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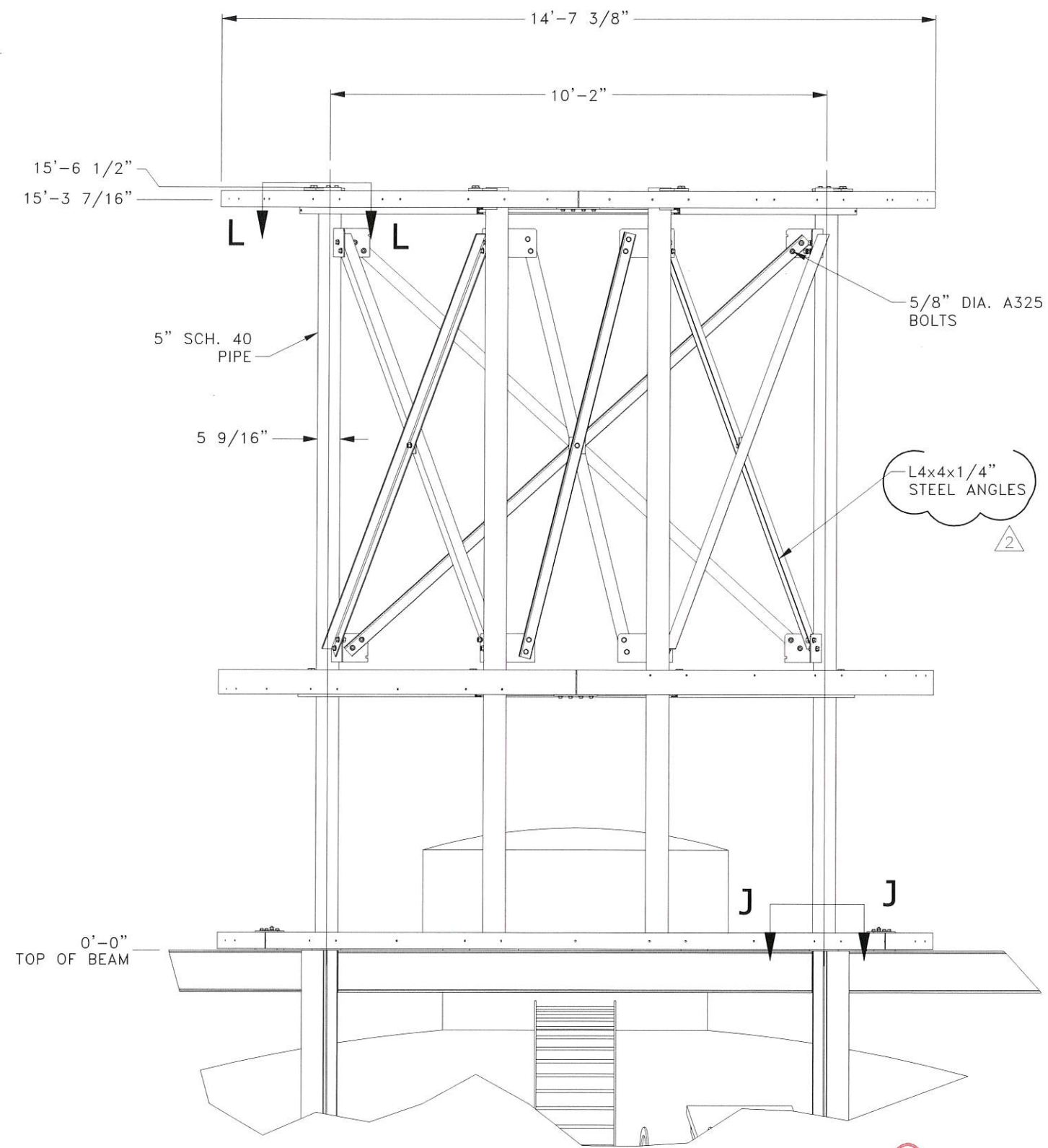
ASSEMBLY - ELEVATIONS

CT 1887
455 VALLEY ROAD
COS COB, CT 06807

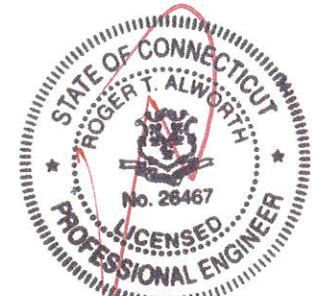
JOB #: CT11-01022W-33R0
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S4

