Date: **October 10, 2016**

Lamarco M. Morrison, MSCM
Greenville Recreation and Parks Dept.
City of Greenville, NC
(252) 329-4242

Tower Engineering Professionals
326 Tryon Road
Raleigh, NC 27603
(919) 661-6351
kedwards@tepgroup.net

Subject: **Maintenance and Condition Assessment Report**

Tower Designation:	**Site Number:**	Unknown
	Site Name:	Greenville Town Commons
Engineering Firm Designation:	**TEP Project Number:**	73500_98734
Site Data:	**105 East 1st Street, Greenville, Pitt County, NC 27858** **Lat., Long.: 35.615773, -77.369100** **(N 35° 36' 56.78", W 77° 22' 8.76")** **185-ft ± – Guyed Tower**	

Dear Mr. Morrison,

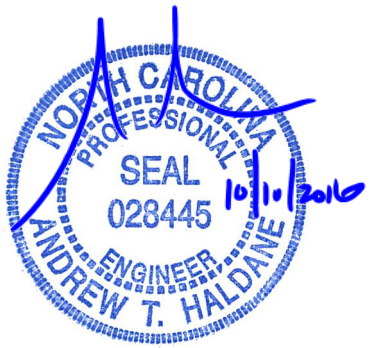
Tower Engineering Professionals (TEP) completed a periodic inspection for the above referenced site. The onsite investigation was performed by Kyle Edwards, P.E., C.W.I. and Cameron Torgent, E.I. of TEP during the September 23, 2016 site visit. The inspection was in accordance with the ANSI/TIA-222-G-2005, Annex J: Maintenance and Condition Assessment (Normative), including all addendums (addendums TIA-222-G-1 2007 and TIA 222-G-2 2009); the checklist can be found on pages 3 thru 8 of this report.

Observations and recommendations are listed herein. For the purpose of this inspection, the tower legs were named by letter according to the magnetic azimuth defined by a line from the center of tower to the leg. "A" leg is the leg closest to magnetic north, followed clockwise by "B" and "C." Guy levels were numbered from the ground up. Guy levels 1-4 are at the 39.5-ft, 79.5-ft, 119.5-ft, and 159.5-ft elevations respectively.

Thank you for the opportunity to provide this service for you. If you have any questions or comments, please contact our office.

Respectfully submitted by:

Andrew T. Haldane, P.E., G.C., C.W.I.



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ANSI/TIA-222-G MAINTENANCE AND CONDITION ASSESSMENT

A. STRUCTURE CONDITION

A.1. Damaged members (legs and bracing)			
☐ Okay	☐ Possible Improvement	☒ Needs Repair	☐ Not Applicable
Notes: Bent diagonal observed on the CA-face at 163-ft. See summary for details.			
A.2. Loose members			
☒ Okay	☐ Possible Improvement	☐ Needs Repair	☐ Not Applicable
Notes:			
A.3. Missing members			
☒ Okay	☐ Possible Improvement	☐ Needs Repair	☐ Not Applicable
Notes:			
A.4. Climbing facilities, platforms, catwalks – all secure			
☐ Okay	☐ Possible Improvement	☒ Needs Repair	☐ Not Applicable
Notes: No safety climb cable is installed on tower. See summary for details.			
A.5. Loose and/or missing bolts and/or nut locking devices			
☐ Okay	☐ Possible Improvement	☒ Needs Repair	☐ Not Applicable
Notes: Guy anchor C has an undersized connection bolt. See summary for details.			
A.6. Visible cracks in welded connections			
☒ Okay	☐ Possible Improvement	☐ Needs Repair	☐ Not Applicable
Notes:			

B. FINISH

B.1. Paint and/or galvanizing condition			
☐ Okay	☐ Possible Improvement	☒ Needs Repair	☐ Not Applicable
Notes: Most of the tower's paint has flaked off. See summary for details.			
B.2. Rust and/or corrosion condition including mounts and accessories			
☐ Okay	☐ Possible Improvement	☒ Needs Repair	☐ Not Applicable
Notes: Significant corrosion on all tower members, guy wires, guy anchors, bolts, and appurtenances. See summary for details.			
B.3. FAA or ICAO color marking conditions			
☐ Okay	☐ Possible Improvement	☐ Needs Repair	☒ Not Applicable
Notes:			
B.4. Water collection in members (to be remedied, e.g., unplug drain holes, etc.)			
☐ Okay	☐ Possible Improvement	☐ Needs Repair	☒ Not Applicable
Notes:			

