

MORRISON HERSHFIELD
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Tel. 770 379 8500 Fax. 770 379 8501



August 3, 2009

Mr. Bryan Besade
Verizon Wireless
777 Yamato Road, Suite 600
Boca Raton, FL 33431
Bryan.Besade@verizonwireless.com

Subject: **Structural Analysis of 250 ft Guyed Tower**
 Site: 68271 / "NPS Research Center"/ Miami-Dade County, FL
 Verizon Wireless Proposed Antenna Loading
 MH Project No. 7090023: MISC-059

Dear Mr. Besade:

Morrison Hershfield has carried out an analysis of the 250 ft guyed tower in Miami-Dade, FL for the addition of *Verizon Wireless*' proposed antenna installation given in Table 2. The structural analysis was done in accordance with the requirements of ANSI/TIA-222-G *Structural Standards for Antenna Supporting Structures and Antenna* using a 3-second gust wind speed of 146 mph, meeting the requirements of the 2007 Florida Building Code with 2009 Supplement. No ice was considered. For the analysis, the tower has been assumed to be in good condition and capable of supporting its full design capacity.

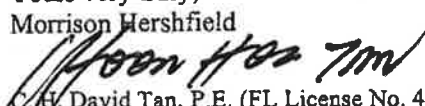
Please note the following:

1. The structural analysis is based on information gathered by Morrison Hershfield's tower and antenna mapping performed 7/17/09.
2. From visual inspection, it is recommended that a full TIA inspection of the tower be performed to document necessary maintenance upgrades to the structure.

Our analysis demonstrates that the existing tower and foundation are not in conformance with the requirements of the above noted standards under the effects of loading due to the permanent and temporary proposed antenna installations and existing antennas.

We trust that this report is satisfactory. If you have any questions regarding the investigation, please contact our office.

Yours very truly,
Morrison Hershfield


C. W. David Tan, P.E. (FL License No. 49812)
Senior Engineer

8-3-09

Table 1: Tower Details

Site ID / Site Name	68271 / NPS Research Center
Location	Everglades National Park, FL / Miami-Dade County, FL (Lat 25.3908333, Long -80.6816667)
Tower Description	250 ft guyed tower
Current Standard and Loading	ANSI/TIA-222-G, 146 mph 3-second gust wind speed and no ice (meets requirements of 2007 Florida Building Code with 2009 Supplement). Exposure Category C, Category 1 Classification.
Previous MH Analyses	None.

Table 2-A: Antenna Loads (Permanent Solution)

Elev. (ft)	Antenna Description	Carrier	Location	TX-Lines
	PROPOSED			
250	(6) BSA-185065/12 2	Verizon	80, 240, 300°	(6) 1 5/8"
	(3) Cell Extender		-	-
	(3) T-Arm		-	-
	EXISTING			
249	(2) 2 1/2" Dia 20' Dipole	-	230°	(1) 7/8"
	(2) Side Mount Standoff		-	-
247	Side Mount Standoff	-	-	-
217	2 1/2" Dia 20' Dipole	-	50°	(1) 7/8"
	Side Mount Standoff		-	-
210	1 1/2" Dia 20' Omni	-	290°	(1) 7/8"
	Side Mount Standoff		-	-
170	2 1/2" Dia 20' Dipole	-	290°	(1) 7/8"
	Side Mount Standoff		-	-
159	Side Mount Standoff	-	-	-
152	2 1/2" Dia 20' Dipole	-	50°	(1) 7/8"
	Side Mount Standoff		-	-
149	Side Mount Standoff	-	-	-
138	2 1/2" Dia 20' Dipole	-	170°	(1) 7/8"
	Side Mount Standoff		-	-
102	2 1/2" Dia 20' Dipole	-	170°	(1) 1/2"
	Side Mount Standoff		-	-

Note: Any discrepancies in loading from this listing should be brought to Morrison Hershfield's attention; results of this analysis cannot be used if the loading is different. See attachments for cable routing.



