LDC
THE CIVIL ENGINEERING GROUP

Commercial
Infrastructure
Residential

March 2, 2011

AT&T Mobility Corporation
c/o: Paul Long
Goodman Networks
8815 122nd Ave NE
Kirkland, WA 98033

RE: **Level 1 Structural Analysis**
SB13 Carillon Point
2000 Carillon Point
Kirkland, WA 98033

I. Introduction

At the request of Goodman Networks, we have performed a structural analysis of the existing antenna mounts at SB13 Carillon Point. The evaluation was completed in conformance with the 2009 IBC, the 2009 IEBC and the ASCE 7-05 under the following site specific conditions:

Basic Wind Speed: 85 mph
Exposure Category: D
Occupancy Category: II

Based on our visual inspection performed on December 14, 2010 the antenna mounts appear to be well maintained and free of corrosion. This evaluation assumes that the mounts were properly installed per the original design documents.

Previous structural analyses from CG engineering and TRK engineering dated August 5, 2002 and November 1, 2004 were reviewed as part of this analysis.

The following tables detail the existing and proposed antenna configurations in the areas subject to change.

II. Existing Antenna Configuration

Sector	Antenna Model	Antenna Weight	Effective Area
X	PowerWave 7263	16.5 lbs	3.76 sf
Y	Kathrein 739684	30.8 lbs	3.65 sf
Z	PowerWave 7263	16.5 lbs	3.76 sf

III. Proposed Antenna Configuration

Sector	Antenna Model	Antenna Weight	Effective Area
X	KMW AM-X-CD-16-65-00T-RET	48.5 lbs	5.90 sf
Y	PowerWave P65-17-XLH-RR	70 lbs	8.00 sf
Z	Kathrein 80010764	40.8 lbs	4.75 sf

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IV. Conclusion

The subject antenna mounts are structurally adequate to support the above stated loading in conformance with IBC Chapter 13. The evaluation compared the existing and proposed gravity and wind loading with the design capacity of the system. See the attached calculations for the detailed analysis. By inspection, the existing penthouse wall is also structurally adequate to support the proposed loading

Please contact the undersigned with any questions relating to this work.

LDC, Inc.

Ryan Anderson, P.E.

SB13 Carillon Point
Antenna Replacement

Proj: 10-601
3/1/11
DAO

Controlling Codes

International Existing Building Code (IEBC) 2009

International Building Code (IBC) 2009

ASCE 7-05

AISC 13

This project consists of the replacement of three existing RF antennas with new antennas of a similar size and shape. The existing antenna mounts are to be used for the new antennas.

Per IEBC section 403.1 this is a Level 1 alteration

Per IEBC Section 606.2 additional dead loads need not comply with IBC if the increase does not exceed 1.05 times the original dead load.

By inspection all new antennas exceed the weight of the original antennas by more than 5%. Therefor check per IBC

SBC Carillon Point
Antenna Replacement

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Antenna Mount Check

Worst Case is Sector Y position 13 where a Kathrein model 739684 is replaced by a PowerWave model P65-17-XLH-RR_ 716 MHz

Kathrein: $b = 10.3''$ $h = 51''$ $t = 4''$ $w = 30.8$ #

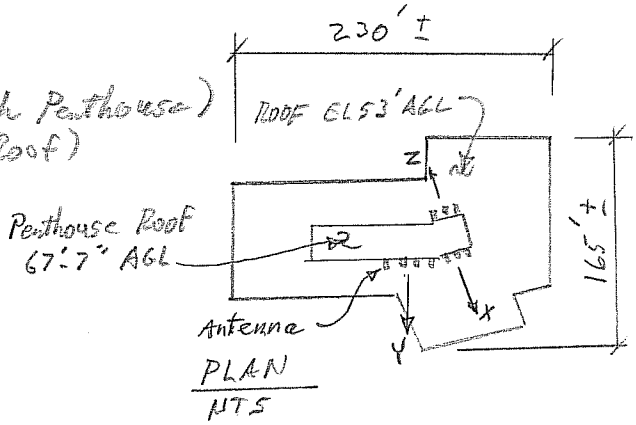
PowerWave: $b = 12''$ $h = 96''$ $t = 6''$ $w = 70$ #

Building Dimensions:

$h = 67'-7''$ (Top of Mech Penthouse)
$h_n = 53'$ (Building Roof)

Width = 165'±
Length = 230'±

X, Y, Z = Sectors



PLAN
NTS

Wind Load

Building is near beach at Lake Washington w/ 1 mile fetch
∴ Roughness Category D per ASCE 7-05 Section 6.5.6.2
∴ Exposure D per ASCE 7-05 Section 6.5.6.3
Basic Wind Speed, $V = 85$ mph (3 sec. gust)
By inspection $K_{zt} = 1.0$
Occupancy Category II (ASCE 7-05 Table 1-1)
$I_w = 1.0$ (ASCE 7-05 Table 6-1)