C. LIGHTING

C.1. Conduit, junction boxes, and fasteners (weather tight and secure)			
☐ Okay	☐ Possible Improvement	☒ Needs Repair	☐ Not Applicable
Notes: Significant corrosion observed on lighting conduit from 0-ft to 185-ft. See summary for details.			
C.2. Drains and vents openings (unobstructed)			
☒ Okay	☐ Possible Improvement	☐ Needs Repair	☐ Not Applicable
Notes:			
C.3. Wiring Condition			
☒ Okay	☐ Possible Improvement	☐ Needs Repair	☐ Not Applicable
Notes:			
C.4. Light Lenses			
☐ Okay	☐ Possible Improvement	☒ Needs Repair	☐ Not Applicable
Notes: Sidelight latches appear to be damaged. See summary for details.			
C.5. Bulb condition			
☐ Okay	☐ Possible Improvement	☒ Needs Repair	☐ Not Applicable
Notes: Sidelights were not operational at the time of inspection. See summary for details.			
C.6.a. Controllers functioning (Flasher)			
☒ Okay	☐ Possible Improvement	☐ Needs Repair	☐ Not Applicable
Notes:			
C.6.b. Controllers functioning (Photo control)			
☒ Okay	☐ Possible Improvement	☐ Needs Repair	☐ Not Applicable
Notes:			
C.6.c. Controllers functioning (Alarms)			
☒ Okay	☐ Possible Improvement	☐ Needs Repair	☐ Not Applicable
Notes:			

D. GROUNDING

D.1. Connections			
☒ Okay	☐ Possible Improvement	☐ Needs Repair	☐ Not Applicable
Notes:			
D.2. Corrosion			
☒ Okay	☐ Possible Improvement	☐ Needs Repair	☐ Not Applicable
Notes:			
D.3. Lightning protection (secured to structure)			
☒ Okay	☐ Possible Improvement	☐ Needs Repair	☐ Not Applicable
Notes:			

E. ANTENNAS AND LINES

E.1. Antenna condition			
☒ Okay	☐ Possible Improvement	☐ Needs Repair	☐ Not Applicable
Notes:			
E.2. Mount and/or ice shield condition (bent, loose, and/or missing members)			
☒ Okay	☐ Possible Improvement	☐ Needs Repair	☐ Not Applicable
Notes:			
E.3. Feed line condition (flanges, seals, dents, jacket damage, grounding, etc.)			
☒ Okay	☐ Possible Improvement	☐ Needs Repair	☐ Not Applicable
Notes:			
E.4. Hanger condition (snap-ins, bolt on, kellum grips, etc.)			
☒ Okay	☐ Possible Improvement	☐ Needs Repair	☐ Not Applicable
Notes:			
E.5. Secured to structure			
☒ Okay	☐ Possible Improvement	☐ Needs Repair	☐ Not Applicable
Notes:			

F. OTHER APPURTENANCES (WALKWAYS, PLATFORMS, SENSORS, FLOODLIGHTS, ETC.)

F.1. Condition			
☐ Okay	☐ Possible Improvement	☐ Needs Repair	☒ Not Applicable
Notes:			
F.2. Secured to structure			
☐ Okay	☐ Possible Improvement	☐ Needs Repair	☒ Not Applicable
Notes:			

G. INSULATOR CONDITION

G.1. Cracking and chipping			
☒ Okay	☐ Possible Improvement	☐ Needs Repair	☐ Not Applicable
Notes:			
G.2. Cleanliness of insulators			
☒ Okay	☐ Possible Improvement	☐ Needs Repair	☐ Not Applicable
Notes:			
G.3. Spark gaps set properly			
☐ Okay	☐ Possible Improvement	☐ Needs Repair	☒ Not Applicable
Notes: Tower is grounded out per site tech.			
G.4. Isolation transformer condition			
☒ Okay	☐ Possible Improvement	☐ Needs Repair	☐ Not Applicable
Notes:			
G.5. Bolts and connection secure			
☒ Okay	☐ Possible Improvement	☐ Needs Repair	☐ Not Applicable
Notes:			