Table 2-B: Antenna Loads (Temp Solution)

Elev. (ft)	Antenna Description	Carrier	Location	TX-Lines
	PROPOSED			
250	BXA185063/12 2	Verizon	240°	(1) 1 5/8"
	TMA (ETW190VS12UV)		-	-
	Side Mount Standoff		-	-
	EXISTING			
249	(2) 2 1/2" Dia 20' Dipole	-	230°	(1) 7/8"
	(2) Side Mount Standoff		-	-
247	Side Mount Standoff	-	-	-
217	2 1/2" Dia 20' Dipole	-	50°	(1) 7/8"
	Side Mount Standoff		-	-
210	1 1/2" Dia 20' Omni	-	290°	(1) 7/8"
	Side Mount Standoff		-	-
170	2 1/2" Dia 20' Dipole	-	290°	(1) 7/8"
	Side Mount Standoff		-	-
159	Side Mount Standoff	-	-	-
152	2 1/2" Dia 20' Dipole	-	50°	(1) 7/8"
	Side Mount Standoff		-	-
149	Side Mount Standoff	-	-	-
138	2 1/2" Dia 20' Dipole	-	170°	(1) 7/8"
	Side Mount Standoff		-	-
102	2 1/2" Dia 20' Dipole	-	170°	(1) 1/2"
	Side Mount Standoff		-	-

Note: Any discrepancies in loading from this listing should be brought to Morrison Hershfield's attention; results of this analysis cannot be used if the loading is different. See attachments for cable routing.



Table 3-A: Maximum Tower Response (Permanent Solution)

Section No.	Elevation	Legs Percent Capacity Used	Diagonals Percent Capacity Used	Horizontals Percent Capacity Used
1	230 – 250 ft	116.1	133.2	79.4
2	210 – 230 ft	276.5	148.7	56.5
3	190 – 210 ft	521.1	182.4	95.2
4	170 – 190 ft	517.7	166.3	45.3
5	150 – 170 ft	381.6	150.0	37.6
6	130 – 150 ft	269.1	167.6	56.7
7	110 – 130 ft	151.8	140.2	35.1
8	90 – 110 ft	142.0	166.6	62.2
9	70 – 90 ft	205.9	158.6	38.4
10	50 – 70 ft	205.9	149.8	35.9
11	30 – 50 ft	217.3	150.2	64.9
12	0 – 30 ft	221.7	106.1	24.7
13	0 – 10 ft	193.7	140.4	22.2

Table 3-B: Maximum Tower Response (Temp Solution)

Section No.	Elevation	Legs Percent Capacity Used	Diagonals Percent Capacity Used	Horizontals Percent Capacity Used
1	230 - 250 ft	30.4	54.4	33.4
2	210 - 230 ft	59.5	75.7	27.7
3	190 - 210 ft	195.0	125.6	72.4
4	170 - 190 ft	188.9	119.1	30.7
5	150 - 170 ft	71.0	122.6	29.5
6	130 - 150 ft	130.1	145.7	60.9
7	110 - 130 ft	131.7	85.4	21.4
8	90 - 110 ft	102.9	114.0	50.1
9	70 - 90 ft	93.2	80.4	20.5
10	50 - 70 ft	110.8	85.2	21.5
11	30 - 50 ft	116.4	84.5	35.8
12	10 - 30 ft	115.2	50.6	10.7
13	0 - 10 ft	107.7	97.9	14.5



Table 4-A: Guy Response Results (Permanent Solution)

Elevation	Guy Type	Percent Capacity Used
243 ft	7/16" EHS	254.3
193 ft	3/8" EHS	135.9
145 ft	7/16" EHS	146.3
95 ft	7/16" EHS	167.0
48 ft	7/16" EHS	152.4

Table 4-B: Guy Response Results (Temp Solution)

Elevation	Guy Type	Percent Capacity Used
243 ft	7/16" EHS	116.4
193 ft	3/8" EHS	97.5
145 ft	7/16" EHS	127.5
95 ft	7/16" EHS	128.2
48 ft	7/16" EHS	89.1

Table 5-A: Foundation Loads Comparison (Permanent Solution)

Load	Original Design	Current Analysis	Pass/Fail *
Mast Axial (kip)	N/A	81.9	FAIL
Anchor Shear (kip)		55.7	
Anchor Uplift (kip)		40.6	

* Foundation has been evaluated and found to be overstressed to the capacity of the foundation.

