PROVENTUS STRUCTURAL SERVICES LLC

PROVIDING THE TOWER DATA YOU NEED

Site Name:	Prospect Tower
Structure Type:	Guyed Tower
Structure Height:	220’
Make:	Rohn
Model:	Model 80
Tower Owner:	Government of Bermuda
Latitude:	32.299186
Longitude:	-64.765877
Date of Visit:	4/26/2017
Employees on Site:	Angie Shyrigh

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Purpose of this Site Visit

To fulfill the inspection requirements set forth in the TIA/EIA222-G, Annex J.1 standard for Maintenance and Condition Assessment of communication structures.

General Information

If a manufacturer's plate is installed, record the information here:
A manufacturer's plate is not installed, however the design details are congruent with Rohn model 80 tower.

Elevations

Ground to top of pier pad: 2"
Top of pier pad to top of base plate: 1"
Top of base plate to top of structure: 220'
Tip height of highest appurtenance: 230'
What is the highest appurtenance? Omni antenna

Leg Orientation

Legs are labeled in a clockwise fashion with "A leg" as the northernmost leg.
Azimuth of "A leg": 315°

Access and Compound

- Access road
- Compound gates & fencing
- Compound substrate
- Shelter exteriors

Observations
The access and compound are in fair condition with no deficiencies observed.

Concrete Foundations

- Ground condition
    - Settlement, movement, earth cracks
    - Erosion
    - Site condition (standing water, drainage, trees, etc.)
- Anchorage condition
    - Nuts and/or locking device (tightened)
    - Grout condition
    - Anchorage and/or anchor rod condition
- Concrete condition
    - Cracking, spalling, or splitting
    - Chipped or broken concrete
    - Honeycombing
    - Low spots to collect moisture

Observations
The tower foundation is in fair, functional condition with no deficiencies observed.

Structure Condition

- Damaged members (legs and bracing)
- Loose members
- Missing members
- Climbing facilities, platforms, catwalks – all secure
- Loose and/or missing bolts and/or locking devices
- Visible cracks in welded connections

Observations

Elevation	Location	Description	Recommendation	Priority
70’ 6”, 205’	Varies	Locking hardware is not installed on the torque arm connection bolt assemblies.	Install locking hardware on the bolt assemblies. (24) 5/8” Ø PAL nuts are required to correct.	To be scheduled within 12 months

Finish

- Paint and/or galvanizing condition
- Rust and/or corrosion condition including mounts and accessories
- FAA or ICAO color marking conditions
- Water collection in members (to be remedied, e. g. unplug drain holes, etc.)

Note: Corrosion Definitions
Category 1 rust: light discoloration of steel surface, galvanizing may be wearing thin however rust does not penetrate steel and there is no loss of material. Recommended action is generally to monitor and record condition to determine the advancement of the condition.
Category 2 rust: discoloration is heavy and light pitting may be present. Recommended action is generally to brush region and treat with zinc rich compound. After treatment, region should be monitored and condition recorded at regular intervals to determine advancement of condition.
Category 3 rust: heavy pitting, flaking and/or loss of material is present. Recommended action is generally to replace component. If component replacement is not feasible, a review of condition by a professional engineer is recommended to determine course of action.

Observations

Elevation	Location	Description	Recommendation	Priority
Ground	Anchor A	Scaling rust is present and advancing at the base of the Anchor A elevation beam.	It is recommended the Engineer of Record be consulted to determine corrective action.	To be scheduled within 12 months
Ground	Anchor B	Scaling rust is present at the guy anchor rods and approximately ¼" material from the diameter of each anchor rod is present.	It is recommended the Engineer of Record be consulted to determine corrective action.	To be scheduled within 12 months
Ground	Base plate	Extensive category 3 pitting rust is present on the base plate as well as the bearing plate.	It is recommended the Engineer of Record be consulted to determine corrective action.	To be scheduled within 12 months
Throughout height	Tower bracing	Numerous tower bracing members (approximately 35% of the diagonals and horizontals) have category 3 rust and are rusted from the inside out at the weep holes.	Replacement of the members would be recommended for much smaller quantities of rusted through bracing members, however due to the quantity, and in light of the condition of other essential components, it is recommended the tower be replaced.	To be scheduled within 2 years

Lighting

- Conduit, junction boxes and fasteners (weather tight and secure)
- Drain and vent openings (unobstructed)
- Wiring condition
- Light lenses
- Photo cell facing north
- Bulb condition
- Controller function if accessible

Light Type	Elevation	Location
LED Sidelight	109’	A Leg
LED Sidelight	109’	B Leg
LED Sidelight	109’	C Leg
Dual Strobe	219’	C Leg
LED Sidelight	109’	A Leg

Observations

Elevation	Location	Description	Recommendation	Priority
109’	B Leg	The side light has no closure clips and is secured with a hose clamp.	It is recommended that replacement hose clamps from the manufacturer be installed.	To be scheduled within 3 months

Grounding

- Connections
- Corrosion
- Lightning protection (secured to structure)

Observations
Aside from grounding issues describing in the “Guy Wires and Associated Hardware” section, the grounding is in fair, function condition with no deficiencies observed.

Personnel Safety

- Presence and condition of safety cable system
- Integrity of climbing facilities
- Availability of adequate anchorage points throughout height of climb

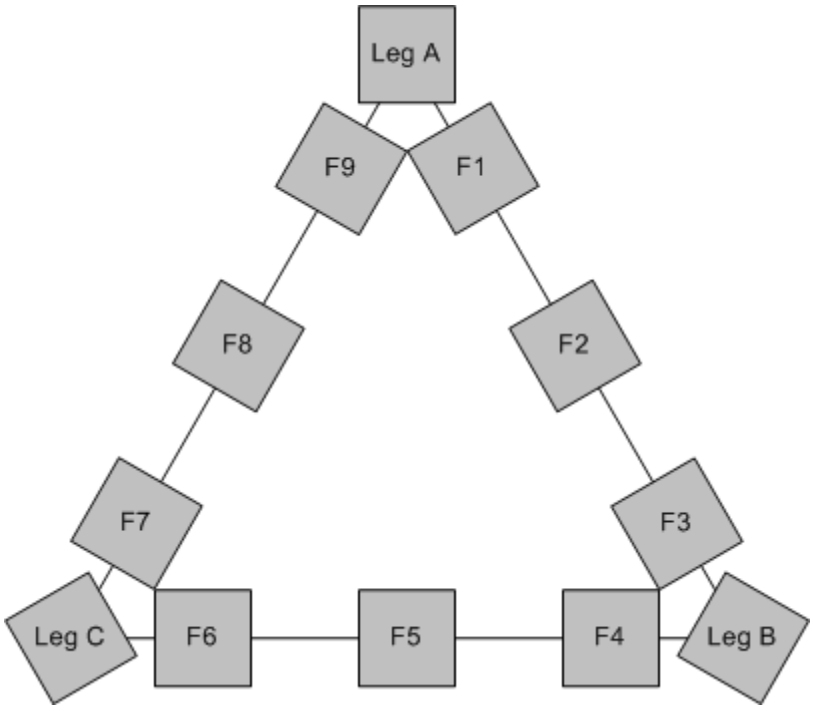
Observations and Issues Found

Elevation	Location	Description	Recommendation	Priority
Throughout height	C Leg	Category 3 rust is present on the safety cable.	It is recommended the safety cable system be replaced and that the safety cable kit be installed per manufacturer's specifications.	To be scheduled within 12 months

