



0	08/04/2016	A. B.	M. I. A.	BTESA	PRIMERA EMISIÓN	PE
Rev.	Fecha	Elaborado por nombre/firma	Revisado por nombre/firma	Aprobado por nombre/firma	Descripción	Estado
<div style="text-align: center;">  <p>TORRE 50 M + EXTENSION 10 M BUENAVISTA - HUILA</p> </div>						
<div style="text-align: center;"> <p>EVALUACION ESTRUCTURAL</p>  </div>						
ESCALA SIN	FORMATO A4	REFERENCIA BTESA TAC50-E10-BU-HU		REFERENCIA RTVC TORRE 50-BUENAVISTA	HOJA 1/24	REV 0

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TORRE 50 + EXTENSION 10.m

EVALUACION ESTRUCTURAL

1. DESCRIPCIÓN:

A continuación presentamos la verificación estructural de la torre auto-soportada de 50 metros, instalada en la estación Buenavista (Huila), es tipo celosía de sección cuadrada, diseñada con perfiles angulares; El chequeo se hace con las cargas de antenas instaladas actualmente: Trece (13) antenas TV, una (1) antena yagui y tres (3) antenas MWØ3.0m, se proyecta la instalación de doce (12) antenas panel, en una extensión de 10m, según cuadro y luego se verifican los elementos que requieren refuerzo.

2. ESPECIFICACIONES:

Carga de diseño:

TIPO / DIAMETRO	ALTURA EN TORRE	CANTIDAD
ANTENAS EXISTENTES		
ANTENA TV	48,5 m	3 und
ANTENA TV	41,5 m	3 und
ANTENA TV	36,5 m	3 und
ANTENA TV	33,5 m	2 und
ANTENA TV	31,5 m	1 und
ANTENA TV	27,0 m	1 und
ANTENA YAGUI	21,0 m	2 und
MWØ3,0 m	15,0 m	1 und
MWØ3,0 m	12,0 m	2 und
ANTENAS NUEVAS		
ANTENA PANEL	58,0 m	12 und

Carga viva: 3 Operarios de 80 kg. c/u.

Velocidad del viento: 120. Km / h

Materiales :- Ángulos, canales y platinas: ASTM A36 y ASTM A572

- Tornillos : ASTM A325 –G5

Galvanizado: Según norma ASTM A153 y ASTM A123

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NOTA:

A CONTINUACION SE MUESTRAN LOS AZIMUT DE LAS CARAS DE LA TORRE:

AZIMUT DE LA CARA A: 101°

AZIMUT DE LA CARA B: 191°

AZIMUT DE LA CARA C: 281°

AZIMUT DE LA CARA D: 11°

3. CARGAS:

Las cargas de diseño corresponden a acciones de gravedad y viento sobre la torre, antenas y demás accesorios, afectadas por un factor de seguridad.

3.1. Cargas de gravedad.

El peso propio de la estructura es evaluado por el programa de análisis estructural y es afectado por un factor de 1.2 para tener en cuenta los elementos redundantes, platinas, tornillos, uniones y galvanizado. El peso de las antenas y sus soportes se obtienen directamente del catálogo del fabricante.

3.2. Carga de viento:

V = Velocidad del viento: 120 Km. / hora.

Para el cálculo de las cargas viento se utiliza el NSR-10, con la siguiente expresión:

Fuerza debida al viento $F = q_z * C_f * A_f$

En donde:

q_z = Presión de viento en daN/m²

C_f = Coeficiente de fuerza según capítulo H

A_f = Área expuesta en m²

La presión del viento q_z , está dada por:

$$q_z = Q \times (Z_V \times V)^2 \times G$$

En donde,

Q Factor de densidad del aire = 0.0048

ZV Factor de terreno.

V Velocidad de viento básica = 120 km/h

G Factor de ráfaga de viento.

Presión de viento básica 76.2 kg/m²

3.3. Viento sobre la estructura.

Se aplican en los nudos que comprenden cada panel analizado.

Para $P(0) = 76.2 \text{ kg / m}^2$

$$P(10) = 76.2$$

$$P(50) = 97.6$$

A = área del panel analizado. S / silueta.

Se plantean tres (3) hipótesis de carga de acuerdo con las especificaciones:

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3.3.1.Viento Transversal:(Hipótesis C1)

Esta dada por la siguiente expresión: $F_t = C_f * P * A$

3.3.2.Viento a 45° : (Hipótesis C2)

Esta dada por la expresión: $F_{45^\circ} = 1.15 * F_t$

Se debe aplicar en cada dirección principal simultáneamente.

Adicionalmente para verificar deformaciones se tiene una hipótesis (C3) con viento de 60.Km/h

4. MATERIALES:

Acero: ASTM A36, A572

Tornillos: ASTM A394 To

Galvanización: ASTM A153 y ASTM A123

5. ANÁLISIS Y DISEÑO.

Se llevó a cabo según lo especificado en las normas EIA-222F, NSR-10 y se ejecutó mediante el programa tower.

6. ANEXOS-EVALUACION ESTRUCTURAL

TORRE 50 m – CON EXTENSION 10 m

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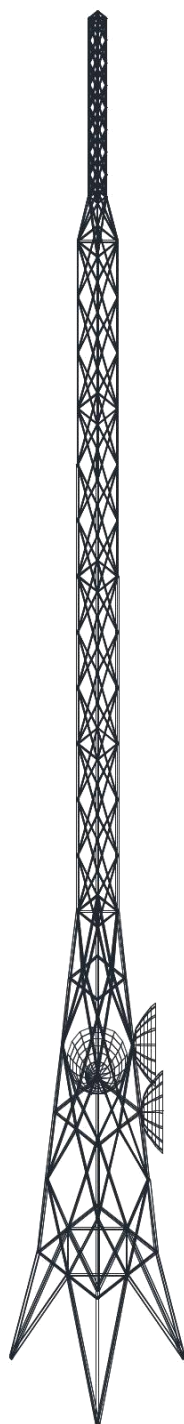
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SILUETA TAC50-ANTENAS



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LISTADO TOWER

 *
 * TOWER - Analysis and Design - Copyright Power Line Systems, Inc. 1986-2006 *
 *

Project Name : TORRE 50.m+EXT.10m-BUENAVISTA -ACT.
 Project Notes: BTESA - RTVC
 Project File : h:\arch 2016\eval btesa\tac50buenavista\tor50m e10.tow
 Date run : 06:23:24 p.m. viernes, 08 de abril de 2016
 by : Tower Version 10.20

Successfully performed linear analysis

The model has 0 warnings.



Member check option: TIA/EIA 222-F
 Connection rupture check: Not Checked
 Crossing diagonal check: Fixed

Joints Geometry:

Joint Label	Symmetry Code	X Coord. (m)	Y Coord. (m)	Z Coord. (m)	X Disp. Rest.	Y Disp. Rest.	Z Disp. Rest.	X Rot. Rest.	Y Rot. Rest.	Z Rot. Rest.
14P	XY-Symmetry	0.3	0.3	60	Free	Free	Free	Free	Free	Free
22P	XY-Symmetry	0.3	0.3	52	Free	Free	Free	Free	Free	Free
23P	XY-Symmetry	0.7	0.7	50	Free	Free	Free	Free	Free	Free
33P	XY-Symmetry	0.7	0.7	25	Free	Free	Free	Free	Free	Free
41P	XY-Symmetry	0.7	0.7	20	Free	Free	Free	Free	Free	Free
45P	XY-Symmetry	1.244	1.244	14	Free	Free	Free	Free	Free	Free
49P	XY-Symmetry	1.785	1.785	8	Free	Free	Free	Free	Free	Free
53P	XY-Symmetry	2.08	2.08	4.73	Free	Free	Free	Free	Free	Free
56P	XY-Symmetry	3.05	3.05	0	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
14X	X-GenXY	0.3	-0.3	60	Free	Free	Free	Free	Free	Free
14XY	XY-GenXY	-0.3	-0.3	60	Free	Free	Free	Free	Free	Free
14Y	Y-GenXY	-0.3	0.3	60	Free	Free	Free	Free	Free	Free
22X	X-GenXY	0.3	-0.3	52	Free	Free	Free	Free	Free	Free
22XY	XY-GenXY	-0.3	-0.3	52	Free	Free	Free	Free	Free	Free
22Y	Y-GenXY	-0.3	0.3	52	Free	Free	Free	Free	Free	Free
23X	X-GenXY	0.7	-0.7	50	Free	Free	Free	Free	Free	Free
23XY	XY-GenXY	-0.7	-0.7	50	Free	Free	Free	Free	Free	Free
23Y	Y-GenXY	-0.7	0.7	50	Free	Free	Free	Free	Free	Free
33X	X-GenXY	0.7	-0.7	25	Free	Free	Free	Free	Free	Free
33XY	XY-GenXY	-0.7	-0.7	25	Free	Free	Free	Free	Free	Free
33Y	Y-GenXY	-0.7	0.7	25	Free	Free	Free	Free	Free	Free
41X	X-GenXY	0.7	-0.7	20	Free	Free	Free	Free	Free	Free
41XY	XY-GenXY	-0.7	-0.7	20	Free	Free	Free	Free	Free	Free
41Y	Y-GenXY	-0.7	0.7	20	Free	Free	Free	Free	Free	Free

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45X	X-GenXY	1.244	-1.244	14	Free	Free	Free	Free	Free	Free
45XY	XY-GenXY	-1.244	-1.244	14	Free	Free	Free	Free	Free	Free
45Y	Y-GenXY	-1.244	1.244	14	Free	Free	Free	Free	Free	Free
49X	X-GenXY	1.785	-1.785	8	Free	Free	Free	Free	Free	Free
49XY	XY-GenXY	-1.785	-1.785	8	Free	Free	Free	Free	Free	Free
49Y	Y-GenXY	-1.785	1.785	8	Free	Free	Free	Free	Free	Free
53X	X-GenXY	2.08	-2.08	4.73	Free	Free	Free	Free	Free	Free
53XY	XY-GenXY	-2.08	-2.08	4.73	Free	Free	Free	Free	Free	Free
53Y	Y-GenXY	-2.08	2.08	4.73	Free	Free	Free	Free	Free	Free
56X	X-GenXY	3.05	-3.05	0	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
56XY	XY-GenXY	-3.05	-3.05	0	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed
56Y	Y-GenXY	-3.05	3.05	0	Fixed	Fixed	Fixed	Fixed	Fixed	Fixed

Secondary Joints:

Joint Label	Symmetry Code	Origin Joint	End Joint	Fraction	Elevation	X Rest.	Y Disp. Rest.	Z Disp. Rest.	X Rot. Rest.	Y Rot. Rest.	Z Rot. Rest.
(m)											
15S	XY-Symmetry	14P	22P	0.125	0	Free	Free	Free	Free	Free	Free
16S	XY-Symmetry	14P	22P	0.25	0	Free	Free	Free	Free	Free	Free
17S	XY-Symmetry	14P	22P	0.375	0	Free	Free	Free	Free	Free	Free
18S	XY-Symmetry	14P	22P	0.5	0	Free	Free	Free	Free	Free	Free
19S	XY-Symmetry	14P	22P	0.625	0	Free	Free	Free	Free	Free	Free
20S	XY-Symmetry	14P	22P	0.75	0	Free	Free	Free	Free	Free	Free
21S	XY-Symmetry	14P	22P	0.875	0	Free	Free	Free	Free	Free	Free
24S	XY-Symmetry	23P	33P	0.1	0	Free	Free	Free	Free	Free	Free
25S	XY-Symmetry	23P	33P	0.2	0	Free	Free	Free	Free	Free	Free
26S	XY-Symmetry	23P	33P	0.3	0	Free	Free	Free	Free	Free	Free
27S	XY-Symmetry	23P	33P	0.4	0	Free	Free	Free	Free	Free	Free
28S	XY-Symmetry	23P	33P	0.5	0	Free	Free	Free	Free	Free	Free
29S	XY-Symmetry	23P	33P	0.6	0	Free	Free	Free	Free	Free	Free
30S	XY-Symmetry	23P	33P	0.7	0	Free	Free	Free	Free	Free	Free
31S	XY-Symmetry	23P	33P	0.8	0	Free	Free	Free	Free	Free	Free
32S	XY-Symmetry	23P	33P	0.9	0	Free	Free	Free	Free	Free	Free
37S	XY-Symmetry	33P	41P	0.5	0	Free	Free	Free	Free	Free	Free
42S	XY-Symmetry	41P	45P	0.5	0	Free	Free	Free	Free	Free	Free
43S	Y-Symmetry	42S	42X	0.5	0	Free	Free	Free	Free	Free	Free
44S	X-Symmetry	42S	42Y	0.5	0	Free	Free	Free	Free	Free	Free
46S	XY-Symmetry	45P	49P	0.5	0	Free	Free	Free	Free	Free	Free
47S	Y-Symmetry	46S	46X	0.5	0	Free	Free	Free	Free	Free	Free
48S	X-Symmetry	46S	46Y	0.5	0	Free	Free	Free	Free	Free	Free
54S	Y-Symmetry	53P	53X	0.5	0	Free	Free	Free	Free	Free	Free
55S	X-Symmetry	53P	53Y	0.5	0	Free	Free	Free	Free	Free	Free
15X	X-GenXY	14P	22P	0.125	0	Free	Free	Free	Free	Free	Free
15XY	XY-GenXY	14P	22P	0.125	0	Free	Free	Free	Free	Free	Free
15Y	Y-GenXY	14P	22P	0.125	0	Free	Free	Free	Free	Free	Free
16X	X-GenXY	14P	22P	0.25	0	Free	Free	Free	Free	Free	Free
16XY	XY-GenXY	14P	22P	0.25	0	Free	Free	Free	Free	Free	Free
16Y	Y-GenXY	14P	22P	0.25	0	Free	Free	Free	Free	Free	Free
17X	X-GenXY	14P	22P	0.375	0	Free	Free	Free	Free	Free	Free
17XY	XY-GenXY	14P	22P	0.375	0	Free	Free	Free	Free	Free	Free
17Y	Y-GenXY	14P	22P	0.375	0	Free	Free	Free	Free	Free	Free
18X	X-GenXY	14P	22P	0.5	0	Free	Free	Free	Free	Free	Free
18XY	XY-GenXY	14P	22P	0.5	0	Free	Free	Free	Free	Free	Free
18Y	Y-GenXY	14P	22P	0.5	0	Free	Free	Free	Free	Free	Free
19X	X-GenXY	14P	22P	0.625	0	Free	Free	Free	Free	Free	Free
19XY	XY-GenXY	14P	22P	0.625	0	Free	Free	Free	Free	Free	Free
19Y	Y-GenXY	14P	22P	0.625	0	Free	Free	Free	Free	Free	Free
20X	X-GenXY	14P	22P	0.75	0	Free	Free	Free	Free	Free	Free
20XY	XY-GenXY	14P	22P	0.75	0	Free	Free	Free	Free	Free	Free
20Y	Y-GenXY	14P	22P	0.75	0	Free	Free	Free	Free	Free	Free
21X	X-GenXY	14P	22P	0.875	0	Free	Free	Free	Free	Free	Free
21XY	XY-GenXY	14P	22P	0.875	0	Free	Free	Free	Free	Free	Free
21Y	Y-GenXY	14P	22P	0.875	0	Free	Free	Free	Free	Free	Free
24X	X-GenXY	23P	33P	0.1	0	Free	Free	Free	Free	Free	Free
24XY	XY-GenXY	23P	33P	0.1	0	Free	Free	Free	Free	Free	Free
24Y	Y-GenXY	23P	33P	0.1	0	Free	Free	Free	Free	Free	Free
25X	X-GenXY	23P	33P	0.2	0	Free	Free	Free	Free	Free	Free
25XY	XY-GenXY	23P	33P	0.2	0	Free	Free	Free	Free	Free	Free
25Y	Y-GenXY	23P	33P	0.2	0	Free	Free	Free	Free	Free	Free
26X	X-GenXY	23P	33P	0.3	0	Free	Free	Free	Free	Free	Free
26XY	XY-GenXY	23P	33P	0.3	0	Free	Free	Free	Free	Free	Free
26Y	Y-GenXY	23P	33P	0.3	0	Free	Free	Free	Free	Free	Free
27X	X-GenXY	23P	33P	0.4	0	Free	Free	Free	Free	Free	Free
27XY	XY-GenXY	23P	33P	0.4	0	Free	Free	Free	Free	Free	Free
27Y	Y-GenXY	23P	33P	0.4	0	Free	Free	Free	Free	Free	Free
28X	X-GenXY	23P	33P	0.5	0	Free	Free	Free	Free	Free	Free
28XY	XY-GenXY	23P	33P	0.5	0	Free	Free	Free	Free	Free	Free
28Y	Y-GenXY	23P	33P	0.5	0	Free	Free	Free	Free	Free	Free
29X	X-GenXY	23P	33P	0.6	0	Free	Free	Free	Free	Free	Free
29XY	XY-GenXY	23P	33P	0.6	0	Free	Free	Free	Free	Free	Free
29Y	Y-GenXY	23P	33P	0.6	0	Free	Free	Free	Free	Free	Free
30X	X-GenXY	23P	33P	0.7	0	Free	Free	Free	Free	Free	Free

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30XY	XY-GenXY	23P	33P	0.7	0	Free	Free	Free	Free	Free	Free
30Y	Y-GenXY	23P	33P	0.7	0	Free	Free	Free	Free	Free	Free
31X	X-GenXY	23P	33P	0.8	0	Free	Free	Free	Free	Free	Free
31XY	XY-GenXY	23P	33P	0.8	0	Free	Free	Free	Free	Free	Free
31Y	Y-GenXY	23P	33P	0.8	0	Free	Free	Free	Free	Free	Free
32X	X-GenXY	23P	33P	0.9	0	Free	Free	Free	Free	Free	Free
32XY	XY-GenXY	23P	33P	0.9	0	Free	Free	Free	Free	Free	Free
32Y	Y-GenXY	23P	33P	0.9	0	Free	Free	Free	Free	Free	Free
37X	X-GenXY	33P	41P	0.5	0	Free	Free	Free	Free	Free	Free
37XY	XY-GenXY	33P	41P	0.5	0	Free	Free	Free	Free	Free	Free
37Y	Y-GenXY	33P	41P	0.5	0	Free	Free	Free	Free	Free	Free
42X	X-GenXY	41P	45P	0.5	0	Free	Free	Free	Free	Free	Free
42XY	XY-GenXY	41P	45P	0.5	0	Free	Free	Free	Free	Free	Free
42Y	Y-GenXY	41P	45P	0.5	0	Free	Free	Free	Free	Free	Free
43Y	Y-Gen	42S	42X	0.5	0	Free	Free	Free	Free	Free	Free
44X	X-Gen	42S	42Y	0.5	0	Free	Free	Free	Free	Free	Free
46X	X-GenXY	45P	49P	0.5	0	Free	Free	Free	Free	Free	Free
46XY	XY-GenXY	45P	49P	0.5	0	Free	Free	Free	Free	Free	Free
46Y	Y-GenXY	45P	49P	0.5	0	Free	Free	Free	Free	Free	Free
47Y	Y-Gen	46S	46X	0.5	0	Free	Free	Free	Free	Free	Free
48X	X-Gen	46S	46Y	0.5	0	Free	Free	Free	Free	Free	Free
54Y	Y-Gen	53P	53X	0.5	0	Free	Free	Free	Free	Free	Free
55X	X-Gen	53P	53Y	0.5	0	Free	Free	Free	Free	Free	Free

Steel Material Properties:

Steel Material Label	Modulus of Elasticity (MPa)	Yield Stress Fy (MPa)	Ultimate Stress Fu (MPa)	Member Stress All. Hyp. 1 (MPa)	Member Stress Rupture Hyp. 2 (MPa)	Member Stress Rupture Hyp. 1 (MPa)	Member Stress Rupture Hyp. 2 (MPa)	Member Bearing Hyp. 1 (MPa)	Member Bearing Hyp. 2 (MPa)
A-572	2e+005	344.7	482.5	0	0	0	0	0	0

Bolt Properties:

Bolt Label	Bolt Diameter (cm)	Hole Diameter (cm)	Ultimate Shear Capacity (kN)	Default End Distance (cm)	Default Bolt Spacing (cm)	Shear Capacity Hyp. 1 (kN)	Shear Capacity Hyp. 2 (kN)
5/8"	1.59	1.749	62.53	2.5	0	0	0
5/8" DC	1.59	1.749	125	2.5	0	0	0

Number Bolts Used By Type:

Bolt Type	Number Bolts
5/8" DC	760
5/8"	564

Angle Properties:

Angle Type	Angle Size (cm)	Long Leg (cm)	Short Leg (cm)	Thick. (cm)	Unit Weight (N/m)	Gross Area (cm^2)	w/t Ratio	Radius of Gyration Rx (cm)	Radius of Gyration Ry (cm)	Radius of Gyration Rz (cm)	Number of Angles	Wind Width (cm)	Short Edge Dist. (cm)	Long Edge Dist. (cm)	Optimize Factor	Section Modulus (cm^3)
DUM	0.1X0.1X1	0.254	0.254	2.54	0	0.06452	2	2.54	2.54	2.54	1	0.254	0	0	1.0000	0
SAE	4X4X0.375	10.16	10.16	0.9525	143	18.52	8.67	3.132	3.132	2.004	1	10.16	0	0	1.0000	0
SAE	4X4X0.3125	10.16	10.16	0.7937	119.7	15.48	10.6	3.15	3.15	2.009	1	10.16	0	0	1.0000	0
SAE	2.5X2.5X0.25	6.35	6.35	0.635	59.83	7.677	7.75	1.953	1.953	1.247	1	6.35	0	0	1.0000	0
SAE	2.5X2.5X0.1875	6.35	6.35	0.4763	44.8	5.935	10.67	1.976	1.976	1.257	1	6.35	0	0	1.0000	0
SAE	2X2X0.25	5.08	5.08	0.635	46.55	6.065	5	1.547	1.547	0.9931	1	5.08	0	0	1.0000	0
SAE	2X2X0.1875	5.08	5.08	0.4763	35.61	4.581	7	1.567	1.567	1.001	1	5.08	0	0	1.0000	0
SAE	5X5X0.375	12.7	12.7	0.9525	179.5	23.29	11	3.962	3.962	2.515	1	12.7	0	0	1.0000	0
SAE	3X3X0.3125	7.62	7.62	0.7937	89.01	11.48	7.6	2.342	2.342	1.496	1	7.62	0	0	1.0000	0
SAE	1.5X1.5X0.25	3.81	3.81	0.635	34.15	4.452	3.5	1.14	1.14	0.7417	1	3.81	0	0	1.0000	0
SAE	1.5X1.5X0.125	3.81	3.81	0.3175	17.95	2.323	8	1.181	1.181	0.7518	1	3.81	0	0	1.0000	0