SB13 Carillon Point
Antenna Mount Wind Analysis
Wind Normal to Long Face of Building (North-South Wind)

Job No. 10-601
Date 3/1/2011
By DAO

Gust Factor Calculation per ASCE 07-05 Section 6.5.8

Building Properties, Exposure Category and Basic Wind Speed

B =	230.00	ft	Width Normal to Wind
L =	165.00	ft	Length Parallel to Wind
h =	53.00	ft	Height to Top of Building
β =	5.00	% damping	Structural Damping
C_t =	0.020		(ASCE 7-05 Table 12.8-2)
x =	0.75		(ASCE 7-05 Table 12.8-2)
Exposure =	D		(ASCE 7-05 6.5.6.3)
V =	85.00	mph Basic Wind Speed (3 Second Gust)	(ASCE 7-05 Figure 6-1)

Derived Quantities

Table 6-2 Values Based on Exposure Category

c =	0.15	(ASCE 7-05 Table 6-2)
b_{bar} =	0.80	(ASCE 7-05 Table 6-2)
alphabar =	0.11	(ASCE 7-05 Table 6-2)
Z_{min} =	7.00 ft	(ASCE 7-05 Table 6-2)
l =	650.00	(ASCE 7-05 Table 6-2)
epsilon =	0.13	(ASCE 7-05 Table 6-2)
Z_{bar} =	31.80	(ASCE 7-05 Table 6-2)
g_Q =	3.40	(ASCE 7-05 6.5.8.2)
g_v =	3.40	(ASCE 7-05 6.5.8.2)

$I_{zbar} = c(33/z_{bar})^{(1/6)}$ (ASCE 7-05 Eqn 6-5)

I_{zbar} = 0.15

$Q = \text{sqrt}(1/(1+0.63((B+h)/L_{zbar})^{\wedge}0.63)$ (ASCE 7-05 Eqn 6-6)

Q = 0.8531

$L_{zbar} = l(z_{bar}/33)^{epsilon}$ (ASCE 7-05 Eqn 6-7)

L_{zbar} = 647.00

$T_a = C_t * h^x$ = 0.39 Sec (ASCE 7-05 Eqn 12.8-7)

$n_1 = 1/T_a$ = 2.55 Hz (ASCE 7-05 6.3)

n1 >= 1 therefore Building is Rigid (ASCE 7-05 6.2)

SB13 Carillon Point Job No. 10-601
Antenna Mount Wind Analysis Date 3/1/2011
Wind Normal to Long Face of Building (North-South Wind) By DAO

Gust Factor Calculation per ASCE 07-05 Section 6.5.8, continued

Derived Quantities, continued

g_R = sqrt(2ln(3600n1)) + 0.577/sqrt(2ln(3600n1)) (ASCE 7-05 Eqn 6-9)
g_R = N/A - Building is Rigid

$V_{barzbar}$ = V(88/60)$b_{bar}(z_{bar}/33)^{(alphabar)}$ (ASCE 7-05 Eqn 6-14)
$V_{barzbar}$ = N/A - Building is Rigid

R_l = 1/eta - (1/2eta^2)(1-$e^{(-2eta)}$) for eta >0 (ASCE 7-05 Eqn 6-13a)
R_l = 1 for eta = 0 (ASCE 7-05 Eqn 6-13b)

R_h = R_l where eta = 4.6n1*h/$V_{barzbar}$
eta = N/A - Building is Rigid
R_h = N/A - Building is Rigid

R_B = R_l where eta = 4.6n_1*B/$V_{barzbar}$
eta = N/A - Building is Rigid
R_B = N/A - Building is Rigid

R_L = Rl where eta = 15.4n1*L/Vbarzbar
eta = N/A - Building is Rigid
R_L = N/A - Building is Rigid

N_1 = n_1*$L_{zbar}/V_{barzbar}$ (ASCE 7-05 Eqn 6-12)
N_1 = N/A - Building is Rigid

R_n = 7.47N_1/(1+10.3N_1)$^{(5/3)}$ (ASCE 7-05 Eqn 6-11)
R_n = N/A - Building is Rigid

R = sqrt((1/β)$R_n R_h R_B$(0.53+0.47R_L)) (ASCE 7-05 Eqn 6-10)
R = N/A - Building is Rigid

Gust Factor

Gf = 0.925((1+1.7gQIzbar*Q)/(1+1.7gv*Izbar)) (ASCE 7-05 Eqn 6-4)
Gf = 0.862
Use G = 0.85 per ASCE 7-05 6.5.8.1

SB13 Carillon Point
Antenna Mount Wind Analysis
Wind Normal to Short Face of Building (East-West Wind)

