-001498

CHECKED BY:	JP
APPROVED BY:	MB

#	DATE	DESCRIPTION	INT.
	03/14/09	90% REVIEW	DZ
	05/28/09	FINAL	SM



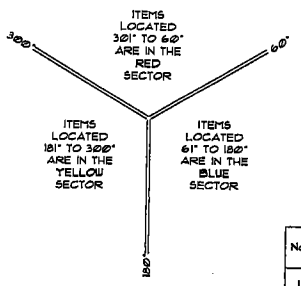
SITE NAME
GOLF CENTER

SITE NO.
IL-CHI5290

SITE ADDRESS
95 ASTER LANE
HOFFMAN ESTATES, IL 60169

SHEET NAME
SITE ELEVATION & DETAILS

SHEET NUMBER
C-4



NOTES COLOR CODING:

1. THE EQUIPAGE OF THE RFUS (DAP HEADS) MUST FOLLOW THE MOTOROLA COLOR ASSIGNMENT OF RED/BLUE/YELLOW REGARDLESS OF THE ACTUAL ANTENNA ORIENTATION. (FOR EXAMPLE, THE FIRST EQUIPPED SECTOR IS RED, BUT IN A SITUATION WHERE THE RED SECTOR IS NOT EQUIPPED WITH AN RFU, THE FIRST RFU (DAP HEAD) MUST BE LABELED RED EVEN IF IT LIES WITHIN THE BLUE SECTOR BASED ON ANTENNA ORIENTATION. ANY MICROWAVE ANTENNAS MUST BE LABELED BASED ON THE ORIENTATION. IN SUCH CASE THERE WOULD BE AN RFU (DAP HEAD) LABELED RED AND MICROWAVE ANTENNA(S) LABELED BLUE WITHIN THE BLUE SECTOR LOCATED BETWEEN 61 AND 180 DEGREES.)
2. THE CONTRACTOR SHALL USE SECTOR APPROPRIATE COLORED TAPE TO DENOTE THE ANTENNA AND MICROWAVE DISHES. TAPE SHOULD BE WRAPPED AROUND THE TOP AND BOTTOM OF THE SUPPORT PIPE AS DEPICTED IN THE TABLE ABOVE.

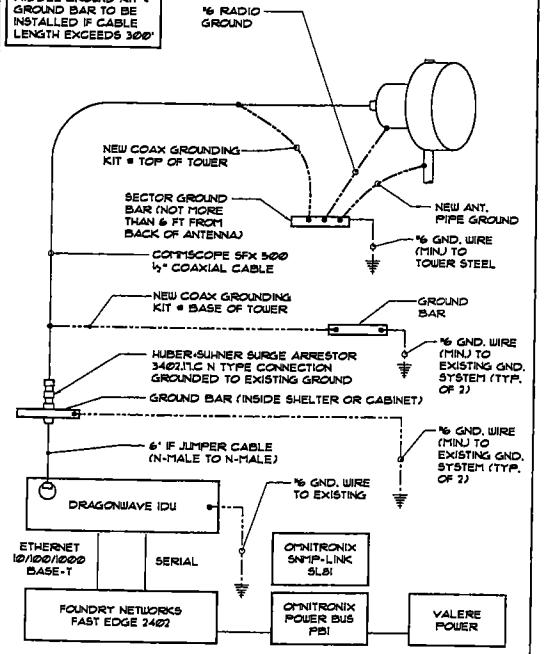
No.	SECTOR DEGREE RANGE	MARKING METHOD COLOR BANDS	MARKING METHOD NUMBER OF BANDS
1	301°-60°	RED	SMALLEST NUMBER WILL BE LABELED "R1". THE NEXT LARGER NUMBER WILL BE LABELED "R2"
2	61°-180°	BLUE	SMALLEST NUMBER WILL BE LABELED "B1". THE NEXT LARGER NUMBER WILL BE LABELED "B2"
3	181°-300°	YELLOW	SMALLEST NUMBER WILL BE LABELED "Y1". THE NEXT LARGER NUMBER WILL BE LABELED "Y2"

DISH COLOR CODING NOTES

1. ANTENNA INSTALLATION SHALL BE CONDUCTED BY FIELD CREWS EXPERIENCED IN THE ASSEMBLY AND ERECTION OF RADIO ANTENNAS, TRANSMISSION LINES, AND SUPPORT STRUCTURES.
2. CONTRACT COMPANIES AND THEIR EMPLOYEES SHALL OBSERVE AND PRACTICE ALL O.S.H.A. SAFETY GUIDELINES WHILE PERFORMING SERVICE FOR CLEARWIRE.
3. CONTRACT COMPANIES AND THEIR EMPLOYEES SHALL OBSERVE AND PRACTICE ALL O.S.H.A. SAFETY GUIDELINES WHILE PERFORMING SERVICE FOR CLEARWIRE.
4. CONTRACTOR SHALL PERFORM A SAFETY INSPECTION PRIOR TO COMMENCING ALL WORK ACTIVITIES AT A CLEARWIRE, LEASED OR OWNED SITE. CLEARWIRE, SHOULD BE IMMEDIATELY NOTIFIED OF SAFETY HAZARD(S) FOUND DURING THE INSPECTION THAT COULD CAUSE DAMAGE TO PROPERTY. ALL WORK SHALL BE HALTED UNTIL SUCH TIME THE REPORTED SAFETY HAZARD IS CORRECTED. THE SAFETY HAZARD, IF POSSIBLE, SHOULD BE CORRECTED BY THE CONTRACTOR WHILE ON SITE. AFTER THE CONTRACTOR HAS NOTIFIED CLEARWIRE TO PERFORM THE CORRECTION.

ANTENNA INSTALLATION NOTES

NOTE:
MIDDLE GROUND KIT & GROUND BAR TO BE INSTALLED IF CABLE LENGTH EXCEEDS 300'



AIRPAIR SINGLE LINE DIAGRAM

NOT USED

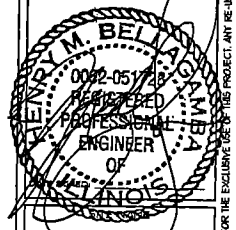
1. ALL BASE TRANSCEIVER SITE EQUIPMENT SHALL BE GROUNDED IN ACCORDANCE WITH THE LATEST EDITIONS OF THE NATIONAL ELECTRICAL CODE (NEC), LIGHTNING PROTECTION CODE (NFPA 780) AND CLEARWIRE STANDARDS.
2. THE ELECTRICAL SERVICE TO THE SITE SHALL BE GROUNDED AT THE SERVICE DISCONNECTING MEANS AS REQUIRED IN ARTICLE 250 OF THE NATIONAL ELECTRICAL CODE AND IN ACCORDANCE WITH ANY LOCAL CODE.
3. ALL UNDERGROUND (BELOW GRADE) GROUNDING CONNECTIONS SHALL BE MADE BY THE EXOTHERMIC PROCESS (MECHANICAL LUG ATTACHMENTS BELOW GRADE ARE NOT ACCEPTABLE.) CONNECTIONS SHALL INCLUDE ALL CABLE TO CABLE SPLICES (TEES, Xs, ETC.), ALL CABLE CONNECTIONS TO GROUND RODS, GROUND ROD SPLICES, AND LIGHTNING PROTECTION SYSTEM AS INDICATED. ALL MATERIALS USED (MOLDS, WELDING METAL, TOOLS, ETC.) SHALL BE INSTALLED PER MANUFACTURER'S RECOMMENDATION AND PROCEDURES.
4. ALL GROUNDING AND BONDING CONDUCTORS THAT ARE CONNECTED ABOVE GRADE OR INTERIOR TO A BUILDING SHALL BE CONNECTED USING TWO HOLE CRIMP TYPE (COMPRESSION) CONNECTIONS FOR #2 AND #6 AWG INSULATED COPPER CONDUCTOR.
5. ALL GROUNDING CONNECTIONS, INTERIOR AND EXTERIOR, MADE THROUGHOUT THIS DOCUMENT SHALL BE MADE USING AN ANTI-OXIDATION COMPOUND. THE ANTI-OXIDATION COMPOUND SHALL BE THOMAS AND BETTS KOPR-SHIELD (TM OF JET LUBE INC.) OR APPROVED EQUAL. COAT ALL WIRES BEFORE CONNECTING.
6. ALL CONNECTIONS SHALL BE MADE TO BARE METAL. ALL PAINTED SURFACES SHALL BE FIELD INSPECTED AND MODIFIED TO ENSURE PROPER CONTACT. PRIOR TO EXOTHERMICALLY CONNECTING, GALVANIZING SHALL BE REMOVED BY GRINDING SURFACE TO BARE METAL. "SLAG" FROM EXOTHERMIC CONNECTION MUST BE REMOVED AND SHALL BE SPRAYED WITH COLD GALVANIZE AFTER COMPLETION.
7. FERROUS METAL CLIPS WHICH COMPLETELY SURROUND THE GROUNDING CONDUCTOR SHALL NOT BE USED. CLIPS OF THE FOLLOWING MATERIALS AND TYPES MAY BE USED TO SUPPORT GROUNDING CONDUCTORS.
   PLASTIC CLIPS
   STAINLESS STEEL CLIPS WHICH DO NOT COMPLETELY SURROUND THE GROUNDING CONDUCTOR.
   FERROUS METAL CLIPS WHICH DO NOT COMPLETELY SURROUND THE GROUNDING CONDUCTOR.
8. ALL HARDWARE, BOLTS, NUTS, WASHERS AND LOCK WASHERS SHALL BE 18-8 STAINLESS STEEL. EVERY CONNECTION SHALL BE BOLT-FLAT WASHER-BUSS-LUG-FLAT WASHER-LOCK WASHER-NUT IN THAT EXACT ORDER, WITH NUT FACING OUTWARD. BACK-TO-BACK LUGGING, BOLT-FLAT WASHER-LUG-FLAT WASHER-LUG-BUSS-LUG-FLAT WASHER-LOCK WASHER-NUT, IN THAT EXACT ORDER IS ACCEPTED WHERE NECESSARY TO CONNECT MANY LUGS TO A BUSS BAR. STACKING OF LUGS, BUSS-LUG-LUG, IS NOT ACCEPTABLE.

GROUNDING NOTES

clear wireless LLC
a Nevada limited liability company, a Sprint affiliate
5600 N. RIVER RD.
SUITE 300
ROSEMONT, IL 60018
(847) 318-3000

Fullerton Engineering Consultants
9700 W. HIGGINS RD.
SUITE 800
ROSEMONT, ILLINOIS 60018
TEL: 847-292-0200
FAX: 847-292-0205
DESIGN FIRM NO. 184-001458

CHECKED BY:	JP	
APPROVED BY:	MB	
# DATE	DESCRIPTION	INT.
03/24/09	90% REVIEW	DZ
05/15/09	FINAL	SY



GOLF CENTER

SITE NO.
IL-CHI5290

SITE ADDRESS
85 ASTER LANE
HOFFMAN ESTATES, IL 60169

SHEET NAME
SINGLE LINE & NOTES

SHEET NUMBER
E-1

VILLAGE OF HOFFMAN ESTATES
ZONING BOARD OF APPEALS

FINDING OF FACT

DATE OF PUBLIC HEARINGS: November 17 and December 8, 2009

DATE OF PRESENTATION TO VILLAGE BOARD: December 14, 2009

PETITION: Hearing held at the request of the Village of Hoffman Estates (Lessor) and The Everest Group/Sprint, Clearwire (Lessee) to consider a special use under the Zoning Code to permit the installation of communication antennas and accompanying equipment on the property located at 3990 Huntington Boulevard.

DISTRICT IN WHICH PROPERTY IS LOCATED: R-7, One Family Residential District

ZONING CODE SECTION(S) FOR SPECIAL USE: 9-3-9-A, 9-5-7-C-4

FINDING-OF-FACT: The ZBA found that the Standards for a Special Use (Section 9-1-18) were met.

MOTION: Request to grant the Village of Hoffman Estates (Lessor) and The Everest Group/Sprint, Clearwire (Lessee), ***a special use under Sections 9-3-9-A and 9-5-7-C-4 to permit the installation of two (2) microwave dishes and associated equipment to be no greater than one hundred and thirty four (134) feet high on a Village water tank at 3990 Huntington Boulevard.*** The following conditions shall apply:

1. This special use shall be subject to approval of the final lease agreement with the Village of Hoffman Estates.
2. No advertising shall be allowed on the equipment or structures.
3. The petitioner shall pay all costs associated with the third party review and inspections, as required by the Village's Public Works Department policy.
4. Should the operation of these microwave dishes cease for a period of six (6) months, the dishes and associated equipment shall be removed per Zoning Code Section 9-1-18-L.

The petitioner was agreeable to the above listed conditions.

RECOMMENDATION: The Zoning Board of Appeals (ZBA) recommends approval of this request.

The petitioner, Mr. Faber representing Sprint-Clearwire, requested a special use to install two microwave dish antennas on the water tank. The dishes operate under a different radio band from the existing cellular antennas and are used to carry the increased volumes of data (video and internet) common in modern cell phones. The Zoning Board noted that the prior request at this location, made by Cricket Communications, was denied. The Chairman noted the dissimilarities of this request from the Cricket request in that no new shelter is being constructed

and the dishes are a relatively small installation. The Zoning Board confirmed that the structural report was completed and was accepted by the Village. The Zoning Board confirmed that each dish weighs approximately 45 pounds including the mounting equipment. The Zoning Board recommended approval of the request.

AUDIENCE COMMENTS

None.

VOTE:
7 Ayes
0 Nays
0 Absent

ZONING BOARD OF APPEALS
Chairman William Weaver
Vice-Chairman Ronald Jehlik
Denise Wilson
Michael Ciffone
Masoom Ali
Donna Boomgarden
Michael Gaeta

*** IMMEDIATE AUTHORIZATION TO APPLY FOR PERMITS IS REQUESTED ***

THIS SPECIAL USE WILL EXPIRE UNLESS ACTED UPON WITHIN ONE (1) YEAR OF VILLAGE BOARD APPROVAL

FINDING OF FACT WRITTEN BY DEVELOPMENT SERVICES STAFF

VILLAGE OF HOFFMAN ESTATES

Memo

TO: William Weaver, Zoning Board of Appeals Chairman

FROM: Josh Edwards, Assistant Planner JAE

RE: **SPRINT-CLEARWIRE COMMUNICATIONS - 3990 HUNTINGTON BOULEVARD - SPECIAL USE - COMMUNICATION ANTENNAS AND ASSOCIATED EQUIPMENT**

DATE: December 3, 2009

HEARING DATE: December 8, 2009

---

1. REQUEST SUMMARY

Request by Village of Hoffman Estates (owner) and Sprint-Clearwire Communications (lessee) for a special use to permit the installation of two microwave dishes and associated equipment on a Village owned water tank at 3990 Huntington Boulevard.

2. BACKGROUND

The existing water tank at 3990 Huntington Boulevard currently contains communication antennas installed by Sprint, Nextel, and T-Mobile. One set of existing antennas is mounted on the neck of the structure at a height of 83 feet and the other sets are mounted on top of the tank at 133 feet and 143'6". The equipment for the existing antennas is located near the base of the tank in a shelter to the southwest (Nextel/Sprint), in a shelter to the north (T-Mobile), and on a concrete pad to the north (Sprint).

3. PETITIONER PROPOSAL

The petitioner is proposing to install two, 30 inch high microwave dishes at 134 feet above grade on top of the bulb of the water tank. The installation requires a special use approval. The two dishes would be attached to the existing array of Sprint cellular antennas located at 133 feet high, which includes 9 antennas.

The function of the new dishes is to support and upgrade the Sprint network with voice and data transmission as an alternative to installing miles of underground fiber optic wires throughout the coverage area.

No separate building or equipment is proposed on the ground. The new equipment for the dishes would be installed entirely within the existing brick equipment shelter located southwest of the water tank. Wiring would be installed underground between the shelter and water tank; and within the water tank to the antenna array.