Angle Groups:

Group Label	Group Description	Angle Type	Angle Size	Material Type	Element Type	Group Type	Optimize Group	Allow. Angle Width For Optimize (cm)	Add. Width (cm)
1	M01	SAE	5X5X0.375	A-572	Beam		Size + Type	30.480	
2	M02	SAE	5X5X0.375	A-572	Beam		Size + Type	30.480	
3	M03	SAE	4X4X0.375	A-572	Beam		Size + Type	30.480	
4	M04	SAE	4X4X0.375	A-572	Beam		Size + Type	30.480	
5	M05	SAE	4X4X0.3125	A-572	Beam		Size + Type	30.480	
6	M06	SAE	4X4X0.3125	A-572	Beam		Size + Type	30.480	
7	M07	SAE	4X4X0.3125	A-572	Beam		Size + Type	30.480	
8	M08	SAE	3X3X0.3125	A-572	Beam		Size + Type	30.480	

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9	M09	SAE	2.5X2.5X0.25	A-572	Beam	Size + Type	30.480
10	M10	SAE	2.5X2.5X0.25	A-572	Beam	Size + Type	30.480
11	M11	SAE	2.5X2.5X0.25	A-572	Beam	Size + Type	30.480
12	M12	SAE	2.5X2.5X0.25	A-572	Beam	Size + Type	30.480
13	D01	SAE	5X5X0.375	A-572	Truss	Size + Type	30.480
14	D02	SAE	2.5X2.5X0.25	A-572	Truss	Size + Type	30.480
15	D03	SAE	2X2X0.25	A-572	Truss	Size + Type	30.480
16	D04	SAE	2X2X0.1875	A-572	Truss	Size + Type	30.480
17	D05	SAE	1.5X1.5X0.25	A-572	Truss	Size + Type	30.480
18	D06	SAE	1.5X1.5X0.25	A-572	Truss	Size + Type	30.480
19	D07	SAE	1.5X1.5X0.25	A-572	Truss	Size + Type	30.480
20	D08	SAE	1.5X1.5X0.125	A-572	Truss	Size + Type	30.480
21	D09	SAE	1.5X1.5X0.125	A-572	Truss	Size + Type	30.480
22	D10	SAE	1.5X1.5X0.125	A-572	Truss	Size + Type	30.480
23	D11	SAE	1.5X1.5X0.125	A-572	Truss	Size + Type	30.480
24	D12	SAE	1.5X1.5X0.125	A-572	Truss	Size + Type	30.480
25	H01	SAE	2.5X2.5X0.1875	A-572	Beam	Size + Type	30.480
26	H02	SAE	2.5X2.5X0.25	A-572	Beam	Size + Type	30.480
27	H03	SAE	2.5X2.5X0.25	A-572	Beam	Size + Type	30.480
28	H04	SAE	2X2X0.1875	A-572	Beam	Size + Type	30.480
29	H05	SAE	1.5X1.5X0.125	A-572	Beam	Size + Type	30.480
30	H06	SAE	1.5X1.5X0.125	A-572	Beam	Size + Type	30.480
31	H07	SAE	1.5X1.5X0.125	A-572	Beam	Size + Type	30.480
32	H08	SAE	1.5X1.5X0.125	A-572	Beam	Size + Type	30.480
33	C01	SAE	2.5X2.5X0.1875	A-572	Truss	Size + Type	30.480
34	C02	SAE	2X2X0.1875	A-572	Truss	Size + Type	30.480
35	C03	SAE	2X2X0.1875	A-572	Truss	Size + Type	30.480
36	C04	SAE	2X2X0.1875	A-572	Truss	Size + Type	30.480
37	ZZ2	DUM	0.1X0.1X1	A-572	Truss Fictitious	None	30.480

Aggregate Angle Information:

Note: Estimate of surface area reported for painting purposes, not wind loading.

Angle Type	Angle Size	Material Type	Total Length (m)	Total Surface Area (m^2)	Total Weight (N)
SAE	5X5X0.375	A-572	78.57	39.92	14102.89
SAE	4X4X0.375	A-572	48.39	19.67	6920.08
SAE	4X4X0.3125	A-572	60.00	24.38	7179.42
SAE	3X3X0.3125	A-572	20.00	6.10	1780.26
SAE	2.5X2.5X0.25	A-572	130.10	33.05	7783.85
SAE	2X2X0.25	A-572	54.08	10.99	2517.50
SAE	2X2X0.1875	A-572	66.03	13.42	2351.00
SAE	1.5X1.5X0.25	A-572	137.53	20.96	4696.27
SAE	1.5X1.5X0.125	A-572	257.54	39.25	4622.52
SAE	2.5X2.5X0.1875	A-572	28.41	7.22	1272.55

Sections:

The adjustment factors below only apply to dead load and wind areas that are calculated for members in the model. They do not apply to equipment or to manually input dead load and drag areas.

Section Label	Joint Defining Section Bottom	Dead Load Adjust. Factor	Transverse Drag x Area For Face	Longitudinal Drag x Area For Face	Transverse Area Factor (CD From Code)	Longitudinal Area Factor (CD From Code)	Af Factor EIA Only	Flat Ar Factor EIA Only	Round Factor For Face	Transverse Drag x Area For All	Longitudinal Drag x Area For All	SAPS Angle Drag x Area Factor	SAPS Round Drag x Area Factor	Force Solid Face
EXT10	22P	1.200	0.000	0.000	0.000	0.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	None
SECC1	23P	1.200	0.000	0.000	0.000	0.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	None
SECC2	27S	1.200	0.000	0.000	0.000	0.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	None
SECC3	31S	1.200	0.000	0.000	0.000	0.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	None
SECC4	41P	1.200	0.000	0.000	0.000	0.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	None
SECC5	45P	1.200	0.000	0.000	0.000	0.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	None
SECC6	49P	1.200	0.000	0.000	0.000	0.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	None
SECC7	53P	1.200	0.000	0.000	0.000	0.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	None
SECC8	56P	1.200	0.000	0.000	0.000	0.000	1.000	1.000	0.000	0.000	0.000	0.000	0.000	None

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*** Loads Data

Loads from file: h:\arch_2016\eval_btesa\tac50buenavista\tor50m_e10.eia

Structure Height Summary (used for calculating wind/ice adjust with height):

Structure height above ground 60.00 (m)
Elevation of structure bottom for wind height adjustment: 0.00 (m)
Structure height for structure gust response factor: 60.00 (m)
Structure gust response factor, G_h : 1.1149
Guy installation temperature: 15.56 (deg C)
Tower Type: Rectangular Latticed

EIA Rev. F Load Cases:

Load Case Description	Dead Load Factor	Wind Load Factor	Ice Load Factor	Strength Factor	Allowable Stress Increase Factor	Basic Wind Speed (m/s)	Wind Dir. (Deg)	Ice Thick. (cm)	Ice Density (N/m ³)	Ice Temperature (deg C)	Point Loads	Joint Displ.
WIN 0 -120	1.2500	0.8500	1.0000	1.0000	1.3300	33.333	0	0.0000	0.0000	20.0	10 loads	
WIN 45-120	1.2500	0.8500	1.0000	1.0000	1.3300	33.333	45	0.0000	0.0000	20.0	10 loads	
WIN 45-60	1.2500	0.8500	1.0000	1.0000	1.3300	16.666	45	0.0000	0.0000	20.0	10 loads	

Concentrated Loads for Load Case "WIN 0 -120":

Joint Label	Force X-Dir (N)	Force Y-Dir (N)	Force Vertical (N)	Moment X-Axis (N-m)	Moment Y-Axis (N-m)	Moment Z-Axis (N-m)	Load Comment
14P	920	920	480	0	0	0	
17S	920	920	480	0	0	0	
20S	920	920	480	0	0	0	
24S	0	1500	600	0	0	0	
26S	0	1500	600	0	0	0	
28S	0	1500	600	0	0	0	
30S	0	1000	400	0	0	0	
31S	0	500	200	0	0	0	
32S	0	500	200	0	0	0	
37S	0	150	100	0	0	0	

Equipment Load Case Information for "WIN 0 -120":

Equipment Label	Equipment Property Set	Elevation Above Ground (m)	qzGh (Pa)	Ice Thick. (cm)	Total Wind Area (m ²)	Wind Incidence Angle (deg)	222-G CA	222-G CS	222-G CM	Antenna Axial Load (N)	Antenna Side Load (N)	Antenna Moment (N-m)	Long. Load (N)	Trans. Load (N)	Vert. Load (N)
ANT MW1	Ant.MW03.0	14.00	709.39	0.00	0.00	225.00	-0.52150	-0.45705	-0.13905	-2615.17	-2291.97	-2091.89	3469.87	228.54	4375.00
ANT MW2	Ant.MW03.0	11.00	662.16	0.00	0.00	225.00	-0.52150	-0.45705	-0.13905	-2441.04	-2139.37	-1952.60	3238.84	213.32	4375.00
ANT MW3	Ant.MW03.0	11.00	662.16	0.00	0.00	315.00	1.62895	-0.04880	0.06130	7624.81	-228.42	860.80	5553.07	-5230.03	4375.00

EIA Section Load Case Information for "WIN 0 -120":

Section Label	Z of Top (m)	Z of Bottom (m)	Elev. Above Gnd. (m)	qzGh (Pa)	Ice Thick. (cm)	Face AF (m ²)	Face AR (m ²)	Face RR*AR (m ²)	Face AG (m ²)	Face e (m)	Face DF (m)	Face DR (m)	Face RF (m)	Face CF (m)	Face AE (m ²)	Face WF (N)	NotF AAF (m ²)	NotF CAF (m ²)	NotF AAR (m ²)	NotF CAR (m ²)	NotF AAR*CAR (m ²)	NotF WA (N)	NotF Wind (N)	Total Weight (N)
EXT10	60.00	52.00	56.00	1054.16	0.00	1.77	2.47	2.39	4.8	0.88	1.00	1.00	0.97	1.91	4.2	8394	0.00	2.00	0.00	1.20	0.00	0	8394	6001
SECC1	52.00	50.00	51.00	1026.36	0.00	0.49	0.82	0.65	2.0	0.66	1.00	1.00	0.79	1.85	1.1	2168	0.00	2.00	0.00	1.20	0.00	0	2168	1898
SECC2	50.00	40.00	45.00	990.30	0.00	2.20	4.12	2.78	14.0	0.45	1.00	1.00	0.67	2.15	5.0	10599	0.00	2.00	0.00	1.20	0.00	0	10599	9209
SECC3	40.00	30.00	35.00	921.69	0.00	2.70	4.12	2.85	14.0	0.45	1.00	1.00	0.69	2.07	5.6	10616	0.00	2.00	0.00	1.20	0.00	0	10616	12993
SECC4	30.00	20.00	25.00	837.21	0.00	3.03	4.12	2.90	14.0	0.51	1.00	1.00	0.70	2.03	5.9	10072	0.00	2.00	0.00	1.20	0.00	0	10072	15537
SECC5	20.00	14.00	17.00	749.86	0.00	2.00	2.47	1.59	11.7	0.38	1.00	1.00	0.64	2.33	3.6	6266	0.00	2.00	0.00	1.20	0.00	0	6266	10402
SECC6	14.00	8.00	11.00	662.16	0.00	2.11	2.47	1.49	18.2	0.25	1.00	1.00	0.60	2.77	3.6	6591	0.00	2.00	0.00	1.20	0.00	0	6591	11853
SECC7	8.00	4.73	6.37	645.45	0.00	1.58	1.35	0.80	12.6	0.22	1.00	1.00	0.60	2.85	2.4	4378	0.00	2.00	0.00	1.20	0.00	0	4378	9123
SECC8	4.73	0.00	2.37	645.45	0.00	2.70	1.95	1.15	24.3	0.15	1.00	1.00	0.59	3.02	3.8	7493	0.00	2.00	0.00	1.20	0.00	0	7493	19023