Job No. 10-601
Date 3/1/2011
By DAO

Gust Factor Calculation per ASCE 07-05 Section 6.5.8

Building Properties, Exposure Category and Basic Wind Speed

B =	165.00	ft	Width Normal to Wind
L =	230.00	ft	Length Parallel to Wind
h =	53.00	ft	Height to Top of Building
β =	5.00	% damping	Structural Damping
C_t =	0.020		(ASCE 7-05 Table 12.8-2)
x =	0.75		(ASCE 7-05 Table 12.8-2)
Exposure =	D		(ASCE 7-05 6.5.6.3)
V =	85.00	mph Basic Wind Speed (3 Second Gust)	(ASCE 7-05 Figure 6-1)

Derived Quantities

Table 6-2 Values Based on Exposure Category

c =	0.15	(ASCE 7-05 Table 6-2)
b_{bar} =	0.80	(ASCE 7-05 Table 6-2)
alphabar =	0.11	(ASCE 7-05 Table 6-2)
Z_{min} =	7.00 ft	(ASCE 7-05 Table 6-2)
l =	650.00	(ASCE 7-05 Table 6-2)
epsilon =	0.13	(ASCE 7-05 Table 6-2)
Z_{bar} =	31.80	(ASCE 7-05 Table 6-2)
g_Q =	3.40	(ASCE 7-05 6.5.8.2)
g_v =	3.40	(ASCE 7-05 6.5.8.2)

$I_{zbar} = c(33/z_{bar})^{(1/6)}$ (ASCE 7-05 Eqn 6-5)

I_{zbar} = 0.15

$Q = sqrt(1/(1+0.63((B+h)/L_{zbar})^{0.63})$ (ASCE 7-05 Eqn 6-6)

Q = 0.8712

$L_{zbar} = l(z_{bar}/33)^{epsilon}$ (ASCE 7-05 Eqn 6-7)

L_{zbar} = 647.00

$T_a = C_t*h^x$ = 0.39 Sec (ASCE 7-05 Eqn 12.8-7)

$n_1 = 1/T_a$ = 2.55 Hz (ASCE 7-05 6.3)

n1 >= 1 therefore Building is Rigid (ASCE 7-05 6.2)

SB13 Carillon Point Job No. 10-601
Antenna Mount Wind Analysis Date 3/1/2011
Wind Normal to Short Face of Building (East-West Wind) By DAO

Gust Factor Calculation per ASCE 07-05 Section 6.5.8, continued

Derived Quantities, continued

g_R = sqrt(2ln(3600n1)) + 0.577/sqrt(2ln(3600n1)) (ASCE 7-05 Eqn 6-9)
g_R = N/A - Building is Rigid

$V_{barzbar} = V(88/60)b_{bar}(z_{bar}/33)^{(alphabar)}$ (ASCE 7-05 Eqn 6-14)
$V_{barzbar}$ = N/A - Building is Rigid

$R_l = 1/eta - (1/2eta^2)(1-e^{(-2eta)})$ for eta >0 (ASCE 7-05 Eqn 6-13a)
R_l = 1 for eta = 0 (ASCE 7-05 Eqn 6-13b)

$R_h = R_l$ where eta = $4.6n1*h/V_{barzbar}$
eta = N/A - Building is Rigid
R_h = N/A - Building is Rigid

$R_B = R_l$ where eta = $4.6n_1*B/V_{barzbar}$
eta = N/A - Building is Rigid
R_B = N/A - Building is Rigid

R_L = Rl where eta = 15.4n1*L/Vbarzbar
eta = N/A - Building is Rigid
R_L = N/A - Building is Rigid

$N_1 = n_1*L_{zbar}/V_{barzbar}$ (ASCE 7-05 Eqn 6-12)
N_1 = N/A - Building is Rigid

$R_n = 7.47N_1/(1+10.3N_1)^{(5/3)}$ (ASCE 7-05 Eqn 6-11)
R_n = N/A - Building is Rigid

$R = sqrt((1/\beta)R_nR_hR_B(0.53+0.47R_L))$ (ASCE 7-05 Eqn 6-10)
R = N/A - Building is Rigid

Gust Factor

Gf = 0.925((1+1.7gQIzbar*Q)/(1+1.7gv*Izbar)) (ASCE 7-05 Eqn 6-4)
Gf = 0.870
Use G = 0.85 per ASCE 7-05 6.5.8.1

SB13 Carillon Point Job No.