4. SITE CONDITIONS

The subject property is zoned R-7, One Family Residential District. The surrounding properties are zoned R-7, One Family Residential District.

5. APPLICABLE REQUIREMENTS

a) Section 9-5-7-C-4 (p. CD9:78) states that public utility and public service uses shall be permitted in the R-7 District subject to the issuance of a special use permit in accordance with the provisions of Section 9-1-18.

b) Section 9-3-9-A (p. CD9:58) states that the total antenna height of any communications tower, antenna or combination thereof of any height over 45 feet upon Village owned or leased facilities shall be permitted only as a special use.

6. ADJACENT OWNER COMMENTS

Standard notification letters have been mailed and as of this writing no comments have been received.

7. RELEVANT SPECIAL USE HISTORY

Subject Property

a) DENIED - September 2008 - The Village board denied a request by Cricket Communications to install 3 cellular antennas and associated equipment on the ground.

b) Ordinance No. 3871-2006 was granted to allow T-Mobile to erect 12 antennas at a height of 143 feet 6 inches.

c) Ordinance No. 2979-1998 was granted to allow Sprint PCS to erect 9 antennas at a height of 83 feet.

d) Ordinance No. 2930-1997 was granted to allow OneComm Corporation (Nextel) to erect 9 antennas at a height of 133 feet. (Nextel is now a part of Sprint.)

e) Ordinance No. 1361-1982 was granted to allow the Village of Hoffman Estates Police and Fire Departments to erect receiving antennas.

Similar Properties

Over the past decade various communication antennas have been installed on all 6 water tanks throughout the Village.

8. PUBLIC WORKS COMMENTS

A thorough structural analysis and engineering review is required prior to the zoning review for Village owned water tanks. A structural analysis prepared by a licensed engineer on behalf of the petitioner has been reviewed by Public Works and the Village's third party engineering consultants. The structural analysis concluded that the installation will have no adverse impact on the water tank. Public Works has accepted the report.

9. IMMEDIATE AUTHORIZATION TO APPLY FOR PERMIT(S)

The petitioner has requested an Immediate Authorization to Apply for Permit(s).

10. DEVELOPMENT SERVICES COMMENTS

The most recent proposal on this property made by Cricket Communications was denied. This proposal is different from the Cricket proposal in that no new shelter or other equipment is proposed on the ground within view of surrounding residences. The only visible additions will be located above the bulb of the water tank.

The proposal to install dishes onto a water tank rather than erecting a separate antenna tower will minimize visual clutter. The proposed dishes are designed to upgrade the existing antennas. The height and shape of the water tank and the relatively small size of the two dishes will reduce the visibility of the dishes from surrounding properties. The dish is smaller than standard cellular antenna arrays and is comparable in size to a residential television satellite dish and no more aesthetically obtrusive.

The existing special use approval and lease for the existing 9 antennas will stay in effect. A new lease will be required for this new installation.

The Federal Telecommunications Act of 1996 expressly preempts local governments from regulating the placement, construction, or modification of personal wireless services on the basis of environmental or health concerns. Such concerns cannot be discussed or used as a basis of the decision whether to grant a special use.

11. MOTION

Should the Zoning Board find that the Standards for a Special Use are met, the following motion is provided with conditions:

A special use under Sections 9-3-9-A and 9-5-7-C-4 to permit the installation of two (2) microwave dishes and associated equipment to be no greater than one hundred and thirty four (134) feet high on a Village water tank at 3990 Huntington Boulevard.

The following conditions shall apply:

1. ***This special use shall be subject to approval of the final lease agreement with the Village of Hoffman Estates.***
2. ***No advertising shall be allowed on the equipment or structures.***
3. ***The petitioner shall pay all costs associated with the third party review and inspections, as required by the Village's Public Works Department policy.***
4. ***Should the operation of these microwave dishes cease for a period of six (6) months, the dishes and associated equipment shall be removed per Zoning Code Section 9-1-18-L.***

cc: Corporation Counsel, D. O'Malley, D. Plass, R. Norton, Petitioner

CHI5380

VILLAGE OF HOFFMAN ESTATES
ZONING BOARD OF APPEALS

REQUEST FOR SPECIAL USE HEARING

FOR VILLAGE USE ONLY

Hearing Fee $ 400.00 Date Paid 7/9/09 Received By J. EDWARDS

Hearing Date: 12/8/09 Time: 7:30 pm Legal Published _____

Receipt Number 293400 Check No. 104885 Zoning District R-1

PLEASE PRINT OR TYPE

1. Name of Property Owner(s)* Village of Hoffman Estates

E-Mail Address joshua.edwards@hoffmanestates.org Fax 847-490-6868

Owner's Address 1900 Hassell Road Phone 847-882-9100

City Hoffman Estates State IL Zip 60169

Subject Property's Address (if different than #1): 3990 ~~3390~~ Huntington Blvd

2. Person applying if other than owner:*

Name Will Faber Company The Everest Group/ Sprint, Clearwire

E-Mail Address wfaber85@gmail.com Fax 773/409-5426

Address 7013 W. 111th St. Phone 773-987-5299

City Worth State IL Zip 60482

3. Property Index Number (PIN) 03-92-313-244-532

5. Please describe the proposed use, or attach a letter.

Addition of 2 dish antennas to existing telecommunications facility

*** If "owner" is an entity other than an individual(s), then an Economic Disclosure Statement must also be filed.**

6. **An Immediate Authorization to Apply for Permits** allows the Code Enforcement Division to begin the building permit review process prior to the adoption of the Ordinance by the Village Board. The Immediate Authorization makes it possible for you to expedite the plan review process by approximately two weeks. Contact the Code Enforcement Division at 847/781-2631 to discuss the building permit application and review process.

Please check one of the following

☒ Yes, I request Immediate Authorization to Apply for Permits upon approval of my application by the Village Board, allowing me to begin the building permit review process prior to adoption of the Ordinance approving my special use.

Or

☐ No, I do not request Immediate Authorization to Apply for Permits.

7. I, the undersigned, certify the information and submissions provided accurately represent the current conditions and proposed improvement(s) requiring a special use.

Owner's Signature _____

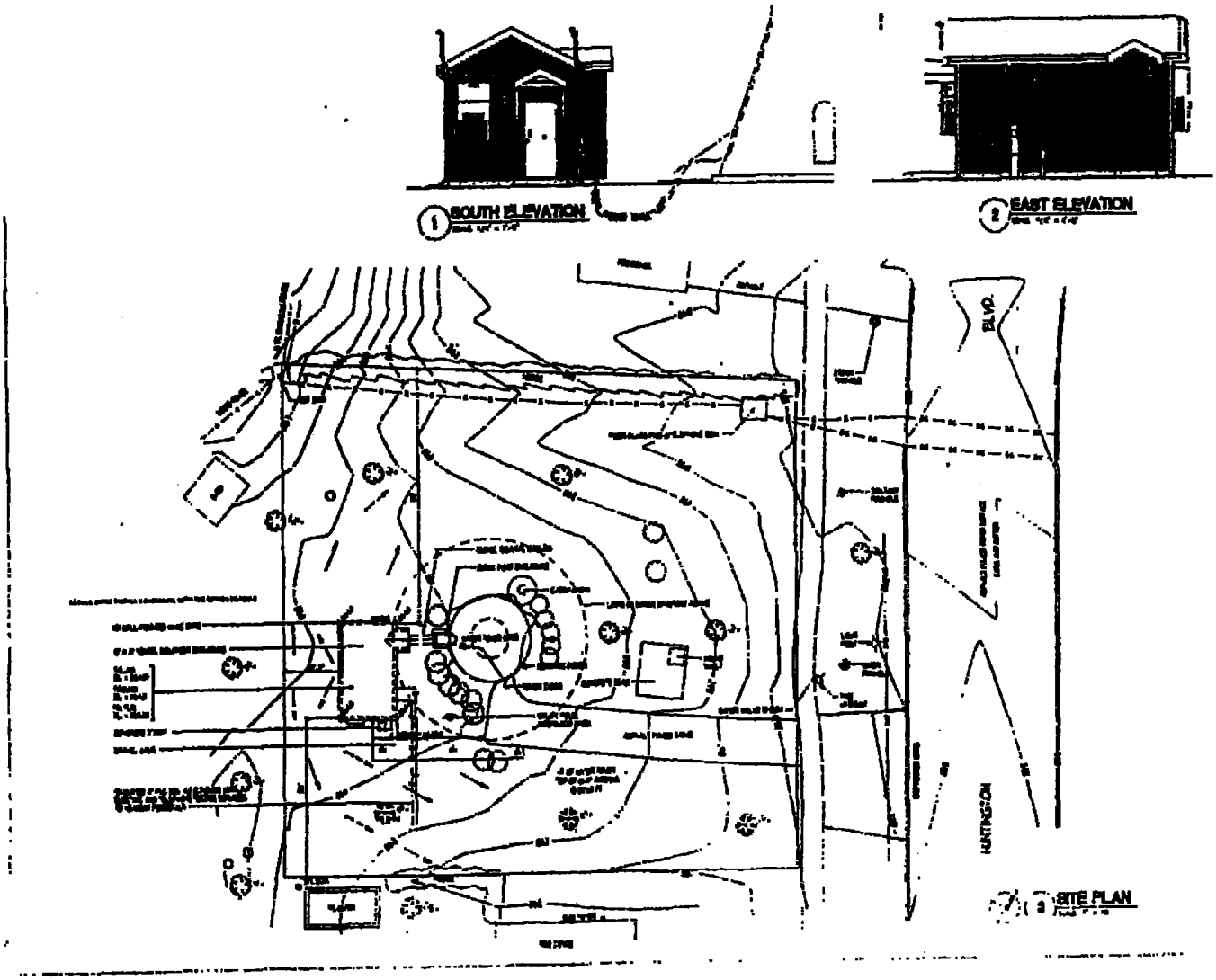
Name (Please Print) Michael Meeley

Applicant's Signature _____

Name (Please Print) William Fale

All requests for a hearing must be accompanied by the items required according to the nature of the request. All fees must be paid before Zoning Board can hear any case. Any additional fees must be paid before any findings or reports are given to the Village Board.

The Premises are described and/or depicted as follows:



INITIALS

Notes:

THE EVEREST GROUP
Representing Sprint/ Clearwire

7013 W 111th St
Worth, IL 60482

773-987-5299

wfaber85@gmail.com

July 8, 2009
Village of Hoffman Estates
1900 Hassell Road
Hoffman Estates, IL 60169

This application for a special use permit on behalf of Sprint/ Clearwire is for the purpose of installing two additional antennas and two lines of associated coaxial cable on the water tank at 3990 Huntington Blvd. The purpose of the communications system upgrade is to facilitate wireless backhaul coverage over the existing Sprint telecommunications network. Effectively, the current T1 system will be replaced with wireless connections between individual communication sites and the central switch. The new antenna will make this linkage possible, thereby lowering costs to consumers and increasing the reliability and robustness of the existing and future data network.

Sincerely yours,

Will Faber

The Everest Group

DEPARTMENT OF PUBLIC WORKS

Memo

TO: Don Plass, Director of Code Enforcement

FROM: Kenneth Hari, Director of Public Works

RE: **CLEARWIRE ANTENNA INSTALLATIONS**

DATE: October 16, 2009

☐ **Urgent** ☒ **For Review** ☐ **Please Comment** ☐ **Please Reply** ☒ **Enclosure(s)**

I have reviewed the proposed projects, including the upgrade load evaluations report issued by Robert Wozniak and the plan review completed by SEH, and concluded that the installations will have no adverse impact on the respective tower located at Huntington Blvd.. Accordingly, a construction permit may be issued for the Huntington Blvd. facility subject to the following:

- ***Before construction may begin, the installation contractor must attend a pre-construction meeting with Public Works Staff.***
- ***During construction, the tower site at ground level must be clean at all times with no equipment or construction materials stored on site at any time.***

In accordance with the above, an antenna installation permit(s) may be released.

Kenneth Hari, Director of Public Works

Dir/Corr09/ClearwireAntennaInstall 101309

cc: w/o Attachments
Joseph Nebel, Superintendent of Operations
Haileng Xiao, Superintendent of Water & Sewer
Josh Edwards, Planner

HOFFMAN ESTATES

GROWING TO GREATNESS

November 5, 2009

To All Interested Parties:

Please be advised the Zoning Board of Appeals of the Village of Hoffman Estates will conduct a public hearing at the request of the Village of Hoffman Estates (Lessor) and The Everest Group/Sprint, Clearwire (Lessee) to consider a special use under the Zoning Code to permit the installation of two 30 inch dish antennas (data) on the existing water tower at ±134 feet in height and accompanying equipment installed within an existing brick shelter on the property located at 3990 Huntington Boulevard.

The hearing will be held in the Municipal Building, 1900 Hassell Road, Hoffman Estates, Illinois, **Tuesday, November 17, 2009 at 7:30 p.m.**

A map designating the subject site is included on the back of this letter. Appropriate time will be available for questions/comments from interested parties. Should you wish any additional information, please feel free to contact the Planning Division at 847/781-2660. Material is available at the office for review.

Should it become necessary to continue this hearing to an additional date, it will be announced at the conclusion of testimony at the hearings. No further notification of this review will be sent.

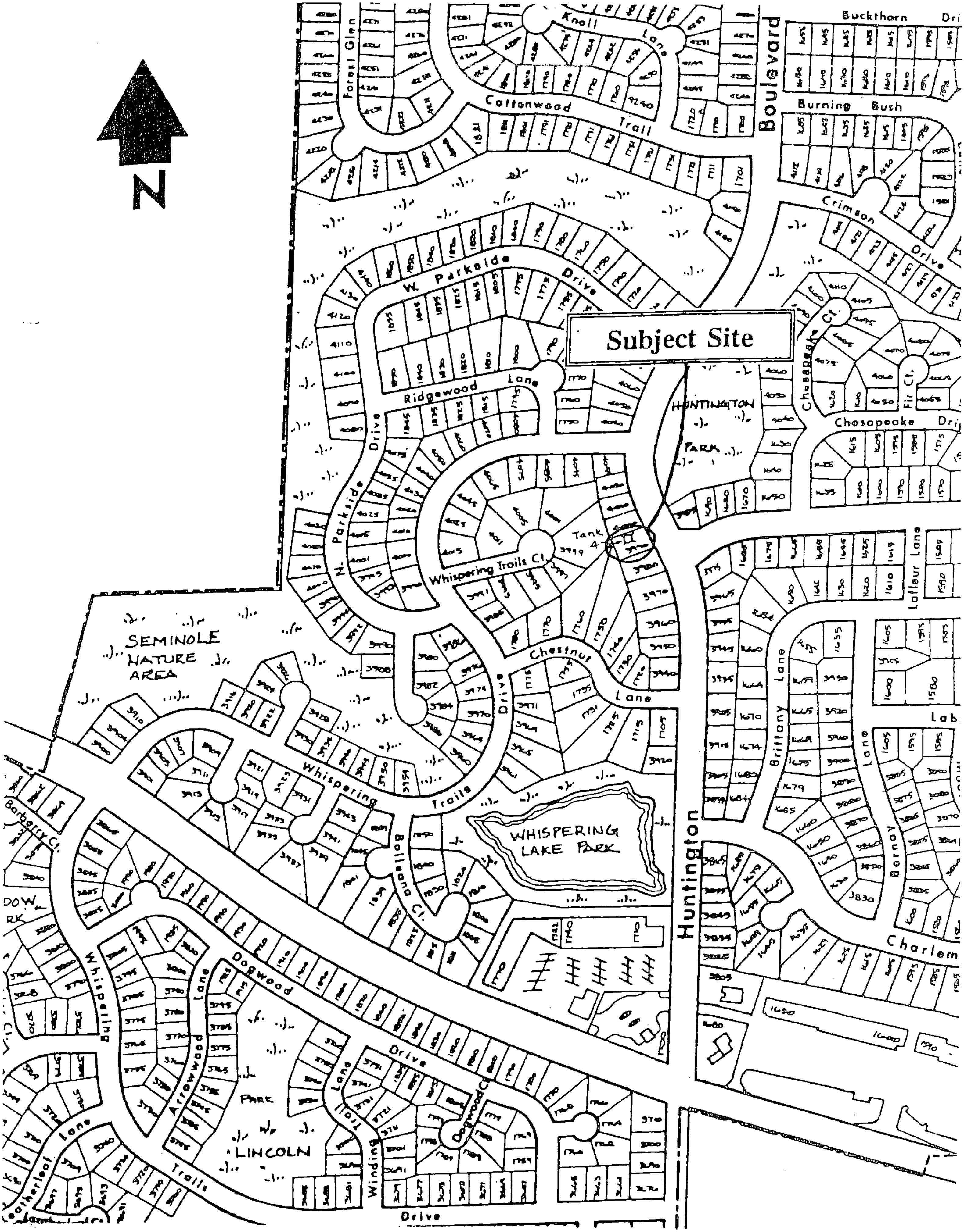
Sincerely,

Josh Edwards, Assistant Planner
Department of Development Services

JE/pm

1900 Hassell Road
Hoffman Estates, Illinois 60169
www.hoffmanestates.org

Phone: 847-882-9100
Fax: 847-843-4822


N
Subject Site
Knoll Lane
Buckthorn Dri
Forest Glen
Cottonwood Trail
Boulevard
Burning Bush
Crimson Drive
W. Parkside Drive
Ridgewood Lane
Chesapeake Ct.
Fir Ct.
Chesapeake Dri
HUNTINGTON PARK
N. Parkside Drive
Whispering Trails Ct.
Tank 4
Chestnut Lane
Lafleur Lane
SEMINOLE NATURE AREA
Brittany Lane
Lane
Whispering Trails Drive
Bolleaux Ct.
WHISPERING LAKE PARK
Huntington
Bernay
Charlem
Barberry Ct.
Dogwood Lane
Whispering
Arrowwood Lane
Dogwood Ct.
Winding Trail Lane
Drive
PARK
LINCOLN
Featherleaf Lane
Trails
Drive