Concentrated Loads for Load Case "WIN 45-120":

Joint Label	Force X-Dir (N)	Force Y-Dir (N)	Force Vertical (N)	Moment X-Axis (N-m)	Moment Y-Axis (N-m)	Moment Z-Axis (N-m)	Load Comment
14P	920	920	480	0	0	0	
17S	920	920	480	0	0	0	
20S	920	920	480	0	0	0	
24S	1060	1060	600	0	0	0	
26S	1060	1060	600	0	0	0	
28S	1060	1060	600	0	0	0	
30S	707	707	400	0	0	0	
31S	354	354	200	0	0	0	
32S	354	354	200	0	0	0	
37S	106	106	100	0	0	0	

Equipment Load Case Information for "WIN 45-120":

Equipment Label	Equipment Property Set	Elevation Above Ground (m)	qzGh (Pa)	Ice Thick. (cm)	Total Wind Area (m ²)	Wind Incidence Angle (deg)	222-G CA	222-G CS	222-G CM	Antenna Axial Load (N)	Antenna Side Load (N)	Antenna Moment (N-m)	Long. Load (N)	Trans. Load (N)	Vert. Load (N)
ANT MW1	Ant.MW03.0	14.00	709.39	0.00	0.00	180.00	-1.05470			-5289.01		3739.90	3739.90	4375.00	
ANT MW2	Ant.MW03.0	11.00	662.16	0.00	0.00	180.00	-1.05470			-4936.85		3490.88	3490.88	4375.00	
ANT MW3	Ant.MW03.0	11.00	662.16	0.00	0.00	270.00	-0.01170	-0.34380	-0.13130	-54.77	-1609.26	-1843.77	1099.20	1176.65	4375.00

EIA Section Load Case Information for "WIN 45-120":

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Concentrated Loads for Load Case "WIN 45-60":

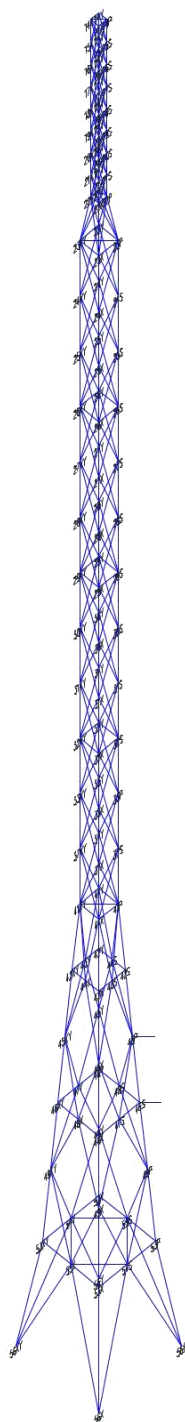
Equipment Load Case Information for "WIN 45-60":

EIA Section Load Case Information for "WIN 45-60":

Section Label	Z of Top (m)	Z of Above. (m)	Elev. Above Gnd. (Pa.2)	qgzh	Ice Thick. (cm)	Face AF (m ²)	Face AR (m ²)	Face Face AR*AR (m ²)	Face AG (m ²)	e	DF	DR	Face RR	Face CF	Face AE (m ²)	Face WF (N)	NotF AAF (m ²)	NotF CAF	NotF AAR (m ²)	NotF CAR (m ²)	NotF NAR (m ²)	Total WA (N)	Total Total (N)	
EXT10	60.00	52.00	56.00	263.52	0.00	1.77	2.47	2.39	4.0	0.88	1.20	1.20	0.97	1.91	5.0	2518	0.00	2.00	0.00	1.20	0.00	0	2518	6001
SECC1	52.00	50.00	51.00	256.37	0.00	0.49	0.82	0.65	2.0	0.66	1.20	1.20	0.79	1.85	1.4	650	0.00	2.00	0.00	1.20	0.00	0	650	1898
SECC2	50.00	40.00	45.00	247.56	0.00	2.20	4.12	2.78	14.0	0.45	1.20	1.20	0.67	2.15	6.0	3180	0.00	2.00	0.00	1.20	0.00	0	3180	9209
SECC3	40.00	41.00	42.00	250.41	0.00	3.03	4.12	2.97	14.0	0.51	1.20	1.20	0.67	2.15	7.1	3189	0.00	2.00	0.00	1.20	0.00	0	3189	9313
SECC4	30.00	20.00	25.00	209.39	0.00	3.03	4.12	2.90	14.0	0.51	1.20	1.20	0.70	2.07	7.1	3022	0.00	2.00	0.00	1.20	0.00	0	3022	15537
SECC5	20.00	14.00	17.00	187.45	0.00	2.00	2.47	1.59	11.0	0.38	1.20	1.20	0.64	2.33	4.3	1880	0.00	2.00	0.00	1.20	0.00	0	1880	10402
SECC6	14.00	8.00	11.00	165.53	0.00	2.11	2.47	1.49	18.2	0.25	1.19	1.19	0.60	2.77	4.3	1959	0.00	2.00	0.00	1.20	0.00	0	1955	11853
SECC7	8.00	7.75	8.37	161.35	0.00	2.11	2.47	1.49	18.2	0.17	1.19	1.19	0.59	2.80	4.3	2122	0.00	2.00	0.00	1.20	0.00	0	2122	12222
SECC8	4.73	0.00	2.37	161.35	0.00	2.70	1.95	1.15	24.3	0.15	1.14	1.14	0.59	3.02	4.4	2142	0.00	2.00	0.00	1.20	0.00	0	2142	19023

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SILUETA TAC50-NUDOS



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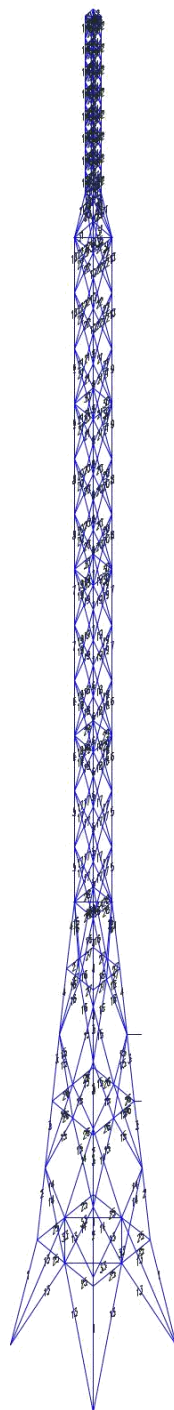
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SILUETA TAC50-ELEMENTOS



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RESUMEN

Project Name : TORRE 50.m+EXT.10m-BUENAVISTA -ACT.
 Project Notes: BTESA - RTVC
 Project File : h:\arch.2016\eval_btesa\tac50buenavista\tor50m_e10.tow
 Date run : 06:23:24 p.m. viernes, 08 de abril de 2016
 by : Tower Version 10.20

Successfully performed linear analysis

The model has 0 warnings.

Member check option: TIA/EIA 222-F
 Connection rupture check: Not Checked
 Crossing diagonal check: Fixed
 Loads from file: h:\arch.2016\eval_btesa\tac50buenavista\tor50m_e10.eia

*** Analysis Results:

Maximum element usage is 412.91% for Angle "38P" in load case "WIN 45-120" NG

Summary of Joint Support Reactions For All Load Cases:

Load Case	Joint Label	Long. Force (kN)	Tran. Force (kN)	Vert. Force (kN)	Shear Force (kN)	Tran. Moment (kN-m)	Long. Moment (kN-m)	Vert. Moment (kN-m)	Bending Moment (kN-m)	Found. Usage %
WIN 0 -120	56P	-37.42	-52.89	247.64	64.79	-0.90	0.75	0.27	1.17	0.00
WIN 0 -120	56X	-17.73	48.46	172.79	51.60	0.51	0.62	-0.07	0.80	0.00
WIN 0 -120	56XY	-19.68	-37.24	-178.79	42.12	-0.52	0.63	0.04	0.82	0.00
WIN 0 -120	56Y	-6.71	37.07	-128.33	37.67	0.25	0.49	-0.10	0.55	0.00
WIN 45-120	56P	-67.88	-67.33	372.70	95.61	-1.21	1.23	-0.04	1.73	0.00
WIN 45-120	56X	17.75	29.86	22.69	34.74	-0.03	0.21	0.00	0.22	0.00
WIN 45-120	56XY	-51.27	-51.36	-307.09	72.57	-1.00	0.98	-0.04	1.39	0.00
WIN 45-120	56Y	29.60	16.95	25.01	34.11	-0.15	-0.05	0.19	0.16	0.00
WIN 45-60	56P	-22.27	-21.96	116.07	31.28	-0.40	0.40	-0.01	0.57	0.00
WIN 45-60	56X	-0.44	12.66	26.21	12.67	0.07	0.14	0.00	0.16	0.00
WIN 45-60	56XY	-8.00	-7.85	-57.39	11.21	-0.17	0.17	-0.01	0.24	0.00
WIN 45-60	56Y	12.77	-0.81	28.42	12.80	-0.13	-0.10	0.05	0.16	0.00

Note: Summary of Joint Support Reactions For All Load Cases in Direction of Leg not printed because none of the angle members attached to foundation joints have a group type of 'Leg'.

