

ENVIRONMENT CANADA MAINTENANCE INSPECTION

12m (40 ft) KNOCK-DOWN SELF-SUPPORT TOWER

WTP Holyrood, NL



Prepared by:



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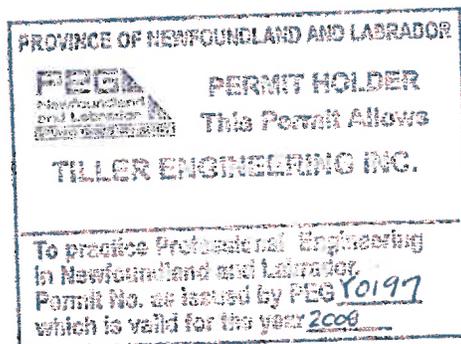
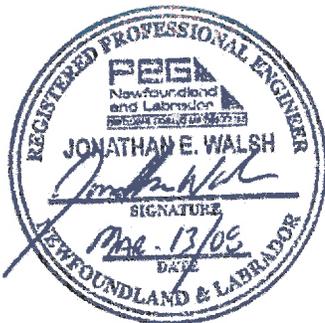
Prepared for:

Environment Canada
National Radar Network Support
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1.0 SITE INFORMATION

Site Name: WTP Holyrood Radar Site

Tower Owner: Environment Canada

Coordinates: Latitude: N 47° 19' 35.3"
Longitude: W 53° 07' 35.6"

Tower Structure: Height: 12 m (40 ft.)
Construction Type: 4 Leg Self-support, Knock-down
Panel Height: Varies
Face Width: Varies
Manufacturer: Unknown

Site Access: 2WD

Inspected by: Jonathan E. Walsh, P. Eng., and Joe Parsons

Personnel on site: Andre Dwyer/Shawn of Environment Canada

Weather Conditions: -8°C, 10 mph NW, Sunny

Date of Inspection: February 05, 2008

Project Manager: Leonard Szarko, P. Eng.

Report Preparation: Joe Parsons

Report Review: Clifford G. Smith, P. Eng.

Report Approved By: Jonathan E. Walsh, P. Eng.

2.0 SCOPE

Tiller Engineering Inc. was retained by Environment Canada to perform tower maintenance inspections as per Appendix D of CSA S37-01 Antennas, Towers, and Antenna-Supporting Structures.

3.0 INSPECTION OBSERVATIONS

3.1 GENERAL SITE

- A. General:** The compound was snow covered but appeared clear of brush and debris. See Appendix A, Photo #1.
- B. Access:** The tower access road was snow covered at the time of inspection but appeared satisfactory.
- C. Fencing:** The fence has a high degree of damage to the North side. See Appendix A, Photo #10. The main gates were snow covered and opened at the time of inspection. See Appendix A, Photo #15. The height of the fence is ineffective to prevent site entry.
- D. Security:** The anti-climb installed at the base of the tower is ineffective to prevent entry. See Appendix A, Photo #9.
- E. Due Diligence:** There is no site warning signage installed on tower compound, fence or tower. Warning sign on building door is satisfactory.

3.2 TOWER STRUCTURE

- A. Tower Members:** The tower members appear satisfactory.
- B. Connections:** The splice connections appear satisfactory.
- C. Foundations:** The four foundations appear satisfactory. See Appendix A, Photo #2.
- The grout between the tower legs and tower foundations are deteriorated. See Appendix A, Photo #17.

3.3 STAIRS AND FALL ARREST SYSTEM

- A. Stairs:** The integral stairs, platforms and safety rails exhibits minor to moderate surface corrosion throughout. See Appendix A, Photo #18.
- B. Fall Arrest System:** The tower is not equipped with a fall arrest system. The stairs and platforms are equipped with a hand rail. See Appendix A, Photo #5.

3.4 ANTENNAS AND TRANSMISSION LINES

- A. Antennas:** The 5.5m radome appears satisfactory. See Appendix A, Photo #3.
- B. Transmission Line:** The existing hard line appears satisfactory.
- C. Antenna Building**
- The siding paint is faded and flaking.
- The outside wooden door exhibits heavy deterioration.
- The seal on the building vent are cracked.

Antenna Schedule:			
Ant #	Antenna Type and Model	TX Line	Azimuth
1	Andrew 73217 s/n W7311	Hard Line	Omni
Comments:			

3.5 WAVEGUIDE BRIDGE, PORT AND CABLE TRAYS

A. Waveguide Bridge: The waveguide bridge appears satisfactory. See Appendix A, Photo # 6.

B. Waveguide Port: The waveguide port appears satisfactory. See Appendix A, Photo #4.

3.6 GROUNDING

A. Tower: The tower grounding appears satisfactory. See Appendix A, Photo #2.

B. Waveguide Post: The waveguide post grounding appears satisfactory. See Appendix A, Photo #7.

C. Equipment Shelter: The equipment shelter's grounding appears satisfactory.

3.7 OBSTRUCTION MARKING

A. Lighting: The lighting summary is as follows:

Light	Type/Make	Location	Elev. m (ft.)	Ice Shield (Y/N)	Teck Line (in)
1	D.O.L.	Top	20(65.6)	N/A	Unknown
Comments: D.O.L.'s were on photo cell located on radome.					
2	Stairs access lighting	3 places		No	In conduit
Comments: One light was located at mid level on tower, bulb was broken. Two more were located on building at top of tower. Bulbs appear to be out.					

B. Paint: The tower is not painted.

C. Lighting electrical: The connector for the switch at the base of the tower exhibits heavy

surface corrosion. See Appendix A, Photo #20.