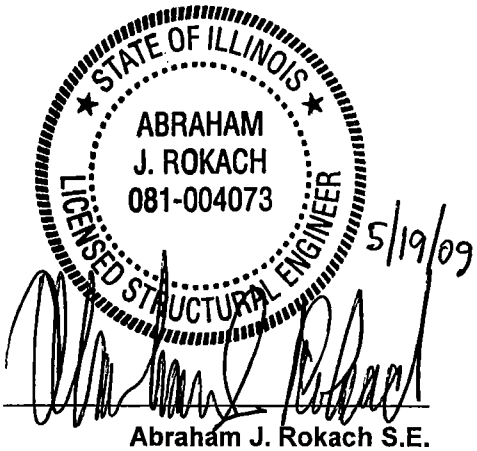
Structural Report

Prepared for: Clear Wireless LLC.

Existing 125 ft. Pedisphere

Clearwire Site No. IL-CHI5380A (IL3759)
Hoffman Estates
3990 Huntington Boulevard
Hoffman Estates, Cook Co., IL 30195

May 19, 2009



Abraham J. Rokach S.E.
Illinois SE License No. 081-04073
Expires 11/30/2010

I certify that this report was prepared by me, or under my direct supervision and control, and, to the best of my knowledge and belief, complies with the requirements of the applicable building code.

Fullerton
Engineering Consultants

9700 West Higgins Road, Suite 800, Rosemont, IL 60018
Phone: (847) 292 0200 Fax: (847) 292 0205

Project Summary

Scope:

Structural analysis of existing 125 ft. water tower under proposed antenna configuration.

Design Criteria:

1. International Building Code, 2006 Edition
2. AWWA-D100-05
3. TIA/EIA-222-F 1996

New Equipment Loads:

Antenna:	(1) - 2 ft. Dish @ centerline 132' AGL (1) - 2.5 ft. Dish @ centerline 128' AGL (2) - 2" Diameter Innerduct w/ cables

Design Loads:

Basic Wind Speed	76 mph (fastest mile) / 90 mph (3-second gust), for appurtenance, per TIA/EIA-222-F 1996. 100 mph (fastest mile) / 120 mph (3-second gust), for water tower structure, per ANSI/AWWA D100-96.

Reference:

Water Tower Drawing, by CB&I, contract no. 61393, dated 1977.

Conclusion:

The structural analysis shows that new dish antenna installation will increase the stresses on the existing water tank. Based on the following calculations, the existing water tank structure, including anchor bolts, are still **adequate** for new loads.

Structural Analysis on Existing Water Tank

Wind Speed

Effective Wind Speed for Water Tank Supports (AWWA-D100-96)	$V_{eff} := 100mph$
Wind Speed For Antennas (TIA-EIA-222-F)	$V_{app} := 76mph$

Material Properties

Material	**(36 ksi)**
Modulus of Elasticity	$E := 29000ksi$

Shape Coefficient for Water Tank Structure

Effective Area Coeffiecient (Flat)	$C_{d\_flat} := 1$
Effective Area Coeffiecient (Cylindrical)	$C_{d\_cyl} := 0.6$
Effective Area Coeffiecient (Sphere)	$C_{d\_sphere} := 0.5$

Water Tank Dimensions

Water Tank

Tank Capacity		$Vol := 250000gal$
Average Tank Diameter		$d_{tank} := 44ft$
Tank Height		$h_{tank} := 32ft$
Top of Roof		$H_{roof} := 124ft$
Top of Capacity Level		$H_{TCL} := 119ft$
Bottom of Capacity Level		$H_{BCL} := 88ft$
Mean Height of Water Tank	$H_{mean} := \frac{H_{TCL} + H_{BCL}}{2}$	$H_{mean} = 103.5\,ft$

Shaft

Diameter of Shaft		$d_{inner} := 9ft$
Shaft Wall Thickness		$t_{shaft} := 0.8in$
Inner Diameter of Shaft	$d_{shaft} := d_{inner} + 2 \cdot t_{shaft}$	$d_{shaft} = 9.13\,ft$
Length of Shaft		$L_{shaft} := 67ft$

Bell

Height of Bell	$h_{bell} := 16ft$
Diameter of Bell	$d_{bell} := 19ft$

Bolt Circle

Diameter of Bolt Circle	$d_{circle} := 19.5ft$
Number of Bolts	$N_{bolt} := 12$
Diameter of Bolts	$d_{bolt} := 1.875in$

Shaft Properties

Radius of Gyration

$$r_{shaft} := \sqrt{\frac{d_{shaft}^2 + d_{inner}^2}{4}} \qquad r_{shaft} = 76.94 \cdot in$$

Slenderness Ratio

$$KL_r := \frac{K \cdot L_{shaft}}{r_{shaft}} \qquad KL_r = 20.9$$

Elastic Section Modulus

$$S_{shaft} := \frac{\pi \cdot \left(d_{shaft}^4 - d_{inner}^4\right)}{32 \cdot d_{shaft}} \qquad S_{shaft} = 7383.8 \cdot in^3$$

Gross Area

$$A_{g\_shaft} := \pi \cdot d_{inner} \cdot t_{shaft} \qquad A_{g\_shaft} = 271.43 \cdot in^2$$

Radius to Thickness Ratio

$$R_{shaft} := \frac{d_{shaft}}{2} \qquad \frac{t_{shaft}}{R_{shaft}} = 0.0146$$

Wind Load on Structures

Wind Pressure

Flat

$$P_{flat} := 30 \cdot C_{d\_flat} \cdot \left(\frac{V_{eff}}{100mph}\right)^2 \cdot psf \qquad P_{flat} = 30 \cdot psf$$

Cylindrical

$$P_{cyl} := 30 \cdot C_{d\_cyl} \cdot \left(\frac{V_{eff}}{100mph}\right)^2 \cdot psf \qquad P_{cyl} = 18 \cdot psf$$

Sphere

$$P_{sphere} := 30 \cdot C_{d\_sphere} \cdot \left(\frac{V_{eff}}{100mph}\right)^2 \cdot psf \qquad P_{sphere} = 15 \cdot psf$$

Wind Projected Area

Tank

$$A_{tank} := \frac{\pi \cdot d_{tank}^2}{4} \qquad A_{tank} = 1520.53\,ft^2$$

Shaft

$$A_{shaft} := L_{shaft} \cdot d_{shaft} \qquad A_{shaft} = 611.93\,ft^2$$

Bell

$$A_{bell} := \frac{d_{shaft} + d_{bell}}{2} \cdot h_{bell} \qquad A_{bell} = 225.07\,ft^2$$

Wind Load

Tank

$$F_{tank} := A_{tank} \cdot P_{sphere} \qquad F_{tank} = 22.81 \cdot kip$$

Shaft

$$F_{shaft} := A_{shaft} \cdot P_{cyl} \qquad F_{shaft} = 11.01 \cdot kip$$

Bell

$$F_{bell} := A_{bell} \cdot P_{cyl} \qquad F_{bell} = 4.05 \cdot kip$$

Antenna Load Summary

$$Carrier = \begin{pmatrix} \text{"Carrier 1"} \\ \text{"(Double Pod)"} \\ \text{"Sprint"} \\ \text{"Sprint"} \\ \text{"Clearwire 1"} \\ \text{"Clearwire 1"} \\ \text{"Carrier 2"} \end{pmatrix} \quad Elev\_Ant = \begin{pmatrix} 140 \\ 130 \\ 128 \\ 128 \\ 132 \\ 132 \\ 80 \end{pmatrix} ft \quad Num\_Ant = \begin{pmatrix} 9 \\ 0 \\ 6 \\ 3 \\ 1 \\ 1 \\ 9 \end{pmatrix} \quad Num\_Cable = \begin{pmatrix} 9 \\ 0 \\ 6 \\ 3 \\ 1 \\ 1 \\ 9 \end{pmatrix}$$

$$Antenna = \begin{pmatrix} \text{"6 ft. Panel Antennas"} \\ \text{"None"} \\ \text{"EMS RR65-12-XXXBL"} \\ \text{"CSS CSS-XS4-65-R"} \\ \text{"2 ft. Dish"} \\ \text{"2.5 ft. Dish"} \\ \text{"6 ft. Panel Antennas"} \end{pmatrix} \quad Height = \begin{pmatrix} 72 \\ 0 \\ 48 \\ 48 \\ 24 \\ 30 \\ 72 \end{pmatrix} \cdot in \quad Width = \begin{pmatrix} 8 \\ 0 \\ 12 \\ 6.7 \\ 24 \\ 30 \\ 8 \end{pmatrix} \cdot in \quad Depth = \begin{pmatrix} 4 \\ 0 \\ 7 \\ 4.1 \\ 6 \\ 8 \\ 4 \end{pmatrix} \cdot in \quad Weight = \begin{pmatrix} 32 \\ 0 \\ 25 \\ 26 \\ 15 \\ 32 \\ 32 \end{pmatrix} lb$$

$$Mount = \begin{pmatrix} \text{"Mini Monopole"} \\ \text{"Pod Mount"} \\ \text{"Water Tower Rooftop Assembly"} \\ \text{"None"} \\ \text{"Single Water Tank Mount"} \\ \text{"Single Water Tank Mount"} \\ \text{"Single Water Tank Mount"} \end{pmatrix} \quad Num\_Mnt = \begin{pmatrix} 1 \\ 2 \\ 1 \\ 1 \\ 1 \\ 1 \\ 6 \end{pmatrix} \quad A\_Mnt = \begin{pmatrix} 16 \\ 20 \\ 20 \\ 0 \\ 3 \\ 3 \\ 3 \end{pmatrix} ft^2 \quad Wt\_Mnt = \begin{pmatrix} 1532 \\ 3000 \\ 1000 \\ 0 \\ 80 \\ 80 \\ 80 \end{pmatrix} lb$$

Force Coefficient on Appurtenance

$Ca(As, F) :=$

$Ca \leftarrow 0$

if $F = 1$

$Ca \leftarrow 1.4$ if $As < 7$

$Ca \leftarrow 2.0$ if $As > 25$

$Ca \leftarrow 1.4 + \frac{(As - 7)}{18} \cdot 0.6$ otherwise

otherwise

$Ca \leftarrow 0.8$ if $As < 7$

$Ca \leftarrow 1.2$ if $As > 25$

$Ca \leftarrow 0.8 + \frac{(As - 7)}{18} \cdot 0.4$ otherwise

Ca

Wind Pressure on Appurtenance

$$P\_Ant := \left| \begin{array}{l} \text{for } i \in 1..N \\ \left| \begin{array}{l} Kz_i \leftarrow \left(\frac{Elev\_Ant_i}{33\,ft}\right)^{0.2857} \\ qz_i \leftarrow \left[0.00256 \cdot Kz \cdot \left(\frac{V_{app}}{mph}\right)^2\right] \cdot psf \\ Gh_i \leftarrow 0.65 + \frac{0.6}{\left(\frac{Elev\_Ant_i}{33\,ft}\right)^{0.1429}} \\ P \leftarrow qz_i \cdot Gh_i \end{array} \right. \\ P \end{array} \right.$$

$$P\_Ant = \begin{pmatrix} 26.34 \\ 25.79 \\ 25.67 \\ 25.67 \\ 25.9 \\ 25.9 \\ 22.45 \end{pmatrix} \cdot psf$$

New Appurtenance

$C := 1$

Antenna 1

$Carrier_C$ = "Carrier 1"

$n := 1$ $F := 1$

Model / Quantity

$Antenna_n$ = "6 ft. Panel Antennas"

$Elev\_Ant_n = 140\,ft$

Dimension

$Height_n = 72 \cdot in$ $Width_n = 8 \cdot in$ $Depth_n = 4 \cdot in$ $Weight_n = 32\,lb$

Number of Antennas & Cables

$Num\_Ant_n = 9$ $Num\_Cable_n = 9$

Aspect Ratio & Force Coefficient

$As := \frac{Height_n}{Width_n}$ $As = 9$ $CA := Ca(As, F)$ $CA = 1.47$

Area / Antenna:

$A\_ant_n := CA\,Height_n \cdot Width_n$ $A\_ant_n = 5.87\,ft^2$

Platform

Model & Quantity

$Mount_C$ = "Mini Monopole"

$Num\_Mnt_C = 1$

$Wt\_Mnt_C = 1532\,lb$ $A\_Mnt_C = 16\,ft^2$

New Appurtenance Load

Total Area of Appurtenance

$$A\_app_C := \sum_{i=1}^{1} \left(Num\_Ant_i \cdot A\_ant_i + Num\_Mnt_i \cdot A\_Mnt_i\right) \quad A\_app_C = 68.8\,ft^2$$

Total Weight of Appurtenance

$$W\_app_C := \sum_{i=1}^{1} \left(Num\_Ant_i \cdot Weight_i + Num\_Mnt_i \cdot Wt\_Mnt_i\right) \quad W\_app_C = 1820\,lb$$

Existing Appurtenance $C := 2$

Antenna 2 $Carrier_C = \text{"(Double Pod)"}$ $n := 2$ $F := 1$

Model $Antenna_n = \text{"None"}$ $Elev\_Ant_n = 130\,ft$

Dimension $Height_n = 0 \cdot in$ $Width_n = 0 \cdot in$ $Depth_n = 0 \cdot in$ $Weight_n = 0\,lb$

Number of Antennas & Cables $Num\_Ant_n = 0$ $Num\_Cable_n = 0$

Aspect Ratio: $As := \frac{Height_n}{Width_n}$ $As = 0$

Force Coeffiecient $CA := Ca(As, F)$ $CA = 1.4$

Area / Antenna: $A\_ant_n := CA\, Height_n \cdot Width_n$ $A\_ant_n = 0\,ft^2$

Platform

Model & Quantity $Mount_C = \text{"Pod Mount"}$ $Num\_Mnt_C = 2$

$Wt\_Mnt_C = 3000\,lb$ $A\_Mnt_C = 20\,ft^2$

Existing Appurtenance Load

Total Area of Appurtenance $A\_app_C := \sum_{i=2}^{2} \left(Num\_Ant_i \cdot A\_ant_i + Num\_Mnt_i \cdot A\_Mnt_i\right)$ $A\_app_C = 40\,ft^2$