Overturning Moment Summary For All Load Cases:

Load Case	Transverse Moment (kN-m)	Longitudinal Moment (kN-m)	Resultant Moment (kN-m)
WIN 0 -120	382.185	2218.992	2251.664
WIN 45-120	2080.412	2066.290	2932.178
WIN 45-60	535.790	522.308	748.249

EIA Sections Information:

Section Label	Top Z (m)	Bottom Z (m)	Joint Count	Member Count	Top Width (m)	Bottom Width (m)	Gross Area (m^2)	Face Adjust Factor	Face Ar Adjust Factor	Dead Load Factor
EXT10	60.000	52.000	36	106	0.60	0.60	4.80	1.0000	1.0000	1.200
SECC1	52.000	50.000	8	18	0.60	1.40	2.00	1.0000	1.0000	1.200
SECC2	50.000	40.000	20	52	1.40	1.40	14.00	1.0000	1.0000	1.200
SECC3	40.000	30.000	20	52	1.40	1.40	14.00	1.0000	1.0000	1.200
SECC4	30.000	20.000	20	58	1.40	1.40	14.00	1.0000	1.0000	1.200
SECC5	20.000	14.000	16	32	1.40	2.49	11.66	1.0000	1.0000	1.200
SECC6	14.000	8.000	16	32	2.49	3.57	18.17	1.0000	1.0000	1.200
SECC7	8.000	4.730	12	24	3.57	4.16	12.64	1.0000	1.0000	1.200
SECC8	4.730	0.000	12	12	4.16	6.10	24.26	1.0000	1.0000	1.200

*** Overall summary for all load cases - Usage = Maximum Stress / Allowable Stress
 Printed capacities do not include EIA allowable stress increase for wind load cases.
 Printed capacities do not include the strength factor entered for each loadcase.

Group Summary (Compression Portion):

Group Label	Group Desc.	Angle Type	Angle Size	Steel Strength (MPa)	Max Usage %	Max Use In Comp. %	Comp. Member	Comp. Foros (kN)	Comp. Control Load Case	L/R Comp. Capacity (kN)	Conn. Shear Capacity (kN)	Conn. Bearing Capacity (kN)	RLX	RLY	RLZ	L/R Length (m)	Curve No.	No. Bolts	Of Comp.
1	M01	SAE	5XSX0.375	344.7	81.31	81.31	1P	-425.647WIN	45-120	393.577	875.035	876.857	0.250	0.250	0.250	48.96	4.925	1	10
2	M02	SAE	5XSX0.375	344.7	88.36	88.36	2P	-410.373WIN	45-120	349.214	875.035	876.857	0.500	0.500	0.500	65.55	3.297	1	10

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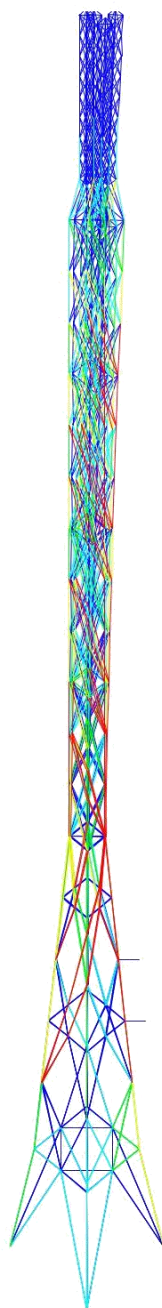
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3	M03	SAE	4X4X0.375	344.7	149.93	149.93	3P	-50.6.717WIN	45-120	254.115	875.035	876.857	0.500	0.500	0.500	75.45	3.024	1	10	NG
4	M04	SAE	4X4X0.375	344.7	144.93	144.93	6P	-489.784WIN	45-120	254.098	875.035	876.857	0.500	0.500	0.500	75.46	3.025	1	10	NG
5	M05	SAE	4X4X0.3125	344.7	187.33	187.33	7P	-594.065WIN	45-120	238.435	875.035	730.714	0.500	0.500	0.500	62.22	2.500	1	10	NG
6	M06	SAE	4X4X0.3125	344.7	141.58	141.58	9P	-448.985WIN	45-120	238.435	700.028	584.572	0.500	0.500	0.500	62.22	2.500	1	8	NG
7	H07	SAE	4X4X0.3125	344.7	115.59	115.59	11P	-366.169WIN	45-120	238.435	700.028	584.572	0.500	0.500	0.500	62.22	2.500	1	8	NG
8	H08	SAE	3X3X0.3125	344.7	119.01	119.01	13P	-22.9.242WIN	45-120	144.834	700.028	584.572	0.500	0.500	0.500	83.55	2.500	1	8	NG
9	M09	SAE	2.5X2.5X0.25	344.7	134.78	134.78	15P	-139.045WIN	45-120	77.565	525.021	350.743	0.500	0.500	0.500	100.23	2.500	1	6	NG
10	M10	SAE	2.5X2.5X0.25	344.7	89.89	89.89	17P	-92.733WIN	45-120	77.565	525.021	350.743	0.500	0.500	0.500	100.23	2.500	1	6	
11	M11	SAE	2.5X2.5X0.25	344.7	39.65	39.65	19P	-51.189WIN	45-120	97.071	525.021	350.743	0.500	0.500	0.500	83.33	2.078	1	6	
12	M12	SAE	2.5X2.5X0.25	344.7	47.01	47.01	20P	-62.797WIN	45-120	100.442	350.014	233.829	1.000	1.000	1.000	80.18	1.000	1	4	
13	D01	SAE	5X5X0.375	344.7	40.98	40.98	28X	-71.561WIN	45-120	250.684	131.307	263.057	0.500	0.250	0.250	72.07	5.711	3	3	
14	D02	SAE	2.5X2.5X0.25	344.7	70.45	70.45	30P	-27.583WIN	45-120	29.439	87.538	116.914	1.000	0.500	0.500	191.33	3.737	6	2	
15	D03	SAE	2X2X0.25	344.7	126.97	126.97	35X	-34.133WIN	45-120	20.212	87.538	116.914	1.000	0.500	0.500	210.68	3.259	6	2	NG
16	D04	SAE	2X2X0.1875	344.7	412.91	412.91	38P	-92.254WIN	45-120	16.799	87.538	87.686	1.000	0.500	0.500	197.33	3.093	6	2	NG
17	D05	SAE	1.5X1.5X0.125	344.7	176.43	176.43	41Y	-39.508WIN	45-120	16.837	87.538	116.914	0.750	0.500	0.500	193.16	2.865	6	2	NG
18	D06	SAE	1.5X1.5X0.125	344.7	166.24	166.24	45Y	-37.227WIN	45-120	16.837	87.538	116.914	0.750	0.500	0.500	193.16	2.865	6	2	NG
19	D07	SAE	1.5X1.5X0.125	344.7	112.22	112.22	51Y	-25.130WIN	45-120	16.837	87.538	116.914	0.750	0.500	0.500	193.16	2.865	6	2	NG
20	D08	SAE	1.5X1.5X0.125	344.7	169.66	169.66	53Y	-20.213WIN	45-120	8.958	87.538	58.457	0.750	0.500	0.500	190.55	2.865	6	2	NG
21	D09	SAE	1.5X1.5X0.125	344.7	144.79	144.79	57Y	-17.251WIN	45-120	8.958	87.538	58.457	0.750	0.500	0.500	190.55	2.865	6	2	NG
22	D10	SAE	1.5X1.5X0.125	344.7	89.40	89.40	60XY	-10.652WIN	45-120	8.958	87.538	58.457	0.750	0.500	0.500	190.55	2.865	6	2	
23	D11	SAE	1.5X1.5X0.125	344.7	88.34	88.34	63aP	-14.521WIN	45-120	12.359	87.538	58.457	0.750	0.500	0.500	151.07	2.272	6	2	
24	D12	SAE	1.5X1.5X0.125	344.7	14.54	13.11	67Y	-4.184WIN	0 -120	24.001	87.538	58.457	0.750	0.500	0.500	77.56	1.166	3	2	
25	H01	SAE	2.5X2.5X0.1875	344.7	56.81	56.81	82P	-44.498WIN	45-120	58.891	87.538	87.686	0.500	0.500	0.500	82.72	2.080	6	2	
26	H02	SAE	2.5X2.5X0.25	344.7	5.65	5.65	84Y	-6.579WIN	0 -120	89.248	87.538	116.914	0.500	0.500	0.500	60.72	1.515	3	2	
27	H03	SAE	2.5X2.5X0.25	344.7	1.32	1.32	89Y	-1.531WIN	45-120	101.180	87.538	116.914	0.500	0.500	0.500	38.97	0.972	3	2	
28	H04	SAE	2X2X0.1875	344.7	17.17	17.17	93P	-9.814WIN	45-120	42.977	87.538	87.686	1.000	0.500	0.500	89.33	1.400	3	2	
29	H05	SAE	1.5X1.5X0.125	344.7	53.88	53.88	94Y	-12.048WIN	0 -120	16.812	87.538	58.457	1.000	0.500	0.500	118.53	1.400	3	2	
30	H06	SAE	1.5X1.5X0.125	344.7	54.79	54.79	96Y	-6.746WIN	0 -120	9.258	87.538	58.457	1.000	1.000	1.000	186.21	1.400	6	2	
31	H07	SAE	1.5X1.5X0.125	344.7	49.75	49.75	100R	-6.126WIN	0 -120	9.258	87.538	58.457	1.000	1.000	1.000	186.21	1.400	6	2	
32	H08	SAE	1.5X1.5X0.125	344.7	4.09	0.00	102YR	0.000		23.586	87.538	58.457	1.000	1.000	1.000	79.80	0.600	3	2	
33	C01	SAE	2.5X2.5X0.1875	344.7	12.00	12.00	103P	-5.140WIN	45-120	32.210	87.538	87.686	1.000	0.500	0.500	148.86	2.942	6	2	
34	C02	SAE	2X2X0.1875	344.7	8.96	8.96	104P	-3.660WIN	45-120	30.726	87.538	87.686	1.000	0.500	0.500	126.34	1.980	6	2	
35	C03	SAE	2X2X0.1875	344.7	6.72	6.72	105X	-2.746WIN	45-120	30.726	87.538	87.686	1.000	0.500	0.500	126.34	1.980	6	2	
36	C04	SAE	2X2X0.1875	344.7	3.04	0.00	106P	-1.500WIN	0 -120	55.461	87.538	87.686	0.500	0.500	0.500	54.14	0.849	6	2	
37	Z22	DIM	0.1X0.1X1	344.7	0.00	0.00		0.000		0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0	0	

Group Summary (Tension Portion):