Table 5-B: Foundation Loads Comparison (Temp Solution)

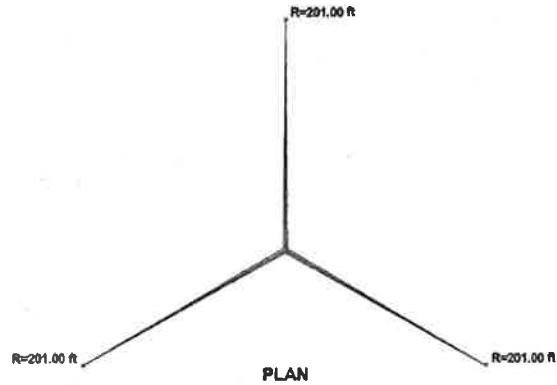
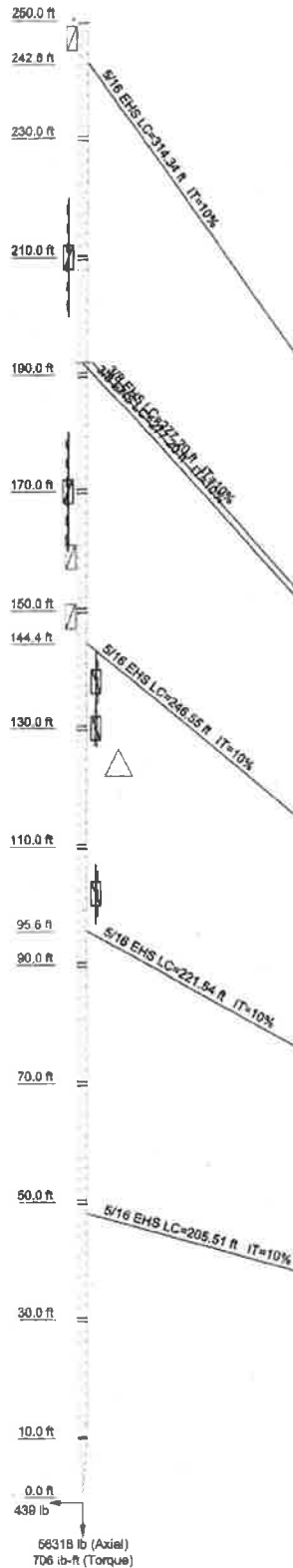
Load	Original Design	Current Analysis	Pass/Fail *
Mast Axial (kip)	N/A	56.3	PASS
Anchor Shear (kip)		38.5	FAIL
Anchor Uplift (kip)		27.3	

* Foundation has been evaluated and found to be overstressed to the capacity of the foundation.

Attachments: Tower Profile, Coax Sketch



Section	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11	T12	T13
Legs													
Leg Grade													
Diagonals													
Diagonal Grade													
Top Girts													
Bottom Girts													
Horizontal													
Face Width (ft)													
# Panels @ (ft)													
Weight (lb) 4201.3													



DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
(2) 2 1/2" Dia 20' Dipole	249	2 1/2" Dia 20' Dipole	152
Side Mount Standoff	249	Side Mount Standoff	152
Side Mount Standoff	247	Side Mount Standoff	149
2 1/2" Dia 20' Dipole	217	2 1/2" Dia 20' Dipole	138
Side Mount Standoff	217	Side Mount Standoff	138
1 1/2" Dia 20' Omni	210	BXA185063/12 2	130
Side Mount Standoff	210	TMA (ETW190VS12UV)	130
2 1/2" Dia 20' Dipole	170	Side Mount Standoff	130
Side Mount Standoff	170	Side Mount Standoff	102
Side Mount Standoff	159	2 1/2" Dia 20' Dipole	102