Total Weight of Appurtenance $W\_app_C := \sum_{i=2}^{2} \left(Num\_Ant_i \cdot Weight_i + Num\_Mnt_i \cdot Wt\_Mnt_i\right)$ $W\_app_C = 6000\,lb$

Existing Appurtenance $C := 3$

Antenna 3 $Carrier_C = \text{"Sprint"}$ $n := 3$ $F := 1$

Model / Quantity $Antenna_n = \text{"EMS RR65-12-XXXBL"}$ $Elev\_Ant_n = 128\,ft$

Dimension $Height_n = 48 \cdot in$ $Width_n = 12 \cdot in$ $Depth_n = 7 \cdot in$ $Weight_n = 25\,lb$

Number of Antennas & Cables $Num\_Ant_n = 6$ $Num\_Cable_n = 6$

Aspect Ratio & Force Coefficient $As := \frac{Height_n}{Width_n}$ $As = 4$ $CA := Ca(As, F)$ $CA = 1.4$

Area / Antenna: $A\_ant_n := CA\, Height_n \cdot Width_n$ $A\_ant_n = 5.6\,ft^2$

Platform

Model & Quantity $Mount_C = \text{"Water Tower Rooftop Assembly"}$ $Num\_Mnt_C = 1$

$Wt\_Mnt_C = 1000\,lb$ $A\_Mnt_C = 20\,ft^2$

Existing Appurtenance Load

Total Area of Appurtenance $A\_app_C := \sum_{i=3}^{3} (Num\_Ant_i \cdot A\_ant_i + Num\_Mnt_i \cdot A\_Mnt_i)$ $A\_app_C = 53.6\,ft^2$

Total Weight of Appurtenance $W\_app_C := \sum_{i=3}^{3} (Num\_Ant_i \cdot Weight_i + Num\_Mnt_i \cdot Wt\_Mnt_i)$ $W\_app_C = 1150\,lb$

Existing Appurtenance $C := 4$

Antenna 4 $Carrier_C = "Sprint"$ $n := 4$ $F := 1$

Model / Quantity $Antenna_n = "CSS\ CSS\text{-}XS4\text{-}65\text{-}R"$ $Elev\_Ant_n = 128\,ft$

Dimension $Height_n = 48 \cdot in$ $Width_n = 6.7 \cdot in$ $Depth_n = 4.1 \cdot in$ $Weight_n = 26\,lb$

Number of Antennas & Cables $Num\_Ant_n = 3$ $Num\_Cable_n = 3$

Aspect Ratio & Force Coefficient $As := \frac{Height_n}{Width_n}$ $As = 7.16$ $CA := Ca(As, F)$ $CA = 1.41$

Area / Antenna: $A\_ant_n := CA\, Height_n \cdot Width_n$ $A\_ant_n = 3.14\,ft^2$

Platform

Model & Quantity $Mount_C = "None"$ $Num\_Mnt_C = 1$

$Wt\_Mnt_C = 0\,lb$ $A\_Mnt_C = 0\,ft^2$

Existing Appurtenance Load

Total Area of Appurtenance $A\_app_C := \sum_{i=4}^{4} (Num\_Ant_i \cdot A\_ant_i + Num\_Mnt_i \cdot A\_Mnt_i)$ $A\_app_C = 9.42\,ft^2$

Total Weight of Appurtenance $W\_app_C := \sum_{i=4}^{4} (Num\_Ant_i \cdot Weight_i + Num\_Mnt_i \cdot Wt\_Mnt_i)$ $W\_app_C = 78\,lb$

Existing Appurtenance $C := 5$

Antenna 5 $Carrier_C = "Clearwire\ 1"$ $n := 5$ $F := 1$

Model / Quantity $Antenna_n = "2\ ft.\ Dish"$ $Elev\_Ant_n = 132\,ft$

Dimension $Height_n = 24 \cdot in$ $Width_n = 24 \cdot in$ $Depth_n = 6 \cdot in$ $Weight_n = 15\,lb$

Number of Antennas & Cables $Num\_Ant_n = 1$ $Num\_Cable_n = 1$

Aspect Ratio & Force Coefficient $As := \frac{Height_n}{Width_n}$ $As = 1$ $CA := Ca(As, F)$ $CA = 1.4$

Area / Antenna: $A\_ant_n := CA\,Height_n \cdot Width_n$ $A\_ant_n = 5.6\,ft^2$

Platform

Model & Quantity $Mount_C$ = "Single Water Tank Mount" $Num\_Mnt_C = 1$

$Wt\_Mnt_C = 80\,lb$ $A\_Mnt_C = 3\,ft^2$

Existing Appurtenance Load

Total Area of Appurtenance $A\_app_C := \sum_{i=5}^{5} \left(Num\_Ant_i \cdot A\_ant_i + Num\_Mnt_i \cdot A\_Mnt_i\right)$ $A\_app_C = 8.6\,ft^2$

Total Weight of Appurtenance $W\_app_C := \sum_{i=5}^{5} \left(Num\_Ant_i \cdot Weight_i + Num\_Mnt_i \cdot Wt\_Mnt_i\right)$ $W\_app_C = 95\,lb$

Existing Appurtenance $C := 6$

Antenna 6 $Carrier_C$ = "Clearwire 1" $n := 6$ $F := 1$

Model / Quantity $Antenna_n$ = "2.5 ft. Dish" $Elev\_Ant_n = 132\,ft$

Dimension $Height_n = 30 \cdot in$ $Width_n = 30 \cdot in$ $Depth_n = 8 \cdot in$ $Weight_n = 32\,lb$

Number of Antennas & Cables $Num\_Ant_n = 1$ $Num\_Cable_n = 1$

Aspect Ratio & Force Coefficient $As := \frac{Height_n}{Width_n}$ $As = 1$ $CA := Ca(As, F)$ $CA = 1.4$

Area / Antenna: $A\_ant_n := CA\,Height_n \cdot Width_n$ $A\_ant_n = 8.75\,ft^2$

Platform

Model & Quantity $Mount_C$ = "Single Water Tank Mount" $Num\_Mnt_C = 1$

$Wt\_Mnt_C = 80\,lb$ $A\_Mnt_C = 3\,ft^2$

Existing Appurtenance Load

Total Area of Appurtenance $A\_app_C := \sum_{i=6}^{6} \left(Num\_Ant_i \cdot A\_ant_i + Num\_Mnt_i \cdot A\_Mnt_i\right)$ $A\_app_C = 11.75\,ft^2$

Total Weight of Appurtenance $W\_app_C := \sum_{i=6}^{6} \left(Num\_Ant_i \cdot Weight_i + Num\_Mnt_i \cdot Wt\_Mnt_i\right)$ $W\_app_C = 112\,lb$

Existing Appurtenance

$C := 7$

Antenna 7

$Carrier_C$ = "Carrier 2"

$n := 7$ $F := 1$

Model / Quantity

$Antenna_n$ = "6 ft. Panel Antennas"

$Elev\_Ant_n = 80\,ft$

Dimension

$Height_n = 72 \cdot in$ $Width_n = 8 \cdot in$ $Depth_n = 4 \cdot in$ $Weight_n = 32\,lb$

Number of Antennas & Cables

$Num\_Ant_n = 9$ $Num\_Cable_n = 9$

Aspect Ratio & Force Coefficient

$As := \frac{Height_n}{Width_n}$ $As = 9$ $CA := Ca(As, F)$ $CA = 1.47$

Area / Antenna:

$A\_ant_n := CA\,Height_n \cdot Width_n$ $A\_ant_n = 5.87\,ft^2$

Platform

Model & Quantity

$Mount_C$ = "Single Water Tank Mount"

$Num\_Mnt_C = 6$

$Wt\_Mnt_C = 80\,lb$ $A\_Mnt_C = 3\,ft^2$

Existing Appurtenance Load

Total Area of Appurtenance

$$A\_app_C := \sum_{i=7}^{7} \left(Num\_Ant_i \cdot A\_ant_i + Num\_Mnt_i \cdot A\_Mnt_i\right) \quad A\_app_C = 70.8\,ft^2$$

Total Weight of Appurtenance

$$W\_app_C := \sum_{i=7}^{7} \left(Num\_Ant_i \cdot Weight_i + Num\_Mnt_i \cdot Wt\_Mnt_i\right) \quad W\_app_C = 768\,lb$$

Summary of Loads

Appurtenance Wind Load & Weight

$$Carrier = \begin{pmatrix} \text{"Carrier 1"} \\ \text{"(Double Pod)"} \\ \text{"Sprint"} \\ \text{"Sprint"} \\ \text{"Clearwire 1"} \\ \text{"Clearwire 1"} \\ \text{"Carrier 2"} \end{pmatrix} \qquad F\_Ant := \left| \begin{array}{l} \text{for } i \in 1..C \\ \quad F_i \leftarrow A\_app_i \cdot P\_Ant_i \\ F \end{array} \right. \qquad F\_Ant = \begin{pmatrix} 1.81 \\ 1.03 \\ 1.38 \\ 0.24 \\ 0.22 \\ 0.3 \\ 1.59 \end{pmatrix} \cdot kip \qquad W\_app = \begin{pmatrix} 1820 \\ 6000 \\ 1150 \\ 78 \\ 95 \\ 112 \\ 768 \end{pmatrix} lb$$

Total Antenna Wind Load

$$F\_Ant_{total} := \sum_{i=1}^{C} F\_Ant_i \qquad F\_Ant_{total} = 6.58 \cdot kip$$

Total Weight of Appurtenance

$$W\_App_{total} := \sum_{i=1}^{C} W\_app_i \qquad W\_App_{total} = 10.02 \cdot kip$$

Structure	Wind Load	Weight	
	$F_{tank} = 22.81 \cdot kip$		
	$F_{shaft} = 11.01 \cdot kip$		
	$F_{bell} = 4.05 \cdot kip$		
		$W_{water} := 62.4pcf \cdot Vol$	$W_{water} = 2085.42 \cdot kip$
		$W_{structure} := 10\% \cdot W_{water}$	$W_{structure} = 208.54 \cdot kip$

Overturning Moment right above the Bell

$$M_{tank} := F_{tank} \cdot (H_{mean} - h_{bell}) \qquad M_{tank} = 1995.7 \cdot kip \cdot ft$$

$$M_{shaft} := F_{shaft} \cdot \frac{L_{shaft}}{2} \qquad M_{shaft} = 369 \cdot kip \cdot ft$$

$$M\_Ant\_bell_1 := F\_Ant_1 \cdot (Elev\_Ant_1 - h_{bell}) \qquad M\_Ant\_bell_1 = 224.69 \cdot kip \cdot ft$$

$$M\_Ant\_bell_2 := F\_Ant_2 \cdot (Elev\_Ant_2 - h_{bell}) \qquad M\_Ant\_bell_2 = 117.58 \cdot kip \cdot ft$$

$$M\_Ant\_bell_3 := F\_Ant_3 \cdot (Elev\_Ant_3 - h_{bell}) \qquad M\_Ant\_bell_3 = 154.11 \cdot kip \cdot ft$$

$$M\_Ant\_bell_4 := F\_Ant_4 \cdot (Elev\_Ant_4 - h_{bell}) \qquad M\_Ant\_bell_4 = 27.08 \cdot kip \cdot ft$$

$$M\_Ant\_bell_5 := F\_Ant_5 \cdot (Elev\_Ant_5 - h_{bell}) \qquad M\_Ant\_bell_5 = 25.84 \cdot kip \cdot ft$$

$$M\_Ant\_bell_6 := F\_Ant_6 \cdot (Elev\_Ant_6 - h_{bell}) \qquad M\_Ant\_bell_6 = 35.3 \cdot kip \cdot ft$$

$$M\_Ant\_bell_7 := F\_Ant_7 \cdot (Elev\_Ant_7 - h_{bell}) \qquad M\_Ant\_bell_7 = 101.71 \cdot kip \cdot ft$$

Total Overturning Moment

$$M_{total\_bell} := M_{tank} + M_{shaft} + \sum_{i=1}^{C} M\_Ant\_bell_i \qquad M_{total\_bell} = 3051 \cdot kip \cdot ft$$

Overturning Moment at Anchor Bolts Level

$M_{tank} := F_{tank} \cdot H_{mean}$ $M_{tank} = 2360.62 \cdot kip \cdot ft$

$M_{shaft} := F_{shaft} \cdot \left(\frac{L_{shaft}}{2} + h_{bell} \right)$ $M_{shaft} = 545.23 \cdot kip \cdot ft$

$M_{bell} := F_{bell} \cdot \frac{h_{bell}}{2}$ $M_{bell} = 32.41 \cdot kip \cdot ft$

$M\_Ant\_anch_1 := F\_Ant_1 \cdot Elev\_Ant_1$ $M\_Ant\_anch_1 = 253.68 \cdot kip \cdot f$

$M\_Ant\_anch_2 := F\_Ant_2 \cdot Elev\_Ant_2$ $M\_Ant\_anch_2 = 134.09 \cdot kip \cdot f$

$M\_Ant\_anch_3 := F\_Ant_3 \cdot Elev\_Ant_3$ $M\_Ant\_anch_3 = 176.13 \cdot kip \cdot f$

$M\_Ant\_anch_4 := F\_Ant_4 \cdot Elev\_Ant_4$ $M\_Ant\_anch_4 = 30.94 \cdot kip \cdot ft$

$M\_Ant\_anch_5 := F\_Ant_5 \cdot Elev\_Ant_5$ $M\_Ant\_anch_5 = 29.4 \cdot kip \cdot ft$

$M\_Ant\_anch_6 := F\_Ant_6 \cdot Elev\_Ant_6$ $M\_Ant\_anch_6 = 40.17 \cdot kip \cdot ft$

$M\_Ant\_anch_7 := F\_Ant_7 \cdot Elev\_Ant_7$ $M\_Ant\_anch_7 = 127.13 \cdot kip \cdot f$

Total Overturning Moment $M_{total\_anchor} := M_{tank} + M_{shaft} + M_{bell} + \sum_{i=1}^{C} M\_Ant\_anch_i$ $M_{total\_anchor} = 3729.81 \cdot kip \cdot ft$

Allowable Stresses on Shaft

Allowable Local Buckling Stress per AWWA-D100-96 Class II Material $F_L := 18ksi$

Slenderness Reduction Factor

$$K_\psi := \begin{cases} C_c \leftarrow \sqrt{\frac{\pi^2 \cdot E}{F_L}} \\ K \leftarrow 1 - \frac{1}{2} \cdot \left(\frac{KL_r}{C_c} \right)^2 \quad \text{if} \quad 25 < KL_r \le C_c \\ K \leftarrow \frac{1}{2} \cdot \left(\frac{KL_r}{C_c} \right)^2 \quad \text{if} \quad KL_r > C_c \\ K \leftarrow 1 \quad \text{if} \quad KL_r \le 25 \\ K \end{cases}$$

$K_\psi = 1$

Allowable Axial Stress $F_{a\_shaft} := F_L \cdot K_\psi$ $F_{a\_shaft} = 18 \cdot ksi$

Allowable Shear Stress $F_{v\_shaft} := F_L$ $F_{v\_shaft} = 18 \cdot ksi$

Allowable Bending Stress $F_{b\_shaft} := F_L$ $F_{b\_shaft} = 18 \cdot ksi$

Stress Analysis

Shear Stress

$$f_{v\_shaft} := \frac{F_{tank} + F_{shaft} + F\_Ant_{total}}{A_{g\_shaft}}$$

$f_{v\_shaft} = 0.15 \cdot ksi$

$f_{v\_shaft} < F_{v\_shaft} = 1$ CHECK = "Shaft is adequate for shear loads"