H. GUYS

H.1. Strand condition (corrosion, breaks, nicks, kinks, etc.)			
☐ Okay	☐ Possible Improvement	☒ Needs Repair	☐ Not Applicable
Notes: Significant corrosion on all tower members, guy wires, guy anchors, bolts, and appurtenances. See summary for details.			
H.2.a. Guy Hardware Conditions (Turnbuckles or equivalent (secure and safety properly applied)			
☒ Okay	☐ Possible Improvement	☐ Needs Repair	☐ Not Applicable
Notes:			
H.2.b. Guy Hardware Conditions (Cable thimbles properly in place (if required))			
☐ Okay	☐ Possible Improvement	☐ Needs Repair	☒ Not Applicable
Notes: No guy wire cable thimbles installed at terminations.			
H.2.c. Guy Hardware Conditions (Service sleeves properly in place (if required))			
☒ Okay	☐ Possible Improvement	☐ Needs Repair	☐ Not Applicable
Notes:			
H.2.d.i. Guy Hardware Conditions (Cable connectors (*end fittings*) (Cable clamps applied properly and bolts tight))			
☐ Okay	☐ Possible Improvement	☒ Needs Repair	☐ Not Applicable
Notes: All Crosby clamps are corroded. See summary for details.			
H.2.d.ii. Guy Hardware Conditions (Cable connectors (*end fittings*) (Wire serving properly applied))			
☒ Okay	☐ Possible Improvement	☐ Needs Repair	☐ Not Applicable
Notes:			
H.2.d.iii. Guy Hardware Conditions (Cable connectors (*end fittings*) (No signs of slippage or damaged strands))			
☒ Okay	☐ Possible Improvement	☐ Needs Repair	☐ Not Applicable
Notes:			
H.2.d.iv. Guy Hardware Conditions (Cable connectors (Preformed wraps – properly applied, fully wrapped, & sleeve in place))			
☐ Okay	☐ Possible Improvement	☐ Needs Repair	☒ Not Applicable
Notes:			
H.2.d.v. Guy Hardware Conditions (Cable connectors (*end fittings*) (Poured sockets secure and showing no separation))			
☐ Okay	☐ Possible Improvement	☐ Needs Repair	☒ Not Applicable
Notes:			
H.2.d.vi. Guy Hardware Conditions (Cable connectors (Shackles, bolts, pins, and cotter pins secure and in good condition))			
☐ Okay	☐ Possible Improvement	☒ Needs Repair	☐ Not Applicable
Notes: Surface corrosion observed on all guy wire shackles. See summary for details.			
H.3. Guy tensions			
☐ Okay	☐ Possible Improvement	☒ Needs Repair	☐ Not Applicable
Notes: Guy tensions not within the ANSI/TIA-222-G-2005 recommended limits. See Appendix A for details.			
H.4. Measure guy tensions			
☒ Okay	☐ Possible Improvement	☐ Needs Repair	☐ Not Applicable
Notes: Tensions measured using a Dillon tension meter.			
H.5. Record temperature, wind speed and wind direction			
☒ Okay	☐ Possible Improvement	☐ Needs Repair	☐ Not Applicable
Notes: Temperature was 73 degrees Fahrenheit at the time of measurement. Wind was calm at the time of inspection.			

I. CONCRETE FOUNDATIONS

I.1.a. Ground condition (Settlement, movement or earth cracks)			
☒ Okay	☐ Possible Improvement	☐ Needs Repair	☐ Not Applicable
Notes:			
I.1.b. Ground condition (Erosion)			
☒ Okay	☐ Possible Improvement	☐ Needs Repair	☐ Not Applicable
Notes:			
I.1.c. Ground condition (Site condition (standing water, drainage, trees, etc.))			
☐ Okay	☒ Possible Improvement	☐ Needs Repair	☐ Not Applicable
Notes: Standing water was observed at A and B guy anchors.			
I.2.a. Anchorage condition (Nuts and/or nut locking device (tightened))			
☐ Okay	☐ Possible Improvement	☐ Needs Repair	☒ Not Applicable
Notes:			
I.2.b. Anchorage condition (Grout condition)			
☐ Okay	☐ Possible Improvement	☐ Needs Repair	☒ Not Applicable
Notes:			
I.2.c. Anchorage condition (Anchorages and/or anchor rod condition)			
☐ Okay	☐ Possible Improvement	☐ Needs Repair	☒ Not Applicable
Notes:			
I.3.a. Concrete condition (Cracking, spalling, or splitting)			
☐ Okay	☐ Possible Improvement	☐ Needs Repair	☒ Not Applicable
Notes:			
I.3.b. Concrete condition (Chipped or broken concrete)			
☐ Okay	☐ Possible Improvement	☐ Needs Repair	☒ Not Applicable
Notes:			
I.3.c. Concrete condition (Honeycombing)			
☐ Okay	☐ Possible Improvement	☐ Needs Repair	☒ Not Applicable
Notes:			
I.3.d. Concrete condition (Low spots to collect moisture)			
☐ Okay	☐ Possible Improvement	☐ Needs Repair	☒ Not Applicable
Notes:			