SYMBOL LIST

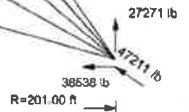
MARK	SIZE	MARK	SIZE
A	7 @ 1.40476		

MATERIAL STRENGTH

GRADE	Fy	Fu	GRADE	Fy	Fu
A36	36 ksi	58 ksi			

TOWER DESIGN NOTES

1. Tower is located in Miami-Dade County, Florida.
2. Tower designed for Exposure C to the TIA-222-G Standard.
3. Tower designed for a 146 mph basic wind in accordance with the TIA-222-G Standard.
4. Deflections are based upon a 80 mph wind.
5. TOWER RATING: 195%



Morrison Hershfield
66 Perimeter Center East, Suite 600
Atlanta, GA
Phone: (770) 379-8500
FAX: (770) 379-8501

Job: MISC-059 / 7090023	Project: NPS Research Center - Temp Solution
Client: Verizon Wireless	Drawn by: HSHe
Code: TIA-222-G	Date: 07/31/09
Path: 	Scale: NTS
	Dwg No. E-

ELEVATION VIEW

250.0 ft
242.5 ft
230.0 ft
210.0 ft
190.0 ft
170.0 ft
150.0 ft
144.4 ft
130.0 ft
110.0 ft
95.6 ft
90.0 ft
70.0 ft
50.0 ft
30.0 ft
10.0 ft
0.0 ft

5/16 ENS LC=341.34 ft IT=10%
5/16 ENS LC=221.54 ft IT=10%
5/16 ENS LC=205.51 ft IT=10%

81927 lb (Axial)
864 lb-ft (Torque)

PLAN VIEW

R=201.00 ft

DESIGNED APPURTENANCE LOADING

TYPE	ELEVATION	TYPE	ELEVATION
(2) BSA-185065/12 2	250	Side Mount Standoff	217
(2) BSA-185065/12 2	250	1 1/2" Dia 20' Omni	210
(2) BSA-185065/12 2	250	Side Mount Standoff	210
Cell Extender	250	2 1/2" Dia 20' Dipole	170
Cell Extender	250	Side Mount Standoff	170
T-Arm	250	Side Mount Standoff	159
T-Arm	250	Side Mount Standoff	152
T-Arm	250	2 1/2" Dia 20' Dipole	152
(2) 2 1/2" Dia 20' Dipoles	249	Side Mount Standoff	149
Side Mount Standoff	249	Side Mount Standoff	138
Side Mount Standoff	247	2 1/2" Dia 20' Dipole	138
2 1/2" Dia 20' Dipole	217	Side Mount Standoff	102
		2 1/2" Dia 20' Dipole	102

SYMBOL LIST

MARK	SIZE	MARK	SIZE
A	7 @ 1.40478		


MATERIAL STRENGTH

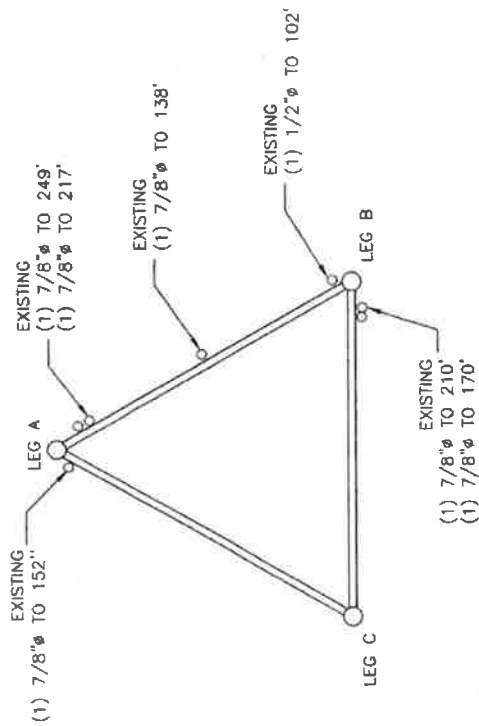
GRADE	Fy	Fu	GRADE	Fy	Fu
A36	36 ksi	58 ksi			