Axial Stress

$$f_{a\_shaft} := \frac{W_{water} + W_{structure} + W\_App_{total}}{A_{g\_shaft}}$$

$f_{a\_shaft} = 8.49 \cdot ksi$

$f_{a\_shaft} < F_{a\_shaft} = 1$ CHECK = "Shaft is adequate for axial loads"

Bending Stress

$M_{total} := M_{total\_bell}$ $M_{total} = 3051 \cdot kip \cdot ft$

$$f_{b\_shaft} := \frac{M_{total}}{S_{shaft}}$$

$f_{b\_shaft} = 4.96 \cdot ksi$

$f_{b\_shaft} < F_{b\_shaft} = 1$ CHECK = "Shaft is adequate for bending"

Combined Stresses (Increased by 1.33 for wind)

$$Stress := \frac{f_{a\_shaft}}{1.33F_{a\_shaft}} + \frac{f_{b\_shaft}}{1.33F_{b\_shaft}}$$

$Stress = 56.17 \cdot \%$

Load Increases Due to Antennas

Incease in Lateral Load

$$\%V := \frac{F\_Ant_{total}}{F_{tank} + F_{shaft} + F_{bell}}$$

$\%V = 17.37 \cdot \%$

Incease in Axial Load

$$\%P := \frac{W\_App_{total}}{W_{water} + W_{structure}}$$

$\%P = 0.44 \cdot \%$

Incease in Moment Load

$$\%M := \frac{\sum_{i=1}^{C} M\_Ant\_anch_i}{M_{tank} + M_{shaft}}$$

$\%M = 27.24 \cdot \%$

Check Anchor Bolts

Diameter of Bolts & Number of Bolts

$d_{bolt} := 88 \cdot in$ $N_{bolt} := 12$

Cross Section Area

$$Ag_{bolt} := \frac{\pi \cdot d_{bolt}^2}{4}$$

$Ag_{bolt} = 76 \cdot in^2$

Diameter of Bolt Circle

$d_{circle} = 19.5\,ft$

Allowable Strength on Anchor Bolt (AWWA-D100-05)

$F_{t.bolt} := 31.25ksi$

Moment of Intertia

$$I_{bolt} := \left| \begin{array}{l} I_{total} \leftarrow 0in^4 \\ \text{for } i \in 1 .. N_{bolt} \\ \quad \left| \begin{array}{l} d_i \leftarrow \frac{d_{circle}}{2} \cdot \sin\left[\frac{360deg}{N_{bolt}} \cdot (i-1)\right] \\ I_i \leftarrow Ag_{bolt} \cdot (d_i)^2 \\ I_{total} \leftarrow I_{total} + I_i \end{array} \right. \\ I_{total} \end{array} \right.$$

$I_{bolt} = 6785.56 \cdot in^4$

Section Modulus of Bolt Configuration

$$S_{bolt} := \frac{I_{bolt}}{d_{circle}}$$

$S_{bolt} = 9.17 \cdot in^3$

Overturning Moment at Anchor Bolt Level

$M_{total} := M_{total\_anchor}$

$M_{total} = 3729.81 \cdot kip \cdot ft$

Stresses on Anchor Bolts due to Bending

$$f_b := \frac{M_{total}}{S_{bolt}}$$

$f_b = 46.18 \cdot ksi$

Stresses on Anchor Bolts due to Axial Loads

$$f_t := \frac{W_{structure} + W\_App_{total}}{N_{bolt} \cdot Ag_{bolt}}$$

$f_t = 6.6 \cdot ksi$

Uplift are possible to occur

$T := f_b - f_t$

$T = 39.59 \cdot ksi$

Allowable Tension Stress

$F_t := 1.33 \cdot F_{t.bolt}$

$F_t = 41.56 \cdot ksi$

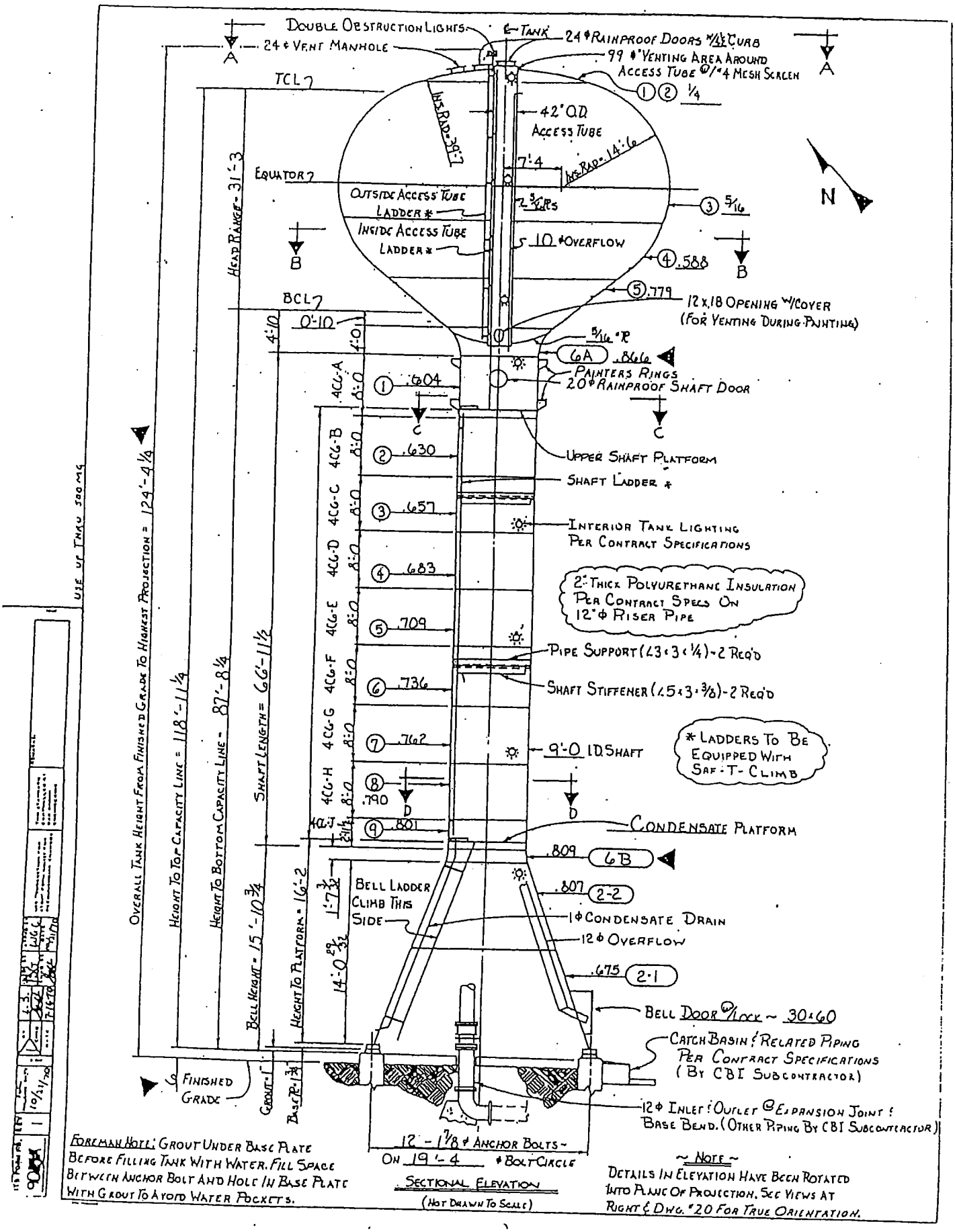
CHECK = "Anchor Bolts are adequate for tension"

$\frac{T}{F_t} = 95.24 \cdot \%$

Conclusions

(2) New dish antennas will be installed on the existing antenna mount, by extending the support pipe of existing installation.

Further structural analysis shows that existing water tower structure is still **adequate** for new loads. Stresses above the bell and possibility of uplift are checked. Anchor bolts are also **adequate** for new loads.


DOUBLE OBSTRUCTION LIGHTS
TANK
24 ϕ RAINPROOF DOORS W/ 4" CURB
24 ϕ VENT MANHOLE
99 ϕ" VENTING AREA AROUND ACCESS TUBE W/ #4 MESH SCREEN
TCL
INS. RAD. = 39'-7"
42" OD ACCESS TUBE
7'-4"
INS. RAD. = 14'-6"
EQUATOR
OUTSIDE ACCESS TUBE LADDER *
INSIDE ACCESS TUBE LADDER *
2 3/8" PIPES
10 ϕ OVERFLOW
HEAD RANGE = 31'-3"
BCL
0'-10"
12 x 18 OPENING W/ COVER (FOR VENTING DURING PAINTING)
5/16" ϕ
PAINTERS RINGS
20 ϕ RAINPROOF SHAFT DOOR
UPPER SHAFT PLATFORM
SHAFT LADDER *
INTERIOR TANK LIGHTING PER CONTRACT SPECIFICATIONS
2" THICK POLYURETHANE INSULATION PER CONTRACT SPECS ON 12" ϕ RISER PIPE
PIPE SUPPORT (L3 x 3 x 1/4) - 2 REQ'D
SHAFT STIFFENER (L5 x 3 x 3/8) - 2 REQ'D
9'-0" I.D. SHAFT
* LADDERS TO BE EQUIPPED WITH SAF-T-CLIMB
CONDENSATE PLATFORM
BELL LADDER CLIMB THIS SIDE
1 ϕ CONDENSATE DRAIN
12 ϕ OVERFLOW
BELL DOOR W/ LOCK ~ 30 x 60
CATCH BASIN & RELATED PIPING PER CONTRACT SPECIFICATIONS (BY CBI SUBCONTRACTOR)
12 ϕ INLET & OUTLET @ EXPANSION JOINT & BASE BEND. (OTHER PIPING BY CBI SUBCONTRACTOR)
FINISHED GRADE
GROUT
12 - 1 7/8 ϕ ANCHOR BOLTS ON 19'-4" ϕ BOLT CIRCLE
OVERALL TANK HEIGHT FROM FINISHED GRADE TO HIGHEST PROJECTION = 124'-4 1/4"
HEIGHT TO TOP CAPACITY LINE = 118'-11 1/4"
HEIGHT TO BOTTOM CAPACITY LINE = 87'-8 1/4"
SHAFT LENGTH = 66'-11 1/2"
BELL HEIGHT = 15'-10 3/4"
HEIGHT TO PLATFORM = 16'-2"
4CG-A 8:0
4CG-B 8:0
4CG-C 8:0
4CG-D 8:0
4CG-E 8:0
4CG-F 8:0
4CG-G 8:0
4CG-H 8:0
4'-10"
4'-0"
14'-0 29/32"
1'-7 3/32"
2'-11 1/4"
.604
.630
.657
.683
.709
.736
.762
.790
.801
.809
.807
.675
6A .866
6B
2-2
2-1
SECTIONAL ELEVATION
(NOT DRAWN TO SCALE)
FOREMAN NOTE: GROUT UNDER BASE PLATE BEFORE FILLING TANK WITH WATER. FILL SPACE BETWEEN ANCHOR BOLT AND HOLE IN BASE PLATE WITH GROUT TO AVOID WATER POCKETS.
~ NOTE ~
DETAILS IN ELEVATION HAVE BEEN ROTATED INTO PLANE OF PROJECTION. SEE VIEWS AT RIGHT & DWG. #20 FOR TRUE ORIENTATION.
N
A
B
C
D

SHEET INDEX

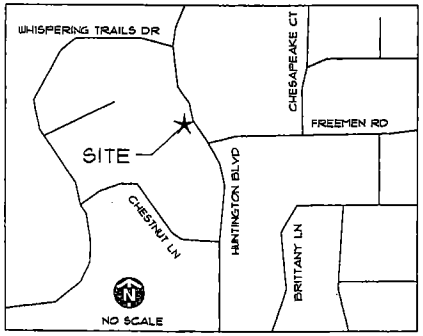
NO.	DESCRIPTION
T-1	TITLE SHEET
C-1	SITE PLAN
C-2	ENLARGED SITE PLAN
C-3	SHELTER/ANTENNA PLAN
C-4	SITE ELEVATION & DETAILS
C-5	DETAILS
E-1	SINGLE LINE & NOTES

DRIVING DIRECTIONS

DEPART FROM CLEARWIRE OFFICE:
5600 N. RIVER RD. ROSEMONT, IL 60018

DEPART ON N RIVER RD (NORTH) ROAD NAME CHANGES TO DES PLAINES RIVER RD (N RIVER RD) TURN LEFT (WEST) ONTO SR-72 (W HIGGINS RD) TURN RIGHT ONTO RAMP "TOLL ROAD" MERGE ONTO I-90 (NORTHWEST TOLLWAY) TURN RIGHT ONTO RAMP KEEP RIGHT TO STAY ON RAMP54 "DO8BEAR RIGHT (NORTH) ONTO N ROSELLE RD TURN LEFT (WEST) ONTO SR-62 (W ALGONQUIN RD) TURN RIGHT (NORTH) ONTO HUNTINGTON BLVD (ARRIVE 3990 HUNTINGTON BLVD, SCHAUMBURG, IL 60195

VICINITY MAP



clear w•reless LLC®

a Nevada limited liability company, a Sprint affiliate

SITE NAME

HOFFMAN ESTATES

SITE NUMBER

IL-CHI5380

SITE ADDRESS

3990 HUNTINGTON BOULEVARD
HOFFMAN ESTATES, IL 60195

PROJECT TYPE

BACKHAUL PROJECT

PROJECT TEAM

clear w•reless LLC
a Nevada limited liability company, a Sprint affiliate
5600 N. RIVER RD.
SUITE 300
ROSEMONT, IL 60018
(847) 318-3000
APPLICANT

EVEREST GROUP
THE EVEREST GROUP, LLC
7913 W. 111TH ST.
WORTH, IL 60482
TEL: (708) 923-1363
REAL ESTATE

Fullerton Engineering Consultants
9700 W. HIGGINS RD.
SUITE 800
ROSEMONT, ILLINOIS 60018
TEL: 847-292-0700
FAX: 847-292-0705

- HANDICAP ACCESS REQUIREMENTS ARE NOT REQUIRED
- FACILITY IS UNMANNED AND NOT FOR HUMAN HABITATION
- FACILITY HAS NO PLUMBING OR REFRIGERANTS
- THIS FACILITY SHALL MEET OR EXCEED ALL FAA AND FCC REGULATORY REQUIREMENTS
- ALL WORK MUST CONFORM TO CLEARWIRE "CLEARWIRE CONSTRUCTION INSTALLATION GUIDE - WIMAX"

SCOPE OF WORK:

- NEW CLEARWIRE BACKHAUL DISH ANTENNAS INSTALLED ON EXISTING WATER TANK.
- NEW CLEARWIRE BACKHAUL EQUIPMENT INSTALLED INSIDE EXISTING SHELTER.