Antennas and Lines

- Antenna condition
- Mount and/or ice shield condition (bent, loose, and/or missing members)
- Feedline condition (flanges, seals, dents, jacket damage, grounding, etc.)
- Feedline hanger condition (snap-ins, bolt on, kellum grips, etc.)
- Secured to structure

Coax Position Diagram



Loading

Antennas							External Devices				Feedlines				Mounts	
#	Elev.	Location	Az.	Make	Model	Description	Quant.	Make	Model	Description	Quant.	Size	In/Out	Coax Position*	Elev.	Description
1	46'	A LEG	235°	ANATEL	MINI-LINK ANT09.6HP	3' DISH	1	ERICSSON	RAU2 X 6U/A31	ODU	1	1/4"	OUTSIDE	A LEG	46'	CLAMPSET TO LEG
2	46'	B LEG	350°	ILLEGIBLE	ILLEGIBLE	1' SQUARE PANEL	NONE				1	CAT5	INSIDE	F7	46'	CLAMPSET TO LEG
3	48' 6"	B LEG	50°	ANATEL	MINI-LINK ANT09.6HP	3' DISH	1	ERICSSON	RAU2 X 6U/A31	ODU	1	1/4"	OUTSIDE	A LEG	48' 6"	CLAMPSET TO LEG
4	50'	A LEG	235°	ERICSSON	ANT2 0.6 13 HP	2' DISH	NONE				1	1/2"	OUTSIDE	F9	52'	PIPE MOUNT
5	53'	A LEG	50°	ERICSSON	ANT2 0.6 13 HP	2' DISH	NONE				1	1/2"	OUTSIDE	F9		
6	58'	A LEG	235°	COMMSCOPE	VHLP4-6W-DW1C	4' DISH	2	DRAGONWAVE	RLHP15B1	ODU	2	3/8"	INSIDE	F6	58'	STANDOFF
7	58'	B LEG	50°	COMMSCOPE	VHLP4-6W-DW1C	4' DISH	2	DRAGONWAVE	RLHP15B1	ODU	2	3/8"	INSIDE	F6	58'	STANDOFF
8	63'	A LEG	315°	COMMSCOPE	VHLP3-6W-DW1	3' DISH	2	DRAGONWAVE	RLHP15B1	ODU	2	3/8"	INSIDE	F6	58'	STANDOFF
9	63'	B LEG	50°	COMMSCOPE	VHLP4-6W-DW1C	4' DISH	2	DRAGONWAVE	RLHP15B1	ODU	2	3/8"	INSIDE	F6	58'	STANDOFF
10	71'	A LEG	235°	RADIOWAVES	HPCPE-23DW2	1' DISH	1	DRAGONWAVE	PHHP23B3SXR1	ODU	1	3/8"	INSIDE	F6	71'	STANDOFF
11	73'	B LEG	50°	COBHAM	AFS-DBG-0360-01	2' PANEL	1	REDLINE	RDL-3000	ODU	1	3/8"	INSIDE	F6	73'	STANDOFF
12	76'	B LEG	195°	RADIOWAVES	ILLEGIBLE	2' DISH	1	REDLINE	RDL-3000	ODU	1	3/8"	INSIDE	F6		
13	76'	A LEG	315°	COBHAM	AFS-DBG-0360-01	2' PANEL	1	REDLINE	RDL-3000	ODU	1	3/8"	INSIDE	F6	80'	STANDOFF
14	80'	A LEG	300°	RADIOWAVES	ILLEGIBLE	2' DISH	1	REDLINE	RDL-3000	ODU	1	3/8"	INSIDE	F6		
15	83'	A LEG	300°	RADIOWAVES	SPD2-5 2NS	2' DISH	1	REDLINE	RDL-3000	ODU	1	3/8"	INSIDE	F6		
16	83'	B LEG	15°	RADIOWAVES	HPCPE-23DW2	1' DISH	1	DRAGONWAVE	PHHP23B3SXR1	ODU	1	3/8"	INSIDE	F6	83'	STANDOFF
17	84'	A LEG	N/A	ILLEGIBLE	ILLEGIBLE	20' DIPOLE	NONE				1	7/8"	INSIDE	F8	84', 104'	STANDOFFS
18	103'	C LEG	195°	RADIOWAVES	HPCPE-23DW2	1' DISH	1	DRAGONWAVE	PHHP23B3SXR1	ODU	1	3/8"	INSIDE	F6	103'	STANDOFF
19	111'	A LEG	N/A	ILLEGIBLE	ILLEGIBLE	20' OMNI	NONE				1	7/8"	INSIDE	F7	111'	STANDOFF
20	115' - 125'	B LEG	N/A	ILLEGIBLE	ILLEGIBLE	2 BAY FM: 2' T X 2' W X 2' L	NONE				1	7/8"	INSIDE	B LEG	115' - 125'	STANDOFF
21	131'	A LEG	275°	SCALA	ILLEGIBLE	PARAGRID: 18" T X 3' W	NONE				1	1/2"	INSIDE	F8	132'	PIPE MOUNT
22	143'	A LEG	N/A	ILLEGIBLE	ILLEGIBLE	20' OMNI	NONE				1	7/8"	INSIDE	F8	142'	STANDOFF
23	161'	A LEG	205°	ILLEGIBLE	ILLEGIBLE	2' DISH	NONE				1	3/8"	INSIDE	A LEG	161'	CLAMPSET
24	175' - 182'	C LEG	N/A	ILLEGIBLE	ILLEGIBLE	2 BAY FM: 3' T X 2" W X 2' L	NONE				1	1-5/8"	INSIDE	F4	175'	PIPE MOUNT
25	190'	A LEG	N/A	ILLEGIBLE	ILLEGIBLE	2' DIAMETER FM ELEMENT	NONE				1	7/8"	INSIDE	F7	190'	CLAMPSET DIRECT TO LEG
26	198'	B LEG	N/A	ILLEGIBLE	ILLEGIBLE	15' OMNI	NONE				1	7/8"	INSIDE	F8	195'	STANDOFF
27	218'	B LEG	N/A	ILLEGIBLE	ILLEGIBLE	6' OMNI	NONE				1	7/8"	INSIDE	F7	217'	STANDOFF
28	219'	A LEG	N/A	ILLEGIBLE	ILLEGIBLE	4' OMNI	NONE				1	7/8"	INSIDE	F7	219'	CLAMPSET
29	223'	B LEG	N/A	ILLEGIBLE	ILLEGIBLE	6' OMNI	1	ILLEGIBLE	ILLEGIBLE	10" X 12" X 8"	1	7/8"	INSIDE	F7	222'	PIPE MOUNT

Observations

Elevation	Location	Description	Recommendation	Priority
46’	B Leg	Antenna #1 mount is secured to the tower with a zip tie.	It is recommended the mount be replaced.	To be scheduled within 12 months
111’	A Leg	The top of antenna #19 is trapped behind a tower bracing member.	It is recommended the antenna be released and that a standoff be installed at the top of the tower to prevent recurrence.	To be scheduled within 12 months
63’	CA Face	Antenna #8’s stiff arm is attached to a diagonal member. Advanced category 3 rust is present at this diagonal member weep hole. The stress of the stiff arm on the failing member is potentially severe enough to cause failure of the member and contribute to the failure of the structure.	Remove and reattach the stiff arm to a tower leg.	To be scheduled within 3 months