Antenna Mount Wind Analysis Date 3/1/2011

Wind Normal to Long Side of Building (N-S Wind) By DAO

Wind Pressure Per ASCE 7-05 Chapter 6

V =	85	mph	Basic Wind Speed (3 second gust)
Reduction	0	%	(from ASCE 37-02 6.2.1)
Case =	1		(from ASCE 7-05 Table 6-3)
Exposure=	D		(from ASCE 7-05 Section 6.5.6.3)
K_d =	0.850		(Directionality Factor from ASCE 7-05 Table 6-4)
K_{zt} =	1.000		(Topographic Factor from ASCE 7-05 Section 6.5.7)
I_w =	1.000		(Importance Factor from ASCE 7-05 Table 6-1)
G =	0.850		(Gust Factor from ASCE 7-05 Section 6.5.8)
C_f =	2.000		(Drag Factor from ASCE 7-05 Figure 6-20, 6-21, 6-22or 6-23)
Δ_h =	6.08	ft	Height Increment for Pressure Calculation
Cf_2 =			(Rooftop Equipt. Increase per ASCE 7-05 Section 6.5.15.1)
V' =	85.00	mph	(from ASCE 7-05 Figure 6-1)

Calculated Values

$G*C_f$ = 1.7

q = 26.73 psf (from ASCE 7-05 6.5.10: $q = 0.00256*K_d*K_{zt}*G*C_f*V^2*I_w$)

alpha = 11.50 (from ASCE 7-05 Table 6-2)

zg = 700.00 (from ASCE 7-05 Table 6-2)

($q_z = q*K_z$ with K_z per ASCE 7-05 Table 6-3, Note 2)

A = Area at height z

Pressures and Forces at Z feet Above Grade						
z (ft)	K_z	q_z (psf)	A (f^2)	F (#'s)	F(kips)	
15.00	1.03	16.20	1.00	28	0.03	
21.08	1.09	17.18	1.00	29	0.03	
27.15	1.14	17.96	1.00	31	0.03	
33.23	1.18	18.60	1.00	32	0.03	
39.30	1.22	19.15	1.00	33	0.03	
45.38	1.25	19.64	1.00	33	0.03	
51.45	1.28	20.07	1.00	34	0.03	
57.53	1.30	20.46	1.00	35	0.03	
63.60	1.32	20.82	1.00	35	0.04	
63.60	1.32	20.82	1.00	35	0.04	(High Point of Interest)
			Total =	325	0.32	

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Antenna Replacement

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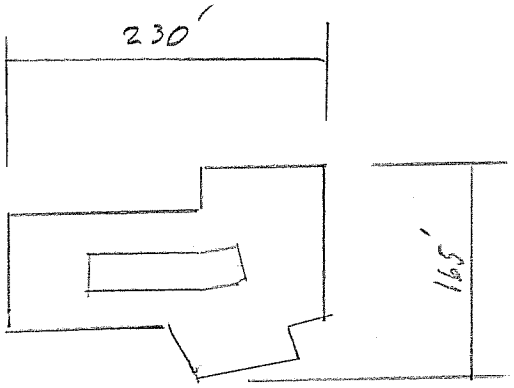
Wind Load, cont



$G = 0.85$ (ASCE 7-05 6.5.8.1)

$K_d = 0.85$ (ASCE 7-05 Table 6-4)

$\frac{h}{D} = \frac{96}{12} = 8$ for Antenna

$\therefore C_f = 2.0$ (ASCE 7-05 Fig 6-21)

$q = .00256\, K_d K_{zt} \times G \times C_f \times V^2 \times I_w$

$q = .00256 \times .85 \times 1 \times .85 \times 2 \times 85^2 \times 1$

$q = 26.73$ psf

$\therefore$ @ $h = 63.6$ (ℓ of 8' long antenna = 67.583 − 4 = 63.583)

$w = 35$ psf

Note: Neglect ASCE 6.5.15.1 because antennas are shielded by penthouse and wind is already increased by factor of 2 per Figure 6-21 which is conservative.

Wind Force Parallel to Penthouse

$F_w = w \times A = 35 \times 1 \times 8 = 280$ #

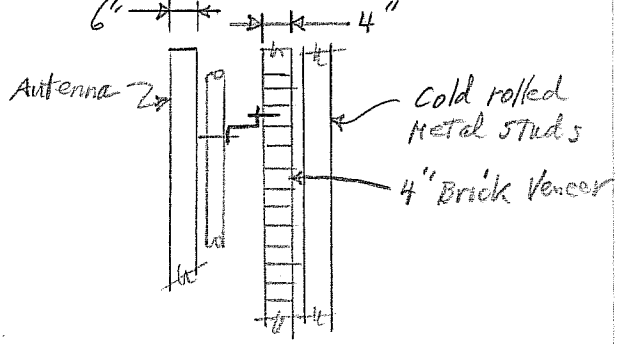
Assume Hilti HIT-HY 20 mounting bolts $\frac{1}{2}$" ϕ

Brick Veneer is 4" thick

$\therefore$ Bolt Capacity is:

$T_A = 775$ #

$V_a = 1375$ #



SB13 Carillon Point
Antenna Replacement

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Wind Load, cont

Wind Parallel to Penthouse, cont

$F_w = \frac{6}{12} \times 8 \times 35 = 140\ \#$

for 2 anchors, one each top & bottom

$V = 140/2 = 70\ \#/\text{anchor}$

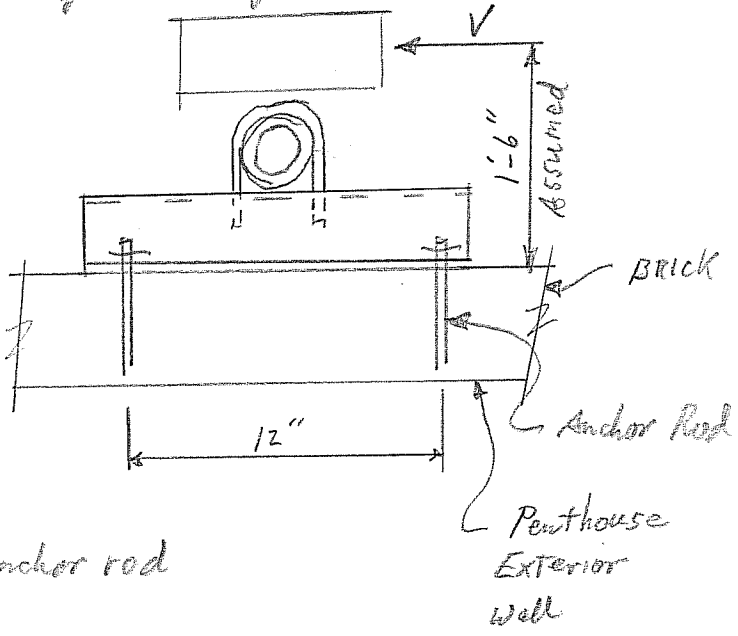
Mounted to 2"ϕ Std Pipe existing mount:

$\therefore t = \frac{18V}{12} = 1.5 \times 70$

$t = 105\ \#$

$S.F._t = \frac{775}{105}$

$S.F._t = 7.4$ ok



$v = \frac{70}{2} = 35\ \#/\text{anchor rod}$

$\therefore S.F._V = \frac{1375}{35}$

$S.F._V = 39.3$ ok

Note; By inspection wind normal to Penthouse Wall is ok because anchors cannot see tension because antenna is shielded by wall.

SB 13 Carillon Point
Antenna Replacement

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Seismic

Site Class D

Latitude : 47° 39' 22.5" N (47.656250° N)

Longitude : 122° 12' 29.36" W (122.206767° W)

$\therefore S_s = 1.266$ from USGS Seismic Hazard App

$S_1 = 0.429$

$I_p = 1$ (ASCE 13.1.3)

$R_p = 2.5$ (ASCE Table 13.6-1)

$a_p = 1.0$ (ASCE Table 13.6-1)

Seismic Force

$$F_p = \frac{0.4\, a_p\, S_{DS}\, W_p}{\left(\frac{R_p}{I_p}\right)}\left(1+2\frac{z}{h}\right)$$

$z = 67.6'$

$h = 53'$

$\frac{z}{h} = \frac{67.6}{53} = 1.28 \Rightarrow 1.0$ per ASCE 13.3.1

$S_{DS} = \frac{2}{3} F_a S_s$ where $F_a = 1.0$ (ASCE Table 11.4-1)

$S_{DS} = 2 \times 1.266/3 = 0.844 > 0.5$

$\therefore$ Seismic Design Category D (ASCE Table 11.6-1)

$$F_p = \frac{.4 \times 1 \times .844\ W_p}{\left(\frac{2.5}{1}\right)}(1+2\times 1) = 0.405\, W_p > .35 S_{DS} I_p W_p \quad \underline{\text{ok}}$$

$$\frac{1.3 R_p F_p}{1.5} = \frac{1.3 \times 2.5 \times .405}{1.5} \times \frac{72}{2} = 30.7\ \#/\text{anchor} \quad \text{(ASCE 13.4.2)}$$

By inspection this load is less than wind load, and anchors can easily carry it in tension. Say ok

SB 13 Carillon Point
Antenna Replacement

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Gravity Loads

Worst Case Load is 70# (Sector 9)

$W = \frac{70}{2} = 35\#/\text{anchor}$

$W_{seismic} = .2 S_{DS} W_p$ (ASCE 12.14.3.1.2 Conservative)

$W_s = .2 \times .844 \times 70/2 = 5.9\#/\text{Anchor}$

Total $W = 78.3\#$

$\therefore W = 39.2\#/\text{Anchor}$

By inspection gravity loads do not control.