TOWER DESIGN NOTES

1. Tower is located in Miami-Dade County, Florida.
2. Tower designed for Exposure C to the TIA-222-G Standard.
3. Tower designed for a 146 mph basic wind in accordance with the TIA-222-G Standard.
4. Deflections are based upon a 60 mph wind.
5. TOWER RATING: 521.1%

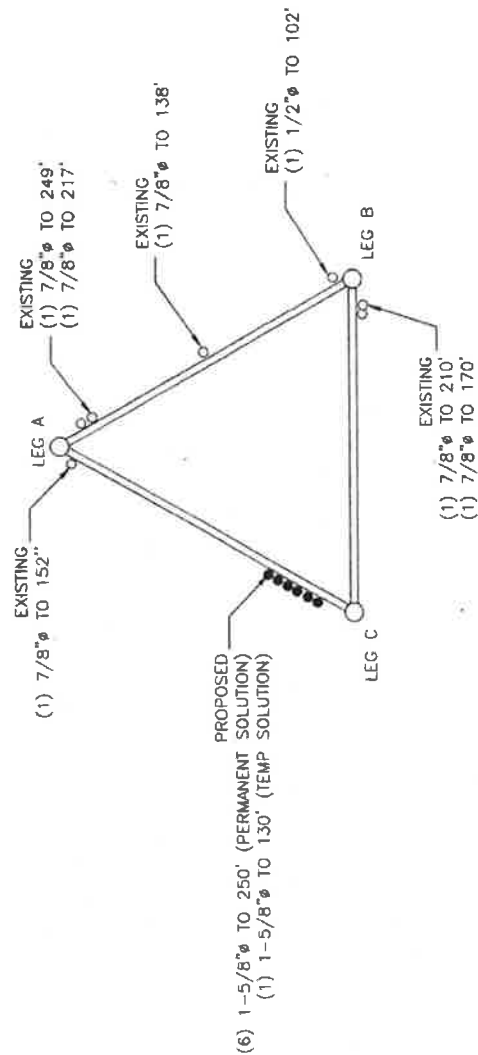
40622 lb
56758 lb
R=201.00 ft

 Morrison Hershfield 66 Perimeter Center East, Suite 600 Atlanta, GA Phone: (770) 379-8500 FAX: (770) 379-8501	Job: MISC-059 / 7090023		
	Project: NPS Research Center		
	Client: Verizon Wireless	Drawn by: HSHe	App'd:
	Code: TIA-222-G	Date: 07/31/09	Scale: NTS
	Path:		Draw No. E-1