Guy Wires and Associated Hardware

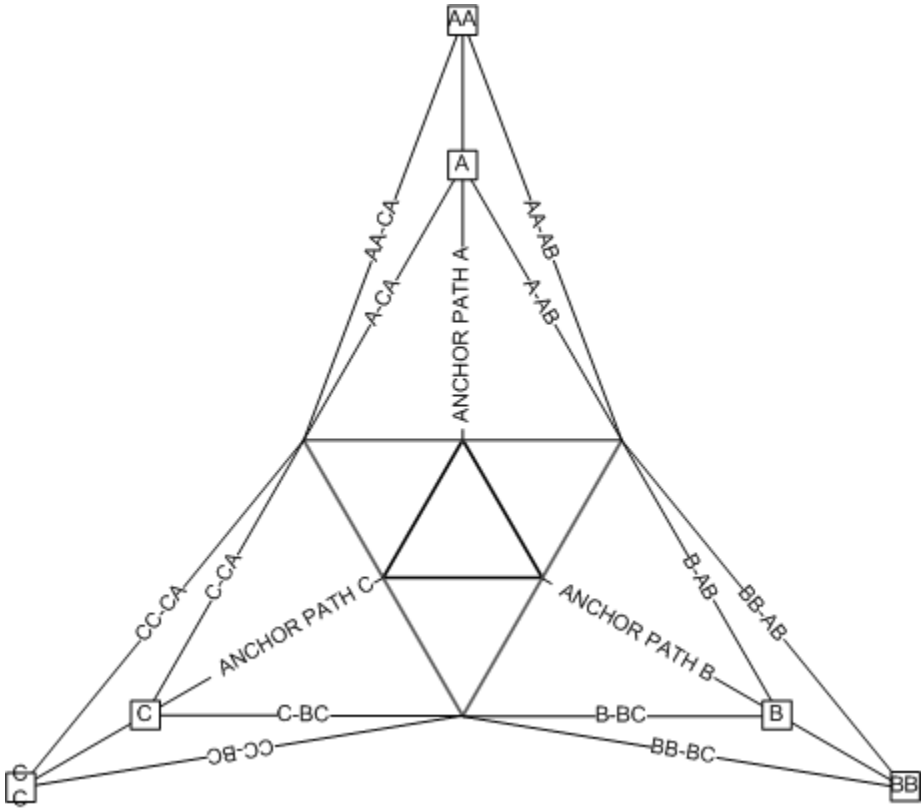
Items inspected include:

- Strand condition (corrosion, breaks, nicks, kinks, etc.)
- Guy hardware conditions
    - Turnbuckles or equivalent (secure and safety properly applied)
    - Cable thimbles properly in place (if required)
    - Service sleeves properly in place (if required)
    - Cable connectors (end fittings)
        - Cable clamps applied and bolts tight
        - Wire serving properly applied
        - No signs of slippage or damaged strands
        - Preformed wraps – properly applied, fully wrapped and sleeves in place
        - Poured sockets secure and showing no separation
        - Shackles, bolts, pins and cotter pins secure and in good condition
- Guy tensions

Note: 1) Minor variations in guy tensions are to be expected due to temperature and low wind speed conditions. The cause of significant changes should be determined immediately and proper remedial action taken. Possible cause may be initial construction loosening, previously experienced extreme wind or ice, anchor movements, base settlement, or connection slippage. 2) Tension variations at a single level are to be expected because of anchor elevation differences, construction deviations and wind effects.

Guy Anchor and Guy Wire Position Codes

- The northernmost anchor is designated “A” followed by “B” and “C” clockwise.
- Outer anchors are designated with a double letter.
- Torque arm guy wires are labeled according to the anchor plate to which it is attached followed by the two paths the guy wire is between.



Guy Tension Results

Temperature	77°
Wind Speed	12MPH
Wind Direction	W

Guy Wire Position Code	Anchor Distance	Anchor Elevation	Guy Wire Attachment Elevation	Guy Wire Diameter	Guy Wire Type	Ideal Initial Tension Range			Measured Tension	Result
						Low	Target	High		
A-CA	131'	+5'	70' 6"	1/2" X 7	EHS	2,455	2,640	3,036	3,300	25% OVER TARGET TENSION
A-AB			70' 6"	1/2" X 7	EHS	2,455	2,640	3,036	3,500	33% OVER TARGET TENSION
A			140'	3/4" X 19	EHS	5,422	5,830	6,705	7,200	23% OVER TARGET TENSION
A-CA			205'	9/16" X 7	EHS	3,255	3,500	4,025	3,600	ACCEPTABLE TENSION
A-AB			205'	9/16" X 7	EHS	3,255	3,500	4,025	3,700	ACCEPTABLE TENSION
B-AB	135'	+2'	70' 6"	1/2" X 7	EHS	2,455	2,640	3,036	3,400	29% OVER TARGET TENSION
B-BC			70' 6"	1/2" X 7	EHS	2,455	2,640	3,036	3,600	36% OVER TARGET TENSION
B			140'	3/4" X 19	EHS	5,422	5,830	6,705	6,900	18% OVER TARGET TENSION
B-AB			205'	9/16" X 7	EHS	3,255	3,500	4,025	3,700	ACCEPTABLE TENSION
B-BC			205'	9/16" X 7	EHS	3,255	3,500	4,025	3,600	ACCEPTABLE TENSION
C-BC	135'	+15'	70' 6"	1/2" X 7	EHS	2,455	2,640	3,036	3,350	27% OVER TARGET TENSION
C-CA			70' 6"	1/2" X 7	EHS	2,455	2,640	3,036	3,400	29% OVER TARGET TENSION
C			140'	3/4" X 19	EHS	5,422	5,830	6,705	6,800	17% OVER TARGET TENSION
C-BC			205'	9/16" X 7	EHS	3,255	3,500	4,025	3,800	ACCEPTABLE TENSION
C-CA			205'	9/16" X 7	EHS	3,255	3,500	4,025	3,700	ACCEPTABLE TENSION

Total quantity of guy wires: 15

Quantity of guy wires within acceptable tension range: 6

Quantity of guy wires under acceptable tension range: 0

Quantity of guy wires over acceptable tension range: 9

It is recommended a plumb and tension be performed to bring the guy wires into acceptable tension range within 2 years, and that a plumb and tension be performed at interims of no more than 3 years.