SB13 Carillon Point

(Project #: 10-601)
Date: 3/1/2011
By: DAO

Antenna Replacement
Gravity Load plus Vertical Seismic

ASCE 7-05 2.4.1 Basic Load Combinations (ASD)

Loads	
D =	70.00
Di =	0.00
Qe =	0.00
F =	0.00
Fa =	0.00
H =	0.00
L =	0.00
Lr =	0.00
R =	0.00
S =	0.00
T =	0.00
W =	0.00
Wi =	0.00
Sds =	0.844
W0 =	1.000

Section 2.4.1		
1. D + F	70.00	
2. D + H + F + L + T	70.00	
3. D + H + F + (Lr or S or R)	70.00	
4. D + H + F + 0.75(L + T) + 0.75(Lr or S or R)	70.00	
5a. D + H + F + W	70.00	
5b. (1 + 0.14*Sds)D + H + F + 0.7*W0*Qe	78.27	<--- controls
6a. D + H + F + 0.75W + 0.75L + 0.75(LR or S or R)	70.00	
6b. (1+.105*Sds)D + H + F +.525*W0*Qe) + 0.75(L + LR)	76.20	
6c. (1+.105*Sds)D + H + F +.525*W0*Qe) + 0.75(L + S)	76.20	
6d. (1+.105*Sds)D + H + F +.525*W0*Qe) + 0.75(L + R)	76.20	
7. 0.6D + W + H	42.00	
8. (0.6 - 0.14*Sds)D - 0.7*W0*Qe + H	33.73	

Section 2.4.2 - Including Flood Loads	
V-Zones or Coastal A-Zones	
1. D + H + F + W + 1.5Fa	N/A
2. D + H + F + 0.75W + 0.75L + 0.75(Lr or S or R) + 1.5Fa	N/A
3. 0.6D - W + H + 1.5Fa	N/A
Noncoastal A-Zones	
1. D + H + F + W + 0.75Fa	N/A
2. D + H + F + 0.75W + 0.75L + 0.75(Lr or S or R) + 0.75Fa	N/A
3. 0.6D - W + H + 0.75Fa	N/A

Section 2.4.3 - Including Atmospheric Ice Loads	
2. D + H + F + L + T + 0.7Di	N/A
3. D + H + F + 0.7Di + 0.7Wi + S	N/A
7. 0.6D + H + 0.7Di + 0.7Wi	N/A

D = dead load
Di = weight of ice
E_h, or Q_e = earthquake load (must NOT be divided by 1.4 prior to use in these load combinations)
F = load due to fluids with well defined pressures and maximum heights
Fa = flood load
H = load due to lateral earth pressure, ground water pressure, or pressure of bulk materials
L = live load
Lr = roof live load
R = rain load
S = snow load
T = self-straining force
W = wind load
Wi = wind-on-ice determined in accordance with ASCE 7-05 Section 10
Sds = design short period spectral accelleration
W_0 = either the Overstrength Factor (Omega 0), or the Redundancy Factor (Rho)

Appendix

P65-17-XLH-RR | Dual Broadband Antennas

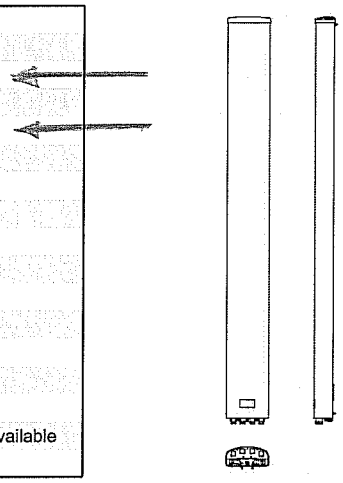
POLARIZATION: Dual linear ±45°
FREQUENCY (MHz): 698-894, 1710-2170
HORIZONTAL BEAM WIDTH (°): 65, 65
GAIN (dBi/dBd): 17.2/15.1 17.5/15.4
TILT: 0-6, 0-10
LENGTH: 96"

ELECTRICAL SPECIFICATIONS*

Frequency range (MHz)	698-894		1710-2170		
Frequency band (MHz)	698-806	806-894	1710-1880	1850-1990	1900-2170
Gain (dBi/dBd)	16.4/14.3	17.2/15.1	16.9/14.8	17.2/15.1	17.5/15.4
Polarization	Dual Linear +/- 45		Dual Linear +/- 45		
Nominal Impedance (Ω)	50		50		
VSWR	< 1.5:1		< 1.5:1		
Horizontal beam width, -3 dB (°)	70	63	60	63	60
Vertical beam width, -3 dB (°)	8.4		6.5		
Electrical down tilt (°)	0 to 6		0 to 10		
Side lobe suppression, vertical 1st upper (dB)	> 16		> 16		
Isolation between inputs (dB)	> 30		> 30		
Inter band Isolation (dB)	> 40				
Tracking, horizontal plane ±60° (dB)	< 2		< 2		
Vertical beam squint (°)	< 0.5		< 0.5		
Front to back ratio (dB) 180°±30° copolar	> 25		> 30		
Front to back ratio (dB) 180°±30° total power	> 22		> 25		
Cross polar discrimination (XPD) 0° (dB)	> 15		> 15		
Cross polar discrimination (XPD) ±60° (dB)	10		10		
IM3, 2xTx@43dBm (dBc)	<-153		<-153		
Power handling, average per input (W)	500		300		
Power handling, average total (W)	1000		600		