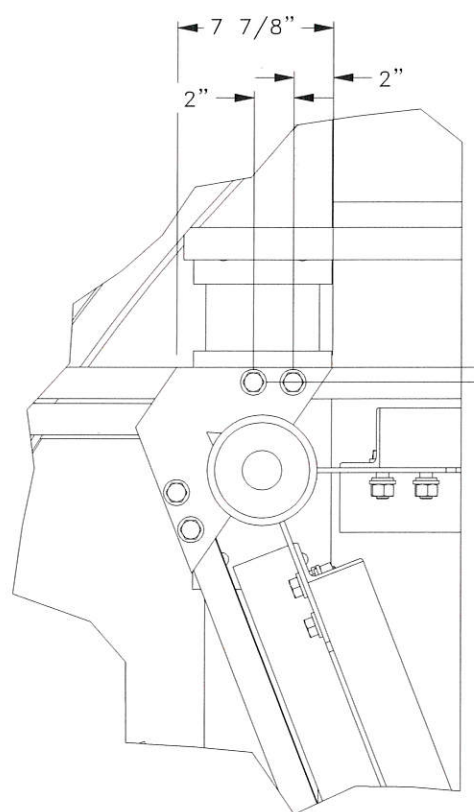
REVISION
2



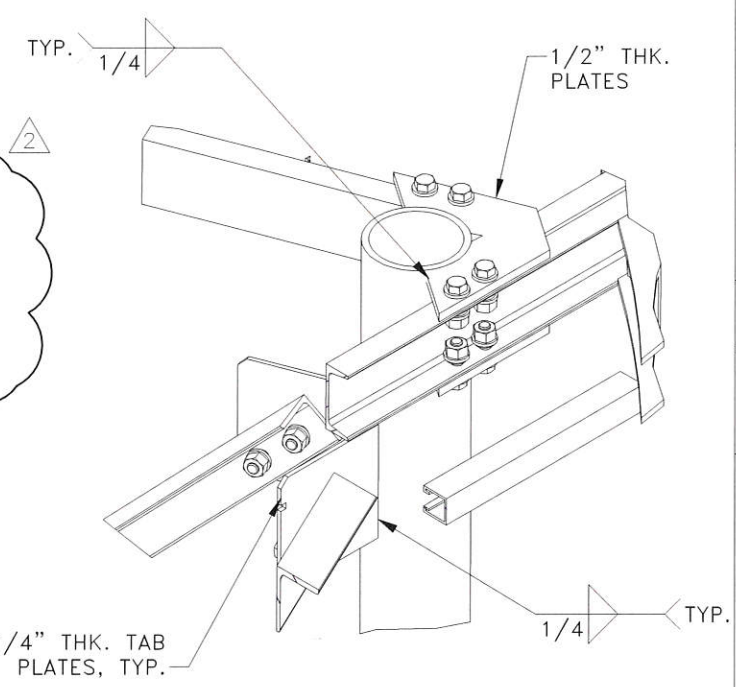
DETAIL H



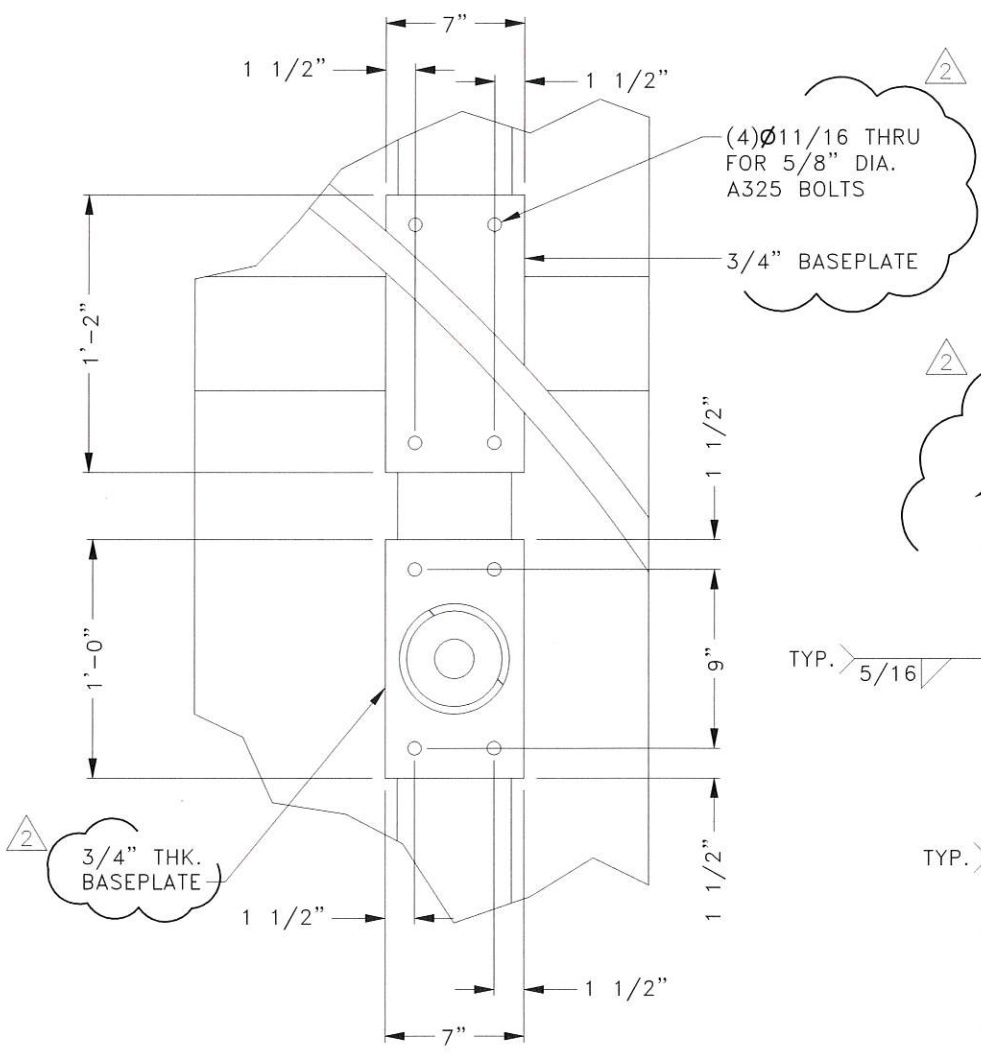
8-2-12



SECTION L-L

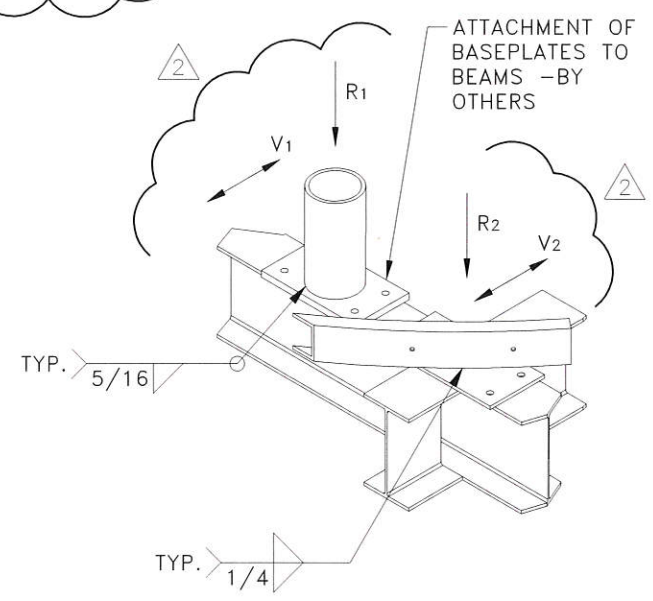


DETAIL N



SECTION J-J

NOTE: SEE SHEET
N1 FOR DESIGN
REACTIONS



VECTOR ENGINEERS

9138 S. STATE STREET, SUITE 101 (801) 990-1775
SANDY, UTAH 84070 (801) 990-1776 FAX

U0142-630-01 DESIGNED: BDV DRAWN: MGP



July 27, 2012

New Cingular Wireless PCS, LLC
500 Enterprise Drive
Rocky Hill, CT 06067

**RE: Structural Design of new Steel Platform & Analysis of the Aquarian Water Tank (CT1887)
Located in Fairfield County, CT
CHA Project No. 18301-1077-28000**

To whom it may concern:

CHA has performed a structural analysis of the referenced water tank for the purpose of evaluating its ability to support existing design loads in addition to new equipment design loads proposed by New Cingular Wireless within a fiberglass enclosure attached above a new steel platform. The proposed fiberglass enclosure is designed by Stealth Concealment Solutions as 15'-6" tall and 15'-0" in diameter.