J. GUYED MAST ANCHORS

J.1. Settlement, movement or earth cracks			
☒ Okay	☐ Possible Improvement	☐ Needs Repair	☐ Not Applicable
Notes:			
J.2. Backfill heaped over concrete for water shedding			
☐ Okay	☐ Possible Improvement	☐ Needs Repair	☒ Not Applicable
Notes:			
J.3. Anchor rod condition below earth (Maintain required structural capacity of anchor during exploration.)			
☐ Okay	☐ Possible Improvement	☒ Needs Repair	☐ Not Applicable
Notes: Significant corrosion observed on all guy anchor rods above grade. See summary for details.			
J.4. Corrosion control measures (galvanizing, coating, concrete encasement, cathodic protection systems, etc.)			
☐ Okay	☐ Possible Improvement	☒ Needs Repair	☐ Not Applicable
Notes: Guy anchors have no corrosion control measures installed.			
J.5. Anchor heads clear of earth			
☒ Okay	☐ Possible Improvement	☐ Needs Repair	☐ Not Applicable
Notes:			

K. TOWER ALIGNMENT

K.1. Tower Plumb and Twist			
☐ Okay	☐ Possible Improvement	☒ Needs Repair	☐ Not Applicable
Notes: Tower twist and plumb not within ANSI/TIA-222-G-2005 recommended limits. See Appendix B for details.			

EXECUTIVE SUMMARY

Photograph	Observations and Recommendations
	**A.1. Damaged members (legs and bracing)** **Observation:** Bent diagonal observed on the CA-face at 163-ft. **Recommendation:** Repair, modify, or replace damaged member.
	**A.4. Climbing facilities, platforms, catwalks – all secure** **Observation:** No safety climb cable is installed on the tower. **Recommendation:** Install safety climb cable per the requirements of ANSI/TIA-222-G.
	**A.5. Climbing facilities, platforms, catwalks – all secure** **Observation:** Guy anchor C has an undersized connection bolt. **Recommendation:** Install a properly sized connection bolt per the tower manufacturer drawings. Install nut locking devices on all new bolts. Tighten all nuts per the AISC “turn of the nut” method. Install nut locking devices on all new bolts.

EXECUTIVE SUMMARY

Photograph	Observations and Recommendations
	**C.1. Conduit, junction boxes, and fasteners (weather tight and secure)** **Observation:** Significant corrosion observed on lighting conduit from 0-ft to 185-ft. **Recommendation:** Replace lighting conduit.
	**C.4. Light Lenses** **Observation:** Sidelight latches appear to be damaged. **Recommendation:** Repair or replace sidelight latches.
	**C.5. Bulb condition** **Observation:** Sidelights were not operational at the time of inspection. **Recommendation:** Repair or replace sidelights.

EXECUTIVE SUMMARY

Photograph	Observations and Recommendations
  	**B.1. Paint and/or galvanizing condition** **Observation:** Most of the tower's paint has flaked off. **Recommendation:** Repaint structure after the corrosion control measures recommended in Section B.2 have been completed.

EXECUTIVE SUMMARY

Photograph	Observations and Recommendations
  	**B.2. Rust and/or corrosion condition including mounts and accessories** **Observation:** Significant corrosion observed on all tower members, guy wires, guy anchors, bolts, and appurtenances. **Recommendation:** Clean areas of corrosion down to sound metal and coat with two brush coats of ZRC cold galvanizing compound or approved equivalent. If area loss greater than 10% of member thickness is observed while cleaning steel, member must be replaced. Replace all corroded bolts. Install nut locking devices on all new bolts. Tighten all nuts per the AISC "turn of the nut" method. Install nut locking devices on all new bolts. Replace all corroded guy wire hardware.