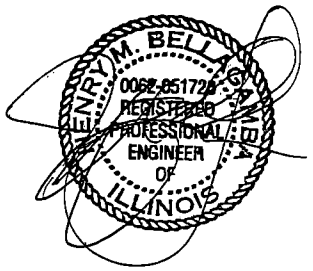
PROJECT SUMMARY

SITE NAME:	HOFFMAN ESTATES
SITE NO:	IL-CHI5380
SPRINT HOST NO:	IL3758
SITE ADDRESS:	3990 HUNTINGTON BOULEVARD HOFFMAN ESTATES, IL 60195
COUNTY:	COOK
LANDLORD ADDRESS:	VILLAGE OF HOFFMAN ESTATES 1900 HASSELL ROAD HOFFMAN ESTATES, IL 60169 PHONE: 847-882-9100
SITE COORDINATES (FROM CLEARVISION):	
LATITUDE:	N 42.0561° (NAD 83)
LONGITUDE:	W 88.1225° (NAD 83)
ZONING:	-
JURISDICTION:	-
BUILDING CODE:	INTERNATIONAL BUILDING CODE 2003 EDITION
ELECTRICAL CODE:	NATIONAL ELECTRICAL CODE 2005 EDITION

ENGINEER'S LICENSE

I CERTIFY THAT THESE DRAWING WERE PREPARED BY ME OR UNDER MY DIRECT SUPERVISION AND CONTROL, AND TO THE BEST OF MY KNOWLEDGE AND BELIEF COMPLY WITH THE REQUIREMENTS OF THE INTERNATIONAL BUILDING CODE, 2003 EDITION

LICENSED ENGINEER - STATE OF ILLINOIS



EXPIRES: 11/30/09 SIGNED: 5/18/09

APPROVALS

CLEARWIRE CONST.		DATE
CLEARWIRE RF		DATE
CLEARWIRE OPS		DATE
LANDLORD		DATE

DRAWING SCALED TO 11"x17"

clear w•reless LLC
a Nevada limited liability company, a Sprint affiliate
5600 N. RIVER RD.
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(847) 318-3000

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FAX: 847-292-0705
DESIGN FIRM NO. 184-001498

CHECKED BY:	JP	
APPROVED BY:	MB	
# DATE	DESCRIPTION	INT.
05/07/09	90% REVIEW	RD
05/18/09	FINAL	RA

DATE SIGNED: _____

SITE NAME
HOFFMAN ESTATES

SITE NO.
IL-CHI5380

SITE ADDRESS
3990 HUNTINGTON BOULEVARD
HOFFMAN ESTATES, IL 60195

SHEET NAME
TITLE SHEET

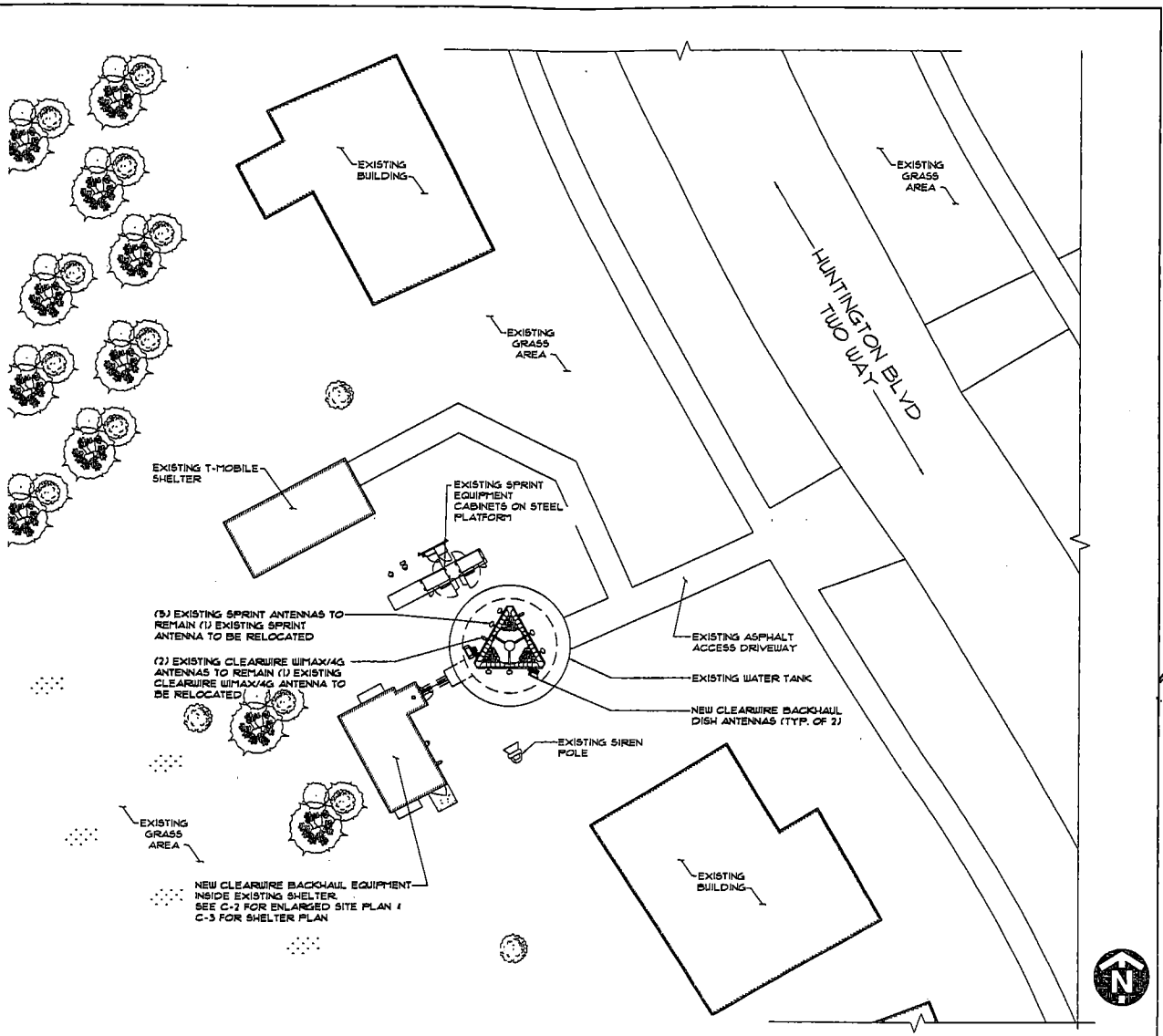
SHEET NUMBER
T-1

ABBREVIATIONS

A/C	AIR CONDITIONER
AFF	ABOVE FINISHED FLOOR
AGL	ABOVE GRADE LEVEL
AMSL	ABOVE MEAN SEA LEVEL
APPROX	APPROXIMATE
AWG	AMERICAN WIRE GAUGE
BLDG	BUILDING
BTS	BASE TRANSMISSION STATION
CAB	CABINET
COL	COLUMN
CONC	CONCRETE
CND	CONDUIT
DWG	DRAWING
FT	FOOT (FEET)
EGB	EQUIPMENT GROUND BAR
ELEC	ELECTRICAL
ELEV	ELEVATION
EMT	ELECTRICAL METALLIC TUBING
EQUIP	EQUIPMENT
(E)	EXISTING
FND	FOUNDATION
GALV	GALVANIZED
GND	GROUND
GPS	GLOBAL POSITIONING SYSTEM
IN	INCH(ES)
LB (#)	POUND(S)
MAX	MAXIMUM
MFR	MANUFACTURER
MGB	MASTER GROUND BAR
MIN	MINIMUM
(N)	NEW
NEC	NATIONAL ELECTRICAL CODE
NOM	NOMINAL
NTS	NOT TO SCALE
OE/OT	OVERHEAD ELECTRIC/TELCO
POS	POSITION
RGS	RIGID GALVANIZED STEEL
SF	SQUARE FOOT
STL	STEEL
T & B	TOP & BOTTOM
T/	TOP
TBD	TO BE DETERMINED
TYP	TYPICAL
UE/UT	UNDERGROUND ELECTRIC/TELCO
UNO	UNLESS NOTED OTHERWISE
VIF	VERIFY IN FIELD
W/	WITH
XFMR	TRANSFORMER

SYMBOLS

- CENTERLINE
- PLATE
- REVISION
- WORK POINT
- UTILITY POLE
- BRICK
- COMPRESSED STONE
- CONCRETE
- EARTH
- GRAVEL
- MASONRY
- STEEL
- CENTERLINE
- PROPERTY LINE
- LEASE LINE
- EASEMENT LINE
- CHAIN LINK FENCE
- WOOD FENCE
- UE — BELOW GRADE ELECTRIC
- UT — BELOW GRADE TELEPHONE
- OE/OT — OVERHEAD ELECTRIC/TELEPHONE
- SECTION REFERENCE



SITE PLAN

SCALE: 1" = 40'-0" | 1

clear wireless LLC
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APPROVED BY:	MB

#	DATE	DESCRIPTION	INT.
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	05/18/09	FINAL	RA

NICK M. BELLAGAMBA
0092-051728
REGISTERED
PROFESSIONAL
ENGINEER
OF
ILLINOIS
DATE SIGNED

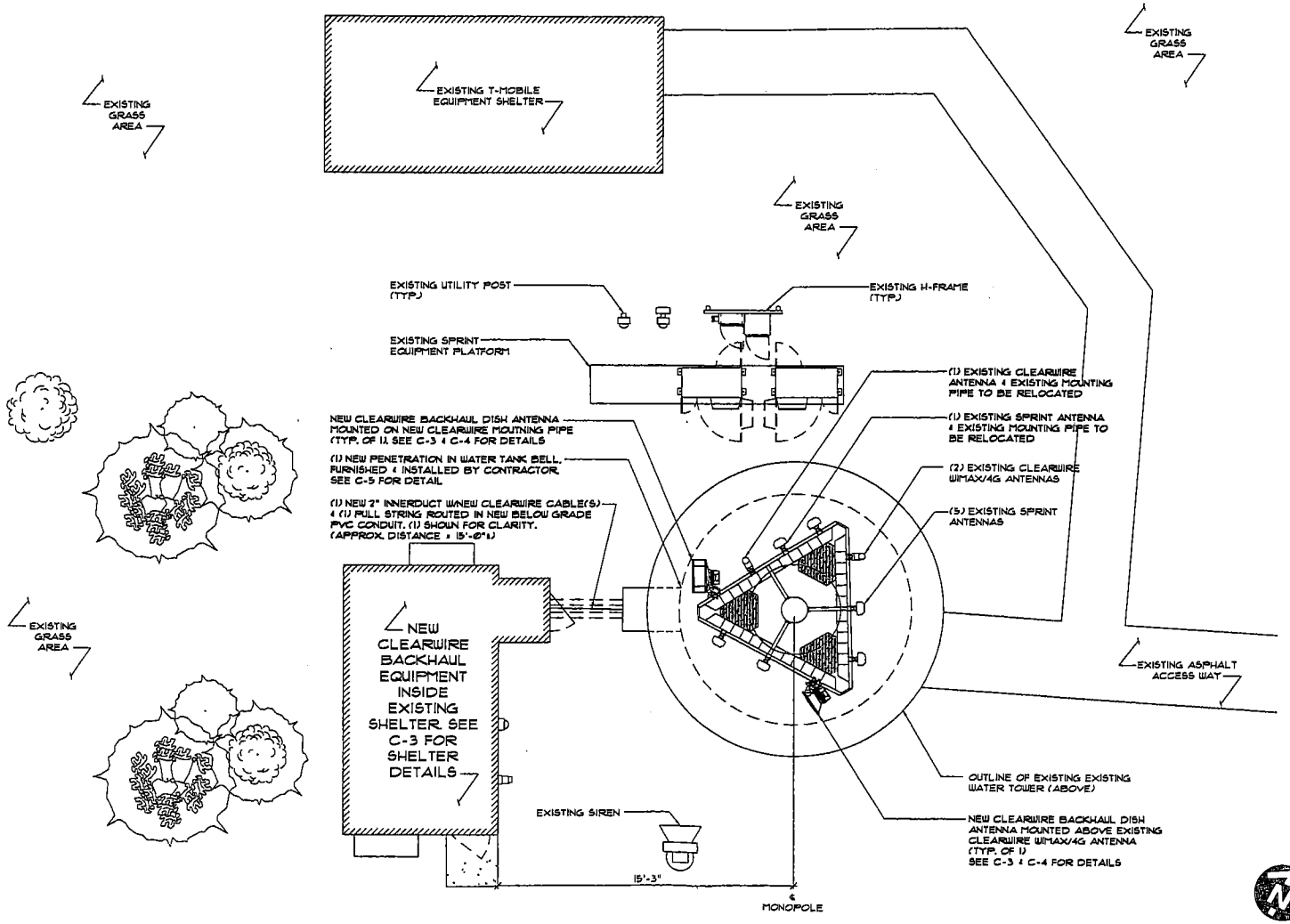
SITE NAME
HOFFMAN ESTATES

SITE NO.
IL-CHI5380

SITE ADDRESS
3950 HUNTINGTON BOULEVARD
HOFFMAN ESTATES, IL 60195

SHEET NAME
SITE PLAN

SHEET NUMBER
C-1



ENLARGED SITE PLAN

SCALE: 1/8" = 1'-0"

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	05/07/09	90% REVIEW	RD
	05/18/09	FINAL	RA

HENRY M. BELLAO
0062-061728
REGISTERED PROFESSIONAL ENGINEER OF ILLINOIS
DATE

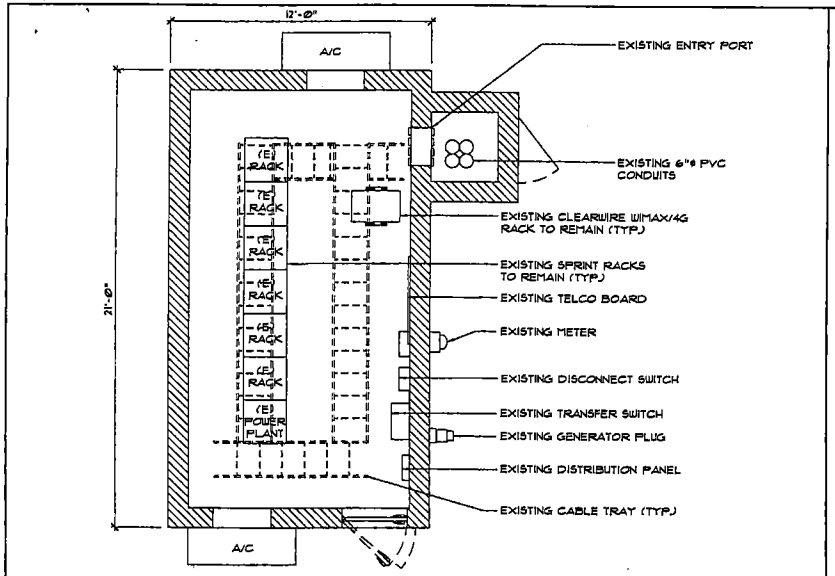
SITE NAME
HOFFMAN ESTATES

SITE NO.
IL-CHI5380

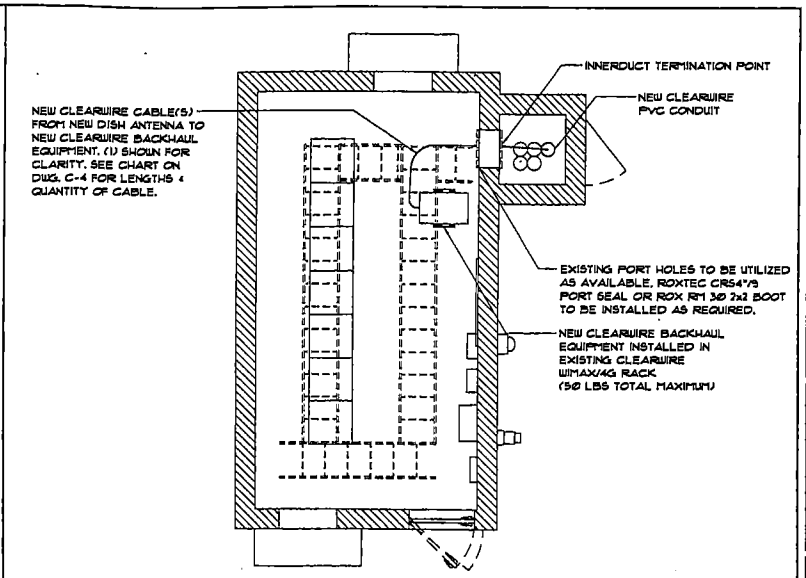
SITE ADDRESS
3950 HUNTINGTON BOULEVARD
HOFMAN ESTATES, IL 60155