Observations

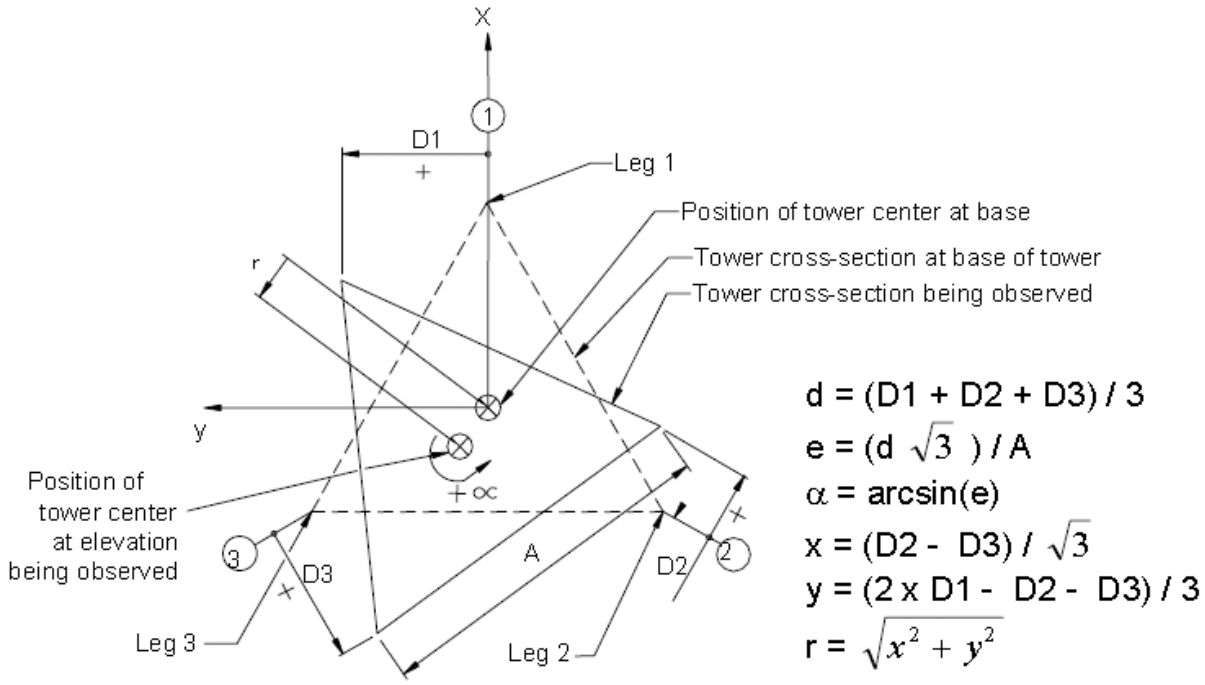
Elevation	Location	Description	Recommendation	Priority
Ground	Each anchor	End sleeves are not present on the guy grip ends.	In order to protect the guy grip ends, it is recommended that end sleeves be installed. (6) ½" end sleeves, (3) ¾" end sleeves and (6) 9/16" end sleeves are required to correct.	To be scheduled within 12 months
Ground	Anchor A	The level 2 guy wire ground has become detached.	Reattach the guy wire ground for proper lightning protection.	To be scheduled within 12 months
Ground	Anchor B	What appears to be electrical feed is draped over the top two guy wires and is secured and cushioned by what appears to be rubber foam.	It is strongly recommended that this feed be relocated away from the tower. The potential for serious injury, death, and equipment damage is great should either the tower or the feed fail.	To be scheduled within 3 months

Tower Alignment

Temperature	77°
Wind Speed	12MPH
Wind Direction	W

OBSERVED MAST DATA					CALCULATED TWIST			CALCULATED OUT-OF-PLUMB		
Mast Elevation in FT.	A IN.	D1 IN.	D2 IN.	D3 IN.	d IN.	e	a DEG.	x IN.	y IN.	r IN.
0.00	42.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
70.00	42.00	-0.30	-0.50	0.70	-0.03	0.00	-0.08	-0.69	-0.27	0.74
140.00	42.00	-0.45	-1.00	0.80	-0.22	-0.01	-0.51	-1.04	-0.23	1.07
205.00	42.00	-1.00	-1.50	1.20	-0.43	-0.02	-1.02	-1.56	-0.57	1.66

Figure J-1: Twist and Out-of Plumb Determination for Triangular Towers



Observations

The tower twist and plumb are within acceptable limits with no deficiencies observed.