Group Label	Group Desc.	Angle Type	Angle Size	Steel Strength (MPa)	Max Usage %	Max Tension Use In Tens. Member %	Tension Force (kN)	Tension Control Load Case	Net Tens. Section Capacity (kN)	Conn. Shear Capacity (kN)	Tens. Bearing Capacity (kN)	Conn. Tens. Capacity (kN)	Rupture Capacity (kN)	Length Member (m)	No. Of Bolts	Of Holes	Hole Diameter (cm)
1	M01	SAE	5X5X0.375	344.7	81.31	59.01	1XY 377.865WIN	45-120	481.485	875.035	876.857	0.000	4.925	10	2,000	1.749	
2	M02	SAE	5X5X0.375	344.7	88.36	57.57	2XY 368.678WIN	45-120	481.485	875.035	876.857	0.000	3.297	10	2,000	1.749	
3	M03	SAE	4X4X0.375	344.7	149.93	94.39	4X1 459.855WIN	45-120	366.310	875.035	876.857	0.000	3.024	10	2,000	1.749	NG
4	M04	SAE	4X4X0.375	344.7	144.93	97.33	6X1 474.172WIN	45-120	366.310	875.035	876.857	0.000	3.025	10	2,000	1.749	NG
5	M05	SAE	4X4X0.3125	344.7	187.33	138.61	7X1 565.130WIN	45-120	306.554	875.035	730.714	0.000	2.500	10	2,000	1.749	NG
6	M06	SAE	4X4X0.3125	344.7	141.58	106.10	9X1 432.580WIN	45-120	306.554	700.028	584.572	0.000	2.500	8	2,000	1.749	NG
7	M07	SAE	4X4X0.3125	344.7	115.59	86.27	11XY 351.742WIN	45-120	306.554	700.028	584.572	0.000	2.500	8	2,000	1.749	NG
8	M08	SAE	3X3X0.3125	344.7	119.01	81.50	13XY 227.686WIN	45-120	210.057	700.028	584.572	0.000	2.500	8	2,000	1.749	NG
9	M09	SAE	2.5X2.5X0.25	344.7	134.78	81.20	15XY 142.153WIN	45-120	131.627	525.021	350.743	0.000	2.500	6	2,000	1.749	NG
10	M10	SAE	2.5X2.5X0.25	344.7	89.89	48.97	17XY 85.731WIN	45-120	131.627	525.021	350.743	0.000	2.500	6	2,000	1.749	
11	M11	SAE	2.5X2.5X0.25	344.7	39.65	27.31	19XY 47.809WIN	45-120	131.627	525.021	350.743	0.000	2.078	6	2,000	1.749	
12	M12	SAE	2.5X2.5X0.25	344.7	47.01	33.03	20XY 57.824WIN	45-120	131.627	350.014	233.829	0.000	1.000	4	2,000	1.749	
13	D01	SAE	5X5X0.375	344.7	40.98	35.36	29XY 61.757WIN	45-120	391.256	131.307	263.057	0.000	5.711	3	1,000	1.749	
14	D02	SAE	2.5X2.5X0.25	344.7	70.45	20.62	31XY 24.010WIN	45-120	118.815	87.538	116.914	0.000	3.737	2	1,000	1.749	
15	D03	SAE	2X2X0.25	344.7	126.97	34.12	34X 39.729WIN	45-120	89.632	87.538	116.914	0.000	3.259	2	1,000	1.749	NG
16	D04	SAE	2X2X0.1875	344.7	412.91	88.73	39XY 80.023WIN	45-120	67.808	87.538	87.686	0.000	3.093	2	1,000	1.749	NG
17	D05	SAE	1.5X1.5X0.125	344.7	176.43	47.54	43P 38.219WIN	45-120	60.449	87.538	116.914	0.000	2.865	2	1,000	1.749	NG
18	D06	SAE	1.5X1.5X0.125	344.7	166.24	40.77	44Y 32.782WIN	45-120	60.449	87.538	116.914	0.000	2.865	2	1,000	1.749	NG
19	D07	SAE	1.5X1.5X0.125	344.7	112.22	34.30	49P 27.573WIN	45-120	60.449	87.538	116.914	0.000	2.865	2	1,000	1.749	NG
20	D08	SAE	1.5X1.5X0.125	344.7	169.66	44.90	55P 19.094WIN	45-120	31.976	87.538	58.457	0.000	2.865	2	1,000	1.749	NG
21	D09	SAE	1.5X1.5X0.125	344.7	144.79	36.91	56Y 15.695WIN	45-120	31.976	87.538	58.457	0.000	2.865	2	1,000	1.749	NG
22	D10	SAE	1.5X1.5X0.125	344.7	89.40	26.57	61P 11.302WIN	45-120	31.976	87.538	58.457	0.000	2.865	2	1,000	1.749	
23	D11	SAE	1.5X1.5X0.125	344.7	88.34	26.03	63aXY 11.072WIN	45-120	31.976	87.538	58.457	0.000	2.272	2	1,000	1.749	
24	D12	SAE	1.5X1.5X0.125	344.7	14.54	13.54	66P 6.184WIN	45-120	31.976	87.538	58.457	0.000	1.166	2	1,000	1.749	
25	H01	SAE	2.5X2.5X0.1875	344.7	56.81	33.73	81Y 39.271WIN	45-120	92.321	87.538	87.686	0.000	2.080	2	1,000	1.749	
26	H02	SAE	2.5X2.5X0.25	344.7	5.65	5.25	86P 6.117WIN	45-120	118.815	87.538	116.914	0.000	1.515	2	1,000	1.749	
27	H03	SAE	2.5X2.5X0.25	344.7	1.32	1.23	90P 1.436WIN	45-120	11.815	87.538	116.914	0.000	0.972	2	1,000	1.749	
28	H04	SAE	2X2X0.1875	344.7	17.17	14.99	92P 14.990WIN	0	120.000	87.538	87.686	0.000	1.000	2	1,000	1.749	
29	H05	SAE	1.5X1.5X0.125	344.7	53.68	36.14	94P 15.370WIN	0	120.000	87.538	58.457	0.000	1.400	2	1,000	1.749	
30	H06	SAE	1.5X1.5X0.125	344.7	54.79	19.68	96P 8.368WIN	0	120.000	87.538	58.457	0.000	1.400	2	1,000	1.749	
31	H07	SAE	1.5X1.5X0.125	344.7	49.75	22.64	100P 9.628WIN	0	120.000	87.538	58.457	0.000	1.400	2	1,000	1.749	
32	H08	SAE	1.5X1.5X0.125	344.7	4.09	4.09	102XY 1.741WIN	0	120.000	87.538	58.457	0.000	0.600	2	1,000	1.749	
33	C01	SAE	2.5X2.5X0.1875	344.7	12.00	2.63	103XY 3.058WIN	45-120	92.321	87.538	87.686	0.000	2.942	2	1,000	1.749	
34	C02	SAE	2X2X0.1875	344.7	8.98	8.98	104XY 1.303WIN	45-120	87.808	87.538	87.686	0.000	1.804	2	1,000	1.749	
35	C03	SAE	2X2X0.1875	344.7	6.72	5.58	105XY 0.524WIN	45-120	67.808	87.538	87.686	0.000	0.980	2	1,000	1.749	
36	C04	SAE	2X2X0.1875	344.7	3.04	0.00	106XY 0.000	0.000	67.808	87.538	87.686	0.000	0.849	2	1,000	1.749	
37	Z22	DUM	0.1X0.1X1	344.0	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0	0	0

SILUETA ESFUERZOS-DEF.



EVALUACION ESTRUCTURAL TAC50



TORRE 50m + EXT.10m

TAC50-E10-BU-HU

HOJA
17 / 24

REV.
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TORRE 50 m – CON EXTENSION 10 m
REFORZAMIENTO

EVALUACION ESTRUCTURAL TAC50



TORRE 50m + EXT.10m

TAC50-E10-BU-HU

HOJA
18 / 24

REV.
0

RESUMEN DE DISEÑO

Project Name : TORRE 50m+EXT.10m-BUENAVISTA -REF.
 Project Notes: BTESA - RTVC
 Project File : h:\arch 2016\eval btresa\tac50buenavista\tor50m_e10_r.tow
 Date run : 03:11:46 p.m. sabado, 09 de abril de 2016
 by : Tower Version 10.20

Successfully performed linear analysis

The model has 0 warnings.

Member check option: TIA/EIA 222-F
 Connection rupture check: Not Checked
 Crossing diagonal check: Fixed
 Loads from file: h:\arch_2016\eval_btresa\tac50buenavista\tor50m_e10.eia

*** Analysis Results:

Maximum element usage is 94.29% for Angle "7P" in load case "WIN 45-120"

Summary of Joint Support Reactions For All Load Cases:

Load Case	Joint Label	Long. Force (kN)	Tran. Force (kN)	Vert. Force (kN)	Shear Force (kN)	Tran. Moment (kN-m)	Long. Moment (kN-m)	Vert. Moment (kN-m)	Bending Moment (kN-m)	Found. Usage %
WIN 0 -120	56P	-44.71	-69.29	281.23	82.47	-1.02	0.83	0.32	1.32	0.00
WIN 0 -120	56X	-23.30	65.63	210.59	69.64	0.62	0.74	-0.07	0.97	0.00
WIN 0 -120	56XY	-19.22	-46.03	-189.62	49.88	-0.56	0.67	0.04	0.87	0.00
WIN 0 -120	56Y	-2.97	45.08	-134.84	45.17	0.27	0.51	-0.11	0.58	0.00
WIN 45-120	56P	-84.78	-84.27	422.03	119.54	-1.37	1.38	-0.03	1.94	0.00
WIN 45-120	56X	22.66	43.82	38.12	49.33	0.02	0.25	-0.01	0.26	0.00
WIN 45-120	56XY	-60.58	-60.56	-333.22	85.66	-1.08	1.07	-0.03	1.52	0.00
WIN 45-120	56Y	43.52	21.76	40.43	48.66	-0.19	-0.11	0.20	0.22	0.00
WIN 45-60	56P	-29.75	-29.42	138.54	41.84	-0.47	0.47	-0.01	0.66	0.00
WIN 45-60	56X	-2.37	19.38	40.20	19.52	0.12	0.18	-0.00	0.21	0.00
WIN 45-60	56XY	-7.17	-6.97	-53.79	10.00	-0.16	0.16	-0.01	0.23	0.00
WIN 45-60	56Y	19.50	-2.79	42.41	19.70	-0.17	-0.15	0.05	0.22	0.00

Note: Summary of Joint Support Reactions For All Load Cases in Direction of Leg not printed because none of the angle members attached to foundation joints have a group type of 'Leg'.

Overturning Moment Summary For All Load Cases:

Load Case	Transverse Moment (kN-m)	Longitudinal Moment (kN-m)	Resultant Moment (kN-m)
WIN 0 -120	382.514	2489.668	2518.881
WIN 45-120	2310.582	2296.459	3257.685
WIN 45-60	593.334	579.850	829.621

EIA Sections Information:

Section Label	Top Z (m)	Bottom Z (m)	Joint Count	Member Count	Top Width (m)	Bottom Width (m)	Gross Area (m^2)	Face Adjust Factor	Face Ar Adjust Factor	Dead Load Factor
EXT10	60.000	52.000	36	106	0.60	0.60	4.80	1.0000	1.0000	1.200
SECC1	52.000	50.000	8	18	0.60	1.40	2.00	1.0000	1.0000	1.200
SECC2	50.000	40.000	20	52	1.40	1.40	14.00	1.0000	1.0000	1.200
SECC3	40.000	30.000	20	52	1.40	1.40	14.00	1.0000	1.0000	1.200
SECC4	30.000	20.000	20	58	1.40	1.40	14.00	1.0000	1.0000	1.200
SECC5	20.000	14.000	16	32	1.40	2.49	11.66	1.0000	1.0000	1.200
SECC6	14.000	8.000	16	32	2.49	3.57	18.17	1.0000	1.0000	1.200
SECC7	8.000	4.730	12	24	3.57	4.16	12.64	1.0000	1.0000	1.200
SECC8	4.730	0.000	12	12	4.16	6.10	24.26	1.0000	1.0000	1.200

*** Overall summary for all load cases - Usage = Maximum Stress / Allowable Stress
 Printed capacities do not include EIA allowable stress increase for wind load cases.
 Printed capacities do not include the strength factor entered for each loadcase.