In summary, our analysis indicates that the water tank, including a new steel platform to support the fiberglass antenna enclosure, given the proposed enclosure dimensions above, is capable of supporting the proposed loading.

CHA was not provided original tank base reactions for the foundation. Therefore, a foundation analysis has not been performed in order to determine its adequacy for supporting the proposed and existing loads.

Our analysis is based on the following information:

- Original water tank drawings and foundation information obtained from design drawings by American Water Works Service Company, Inc., dated September 24, 1953.
- Proposed and existing equipment information, including antenna models and elevations, obtained from New Cingular Wireless dated July 11, 2011.
- Water tank field investigation information obtained from NE Towers, dated August 10, 2011.
- Previous analysis by CHA, dated November 9, 2011.
- Final Fiberglass Enclosure Design Drawings by Stealth Concealment Solutions, dated June 22, 2012.

Our analysis includes data for the following proposed equipment and cables:

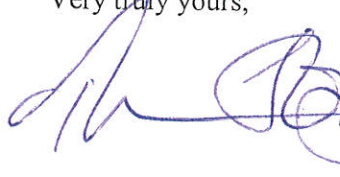
1- New Cingular Wireless

- Twelve (12) Powerwave P65-17-XLH-RR panel antennas mounted within a fiberglass enclosure, at a centerline elevation of 60' AGL, with eighteen (18) 1-5/8" coaxial cables.
- Six (6) Remote Radio Units mounted to the new fiberglass enclosure at a centerline elevation of 60' AGL.
- Six (6) Powerwave TT19-08BP111-001 TMA's mounted within the new fiberglass enclosure at a centerline elevation of 60' AGL.
- One (1) Raycap DC-48-60-18-8F Surge Arrestor
- Two (2) DC Power Cables and one (1) 5/8" Fiber Cable in a 3" innerduct.

With this information and ANSI/TIA/EIA-222-F, *Structural Standards for Steel Antenna Towers and Antenna Supporting Structures*, International Building Code 2009 & ASCE 7-05 as well as ANSI/AWWA, *American Water Works Association Standards - D100-05* with FM approvals dated May 2011, the analysis was performed to verify the adequacy of the tank to resist the increase of stress on the tank's walls. A plate analysis of the tank walls to determine their adequacy to support loads due to the proposed enclosure and platform, under load combinations due to wind and ice, has been performed with structural modeling program RAM ADVANSe v9.6. Per the AWWA standard, wind speed considered in the analysis is 100 mph, which coincides with the wind speed for the Municipality of Greenwich per the 2005 CT Supplement to the Building Code. A wind speed of 73.6 mph was used in conjunction with ice per TIA/EIA-222-F. Based on the data provided, applicable wind and ice loads were calculated. These wind loads were then applied to the existing structure with the proposed enclosure reactions provided by Stealth.

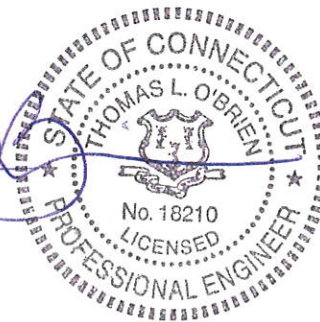
If you have any questions, or if we can be of further assistance, please do not hesitate to call.

Very truly yours,



Thomas L. O'Brien, P.E.

Partner





CHA COMPUTATION PAD

COMPLETED BY: A. MARCUSO
 CHECKED BY: _____
 PROJECT NAME: CT 1887 GREENWICH WATER TANK
 PROJECT LOCATION: 955 VALLEY RD - COS COB, CT 06807

PROJECT	PHASE	ORG
18301	1077	28000
SHEET #:	1	OF _____
DATE:	7.2.12	
SUBJECT:	ENCLOSURE STEEL PLATFORM DESIGN	

STEEL PLATFORM DESIGN :

PLATFORM WILL SUPPORT NEW STEALTH ENCLOSURE @ TOP OF EXISTING WATER TANK. PLATFORM WILL HAVE POSTS WHICH WILL BE ATTACHED TO EXISTING TANK WALLS. PLATFORM DESIGN LOADS ARE BASED ON ENCLOSURE DESIGN REACTIONS PROVIDED BY STEALTH IN FINAL SHOP DWGS DATED 6/22/12.

DESIGN RXNS (SERVICE) :

UPPER ASSEMBLY - (3) PIPE POSTS = $\downarrow 7.5^k \ \& \ 5.7^k \uparrow$
 ANY HORIZONTAL DIRECTION = $2.2^k \rightarrow$

(4) BOT. ROLLED CHANNELS = $0.1^k \downarrow$
 ANY HORIZONTAL DIRECTION = $0.3^k \rightarrow$

LOWER PANEL ASSEMBLY - PANEL WT. = 2 psf \downarrow
 WIND PRESSURE = 15 psf \rightarrow

UPPER ASSEMBLY WT. = 5,500 lbs

LOWER PANELS WT. = 2,100 lbs

STEALTH ENCLOSURE SKIN = 1.4 psf EA (10'x4')

STEEL PLATFORM DESIGN IS BASED ON THE LOADING ABOVE & DESIGN IS PERFORMED PER RAM ADVANSE. PLATFORM DESIGN OUTPUT & DIAGRAMS ARE ATTACHED ON PAGES 2 \rightarrow 8

EXISTING STEEL WATER TANK WALLS WILL BE ANALYZED BASED ON REACTIONS OBTAINED FROM RAM OUTPUT @ CRITICAL NODES, P. 18

NOTE: DISTANCE ACROSS STEEL FRAME = 31'-0" (BASED ON 30'-0" O.D.)
 MAX (PER DWGS DATED 9/24/53.)

PER STEALTH-6/22

D + W
W ONLY

D ONLY
W ONLY

RAM ADVANSE
OUTPUT - P. 2 \rightarrow

DWGS BY
AMERICAN WATER
SERVICE CO.



CHA COMPUTATION PAD

COMPLETED BY: Am

CHECKED BY: _____

PROJECT NAME: CT 1887

PROJECT LOCATION: Cos Cob, CT.

PROJECT	PHASE	ORG
18301	1077	28000

SHEET #: 1A OF _____

DATE: 7.26.12

SUBJECT: STEEL PLATFORM DESIGN LOADS

ADD'L Loading: Per TIA-222-f, ICE loads of 1/2" RADIAL must BE CONSIDERED.

STEALTH BASE RXNS: SINCE BASE RXNS DO NOT INCLUDE ICE LOADING, ASSUME 50% OF RXNS AS ICE LOAD.