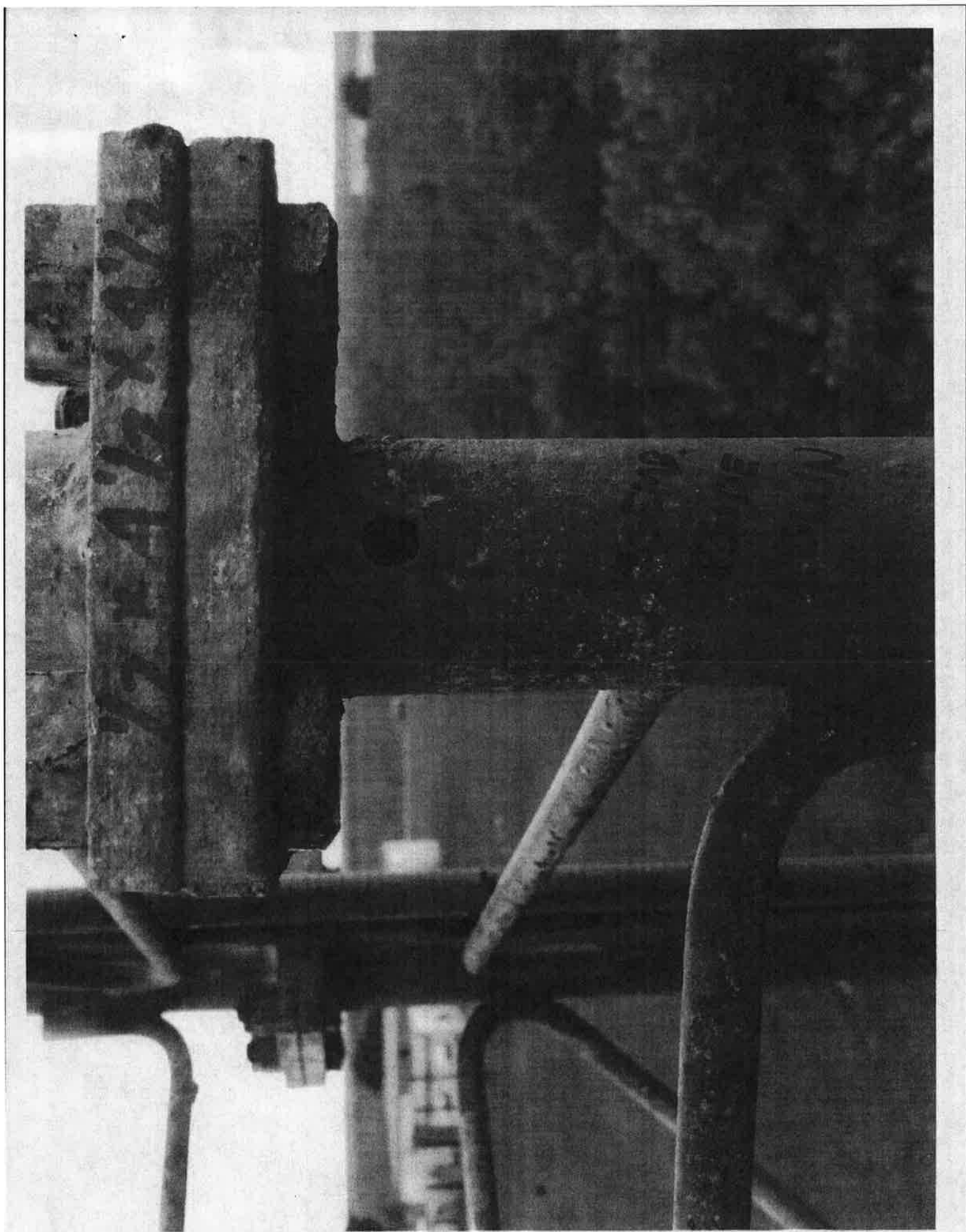
NOTE: ACTUAL LOCATIONS OF EXISTING CABLES MAY VARY FROM THE LAYOUT SHOWN. PLEASE CONTACT MORRISON HERSHFIELD PRIOR TO INSTALLING PROPOSED LINES IF LAYOUT IS SUBSTANTIALLY DIFFERENT FROM THAT SHOWN.

EXISTING CABLE RUNS (NOT TO SCALE)



PROPOSED CABLE RUNS (NOT TO SCALE)

 <p>MORRISON HERSHFIELD 86 Piedmont Center East, Suite 600 Atlanta, GA 30346 Phone: 770-379-8600 Fax: 770-379-8601 www.morrisonhershfield.com</p>	<p>Project: MSC-059 / 7090023 NPS RESEARCH CENTER VERIZON WIRELESS</p>



SECT.
#13
1-6
ASSEM.
IN CORR.
ECTRY