Group Summary (Compression Portion):

Group Label	Group Desc.	Angle Type	Steel Size	Max Strength (MPa)	Max Usage %	Max Use In Comp. %	Comp. Member	Comp. Force (kN)	Comp. Control Load Case	L/R Capacity (kN)	Comp. Shear Capacity (kN)	Conn. Bearing Capacity (kN)	RLX	RLY	RLZ	L/R Length (m)	Curve No.	No. Of Bolts	OF Comp.
1	M01	SAE	5X5X0.375	344.7	84.88	84.88	1P	-444.33	WIN 45-120	393.577	875.035	876.857	0.250	0.250	0.250	48.96	4.925	1	10
2	M02	SAE	5X5X0.375	344.7	92.21	92.21	2P	-428.28	WIN 45-120	349.214	875.035	876.857	0.500	0.500	0.500	65.55	3.297	1	10
3	M03	DAI	4X3/8+4X5/16	344.7	75.72	75.72	3P	-612.02	WIN 45-120	607.737	875.035	1753.715	0.500	0.500	0.500	39.17	3.024	1	10
4	M04	DAI	4X3/8+4X5/16	344.7	58.36	58.36	5P	-471.62	WIN 45-120	607.726	875.035	1753.715	0.500	0.500	0.500	39.17	3.025	1	10
5	M05	DAI	4X5/16+4X1/4	344.7	94.29	94.29	7P	-650.34	WIN 45-120	518.586	875.035	1461.521	0.500	0.500	0.500	32.38	2.500	1	10

EVALUACION ESTRUCTURAL TAC50



TORRE 50m + EXT.10m

TAC50-E10-BU-HU

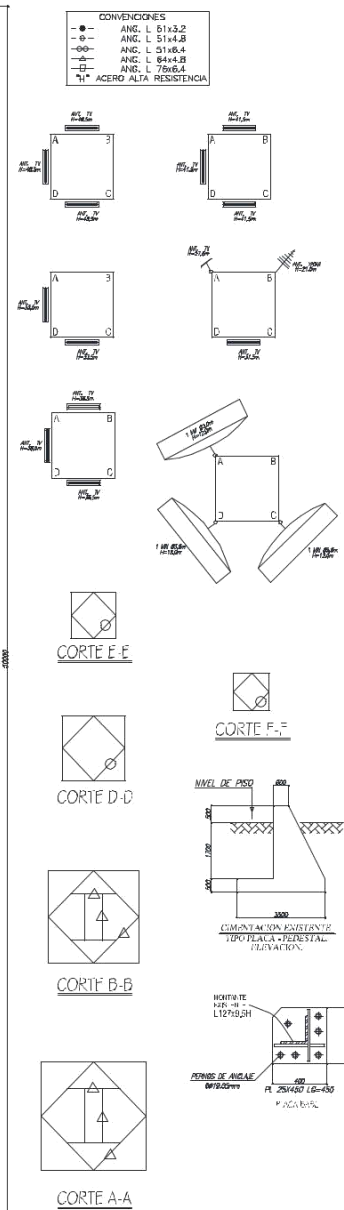
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6	M06	DAI	4X5/16+4x1/4	344.7	70.23	70.23	9P	-484.374WIN	45-120	518.586	700.028	1169.217	0.500	0.500	0.500	32.38	2.500	1	8
7	M07	DAI	4X5/16+4x1/4	344.7	56.61	56.61	11P	-390.480WIN	45-120	518.586	700.028	1169.217	0.500	0.500	0.500	32.38	2.500	1	8
8	M08	DAI	4X1/4+3X1/4	344.7	63.33	63.33	13P	-230.646WIN	45-120	273.851	700.028	584.572	0.500	0.500	0.500	37.00	2.500	1	8
9	M09	DAI	2.5X2.5X0.25	344.7	39.53	39.53	15P	-133.997WIN	45-120	254.867	525.021	701.596	0.500	0.500	0.500	51.80	2.500	1	6
10	M10	SAE	2.5X2.5X0.25	344.7	87.95	87.95	17P	-90.730WIN	45-120	77.565	525.021	350.743	0.500	0.500	0.500	100.23	2.500	1	6
11	M11	SAE	2.5X2.5X0.25	344.7	39.43	39.43	19P	-50.900WIN	45-120	97.071	525.021	350.743	0.500	0.500	0.500	83.33	2.078	1	6
12	M12	SAE	2.5X2.5X0.25	344.7	47.06	47.06	20P	-62.860WIN	45-120	100.442	350.014	233.829	1.000	1.000	1.000	80.18	1.000	1	4
13	D01	SAE	5X5X0.375	344.7	58.00	58.00	28X	-101.296WIN	45-120	250.684	131.307	263.057	0.500	0.250	0.250	72.07	5.711	3	3
14	D02	DAE	2.5X2.5X0.25	344.7	65.73	65.73	30P	-51.473WIN	45-120	58.878	87.538	233.829	1.000	0.500	0.500	191.33	3.737	6	2
15	D03	DAE	2.5X2.5X0.25	344.7	57.44	55.89	35X	-53.074WIN	45-120	71.395	87.538	233.829	1.000	0.500	0.500	166.85	3.259	6	2
16	D04	DAE	3X3X0.25	344.7	87.72	87.72	38P	-139.011WIN	45-120	119.150	131.307	350.743	1.000	0.500	0.500	130.92	3.093	6	3
17	D05	DAE	2X2X0.1875	344.7	63.98	63.98	41Y	-47.439WIN	45-120	55.753	87.538	175.371	0.750	0.500	0.500	137.12	2.865	6	2
18	D06	DAE	2X2X0.1875	344.7	57.99	57.99	44X	-43.003WIN	45-120	55.753	87.538	175.371	0.750	0.500	0.500	137.12	2.865	6	2
19	D07	DAE	2X2X0.1875	344.7	37.35	37.35	51Y	-27.695WIN	45-120	55.753	87.538	175.371	0.750	0.500	0.500	137.12	2.865	6	2
20	D08	DAE	2X2X0.1875	344.7	35.83	35.83	53Y	-26.566WIN	45-120	55.753	87.538	175.371	0.750	0.500	0.500	137.12	2.865	6	2
21	D09	DAE	2X2X0.1875	344.7	30.23	30.23	57Y	-22.418WIN	45-120	55.753	87.538	175.371	0.750	0.500	0.500	137.12	2.865	6	2
22	D10	SAE	1.5X1.5X0.125	344.7	79.75	79.75	61XY	-9.502WIN	0 -120	8.958	87.538	58.457	0.750	0.500	0.500	190.55	2.865	6	2
23	D11	SAE	1.5X1.5X0.125	344.7	89.63	89.63	62aP	-14.733WIN	45-120	12.359	87.538	58.457	0.750	0.500	0.500	151.07	2.272	6	2
24	D12	SAE	1.5X1.5X0.125	344.7	14.55	13.11	67Y	-4.185WIN	0 -120	24.001	87.538	58.457	0.750	0.500	0.500	77.56	1.166	3	2
25	H01	SAE	2.5X2.5X0.1875	344.7	58.81	58.81	82P	-46.061WIN	45-120	58.891	87.538	87.686	0.500	0.500	0.500	82.72	2.080	3	2
26	H02	SAE	2.5X2.5X0.25	344.7	7.20	6.51	84Y	-7.579WIN	0 -120	89.248	87.538	116.914	0.500	0.500	0.500	60.72	1.515	3	2
27	H03	SAE	2.5X2.5X0.25	344.7	2.14	2.07	89Y	-2.411WIN	45-120	101.180	87.538	116.914	0.500	0.500	0.500	38.97	0.972	3	2
28	H04	SAE	2X2X0.1875	344.7	6.31	0.00	93X	0.000	0.000	42.977	87.538	87.686	1.000	0.500	0.500	89.33	1.400	3	2
29	H05	SAE	1.5X1.5X0.125	344.7	55.35	55.35	94Y	-12.375WIN	0 -120	16.812	87.538	58.457	1.000	0.500	0.500	118.53	1.400	3	2
30	H06	SAE	1.5X1.5X0.125	344.7	62.23	62.23	96Y	-7.663WIN	0 -120	9.258	87.538	58.457	1.000	1.000	1.000	186.21	1.400	6	2
31	H07	SAE	1.5X1.5X0.125	344.7	43.22	43.22	100R	-5.321WIN	0 -120	9.258	87.538	58.457	1.000	1.000	1.000	186.21	1.400	6	2
32	H08	SAE	1.5X1.5X0.125	344.7	4.09	0.00	102YR	0.000	0.000	23.586	87.538	58.457	1.000	1.000	1.000	79.80	0.600	3	2
33	C01	SAE	2.5X2.5X0.1875	344.7	26.32	26.32	103P	-11.275WIN	45-120	32.210	87.538	87.686	1.000	0.500	0.500	148.86	2.942	6	2
34	C02	SAE	2X2X0.1875	344.7	6.85	6.85	104P	-2.799WIN	45-120	30.726	87.538	87.686	1.000	0.500	0.500	126.34	1.980	6	2
35	C03	SAE	2X2X0.1875	344.7	6.24	6.24	105P	-2.550WIN	45-120	30.726	87.538	87.686	1.000	0.500	0.500	126.34	1.980	6	2
36	C04	SAE	2X2X0.1875	344.7	3.04	3.04	106P	-2.240WIN	0 -120	55.461	87.538	87.686	1.000	0.500	0.500	54.14	0.849	3	2
37	Z22	DUM	0.1X0.1X1	344.7	0.00	0.00		0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.00	0.000	0	0

Group Summary (Tension Portion):