CONSERVATIVE

∴ 1/2" ICE LOADS DUE TO NEW STENCH (ENCLOSURE AIR);

$$\begin{aligned} \text{UPPER ASSEMBLY} - (3) \text{ PIPE POSTS} &= 7.5^k \\ &- \underline{5.7^k} \text{ UPLIFT} \\ &1.8^k \end{aligned}$$

$$\begin{aligned} 1.8^k \times 1.5 &= 2.70^k \\ &- \underline{1.80^k} \end{aligned}$$

w/ ICE

$$\boxed{0.90^k}$$

ICE LOAD PER POST.

$$\begin{aligned} (4) \text{ ROLLED CHANNELS} &= 0.1^k \times 1.5 = 0.15^k \\ &- \underline{0.10^k} \end{aligned}$$

$$\boxed{0.05^k}$$

ICE LOAD PER CONNECTION.

* ICE LOADS APPLIED TO RAM MODEL AS DOWNWARD ICE LOAD.

1/2" RADIAL ICE ACCUMULATION OF W/2 POST:

$$A_{w/2+26} = 7.7 \text{ IN}^2$$

$$A_{w/2+26} \text{ w/ ICE} = 26.1 \text{ IN}^2 \quad (0.18 \text{ FT}^2)$$

$$\delta_{ICE} = 56 \text{ Pcf}$$

$$\text{WT, ICE PER POST} = (56 \text{ pcf}) (0.18 \text{ ft}^2) (10') \approx \boxed{105 \text{ lbs}}$$

Current Date: 7/27/2012 8:28 AM

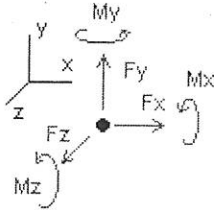
Units system: English

File name: W:\SAI Cingular\18301\Sites\1077 Greenwich 1887\Struct\Rev 4\Platform Frame Model - R1.ad\

Analysis Results

Envelope for nodal reactions

Note.- Ic is the controlling load condition



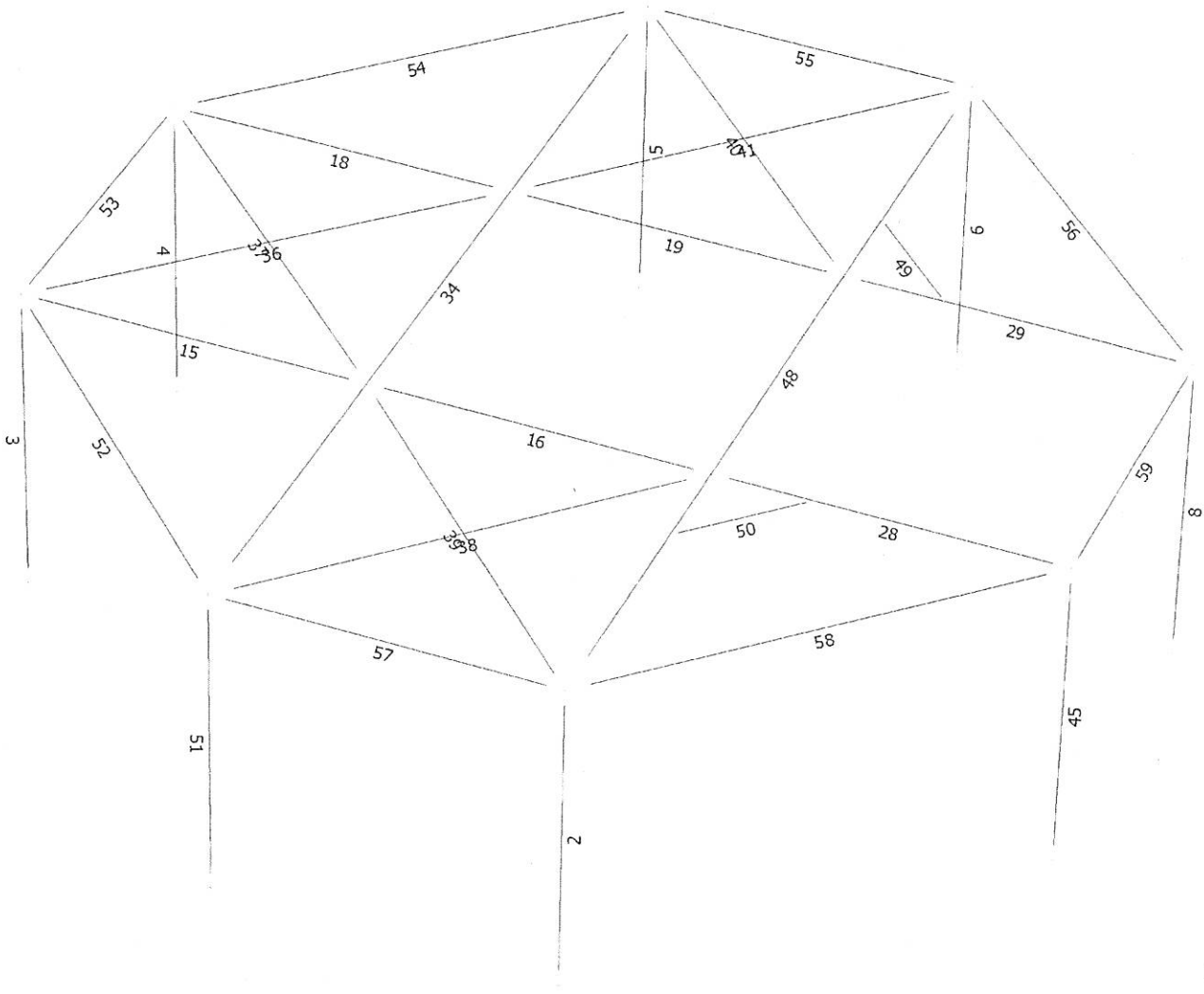
Direction of positive forces and moments