Photos

Anchor A
File 001

Anchor A
File 002

Scaling rust at Anchor A
File 003

Scaling rust at Anchor A
File 004

Scaling rust at Anchor A
File 005

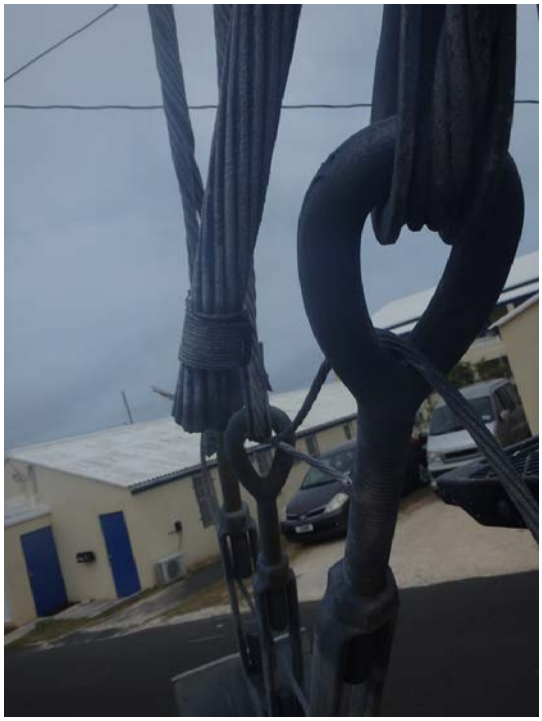
Scaling rust at Anhcor A
File 006

Additional rust forming at Anchor A
File 007

Anchor A
File 008

Anchor A
File 009

Anchor A
File 010



Anchor A
File 011

Anchor A
File 012

Anchor A guy grounds
File 013

Anchor A guy grounds
File 014

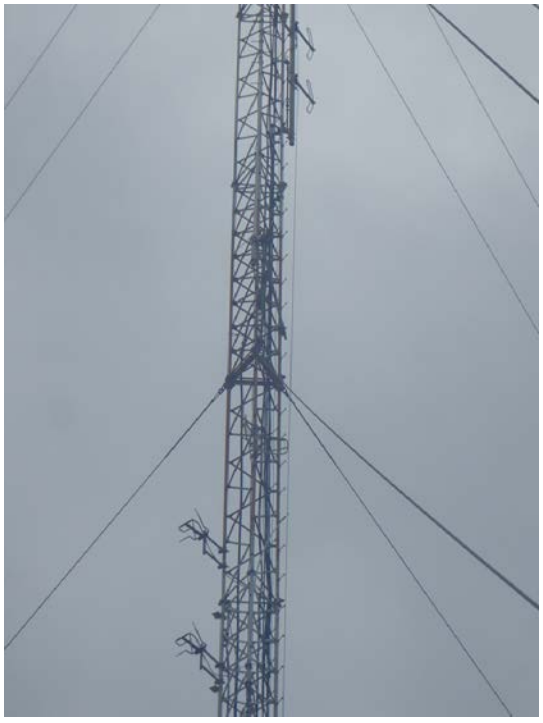
Tower profile
File 015

Tower profile
File 016

Tower profile
File 017

Tower profile
File 018

Tower profile
File 019



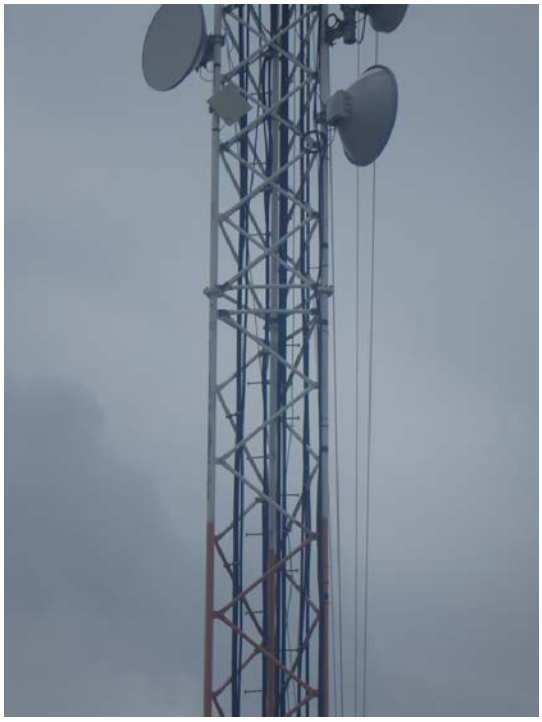
Tower profile
File 020

Tower profile
File 021

Tower profile
File 022

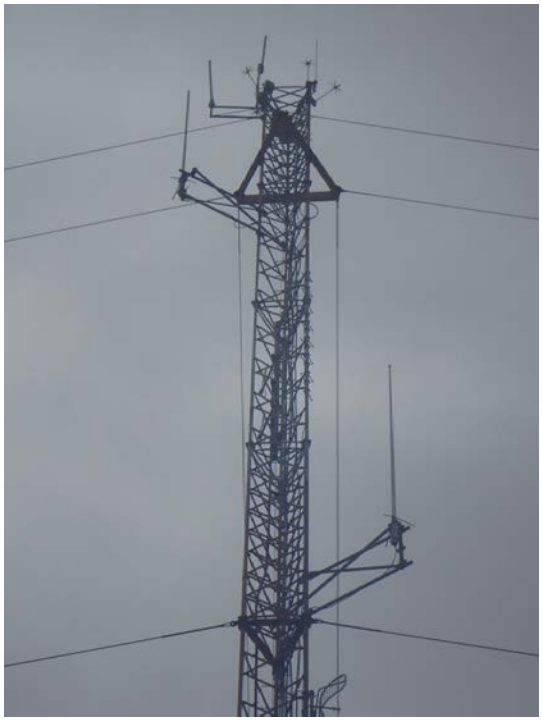
Tower profile
File 023

Tower profile
File 024

	
Tower profile File 025	Tower profile File 026
	
Tower profile File 027	Tower profile File 028

Tower profile
File 029