SHEET NAME
ENLARGED SITE PLAN

SHEET NUMBER
C-2



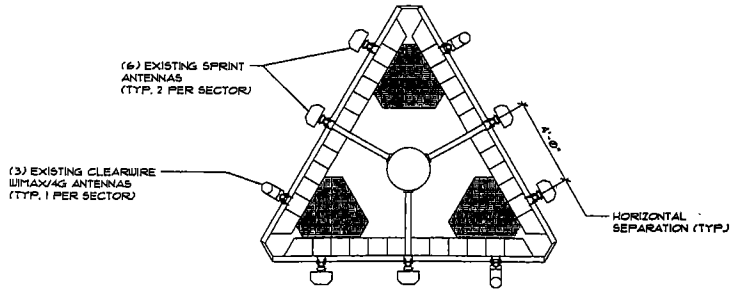
EXISTING SHELTER PLAN — SCALE: 3/16" = 1'-0" | 1



NEW SHELTER PLAN — SCALE: 3/16" = 1'-0" | 2

ANTENNA TYPE

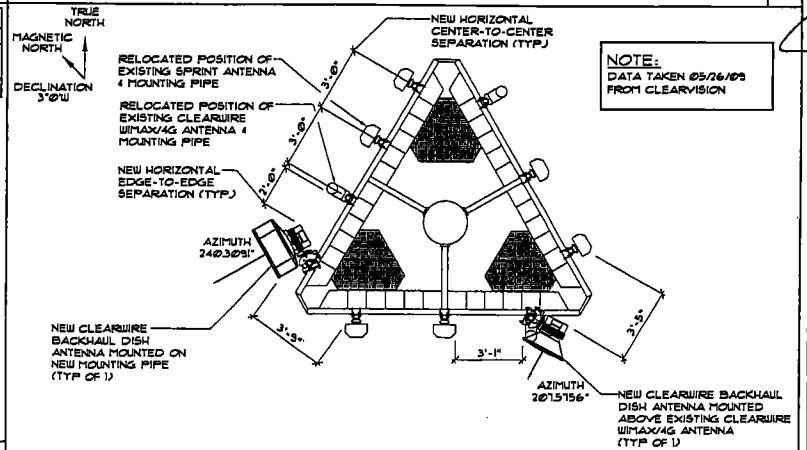
SPRINT	CLWR	BACKHAUL



SECTOR	1	2	3
CLEARWIRE AZIMUTH PER SPRINT SITERRA- SEE NOTE	60°	180°	300°

NOTE:
CONTRACTOR IS REQUIRED TO DISMANTLE EXISTING CLEARWIRE ANTENNA FOR NEW MOUNTING PIPE INSTALLATION. CONTRACTOR SHALL FIELD VERIFY CLEARWIRE ANTENNA AZIMUTH & REPLACE TO EXISTING AZIMUTH.

EXISTING ANTENNA CONFIGURATION/BACKHAUL SCHEDULE — SCALE: 3/16" = 1'-0" | 3



NOTE:
DATA TAKEN 05/26/09 FROM CLEARVISION

ANTENNA AZIMUTH	ANTENNA MODEL	SIZE (NOM) (IN)	ANTENNA MOUNT HEIGHT (FT)	DISTANCE (MILES)	RECEIVING SITE NUMBER	RADIO MODEL
201±3156°	VHLP2-18	24"	132'	2.26	IL-CHI5460	AIRPAIR HP
240±3Ø91°	VHLP3.5-11	30"	128'	3.318	IL-CHI6058	AIRPAIR HP

NEW ANTENNA CONFIGURATION/BACKHAUL SCHEDULE — SCALE: 3/16" = 1'-0" | 4

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	05/07/09	90% REVIEW	RO
	05/18/09	FINAL	RA

HENRY M. BELL
0062-001728
REGISTERED PROFESSIONAL ENGINEER OF ILLINOIS
DATE SIGNED

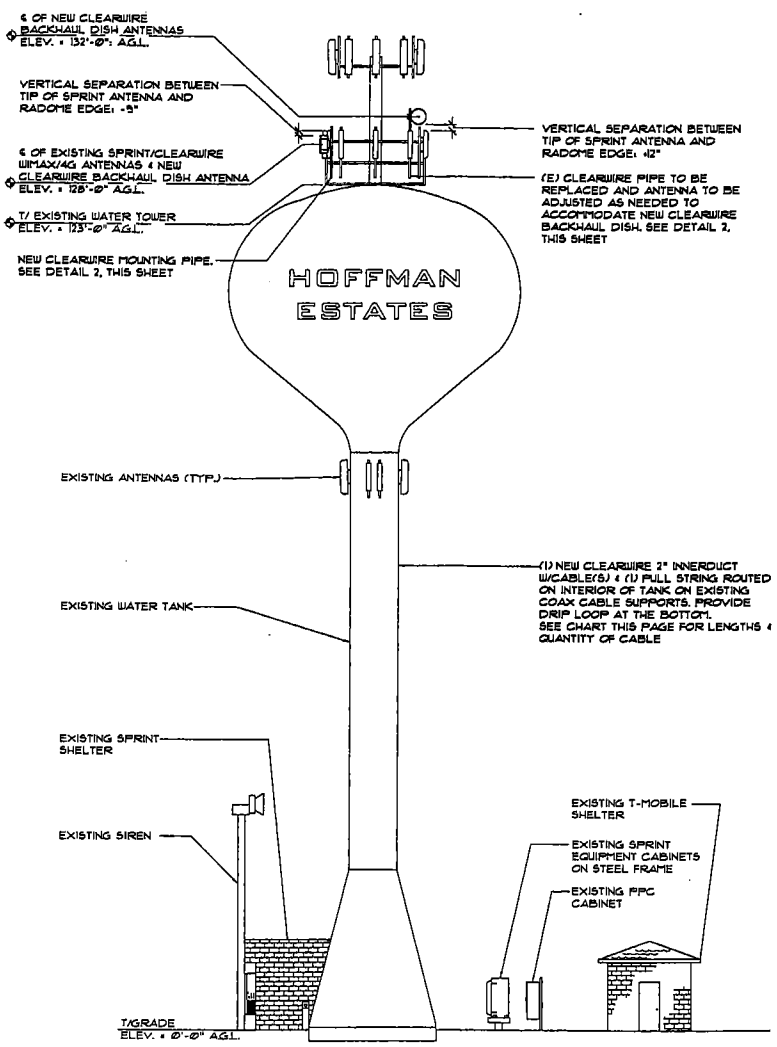
SITE NAME
HOFFMAN ESTATES

SITE NO.
IL-CHI5380

SITE ADDRESS
3990 HUNTINGTON BOULEVARD
HOFMAN ESTATES, IL 60195

SHEET NAME
SHELTER/ ANTENNA PLAN

SHEET NUMBER
C-3



ELEVATION — SCALE: NTS | 1

ANTENNA NOTES:

1. THE SIZE, HEIGHT, AND DIRECTION OF THE ANTENNA SHALL BE ADJUSTED TO MEET SYSTEM REQUIREMENTS.
2. CONTRACTOR SHALL VERIFY HEIGHT OF ANTENNA WITH CLEARWIRE REPRESENTATIVE.
3. ALL ANTENNA AZIMUTH TO BE FROM TRUE NORTH.

STRUCTURAL NOTES:

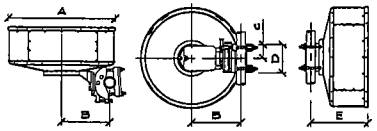
1. STRUCTURAL CALCULATION PREPARED BY FULLERTON ENGINEERING CONSULTANTS. CONTRACTOR TO COORDINATE WITH CLEARWIRE REPRESENTATIVE TO OBTAIN A COPY.
2. CONTRACTOR TO REFER TO TOWER STRUCTURAL CALCULATIONS FOR ADDITIONAL LOADS. NO ERECTION OR MODIFICATION OF TOWER SHALL BE MADE WITHOUT APPROVAL OF STRUCTURAL ENGINEER.

BACKHAUL CABLE SCHEDULE

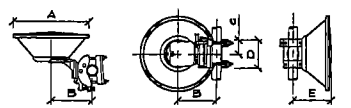
ANTENNA TYPE	AZIMUTH	QTY.	ESTIMATED LENGTH	RADIO MODEL	TYPE	SIZE
DISH	207.5136°	1	x 180' = 180 FT.	AIRPAIR HP	5FX500	1/2" ø
DISH	240.3091°	1	x 180' = 180 FT.	AIRPAIR HP	5FX500	1/2" ø
		TOTAL:	360 FT.	OF	5FX500	1/2" ø

NOTES:

1. ACTUAL LENGTHS SHALL BE DETERMINED PER SITE CONDITION BY THE CONTRACTOR.
2. THE CONTRACTOR SHALL VERIFY THE ACTUAL LENGTHS BEFORE INSTALLATION.



30" DISH		A	B	C	D	E
	IN.	30.0	13.1	3.60	7.20	19.10



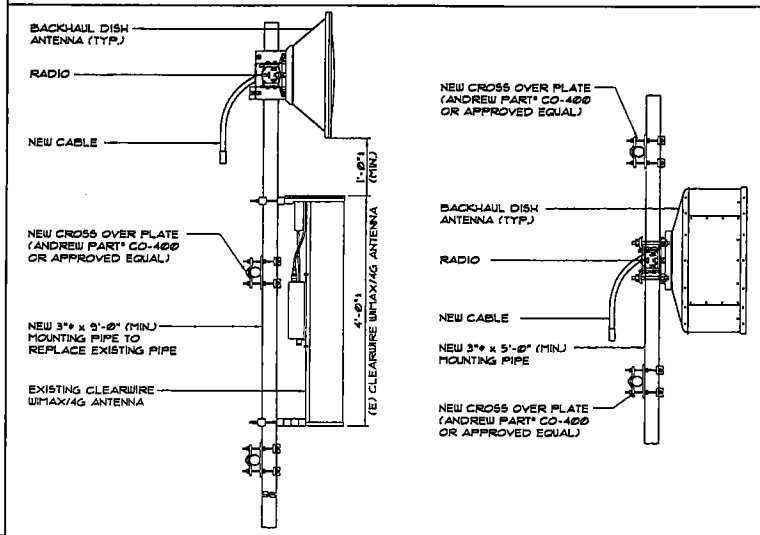
24" DISH		A	B	C	D	E
	IN.	26.10	14.10	2.80	5.60	13.20

NOTE: RADIO NOT SHOWN FOR CLARITY

DISH SUPPORT DETAIL — SCALE: N.T.S. | 2

BACKHAUL ANTENNA DETAIL

SCALE: N.T.S. | 3



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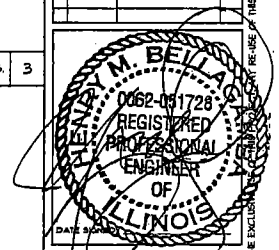


SITE NAME: HOFFMAN ESTATES

SITE NO.: IL-CHI5380

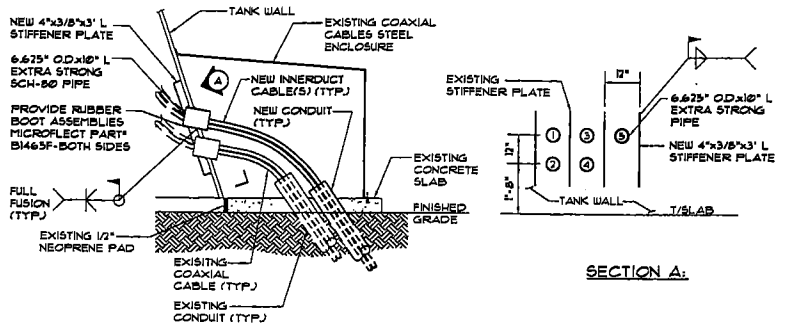
SITE ADDRESS: 3990 HUNTINGTON BOULEVARD HOFMAN ESTATES, IL 60195

SHEET NAME: SITE ELEVATION & DETAILS

SHEET NUMBER: C-4

NOTES:

1) REDUCE TANK CONTENTS BY 50% OR MORE BEFORE CUTTING SHELL FOR PENETRATIONS.
2) WELD STIFF. R'S BEFORE ANY PENETRATION.
3) CUT SLEEVE HOLE ONE & WELD PIPE SLEEVE IN PLACE
4) CUT SLEEVE HOLE #2 & WELD PIPE SLEEVE IN PLACE
5) REPEAT SEQUENCE FOR ALL HOLES



SECTION A:

BELL/PEDESTAL PLATE PENETRATION — SCALE: N.T.S. | 1

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APPROVED BY:		MB	
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	05/13/09	FINAL	RA

GARY M. BELL
0062-051728
REGISTERED PROFESSIONAL ENGINEER
OF ILLINOIS
DATE SIGNED: 5/13/09

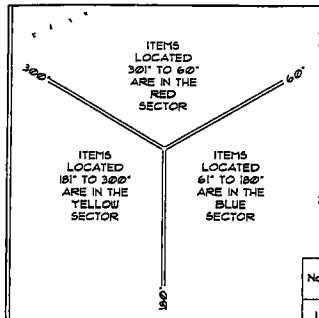
SITE NAME
HOFFMAN ESTATES

SITE NO.
IL-CHI5380

SITE ADDRESS
3990 HUNTINGTON BOULEVARD
HOFFMAN ESTATES, IL 60195

SHEET NAME
DETAILS

SHEET NUMBER
C-5



NOTES COLOR CODING:

1. THE EQUIPAGE OF THE RFUS (DAP HEADS) MUST FOLLOW THE MOTOROLA COLOR ASSIGNMENT OF RED/BLUE/YELLOW REGARDLESS OF THE ACTUAL ANTENNA ORIENTATION. (FOR EXAMPLE, THE FIRST EQUIPPED SECTOR IS RED, BUT IN A SITUATION WHERE THE RED SECTOR IS NOT EQUIPPED WITH AN RFU, THE FIRST RFU (DAP HEAD) MUST BE LABELED RED EVEN IF IT LIES WITHIN THE BLUE SECTOR BASED ON ANTENNA ORIENTATION. ANY MICROWAVE ANTENNAS MUST BE LABELED BASED ON THE ORIENTATION. IN SUCH CASE THERE WOULD BE AN RFU (DAP HEAD) LABELED RED AND MICROWAVE ANTENNA(S) LABELED BLUE WITHIN THE BLUE SECTOR LOCATED BETWEEN 61 AND 180 DEGREES.)
2. THE CONTRACTOR SHALL USE SECTOR APPROPRIATE COLORED TAPE TO DENOTE THE ANTENNA AND MICROWAVE DISHES. TAPE SHOULD BE WRAPPED AROUND THE TOP AND BOTTOM OF THE SUPPORT PIPE AS DEPICTED IN THE TABLE ABOVE.