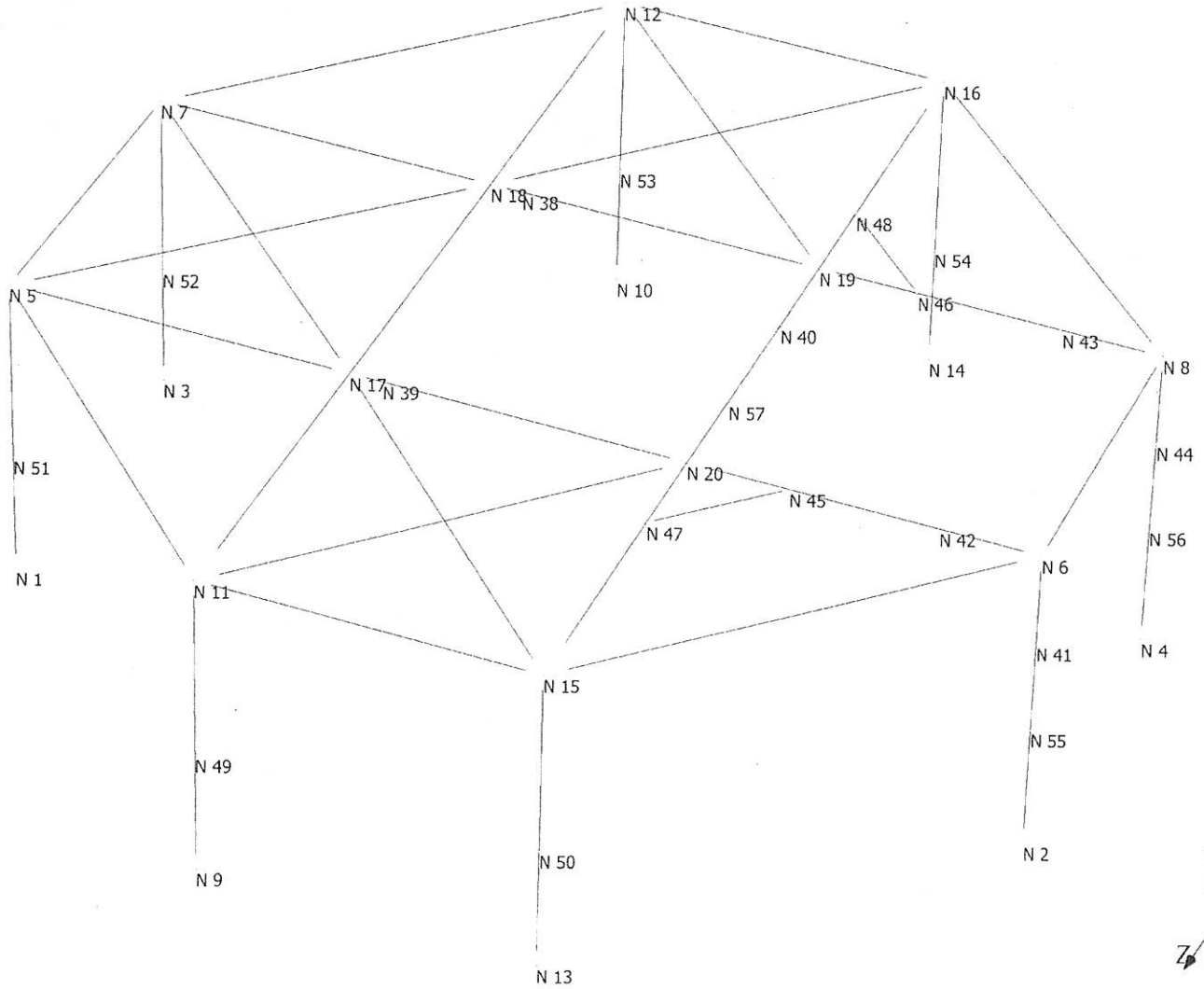
Envelope of nodal reactions for :

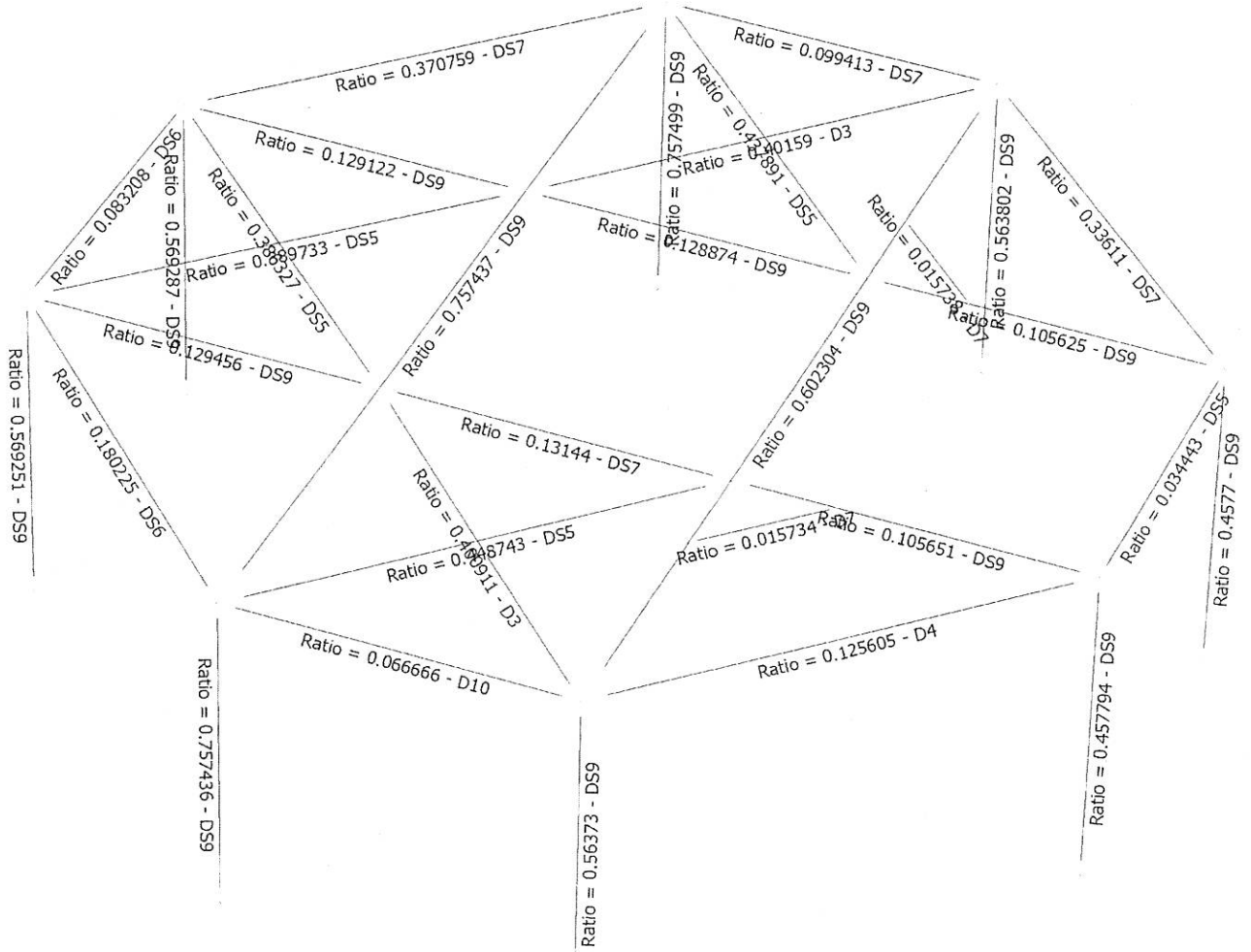
- D1=1.4DL
- D2=1.2DL+1.6S
- D3=1.2DL+0.8Wx+1.6S
- D4=1.2DL+0.8Wz+1.6S
- D5=1.2DL+0.8Wx
- D6=1.2DL+0.8Wz
- D7=1.2DL+1.6Wx
- D8=1.2DL+1.6Wz
- D9=1.2DL+1.6Wx+0.5S
- D10=1.2DL+1.6Wz+0.5S
- D11=0.9DL+1.6Wx
- D12=0.9DL+1.6Wz
- D13=1.2DL+1.6S+0.8Wu
- D14=1.2DL+1.6S+0.8Wd
- D15=1.2DL+0.8Wu
- D16=1.2DL+0.8Wd
- D17=1.2DL+1.6Wu
- D18=1.2DL+1.6Wd
- D19=1.2DL+0.5S+1.6Wu
- D20=1.2DL+0.5S+1.6Wd
- D21=0.9DL+1.6Wu
- D22=0.9DL+1.6Wd
- DS1=1.2DL+1.6S+1.6Ic
- DS2=1.2DL+1.6S+1.6Ic+0.8Wx
- DS3=1.2DL+1.6S+1.6Ic+0.8Wz
- DS4=1.2DL+1.6S+1.6Ic+0.8Wu
- DS5=1.2DL+1.6S+1.6Ic+0.8Wd
- DS6=1.2DL+1.6Wx+0.5S+0.5Ic
- DS7=1.2DL+1.6Wz+0.5S+0.5Ic
- DS8=1.2DL+1.6Wu+0.5S+0.5Ic
- DS9=1.2DL+1.6Wd+0.5S+0.5Ic