Tower profile
File 030



Tower profile
File 031

Anchor B
File 032

Anchor B
File 033

Anchor B -
File 034

Anchor B
File 035

Anchor B guy grounding
File 036

Anchor B
File 037

Anchor B
File 038

Anchor B
File 039

Anchor B
File 040

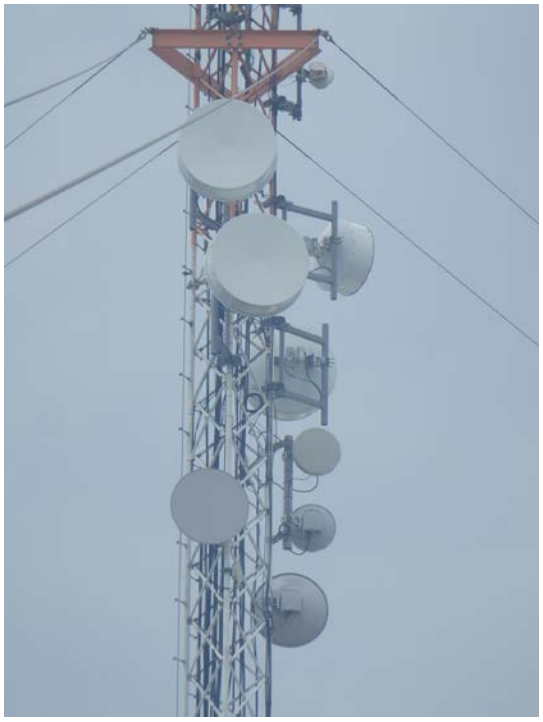
Anchor B
File 041

Scaling rust on Anchor B rods
File 042

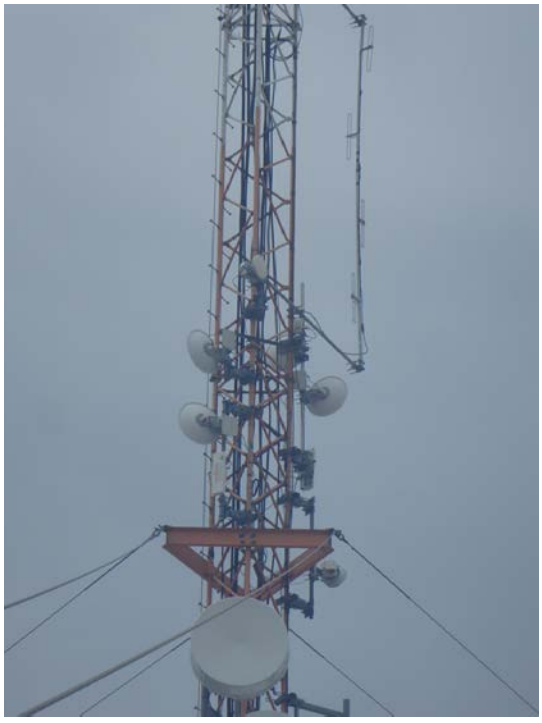
Tower profile
File 043

Tower profile
File 044

Tower profile
File 045



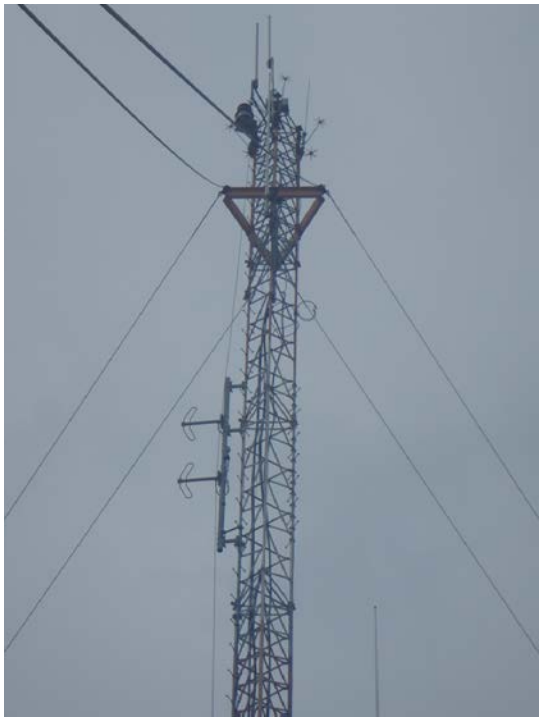
Tower profile
File 046



Tower profile
File 047

Tower profile
File 048

Tower profile
File 049



Tower profile
File 050

Anchor C
File 051

Anchor C
File 052

Anchor C
File 053

Anchor C
File 054

Anchor C
File 055

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File 056

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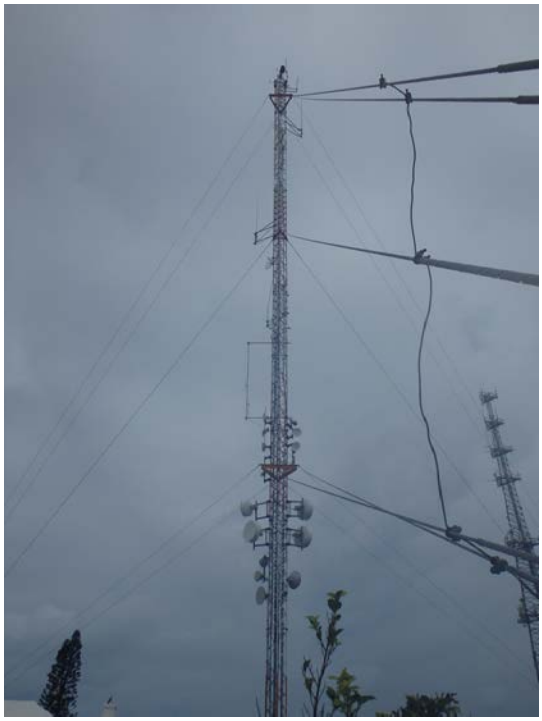
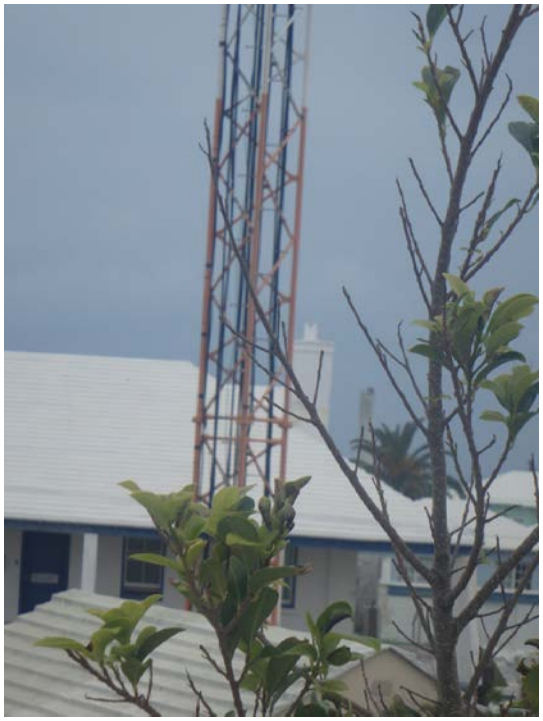
File 060