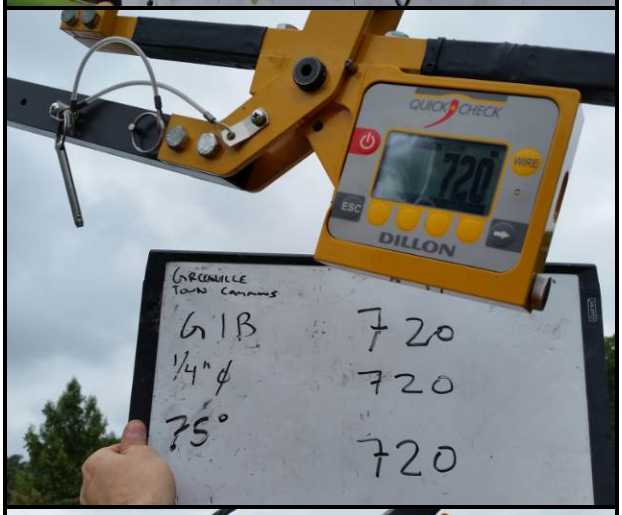
EXECUTIVE SUMMARY

Photograph	Observations and Recommendations
 	**<u>H.2.d.i. Guy Hardware Conditions (Cable connectors (*end fittings*) (Cable clamps applied properly and bolts tight))</u>** **Observation:** All guy wire Crosby clamps are corroded **Recommendation:** Remove and re-install at least (2) Crosby clamps at each guy wire termination. Install Crosby clamps per the manufacturer specifications.
	**<u>H.2.d.vi. Guy Hardware Conditions (Cable connectors (Shackles, bolts, pins, and cotter pins secure and in good condition))</u>** **Observation:** Surface corrosion observed on all guy wire shackles. **Recommendation:** Replace all guy wire shackles.

EXECUTIVE SUMMARY

Photograph	Observations and Recommendations
 	**J.3. Anchor rod condition below earth (Maintain required structural capacity of anchor during exploration.)** **Observation:** Significant corrosion observed on all guy anchor rods above grade. Anchor rods could not be inspected below grade due to standing water. **Recommendation:** A guy anchor investigation below grade must be performed to determine the extent of corrosion damage.

EXECUTIVE SUMMARY

Photograph	Observations and Recommendations
  	**H.3. Guy tensions** **Observation:** Guy tensions not within the ANSI/TIA-222-G-2005 recommended limits. See Appendix A for details. **Recommendation:** Re-tension guy wires to be within allowable tolerances.

EXECUTIVE SUMMARY

Photograph	Observations and Recommendations
	**K.1. Tower Plumb and Twist** **Observation:** Tower twist and plumb not within ANSI/TIA-222-G-2005 recommended limits. See Appendix B for details. **Recommendation:** Ensure that tower is within plumb tolerance while re-tensioning guy wires.

APPENDIX A: GUY TENSIONS

Table A-1 (Assumed Initial Tension is 10% of Breaking Strength)

Guy Path	Guy #	Guy Size (diameter in inches) Measured	-10% of Initial Tension at 60°F (lbs)	+10% of Initial Tension at 60°F (lbs)	Measured tension converted to 60°F (lbs)	Results
A	1 at 39.5’	1/4	598.5	731.5	891	HIGH
	2 at 79.5’	1/4	598.5	731.5	933	HIGH
	3 at 119.5’	1/4	598.5	731.5	707	OK
	4 at 159.5’	1/4	598.5	731.5	482	LOW
B	1 at 39.5’	1/4	598.5	731.5	802	HIGH
	2 at 79.5’	1/4	598.5	731.5	948	HIGH
	3 at 119.5’	1/4	598.5	731.5	635	OK
	4 at 159.5’	1/4	598.5	731.5	483	LOW
C	1 at 39.5’	1/4	598.5	731.5	757	HIGH
	2 at 79.5’	1/4	598.5	731.5	1038	HIGH
	3 at 119.5’	1/4	598.5	731.5	560	LOW
	4 at 159.5’	1/4	598.5	731.5	585	LOW

APPENDIX B: TOWER PLUMB AND TWIST MEASUREMENTS

Table B-1: Tower Twist Measurements

	Reference Elevation (above conc.)	Twist with Respect To Base (°)	Allowable Twist with Respect To Base (°)	Relative Twist Between Reference Elevations (°)	Allowable Twist Between Reference Elevations (°)
Tower Twist Measurements	159.5-ft	**6.97**	± 5.00		
				1.40	± 2.00
	119.5-ft	**5.57**	± 5.00		
				1.40	± 2.00
	79.5-ft	**4.17**	± 3.98		
				1.39	± 2.00
	39.5-ft	**2.78**	± 1.98		
				2.78	± 1.98
	0.0-ft	0.00	± 0.00		

Table B-2: Lateral Deflection Measurements

	Reference Elevation (above conc.)	Resultant Deflection (in)	Allowable Resultant Deflection (in) per TIA	Relative Deflection Between Reference Elevations (in)	Allowable Deflection Between Reference Elevations (in) per TIA
Tower Deflection Measurements	159.5-ft	+1.02	± 4.79		
				+0.235	± 1.2
	119.5-ft	+1.22	± 3.59		
				+0.235	± 1.2
	79.5-ft	+1.02	± 2.39		
				+0.235	± 1.2
	39.5-ft	+0.81	± 1.19		
				+0.813	± 1.2
	0.0-ft	0.00	± 0.00		

APPENDIX C: TYPICAL GUY ANCHOR CONFIGURATION