MECHANICAL SPECIFICATIONS*

Connector	4 X 7/16 DIN Female
Connector position	Bottom
Dimensions, HxWxD, in (mm)	96" x 12" x 6" (2438 x 305 x 152)
Mounting	Pre-mounted Tilt Brackets
Weight, with brackets, lbs (kg)	70 (32)
Weight, without brackets, lbs (kg)	59 (27)
Wind load, frontal/lateral/rear side 42 m/s Cd=1.0 (N)	1840
Maximum operational wind speed, mph (m/s)	100 (45)
Survival wind speed, mph (m/s)	150 (67)
Lightning protection	DC Ground
Operating Temperature	
Radome material	PVC
Packet size, HxWxD, in (mm)	107" x 16" x 10" (2725 x 400 x 255)
Radome colour	Light Grey
Shipping weight, lbs (kg)	81 (37)
RET	iRET AISGv1.1, MET and AISGv2.0 Available
Brackets	7256.00, 7454.00



*All specifications subject to change without notice. Please contact your Powerwave representative for complete performance data.

ANTENNA PATTERNS*

For detailed patterns visit http://www.powerwave.com/rpa/.

4.2.8 HIT-HY 20 for Masonry Anchoring System

HIT HY 20 Allowable Loads for Threaded HIT-A Rods in Hollow Concrete Block, Lightweight Concrete Block, Brick with Holes, Clay Tile[1, 2]

Anchor Type	Anchor Diameter in. (mm)	HIT-A Short 2" (51mm) Embedment		HIT-A Standard 3-3/8" (86mm) Embedment			
		L/W or N/W Hollow Concrete Block		Brick with Holes		Clay Tile	
		Tension lb (kN)	Shear lb (kN)	Tension lb (kN)	Shear lb (kN)	Tension lb (kN)	Shear lb (kN)
HIT-A Rod Anchor	1/4[3] (6.4)[3]	255 (1.1)	340 (1.5)	365 (1.6)	305 (1.4)	130 (0.6)	100 (0.4)
	5/16 (7.9)	370 (1.6)	505 (2.2)	565 (2.5)	530 (2.4)	150 (0.7)	220 (1.0)
	3/8 (9.5)	525 (2.3)	790 (3.5)	775 (3.4)	930 (4.1)	150 (0.7)	220 (1.0)
	1/2 (12.7)	525 (2.3)	1230 (5.5)	775 (3.4)	1375 (6.1)	150 (0.7)	500 (2.2)

1 Based on using a safety factor of 6 for tension and 4 for shear.

2 Due to wide strength variations encountered in masonry, these values should be considered as guide values.

3 1/4" anchor diameter installed at 2" embedment in brick with holes and clay tile.

HIT HY 20 Allowable Loads for Threaded HIT-I Inserts in Hollow Concrete Block, Lightweight Concrete Block, Brick with Holes, Clay Tile[1, 2]

Anchor Type	Anchor Diameter in. (mm)	HIT Short 2" (51mm) Embedment		HIT Standard 3-3/8" (86mm) Embedment			
		L/W or N/W Hollow Concrete Block		Brick with Holes		Clay Tile	
		Tension lb (kN)	Shear lb (kN)	Tension lb (kN)	Shear lb (kN)	Tension lb (kN)	Shear lb (kN)
HIT-I Insert Anchor	No 14 screw w/ insert[3] (6.4)	240 (1.1)	510 (2.3)	300 (1.3)	530 (2.4)	85 (0.4)	150 (0.7)
	5/16 (7.9)	400 (1.8)	780 (3.5)	585 (2.6)	750 (3.3)	175 (0.8)	220 (1.0)
	3/8 (9.5)	400 (1.8)	1425 (6.3)	1160 (5.2)	1380 (6.1)	185 (0.8)	435 (1.9)
	1/2 (12.7)	400 (1.8)	1800 (8.0)	1160 (5.2)	1635 (7.3)	185 (0.8)	500 (2.2)

1 Based on using a safety factor of 6 for tension and 4 for shear.

2 Due to wide strength variations encountered in masonry, these values should be considered as guide values.

3 1/4" anchor installed at 2" embedment in brick with holes and clay tile.