Anchor C
File 061

Anchor C
File 062

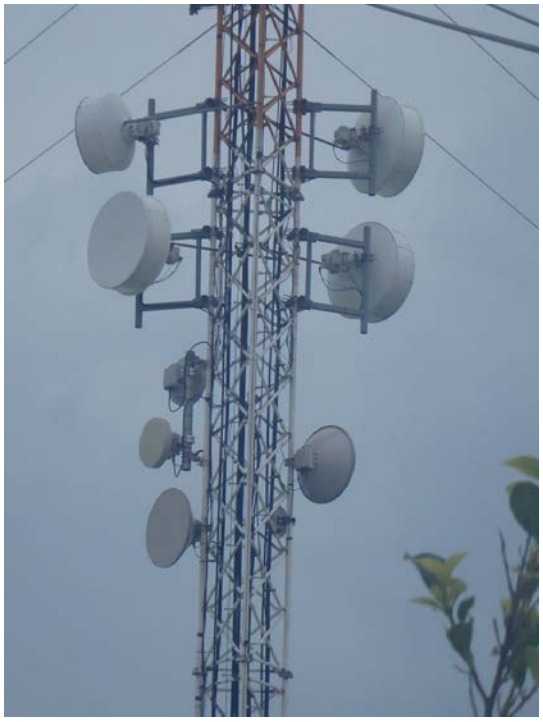


Tower profile
File 063

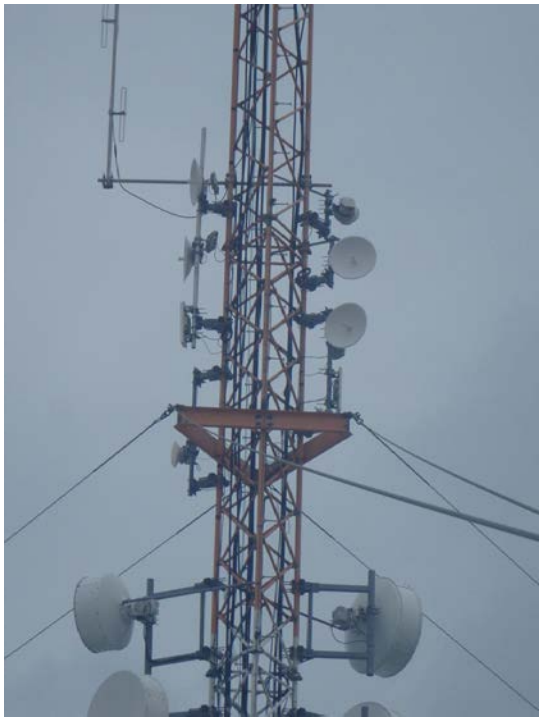


Tower profile
File 064

Tower profile
File 065



Tower profile
File 066



Tower profile
File 067

Tower profile
File 068

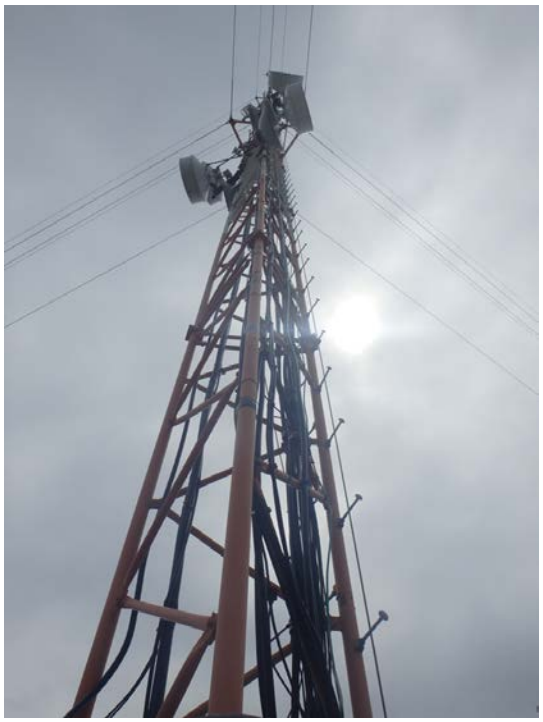
Tower profile
File 069

Tower profile
File 070

Tower profile
File 071

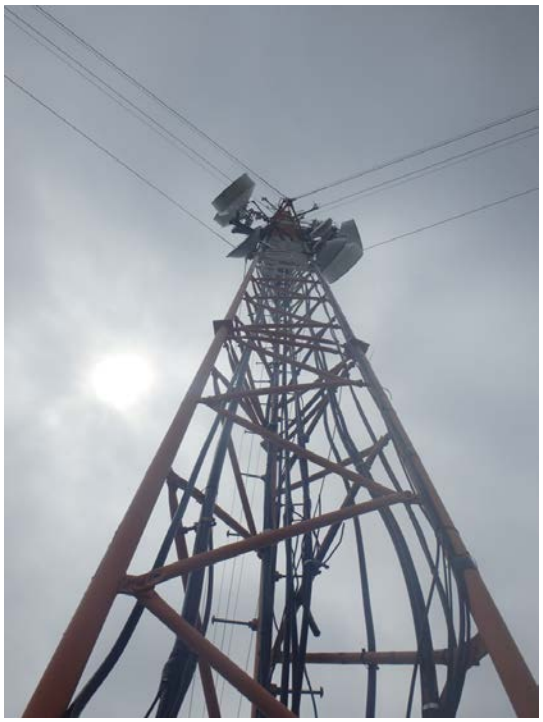
Base of tower
File 072

Pivot section
File 073



B Leg
File 074

Base of tower
File 075



CA Face
File 076

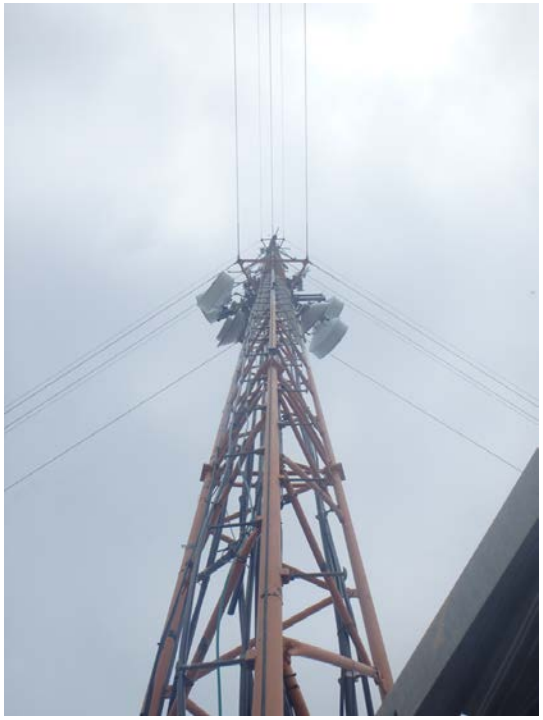
Base of tower
File 077

C Leg
File 078

Pivot section
File 079

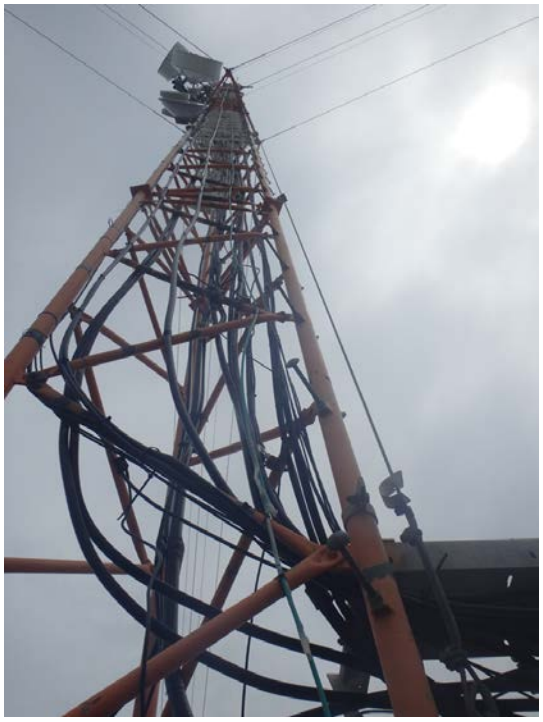
BC Face
File 080

Base of tower
File 081



C Leg
File 082

Base of tower
File 083



CA Face
File 084

Corrosion on base plate and bearing plate
File 085

Corrosion on base plate and bearing plate
File 086

Corrosion on bearing plate
File 087

Corrosion on bearing plate
File 088

Corrosion on bearing plate
File 089

Corrosion on base plate
File 090

5' leg splice
File 091

5' leg splice
File 092

5' leg splice
File 093

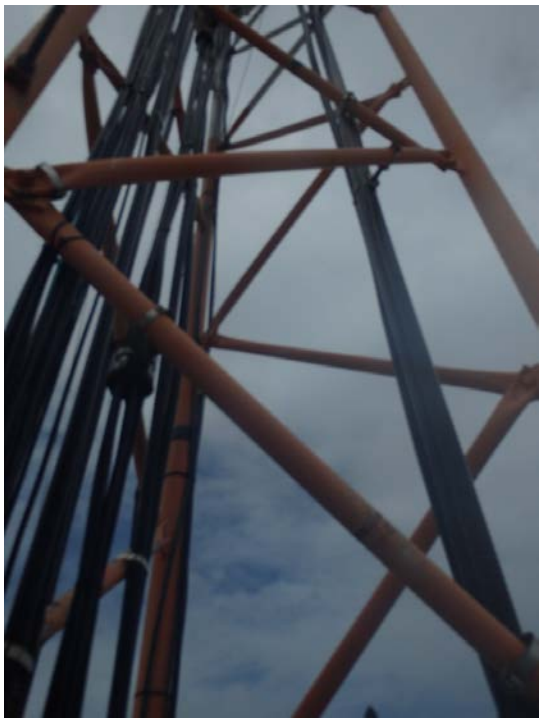
Feedline routing
File 094

Feedline routing
File 095

Ice bridge
File 096

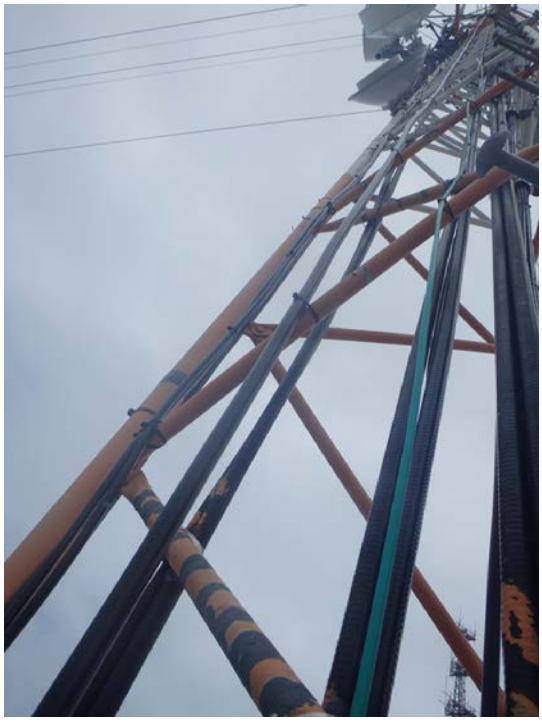
20' leg splice
File 097

Category 3 rust on horizontal
File 098



20' - 40' section
File 099

20' - 40' diagonal member
File 100



20' - 40' tower section
File 101

40' tower section
File 102

40' - 60' tower section
File 103

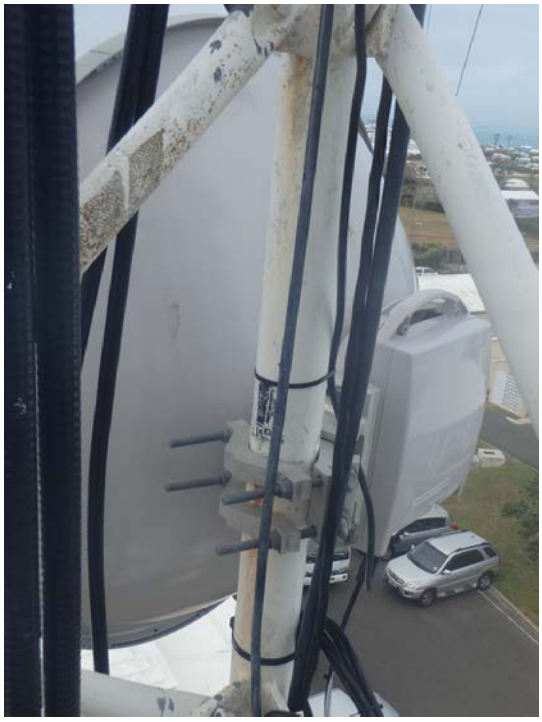
20' - 40' tower section
File 104

20' - 40' tower section horizontal member
File 105

20' - 40' tower section horizontal member
File 106

20' - 40' tower section horizontal member
File 107

20' - 40' tower horizontal member
File 108



Antenna #1
File 109

Antenna #1
File 110

Antenna #1 label
File 111

ODU #1 label
File 112

Antenna #2
File 113

Antenna #2 mount
File 114

Antenna #4
File 115

Antenna #5
File 116

40' - 60' tower bracing member
File 117

40' - 60' tower bracing member
File 118

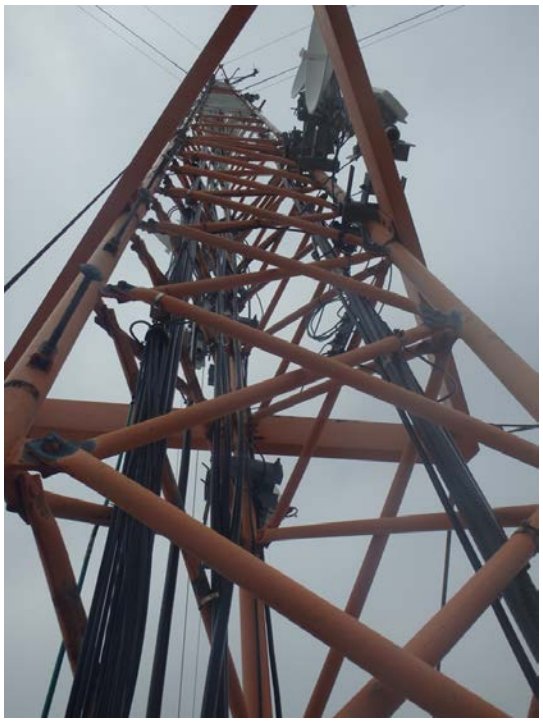
Antenna #6
File 119

Antenna #6
File 120

Antenna #7
File 121

Antenna #7 label
File 122

60' leg splice
File 123



60' - 80' tower section