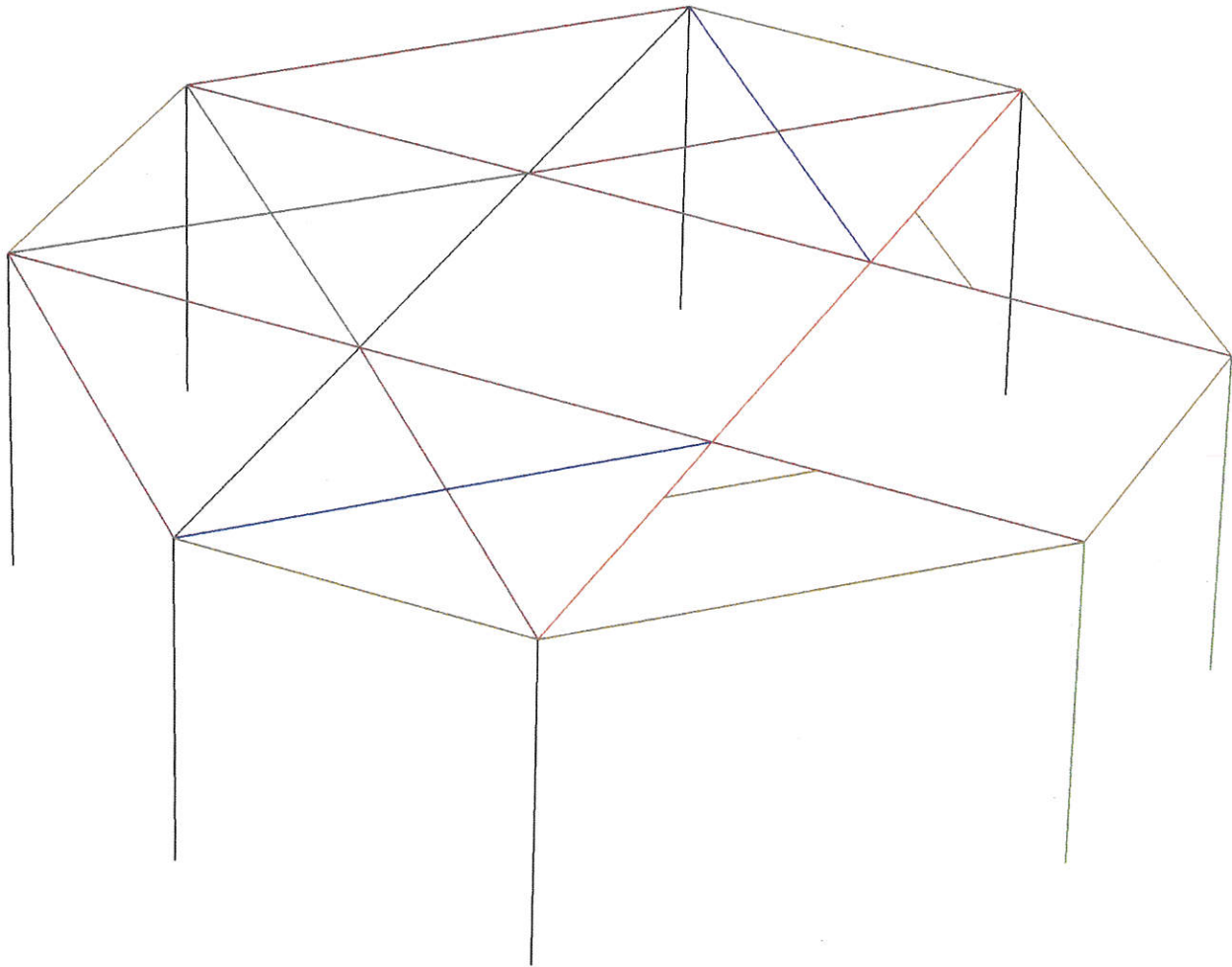
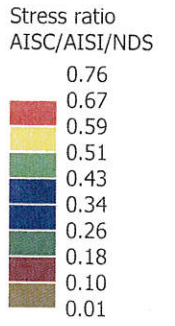
Node	Forces						Moments						
		Fx Ic		Fy Ic		Fz Ic		Mx Ic		My Ic		Mz Ic	
		[Kip]		[Kip]		[Kip]		[Kip*ft]		[Kip*ft]		[Kip*ft]	
1	Max	0.571	D21	0.222	DS1	4.757	D12	0.00000	D1	0.00000	D1	0.00000	D1
	Min	-1.213	DS9	0.047	D11	-0.042	DS6	0.00000	D1	0.00000	D1	0.00000	D1
2	Max	1.066	DS9	0.222	DS1	4.101	D12	0.00000	D1	0.00000	D1	0.00000	D1
	Min	-0.483	D21	0.047	D11	-0.011	DS9	0.00000	D1	0.00000	D1	0.00000	D1