Label	Group	Angle Desc. Type	Angle Size	Steel	Max	Max	Tension	Tension	Tension	Net	Conn.	Tens.	Conn.	Tens.	Conn.	Length	No.	Of	Hole	
				Strength	Usage	Use	In	Control	Force	Control	Section	Tens.	Conn.	Tens.	Conn.	Tens.	Conn.	Member	Of	Diameter
				(MPa)		Tens.	%	Member	(kN)	Load Case	Capacity (kN)	Capacity (kN)	Capacity (kN)	Capacity (kN)	Capacity (kN)	Capacity (kN)	Capacity (kN)	(m)	Tens.	(cm)
1	M01	SAE	5X5X0.375	344.7	84.88	60.33	1XY	386.344WIN	45-120	481.485	875.035	876.857	0.000	4.925	10	2.000	1.749			
2	M02	SAE	5X5X0.375	344.7	92.21	58.89	2XY	377.128WIN	45-120	481.485	875.035	876.857	0.000	3.297	10	2.000	1.749			
3	M03	DAI	4X3/8+4x5/16	344.7	75.72	56.84	4XY	531.152WIN	45-120	702.617	875.035	1753.715	0.000	3.024	10	2.000	1.749			
4	M04	DAI	4X3/8+4x5/16	344.7	58.36	49.72	6XY	464.639WIN	45-120	702.617	875.035	1753.715	0.000	3.025	10	2.000	1.749			
5	M05	DAI	4X5/16+4x1/4	344.7	94.29	78.88	7XY	607.756WIN	45-120	579.330	875.035	1461.521	0.000	2.500	10	2.000	1.749			
6	M06	DAI	4X5/16+4x1/4	344.7	70.23	59.61	9XY	459.273WIN	45-120	579.330	700.028	1169.217	0.000	2.500	8	2.000	1.749			
7	M07	DAI	4X5/16+4x1/4	344.7	56.61	47.37	11XY	364.975WIN	45-120	579.330	700.028	1169.217	0.000	2.500	8	2.000	1.749			
8	M08	DAI	4X1/4+3X1/4	344.7	63.33	38.40	13XY	230.357WIN	45-120	451.082	700.028	584.572	0.000	2.500	8	2.000	1.749			
9	M09	DAI	2.5X2.5X0.25	344.7	39.53	33.52	15XY	141.297WIN	45-120	316.958	525.021	701.596	0.000	2.500	6	2.000	1.749			
10	M10	SAE	2.5X2.5X0.25	344.7	87.95	47.89	17XY	83.837WIN	45-120	131.627	525.021	350.743	0.000	2.500	6	2.000	1.749			
11	M11	SAE	2.5X2.5X0.25	344.7	39.43	27.46	19XY	48.067WIN	45-120	131.627	525.021	350.743	0.000	2.078	6	2.000	1.749			
12	M12	SAE	2.5X2.5X0.25	344.7	47.06	33.11	20XY	57.955WIN	45-120	131.627	350.014	233.829	0.000	1.000	4	2.000	1.749			
13	D01	SAE	5X5X0.375	344.7	58.00	48.03	29X	83.871WIN	45-120	391.256	131.307	263.057	0.000	5.711	3	1.000	1.749			
14	D02	DAE	2.5X2.5X0.25	344.7	65.73	34.72	30XY	40.426WIN	0-120	257.724	87.538	233.829	0.000	3.737	2	1.000	1.749			
15	D03	DAE	2.5X2.5X0.25	344.7	57.44	57.44	34X	66.877WIN	45-120	257.724	87.538	233.829	0.000	3.259	2	1.000	1.749			
16	D04	DAE	3X3X0.25	344.7	87.72	63.67	39XY	111.191WIN	45-120	316.089	131.307	350.743	0.000	3.093	3	1.000	1.749			
17	D05	DAE	2X2X0.1875	344.7	63.98	38.09	43P	44.348WIN	45-120	151.854	87.538	175.371	0.000	2.865	2	1.000	1.749			
18	D06	DAE	2X2X0.1875	344.7	57.99	30.72	45X	35.769WIN	45-120	151.854	87.538	175.371	0.000	2.865	2	1.000	1.749			
19	D07	DAE	2X2X0.1875	344.7	37.35	26.15	49P	30.448WIN	45-120	151.854	87.538	175.371	0.000	2.865	2	1.000	1.749			
20	D08	DAE	2X2X0.1875	344.7	35.83	21.16	55P	24.632WIN	45-120	151.854	87.538	175.371	0.000	2.865	2	1.000	1.749			
21	D09	DAE	2X2X0.1875	344.7	30.23	15.66	56Y	18.232WIN	45-120	151.854	87.538	175.371	0.000	2.865	2	1.000	1.749			
22	D10	SAE	1.5X1.5X0.125	344.7	79.75	24.64	61X	10.480WIN	0-120	31.976	87.538	58.457	0.000	2.865	2	1.000	1.749			
23	D11	SAE	1.5X1.5X0.125	344.7	89.63	25.86	63aXY	10.997WIN	45-120	31.976	87.538	58.457	0.000	2.272	2	1.000	1.749			
24	D12	SAE	1.5X1.5X0.125	344.7	14.55	14.55	66P	6.187WIN	45-120	31.976	87.538	58.457	0.000	1.166	2	1.000	1.749			
25	H01	SAE	2.5X2.5X0.1875	344.7	58.81	34.28	81Y	39.916WIN	45-120	92.321	87.538	87.686	0.000	2.080	2	1.000	1.749			
26	H02	SAE	2.5X2.5X0.25	344.7	7.20	7.20	86P	8.380WIN	45-120	118.815	87.538	116.914	0.000	1.515	2	1.000	1.749			
27	H03	SAE	2.5X2.5X0.25	344.7	2.14	2.14	90P	2.494WIN	45-120	118.815	87.538	116.914	0.000	0.972	2	1.000	1.749			
28	H04	SAE	2X2X0.1875	344.7	6.31	6.31	92Y	5.695WIN	45-120	67.808	87.538	87.686	0.000	1.400	2	1.000	1.749			
29	H05	SAE	1.5X1.5X0.125	344.7	55.35	42.42	94P	18.040WIN	0-120	31.976	87.538	58.457	0.000	1.400	2	1.000	1.749			
30	H06	SAE	1.5X1.5X0.125	344.7	62.23	27.84	96P	11.842WIN	0-120	31.976	87.538	58.457	0.000	1.400	2	1.000	1.749			
31	H07	SAE	1.5X1.5X0.125	344.7	43.22	20.89	100P	8.883WIN	0-120	31.976	87.538	58.457	0.000	1.400	2	1.000	1.749			
32	H08	SAE	1.5X1.5X0.125	344.7	4.09	4.09	102YR	1.741WIN	0-120	31.976	87.538	58.457	0.000	0.600	2	1.000	1.749			
33	H09	SAE	2.5X2.5X0.1875	344.7	26.32	12.75	103X	7.590WIN	45-120	67.808	87.538	87.686	0.000	2.949	2	1.000	1.749			
34	C02	SAE	2X2X0.1875	344.7	6.95	0.08	104X	0.075WIN	0-120	67.808	87.538	87.686	0.000	1.980	2	1.000	1.749			
35	C03	SAE	2X2X0.1875	344.7	6.24	0.04	105X	0.393WIN	45-120	67.808	87.538	87.686	0.000	1.980	2	1.000	1.749			
36	C04	SAE	2X2X0.1875	344.7	3.04	0.00	106X	0.000	0.000	67.808	87.538	87.686	0.000	0.849	2	1.000	1.749			
37	Z22	DUM	0.1X0.1X1	344.7	0.00	0.00	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0	0.000	0			

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TORRE 50 m – CON EXTENSION 10 m
CIMENTACION

EVALUACION ESTRUCTURAL TAC50



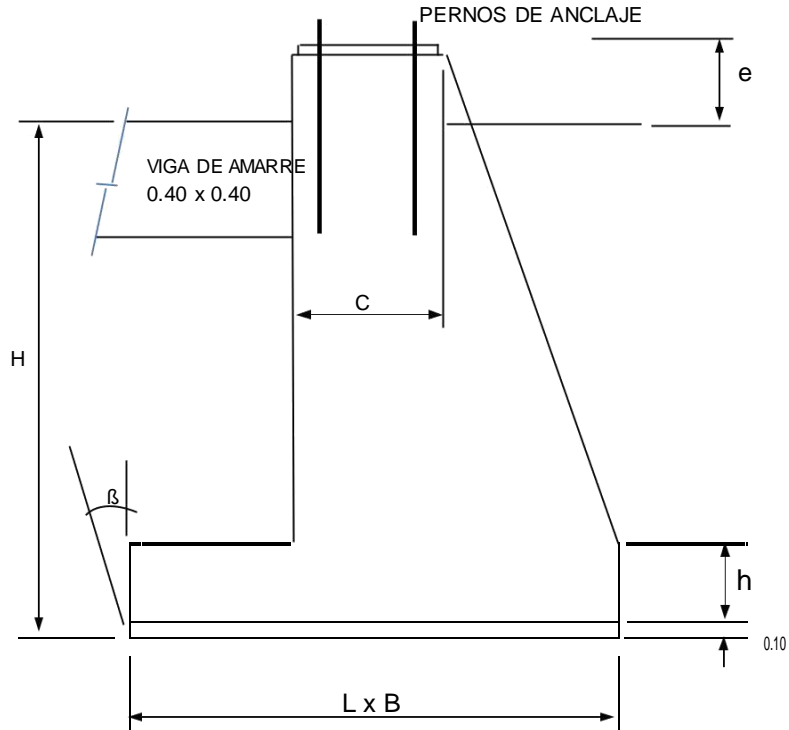
TORRE 50m + EXT.10m

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TORRE 50,m - BUENAVISTA
CIMENTACION EN CONCRETO



MATERIALES: Acero $f_y = 4,200$ Kg / cm²
 Concr. $f'_c = 210$ Kg / cm²
 Angulo $\beta = 16$ grados. $T_g = 0.287$
 Suelo $q_u = 1.00$ Kg / cm²
 Suelo $C = 0.10$ Kg / cm²

PREDIMENSIONAMIENT. CHEQUEO ESTABLD.

Dimensiones (m.)	H = 2.20	h = 0.50	C = 0.60	L = 3.50	e = 0.50
Volumen de Concreto (m3)	V1 = 0.774	V2 = 6.125	V3 = 0.613	Vc = 7.51	Cortante Vu =
Volumen de Suelo (m3)	V4 = 26.950	V5 = 9.278	V6 = 0.856	Vs = 29.573	11,954
Peso Específico (Ton / m3)	Suelo 1.60	Concreto 2.40	R. Cohesión 15.400	P. Suelo 47.316	P. Concreto 18.028
Peso total Fundación (Ton.)	80,744	Arrancamiento $F_u =$	33,322	Factor de seguridad al arranque K =	2.06
Compresión C =	42,203	Area m2 12.25	0.22	Kg / cm2	Presión sobre el terreno

EVALUACION ESTRUCTURAL TAC50



TORRE 50m + EXT.10m

TAC50-E10-BU-HU

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CONCLUSIONES:

La torre de 50 metros instalada en sitio Buenavista-Huila, en el estado actual y después del análisis con las antenas instaladas:

1. La estructura metálica en las condiciones de trabajo con las cargas actuales mas las antenas nuevas, no cumple por esfuerzos y deformaciones; El elemento más esforzado está trabajando al 412.91 %, referido al límite fluencia, fallan los elementos M03, M04 de L4"x3/8", M05, M06, M07 de L4"x5/16", M08 de L3"x5/16", M09 de L2-1/2"x1/4", D03 de L2"x1/4", D04 de L2"x3/16", D05, D06, D07 de L21-1/2"x1/4" y D08, D09 de L21-1/2"x1/8" marcados en rojo en la silueta.
2. El análisis estructural se hace considerando que los elementos que conforman la estructura están en buen estado.
3. La deflexión máxima en el extremo superior de la torre, para cargas de trabajo, con viento de 60.km/h es 0.408 m, es decir 0.41 ° menor a 0.5°.
4. Se propone un refuerzo para los elementos M03, M04 con L4"x5/16", M05, M06, M07, M08 con L4"x1/4", M09 con L2-1/2"x1/4", D03 con L2"x1/4", D04 con L2"x3/16", D05, D06, D07 con L1-1/2"x1/4" y D08, D09 con L1-1/2"x3/16"; El peso aprox. del reforzamiento es 5.200 kg.
5. La cimentación, según el informe de campo, está compuesta por zapatas cuadradas de 3.5m, con pedestales de 0.60x0.60 a una profundidad de 2.20 metros, con suelo $q_a=1.0 \text{ kg/cm}^2$ y según la verificación, la cimentación cumple por esfuerzos para las cargas de la torre con las antenas nuevas.
6. Según el reglamento NSR-10 de deben construir vigas de amarre entre los pedestales, para este caso se proyectan de 0.40x0.40. Las cantidades de obra son 3.9 m^3 de concreto de 3000 psi y 350 kg de acero de refuerzo.

EVALUACION ESTRUCTURAL TAC50

		TORRE 50m + EXT.10m		
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