File 124

60' - 80' tower section
File 125

60' - 80' tower bracing member
File 126

60' - 80' tower bracing member
File 127

60' - 80' tower bracing member
File 128

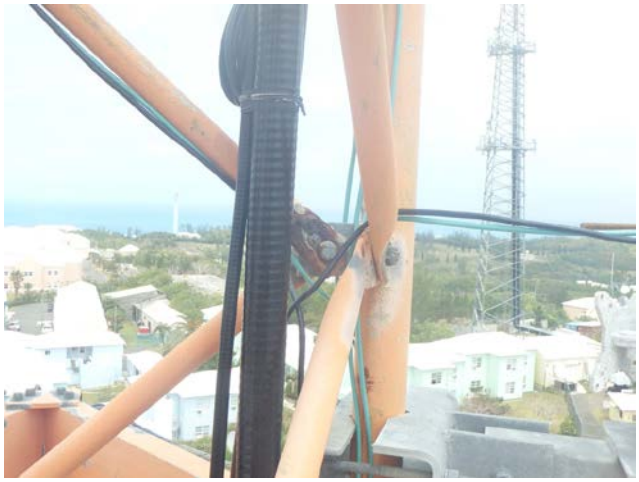
60' - 80' tower bracing members
File 129

60' - 80' tower bracing members
File 130

Antenna #8
File 131

Antenna #8 stiff arm attachment
File 132

Antenna #8 label
File 133



60' - 80' tower bracing member
File 134

60' - 80' tower bracing member
File 135

Antenna #10
File 136

Antenna #10
File 137

Antenna #10 label
File 138

70' 6" guy attachment
File 139

70' 6" torque arm bolt assemblies
File 140

70' 6" torque arm bolt assemblies
File 141

70' 6" guy attachment
File 142

Antenna #11
File 143

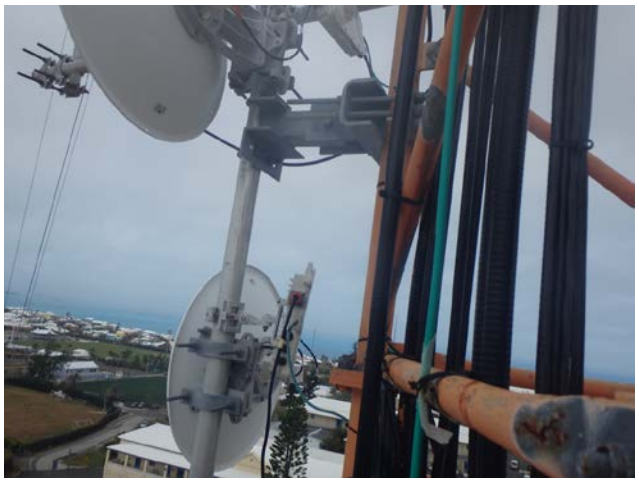
Antenna #11 label
File 144

ODU #11 label
File 145

Antenna #13
File 146

Antenna #12
File 147

Antenna #12
File 148



Antenna #14
File 149

Antenna #15
File 150

Antenna #16
File 151

60' - 80' tower bracing member
File 152

60' - 80' tower bracing member
File 153

80' leg splice
File 154

Antenna #12
File 155

Antenna #14
File 156

Antenna #15
File 157

ODU #15 label
File 158

Antenna #15 label
File 159

Antenna #16
File 160

80' - 100' tower bracing member
File 161

80' - 100' tower bracing member
File 162

80' - 100' tower bracing member
File 163

80' - 100' tower bracing member
File 164

80' - 100' tower bracing member
File 165

80' - 100' tower bracing member
File 166

80' - 100' tower section
File 167

Antenna #17
File 168

Antenna #16
File 169

80' - 100' tower bracing member
File 170

80' - 100' tower bracing members
File 171

100' leg splice
File 172

100' leg splice
File 173

100' - 120' tower bracing member
File 174

100' - 120' tower bracing member
File 175

Antenna #18
File 176

Antenna #18 label
File 177

ODU #18 label
File 178

Side light
File 179

Side light
File 180

Side light
File 181

Antenna #19
File 182

Antenna #19
File 183

100' - 120' tower section
File 184

Antenna #20
File 185

100' - 120' tower section
File 186

Aerial of compound
File 187

Aerial of compound
File 188

Aerial of compound
File 189

Condition of safety cable
File 190

Condition of safety cable
File 191

100' - 120' tower bracing member
File 192