Anchor Spacing and Edge Distance Guidelines

Brick with Holes & Multi-Wythe Brick Walls

Spacing:

$s_{cr} = s_{min}$ = Two (2) complete bricks in any direction

Edge Distance:

$c_{cr} = c_{min}$ = Two (2) complete bricks, or 16" (406 mm) in any direction (whichever is less.)

Clay Tile

Spacing:

$s_{cr} = s_{min}$ = One (1) anchor per tile cell

Edge Distance:

$c_{cr} = c_{min}$ = 12" (305 mm) from free edge

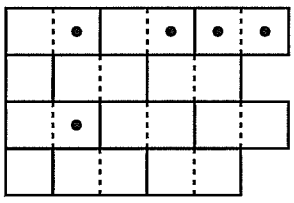
Hollow, Normal Weight & Lightweight Concrete Block

Spacing:

$s_{cr} = s_{min}$ = One (1) anchor per block cell

Edge Distance:

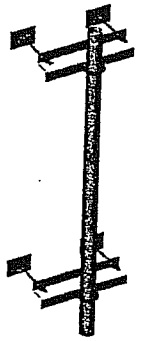
$c_{cr} = c_{min}$ = 12" (305 mm) min. from free edge

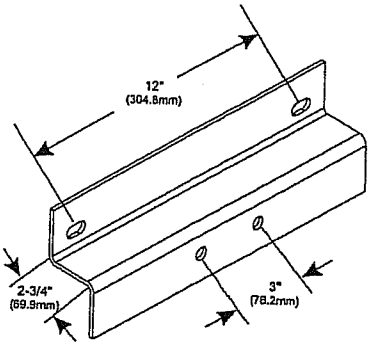


Wall Elevation

Cantilever Wall Mount Bracket

The Cantilever Wall Mount Bracket provides a secure, low-profile support for wireless antennas in wall-mounting applications. The design of the Cantilever Wall Mount Bracket keeps the antenna close to the supporting wall, minimizing the visual impact of the antenna installation. This versatile mount accepts standard 2-3/8" (60.3mm) OD mounting pipe, which must be purchased separately in an appropriate length to suit the exact antenna size and application requirements. Each kit includes two wall brackets and all necessary hardware for installation on hollow or solid walls. The Cantilever Wall Mount Bracket is hot-dip galvanized to ensure long-term performance in all environmental conditions.





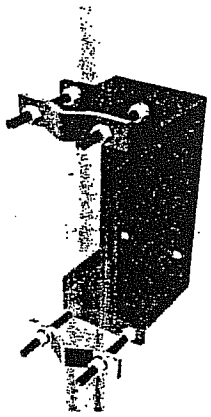
App.: Rooftops
Size: 14-1/2" (368.3mm) wide
Design: Z-shaped wall brackets
Feature: Low profile design

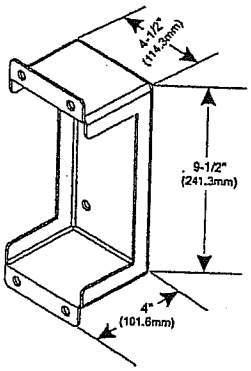
Mounts to: Solid or hollow walls
Material: Hot dip galv. steel
Incl.: Two brackets, U-bolts, wall mt hardware
Order Sep.: 2-3/8" (60.3mm) OD pipe

Part #	Description	Price US$ Kit Qty.	Wt. lbs (Wt. kg)
MT-250	Cantilever Wall Mount Bracket. Order 2-3/8" (60.3mm) OD pipe separately.	75.00 Kit of 2	15.0 (6.8)

Low Profile Wall Mount

The design of the Low Profile Wall Mount allows wireless antennas to be mounted to a building wall while remaining virtually transparent from ground level. Adjustable pipe clamps included with each mount will accommodate pipe up to 2-3/8" (60.3mm) OD making this design an ideal solution for securing 1" (25.4mm) GPS Antenna mounting pipes. 2-3/8" (60.3mm) OD plain end pipe is purchased separately to accommodate specific antenna requirements. Each wall mount is manufactured from galvanized steel and includes all pipe mount hardware. Two wall mounts are recommended when securing panel antennas over 48" (1.2m) in length. Wall attachment hardware to accommodate different wall types must be purchased separately.





App.: Rooftops
Size: 9-1/2" (241.3mm) high
Design: Unique, narrow bracket
Feature: Ideal for GPS installs

Mounts to: Walls
Material: Hot dip galv. steel
Incl.: Bracket and pipe clamps
Order Sep.: Up to 2-3/8" OD (60.3mm) OD pipe

Part #	Description	Price US$ Kit Qty.	Wt. lbs (Wt. kg)
MT-249	Low Profile Wall Mount	45.00 Each	5.2 (2.4)

Make use of the Index by Part Number and Index by Description located in the back of this Buyers' Guide to quickly locate the exact components that you require.