3	Max	0.571	D21	0.222	DS1	4.763	DS7	0.00000	D1	0.00000	D1	0.00000	D1
	Min	-1.213	DS9	0.047	D11	-0.006	D21	0.00000	D1	0.00000	D1	0.00000	D1
4	Max	1.066	DS9	0.222	DS1	4.109	DS7	0.00000	D1	0.00000	D1	0.00000	D1
	Min	-0.483	D21	0.047	D11	-0.034	D11	0.00000	D1	0.00000	D1	0.00000	D1
9	Max	4.726	DS6	0.222	DS1	1.643	DS9	0.00000	D1	0.00000	D1	0.00000	D1
	Min	-0.303	D21	0.047	D11	-0.792	D21	0.00000	D1	0.00000	D1	0.00000	D1
10	Max	4.722	DS6	0.222	DS1	0.791	D21	0.00000	D1	0.00000	D1	0.00000	D1
	Min	-0.305	D21	0.047	D11	-1.643	DS9	0.00000	D1	0.00000	D1	0.00000	D1
13	Max	4.713	DS6	0.222	DS1	1.225	DS9	0.00000	D1	0.00000	D1	0.00000	D1
	Min	-0.296	D21	0.047	D11	-0.538	D21	0.00000	D1	0.00000	D1	0.00000	D1
14	Max	4.715	DS6	0.222	DS1	0.538	D21	0.00000	D1	0.00000	D1	0.00000	D1
	Min	-0.295	D21	0.047	D11	-1.225	DS9	0.00000	D1	0.00000	D1	0.00000	D1
49	Max	0.505	D21	11.726	DS9	3.118	D21	0.00000	D1	0.00000	D1	0.00000	D1
	Min	-8.021	DS6	-4.341	D21	-6.471	DS9	0.00000	D1	0.00000	D1	0.00000	D1
50	Max	0.494	D21	8.391	DS9	2.121	D21	0.00000	D1	0.00000	D1	0.00000	D1
	Min	-7.999	DS6	-2.297	D21	-4.825	DS9	0.00000	D1	0.00000	D1	0.00000	D1
51	Max	4.899	DS9	3.017	DS5	0.069	DS6	0.00000	D1	0.00000	D1	0.00000	D1
	Min	-2.323	D21	-0.091	D21	-8.075	D12	0.00000	D1	0.00000	D1	0.00000	D1
52	Max	4.899	DS9	3.017	DS5	0.010	D21	0.00000	D1	0.00000	D1	0.00000	D1
	Min	-2.322	D21	-0.091	D21	-8.083	DS7	0.00000	D1	0.00000	D1	0.00000	D1
53	Max	0.508	D21	11.727	DS9	6.471	DS9	0.00000	D1	0.00000	D1	0.00000	D1
	Min	-8.014	DS6	-4.341	D21	-3.118	D21	0.00000	D1	0.00000	D1	0.00000	D1
54	Max	0.492	D21	8.391	DS9	4.826	DS9	0.00000	D1	0.00000	D1	0.00000	D1
	Min	-8.003	DS6	-2.297	D21	-2.121	D21	0.00000	D1	0.00000	D1	0.00000	D1
55	Max	1.834	D21	2.520	DS5	0.017	DS9	0.00000	D1	0.00000	D1	0.00000	D1
	Min	-4.091	DS9	0.055	D21	-6.980	D12	0.00000	D1	0.00000	D1	0.00000	D1
56	Max	1.834	D21	2.520	DS5	0.057	D11	0.00000	D1	0.00000	D1	0.00000	D1
	Min	-4.090	DS9	0.055	D21	-6.992	DS7	0.00000	D1	0.00000	D1	0.00000	D1









Project Number: 18301-1077
 Date: 7/26/2012
 Completed By: A. Marruso

Page # 9 of
 CHK:

Loads and Design Criteria

Governing Building Code: IBC 2009 & AWWA

Building Classification: II Tbl 1604.5

The admin building is part of a waste water treatment facility.

Wind Loads: ASCE 7-05, IBC 2009 and AWWA

Wind Load Importance Factor:	1.15	AWWA
Basic Wind Speed (mph):	110	Fig 1609
Surface Roughness Category:	B	Sect 1609.4.2
"Urban and suburban areas, wooded areas or other terrain with numerous closely spaced obstructions having the size of single-family dwellings or larger."		
Exposure Category:	B	Sect 1609.4.3
Internal Pressure Coefficient	±0.18	ASCE Fig 6-5

Seismic Loads: ASCE 7-05 and IBC 2009

Seismic Importance Factor:	1.25	ASCE 11.5-1
Site Class:	D	IBC 1613.5.2
"When the soil properties are not known in sufficient detail to determine the site class, Site Class D shall be used unless the code enforcement official or geotechnical data determines that Site Class E or F soil is likely to be present at the site."		
Mapped Spectral Response Acceleration at Short Periods, S_s :	0.33	From USGS.gov
Mapped Spectral Response Acceleration at Short Periods, S_1 :	0.0680	From USGS.gov
Seismic Design Category:	C	IBC Table 1613.5.6(1) & (2)
Seismic-Force-Resisting System:	Steel Systems not Specifically Detailed for Seismic Resistance	
Response Modification Coefficient, R:	3	ASCE Table 12.2-1
System Overstrength Factor, Ω :	3	ASCE Table 12.2-1
Deflection Amplification Factor, C_d :	3	ASCE Table 12.2-1



CLOUGH HARBOUR & ASSOCIATES LLP

Project Number: 18301-1077
Date: 7/26/2012
Completed By: A. Marruso

Page # 10 of

Snow Load: ASCE 7-05 and Building Code of Virginia, 2010

Ground Snow Load, P_g :	30 psf	ASCE 7-05
Flat Roof Snow Load, P_f :	27.72 psf	ASCE Eqn 7-1
Exposure Factor, C_e :	1.0	ASCE Table 7-2
Thermal Factor, C_t :	1.2	ASCE Table 7-3
Importance Factor, I	1.10	ASCE Table 7-4
Maximum Snow Drift	No drift on tank roof	

Roof Live Load: 15 psf AWWA min.