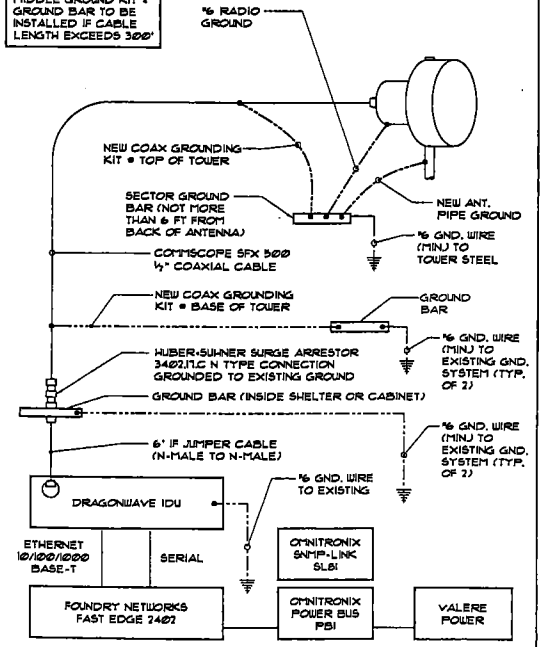
No.	SECTOR DEGREE RANGE	MARKING METHOD COLOR BANDS	MARKING METHOD NUMBER OF BANDS
1	301°-60°	RED	SMALLEST NUMBER WILL BE LABELED "R1". THE NEXT LARGER NUMBER WILL BE LABELED "R2"
2	61°-180°	BLUE	SMALLEST NUMBER WILL BE LABELED "B1". THE NEXT LARGER NUMBER WILL BE LABELED "B2"
3	181°-300°	YELLOW	SMALLEST NUMBER WILL BE LABELED "Y1". THE NEXT LARGER NUMBER WILL BE LABELED "Y2"

DISH COLOR CODING NOTES — SCALE: N.T.S. | 1

1. ANTENNA INSTALLATION SHALL BE CONDUCTED BY FIELD CREWS EXPERIENCED IN THE ASSEMBLY AND ERECTION OF RADIO ANTENNAS, TRANSMISSION LINES, AND SUPPORT STRUCTURES.
2. CONTRACT COMPANIES AND THEIR EMPLOYEES SHALL OBSERVE AND PRACTICE ALL O.S.H.A. SAFETY GUIDELINES WHILE PERFORMING SERVICE FOR CLEARWIRE.
3. CONTRACT COMPANIES AND THEIR EMPLOYEES SHALL OBSERVE AND PRACTICE ALL O.S.H.A. SAFETY GUIDELINES WHILE PERFORMING SERVICE FOR CLEARWIRE.
4. CONTRACTOR SHALL PERFORM A SAFETY INSPECTION PRIOR TO COMMENCING ALL WORK ACTIVITIES AT A CLEARWIRE, LEASED OR OWNED SITE. CLEARWIRE, SHOULD BE IMMEDIATELY NOTIFIED OF SAFETY HAZARD(S) FOUND DURING THE INSPECTION THAT COULD CAUSE DAMAGE TO PROPERTY. ALL WORK SHALL BE HALTED UNTIL SUCH TIME THE REPORTED SAFETY HAZARD IS CORRECTED. THE SAFETY HAZARD, IF POSSIBLE, SHOULD BE CORRECTED BY THE CONTRACTOR WHILE ON SITE. AFTER THE CONTRACTOR HAS NOTIFIED CLEARWIRE TO PERFORM THE CORRECTION.

ANTENNA INSTALLATION NOTES — SCALE: N.T.S. | 2

NOTE:
MIDDLE GROUND KIT & GROUND BAR TO BE INSTALLED IF CABLE LENGTH EXCEEDS 300'



AIRPAIR SINGLE LINE DIAGRAM — SCALE: N.T.S. | 3

NOT USED — SCALE: N.T.S. | 4

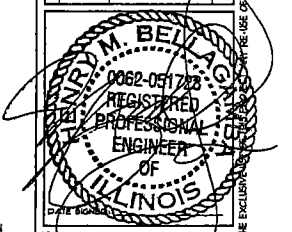
1. ALL BASE TRANSCEIVER SITE EQUIPMENT SHALL BE GROUNDED IN ACCORDANCE WITH THE LATEST EDITIONS OF THE NATIONAL ELECTRICAL CODE (NEC), LIGHTNING PROTECTION CODE (NFPA 780) AND CLEARWIRE STANDARDS.
2. THE ELECTRICAL SERVICE TO THE SITE SHALL BE GROUNDED AT THE SERVICE DISCONNECTING MEANS AS REQUIRED IN ARTICLE 250 OF THE NATIONAL ELECTRICAL CODE AND IN ACCORDANCE WITH ANY LOCAL CODE.
3. ALL UNDERGROUND (BELOW GRADE) GROUNDING CONNECTIONS SHALL BE MADE BY THE EXOTHERMIC PROCESS (MECHANICAL LUG ATTACHMENTS BELOW GRADE ARE NOT ACCEPTABLE). CONNECTIONS SHALL INCLUDE ALL CABLE TO CABLE SPLICES (TEES, Xs, ETC.), ALL CABLE CONNECTIONS TO GROUND RODS, GROUND ROD SPLICES, AND LIGHTNING PROTECTION SYSTEM AS INDICATED. ALL MATERIALS USED (MOLDS, WELDING METAL, TOOLS, ETC.) SHALL BE INSTALLED PER MANUFACTURER'S RECOMMENDATION AND PROCEDURES.
4. ALL GROUNDING AND BONDING CONDUCTORS THAT ARE CONNECTED ABOVE GRADE OR INTERIOR TO A BUILDING SHALL BE CONNECTED USING TWO HOLE CRIMP TYPE (COMPRESSION) CONNECTIONS FOR #2 AND #6 AWG INSULATED COPPER CONDUCTOR.
5. ALL GROUNDING CONNECTIONS, INTERIOR AND EXTERIOR, MADE THROUGHOUT THIS DOCUMENT SHALL BE MADE USING AN ANTI-OXIDATION COMPOUND. THE ANTI-OXIDATION COMPOUND SHALL BE THOMAS AND BETTS KOPR-SHIELD (TM OF JET LUBE INC.) OR APPROVED EQUAL. COAT ALL WIRES BEFORE CONNECTING.
6. ALL CONNECTIONS SHALL BE MADE TO BARE METAL. ALL PAINTED SURFACES SHALL BE FIELD INSPECTED AND MODIFIED TO ENSURE PROPER CONTACT. PRIOR TO EXOTHERMICALLY CONNECTING, GALVANIZING SHALL BE REMOVED BY GRINDING SURFACE TO BARE METAL. "SLAG" FROM EXOTHERMIC CONNECTION MUST BE REMOVED AND SHALL BE SPRAYED WITH COLD GALVANIZE AFTER COMPLETION.
7. FERROUS METAL CLIPS WHICH COMPLETELY SURROUND THE GROUNDING CONDUCTOR SHALL NOT BE USED. CLIPS OF THE FOLLOWING MATERIALS AND TYPES MAY BE USED TO SUPPORT GROUNDING CONDUCTORS.
   PLASTIC CLIPS
   STAINLESS STEEL CLIPS WHICH DO NOT COMPLETELY SURROUND THE GROUNDING CONDUCTOR.
   FERROUS METAL CLIPS WHICH DO NOT COMPLETELY SURROUND THE GROUNDING CONDUCTOR.
8. ALL HARDWARE, BOLTS, NUTS, WASHERS AND LOCK WASHERS SHALL BE 18-8 STAINLESS STEEL. EVERY CONNECTION SHALL BE BOLT-FLAT WASHER-BUSS-LUG-FLAT WASHER-LOCK WASHER-NUT IN THAT EXACT ORDER, WITH NUT FACING OUTWARD. BACK-TO-BACK LUGGING, BOLT-FLAT WASHER-LUG-FLAT WASHER-LUG-BUSS-LUG-FLAT WASHER-LOCK WASHER-NUT, IN THAT EXACT ORDER IS ACCEPTED WHERE NECESSARY TO CONNECT MANY LUGS TO A BUSS BAR. STACKING OF LUGS, BUSS-LUG-LUG, IS NOT ACCEPTABLE.

GROUNDING NOTES — SCALE: N.T.S. | 4

clear wireless LLC
a Nevada limited liability company,
a Sprint affiliate
5600 N. RIVER RD.
SUITE 300
ROSEMONT, IL 60018
(847) 318-3000

Fullerton Engineering Consultants
9700 W. HIGGINS RD.
SUITE 300
ROSEMONT, ILLINOIS 60018
TEL: 847-292-0200
FAX: 847-292-0265
DESIGN FIRM NO. 184-001498

CHECKED BY:	JP	
APPROVED BY:	MB	
#	DATE	DESCRIPTION	INT.
	05/01/09	90% REVIEW	RD
	05/15/09	FINAL	RA



SITE NAME
HOFFMAN ESTATES

SITE NO.
IL-CHI5380

SITE ADDRESS
3990 HUNTINGTON BOULEVARD
HOFFMAN ESTATES, IL 60195

SHEET NAME
SINGLE LINE & NOTES

SHEET NUMBER
E-1

ADDITIONAL BUSINESS

AGREEMENT

THIS AGREEMENT, for conditions of employment APPROVED BY THE VILLAGE BOARD ON DECEMBER __, 2009 by and between the Village of Hoffman Estates, State of Illinois, a municipal corporation, hereinafter sometimes called "Village", and James H. Norris, hereinafter sometimes called "Employee", both of whom understand as follows:

WITNESSETH

WHEREAS, the Village desires to continue to employ the services of said James H. Norris as Village Manager of the Village of Hoffman Estates, pursuant to the laws of the State of Illinois and the ordinances of said Village; and

WHEREAS, the parties desire to make provisions for the Employee's duties, compensation, benefits and other conditions of employment; and

WHEREAS, it is the desire of the President and Village Board to continue the services of Employee and provide inducement from him to remain in such employment, to make possible full work productivity by assuring Employee's morale and peace of mind with respect to future security, to provide for an equitable means for terminating Employee's services at such time as he may be unable to discharge his duties due to age or disability or when Village may desire to otherwise terminate his employ; and

WHEREAS, Employee desires to continue employment as Village Manager of the Village of Hoffman Estates and the Village agrees to a severance package as set forth herein.

NOW, THEREFORE, in consideration of the mutual covenants contained herein; the parties hereto agree as follows:

1. Duties - James H. Norris, as Village Manager of the Village of Hoffman Estates, shall continue to perform all duties required by law including, but not limited to, Section 4, Article 7, of the Hoffman Estates Municipal Code and the existing and future ordinances of the Village of Hoffman Estates, Illinois. These duties shall specifically include, but not be limited to, the following:

    A. The Village Manager shall be the administrative head of government subject to the collective direction and supervision of the President and Board of Trustees;

B. He shall make all appointments to offices and positions as provided by law;

C. He shall see that the laws and ordinances are enforced;

D. He shall exercise administrative direction of all departments and divisions now existing or that may hereafter be created by the President and Board of Trustees;

E. Attend all meetings of the President and Board of Trustees with the responsibility to take part in discussion, but having no vote;

F. Recommend to the President and Board of Trustees for adoption such measures as may be deemed necessary for the efficient and effective operation of the Village;

G. Prepare and submit the annual budget and keep the President and Board of Trustees fully advised as to the financial conditions and needs of the Village and to perform such other duties as may be prescribed by law or be required of him by any ordinance or resolution of the President and Board of Trustees.

2. Compensation - The Employee shall be compensated at a rate to be paid in the same manner as other employees of the Village. The President and Board of Trustees shall collectively schedule a review of the Employee's performance in March, annually. Salary review shall occur in conjunction with the March performance review and the President and Board of Trustees may adjust the Employee's annual compensation as the President and Board of Trustees shall deem appropriate.

3. The Employee shall be appointed for an indefinite term and shall be considered an at will employee.

4. Termination Conditions and Pay -

A. Nothing in this Agreement shall prevent, limit or otherwise interfere with the right of the President and Board of Trustees to terminate the services of Employee at any time subject only to the provisions set forth in this Section, paragraphs C and D, of this Agreement.

B. Nothing in this Agreement shall prevent, limit or otherwise interfere with the right of the Employee to resign at any time from his position with the Village, subject only to the provision set forth in this Section, paragraph G, of this Agreement.

C. In the event that the Employee is terminated during the term of this Agreement by the Village President and Board of Trustees, by receipt and acknowledgment of written notice and concurrently while Employee is willing and able to perform the duties of Village Manager, in such event, the Village agrees to pay Employee under the following schedule:

1. Termination during the term of this Agreement an amount equal to six (6) months aggregate salary to be paid in the same manner as other employees of the Village or until full time professional employment is gained by the Employee, whichever occurs first.

D. In the event that the Employee and Village, are unable to reach agreement upon a new employment agreement between November 30 and December 31, 2010, the Employee shall be able to elect to be terminated as provided in this Section, paragraph E, and will receive six (6) months aggregate salary as severance and liquidated damages to be paid in the same manner as other employees of the Village or until full time professional employment is gained by the Employee, whichever arises first.

Aggregate salary for the terms of this Agreement shall mean salary and benefits including insurance benefits and retirement contributions or an amount sufficient to obtain equal coverage.

E. In the event the Village at any time during the term of this Agreement reduces the salary or other financial benefits of Employee in a greater percentage than an applicable across-the-board reduction for all employees of the Village, or in the event Village refuses, following written

notice to comply with any other provisions benefiting Employee herein, or the Employee receives a formal suggestion by the President and Board of Trustees that he resign, then in that event, Employee may, at his option, within fourteen (14) days of the suggestion of resignation or after delivery of the written demand, elect to be "terminated" as a result of such reduction, suggestions or resignation or such refusal to comply within the meaning and context of the herein termination/severance pay provisions.

F. If Employee shall die during any period in which payments are being made in accordance with Section C or D, the balance of the payments shall be made to Employee's heirs or estate. If Employee should die during his regular employment, the payments under Section C or D will not be made and the insurance proceeds shall be in lieu thereof.

G. In the event Employee voluntarily resigns his position with the Village, the Employee shall give Village thirty (30) days written notice, unless parties otherwise agree. If Employee voluntarily resigns his position, the termination/severance salary and benefit provisions of this Agreement shall not apply.

H. Upon termination, Village shall compensate Employee for all accrued sick, holiday and vacation leave in accordance with the Village of Hoffman Estates' Staff Policy Manual. Said compensation shall be based upon Employee's salary as of the date of employment termination.

I. In the event that the Employee is terminated because of his conviction of any felony or any illegal act involving malfeasance or dishonesty for personal gain then, in that event, Village shall have no obligation to pay termination compensation stated in this Agreement.

5. Automobile Use - Village shall provide Employee with the use of a municipal vehicle for all work related purposes and personal use within a 75-mile radius of Hoffman Estates. Employee shall be responsible for all costs related to personal use. Upon Employee's request, the provision of an automobile will change to an automobile allowance in the amount of $550.00 per month.

6. Insurance Coverage -

A. Village shall provide full major medical insurance for Employee and dependents as provided for other Village employees.

B. Village shall provide Employee with life insurance in the amount of $200,000.

7. Vacation and Sick Leave -

A. Employee shall accrue twenty-five (25) days of vacation per year.

B. Employee shall accrue twelve (12) days of sick leave per year and the right to use sick leave in advance of accrual up to 12 days upon presentation of good cause.

8. Hours of Work - The Village recognizes that the Employee must devote a great deal of his time outside normal office hours to business of the Village and, to that end, the Employee will be allowed to take personal compensatory time off during regular business hours. The Village shall have no cash obligation for any compensatory time not used. It is understood that the Village shall not be liable for hour-for-hour compensatory time. In addition, the Employee may engage in occasional teaching, writing, consulting, or military reserve service performed on Employee's time off. This shall not exceed more than 25 hours per year without the prior approval of the President and Board of Trustees.

9. Memberships, Conferences, Training and Education - Village shall budget and pay for the cost of memberships to the International City Management Association (ICMA), Illinois City Management Association (ILCMA), and local metropolitan association as well as the Hoffman Estates Chamber of Commerce. Village shall also budget for the cost of registration, travel and expenses for the ICMA and ILCMA annual conferences as well as other training programs and seminars which serve to continue the professional education and development of the Employee.

10. Business Expenses - The Village shall reimburse Employee for all employment related expenses, including business meals, as may be annually budgeted in accordance with Village policies.

11. General Conditions of Employment - In addition to the benefits cited herein, Village shall provide Employee with any and all benefits that apply to other full-time general Village employees.

12. Binding Effect - This Agreement shall be binding of the Village and Employee and the successors, assigns and heirs of each respectively.

13. Severability - If any clause or provisions herein shall be adjudged invalid or unenforceable by a Court of competent jurisdiction or by operation of any applicable law, it shall not affect the validity of any other clause or provision which shall remain in full force and effect.

14. Waiver of Breach - The waiver by the Village of a breach of any provisions of this Agreement by the Employee shall not operate or be construed as a waiver of any subsequent breach by the Employee.

15. Term – This Agreement shall terminate on December 31, 2010.

IN WITNESS WHEREOF, the Village of Hoffman Estates and Employee have caused this Agreement to be signed and executed.

_____
William D. McLeod, Village President

ATTEST:

_____
Village Clerk

_____
Employee