ASCE 7 - 05			Reference	CVCC Reference	
Site Class		D	ASCE 7-05 11.4.2	Sect 1613.5.2	default b/c geotech information is not known
Occupancy Category		II	Table 1-1	Table 1604.5	Admin Building on WWTP
Importance Factor, I		1.25	Table 11.5-1		

Seismic Force-Resisting System		H	Table 12.2-1		Steel Systems not Specifically Detailed for Seismic Resistance
Response Modification Coeff	R	3	Table 12.2-1		
System Overstrength Factor	Ω	3	Table 12.2-1		
Deflection Amplification Factor	C_d	3	Table 12.2-1		

Long-period Transition Period	T_L	6 sec	Fig 22-15		
Fundamental Period of Building	$T = C_t * h_n^x$	0.15 sec	Eqn 12.8-7		Approximation
	C_t	0.02	Table 12.8-2		All other structural systems
	x	0.75	Table 12.8-2		All other structural systems
Height of Structure	h_n	15 ft			Height of enclosure only
	S_s	0.3300 %g	Fig 22-1	Fig 1613.5(1)	
	S_1	0.0680 %g	Fig 22-2	Fig 1613.5(2)	
	F_a	1.54	Table 11.4-1	Table 1613.5.3(1)	
	F_v	2.4	Table 11.4-2	Table 1613.5.3(2)	
	$S_{MS} = F_a * S_s$	0.507	Eqn 11.4-1	Eqn 16-37	
	$S_{M1} = F_v * S_1$	0.1632	Eqn 11.4-2	Eqn 16-38	
	$S_{D5} = 2/3 * S_{MS}$	0.33792	Eqn 11.4-3	Eqn 16-39	
	$S_{D1} = 2/3 * S_{M1}$	0.1088	Eqn 11.4-4	Eqn 16-40	
Seismic Design Category	Based on S_{D5}	C	Table 11.6-1	Table 1613.5.6(1)	
	Based on S_{D1}	C	Table 11.6-2	Table 1613.5.6(2)	

Equivalent Lateral Force Procedure, Sect 12.8

Seismic Response Coefficient	$C_s = S_{D5} / (R/I)$	0.141	Eqn 12.8-2		
Maximum C_s	$C_s = S_{D1} / T^2 * (R/I)$	0.297	Eqn 12.8-3		Based on $T \leq T_L$
Maximum C_s	$C_s = T_L * S_{D1} / T^2 * (R/I)$ see above		Eqn 12.8-4		Based on $T > T_L$
Minimum C_s	C_{smin}	0.010	Eqn 12.8-5		
Minimum C_s	$C_{smin} = 0.5 * S_1 / (R/I)$ see above		Eqn 12.8-6		If $S_1 \geq 0.6g$
	Design C_s	0.141			
	ASD Design C_s	0.099			
Seismic Base Shear	$V = C_s * W$	0.40 kip	Eqn 12.8-1		

Effective Seismic Weight (Sect 12.7.2)

Building Geometry	DIA or Length	12.00 ft			
	Width	0.00 ft			
	Square Footage	113.04 ft ²			
	Perimeter	37.68 ft	at centerline of wall		
	Wall height	8 ft	median wall height		
Tank Roof	Given weight	10 psf	Enclosure Walls, equipment, cables		
	Total Weight	3.01 kip	using median height and perimeter at centerline		
Walls + Floor Dead Weight		0 psf	not considered for connections at enclosure		
	Water	psf			
	1/2" plywood	0 psf			
	Standing seam metal roof	0 psf			
	Insulation	0 psf			
	Mechanical Duct	0 psf			
	Suspended Ceiling	0 psf			
	Total Rounded Up	0 psf			
	Total Dead Weight	0 kip			
Connections	Assumed	1 kip			
Total Weight		4.01 kip			

$4.01^k / (15' \times 13' \text{ ft.}) = 20.6 \text{ psf}$

Story Seismic Force, F_x

$F_x = C_{vx} * V$ Eqn 12.8-11
 $C_{vx} = w_x * h_x^k / \sum w_i * h_i^k$ Eqn 12.8-12
 k 1

WIND: 23.2 psf (Governs)

	w_i kip	h_i ft	$w_x * h_x^k$	C_{vx}	F_x kip
Roof	2.5072	8	20.0576	1	0.40
Ground	1.5072	0	0	0	0.00
	4.0144		20.0576		0.40



CHA COMPUTATION PAD

COMPLETED BY: AM
 CHECKED BY: _____
 PROJECT NAME: CT 1887
 PROJECT LOCATION: OS COB, CT.

PROJECT	PHASE	ORG
18301	1077	28000

SHEET #: 12 OF _____
 DATE: 7.17.12
 SUBJECT: CONNECTIONS DESIGN

- REQ'D :
1. Design of STEALTH P5 STD. POST CONNECTION BASE PL TO PLATFORM STEEL.
 2. Design of STEALTH C4x5.4 ROLLED CHANNEL CONNECTION TO PLATFORM STEEL
 3. Design of New PLATFORM STEEL MEMBERS @ BASE of STEALTH ENCLOSURE
 4. STEEL POST TO EXIST. TANK WALL.
 5. New ROLLED CHANNEL TO SUPPORT STEALTH SKIN[®] CONNECTION TABS.

1. P5 STD. BASE PL : PER FINAL DESIGN DWGS. BY STEALTH DATED 6.22.12 ;

$$F_{y \max} = 7.5^k \downarrow + 50\% \text{ ICE WT.} = 11.3^k$$

$$F_{x \max} = 2.2^k \rightarrow$$

P5 Post WELDED TO 12 x 7 x 1/2" THK PL

TRY 3/4" ϕ A325-N BOLTS - ASSUME (2) BOLTS ;

LRFD SHEAR STRENGTH = 15.9^k EA. x 2 = 31.8^k TOTAL > 11.3^k ✓ OK AISC-13TH

LRFD TENSILE STRENGTH = 29.8^k EA. x 2 = 59.6^k TOTAL > 2.2^k ✓ OK TBL 7-1&2

USE 3/4" ϕ A325-N BOLTS FOR CONNECTION

2. C4 x 5.4 ROLLED CHANNEL BASE PL : BASE PLANS PER STEALTH DWGS - 6.22.12

$$\left. \begin{aligned} F_{y \max} &= 0.15^k \\ F_{x \max} &= 0.3^k \end{aligned} \right\} 3/4" \phi \text{ A325-N BOLTS } \checkmark \text{ OK B.I.}$$

USE 3/4" ϕ A325-N BOLTS FOR CONNECTION