The junction box cover at the top of the tower on leg 3 exhibits minor surface corrosion. See Appendix A, Photo #29.

All lighting connector's exhibits moderate to heavy surface corrosion. See Appendix A, Photo #30.

3.8 GALVANIZING

A. General:

Bolts throughout the tower exhibit minor surface corrosion.

3.9 EQUIPMENT SHELTER

A. Condition:

The buildings metal eave covering exhibits minor surface corrosion. See Appendix A, Photo #23.

The conduit on the exterior wall to the main building is broken clear. See Appendix A, Photo #31.

The door hinges to the back-up power building exhibits moderate surface corrosion.

The air conditioning control box exhibits moderate surface corrosion. See Appendix A, Photo #19.

The vent for the power backup building is bleeding rust onto building siding. See Appendix A, Photo #24.

The caulking around the building vents is deteriorated.

The exhaust pipe for the power backup building exhibits moderate surface corrosion. See Appendix A, Photo #25.

B. Electrical:

The siding around the electrical service entrance exhibits minor surface corrosion. See Appendix A, Photo #26.

The exterior power outlets are not equipped with GFI plugs.

3.10 ADDITIONAL COMMENTS

- The protective posts for the air conditioning unit exhibits minor surface corrosion.
- The site fence is approximately 4 feet in height and is ineffective in preventing entry.

4.0 ALIGNMENT & TWIST

A. Tower Alignment:

The tower alignment is within allowable tolerances.

B. Tower Twist:

The tower twist is within allowable tolerances.

5.0 CONCLUSIONS AND RECOMMENDATIONS:

Item	Description	Priority
1	Install or improve engineered anti-climb around base of tower "Use Marion Bridge anti-climb as a reference".	A
2	Replace corroded hardware holding 2 ½ conduit on face 3-4 with stainless steel hardware.	B
3	Install warning signs around perimeter of site, on buildings, and tower.	C
4	Wire brush and cold galvanize surface corrosion on bolts, waveguide post and steel throughout tower.	C
5	Replace corroded connector's at switches, junction boxes and lighting component on tower.	C
6	Replace or repair damaged fencing components on perimeter fence "recommend installing higher fence for site security".	C
7	Clean and repaint building at top of tower.	C
8	Replace wooden frame and exterior door to building at top of tower.	C
9	Wire brush and paint corroded air conditioning control box.	C
10	Clean bleeding rust from siding on power backup building.	C
11	Wire brush and spray exhaust pipe with high heat paint.	C
12	Install GFI approved plugs in all exterior outlet	C
13	Relocate photocell to a more accessible location.	C
14	Wire Brush and cold galvanize metal conduit in waveguide bridge.	C
15	Re-lamp access lighting on tower and building.	C
16	Repair damaged grout at base of tower legs.	C
17	Reseal building vent hoods.	C
18	Clean or replace hinges on door to power back-up building.	C
19	Trim top hand rail at base of stairs to be sloped.	C
20	Replace broken conduit bracket at the first level on face 3 – 4.	C
21	Repaint protective post for air conditioning unit.	C
22	Re-glue conduit on wall outside main entrance to building	C

Priority Rating System A Priority Rating System of A, B, C, D or E is to be placed on each conclusion, Recommendation, or item identified in the tower inspection report as requiring attention. The ratings are related to safety, structural integrity, system performance, and proper maintenance of the tower and attachments. In all cases, safety of the public and Environment Canada personnel is of paramount importance.

Priority A—Safety – Includes items or faults which, if not corrected, may lead to collapse or failure of the structural system or antenna or may pose a threat to the safety of personnel that might be on site. Such faults would include:

- Damaged members
- Loose connections
- Excessively poor alignment of the tower or guy tensions
- Extreme corrosion of structural elements
- Damaged guys or hardware
- Lack of adequate daylight and night obstruction markings

Priority B—Performance – Includes items or faults, which have or will significantly impact on the quality or reliability of transmission signals. These faults are generally related to:

- Antennas and transmission lines, their mountings, connectors, and groundings.
- Loose connectors, safety cables, and anti-rotation chain at anchors (on FM and AM towers).
- Poor guy grounding on low band VHF transmitters, which may also result in poor performance.

Note – Priority A and B have to be addressed as soon as possible, if not completed during the inspection. If there are issues of a critical nature, they should be reported to the control base when discovered.

Priority C—Maintenance – Includes items or faults, which do not have an immediate effect on the performance or safety but rather items and faults, if not corrected, will in time shorten the service life of the antenna or tower or its elements. Faults in this category might include:

- Corrosion on parts such as conduit and lighting hardware.
- Other non-structural elements and minor corrosion on structural elements.
- Damage grounding of the tower base and guys.

Priority D—Future Attention – Includes items or faults, which require attention during the next scheduled visit. These faults are not expected to cause further damage or outages if corrections of the item or fault, is delayed.

Priority E—Housekeeping – Includes items or faults related to the general condition of the transmitter site, access road, which when corrected will improve the overall workmanship and ease of maintenance at the site. Includes items such as condition of:

- Ladder, Safety Rail, Anti-climb
- Access Road, Fencing, Gate, Locks
- Antenna and Transmission Line
- And the Ease of Access to the Site.

**APPENDIX A
PHOTOGRAPHS**



Photo #1: Tower Profile



Photo #2: Tower Foundation Typical 4 Locations



Photo #3: Building and Radome



Photo #4: Port Entry



Photo #5: Integral Stairs and Platforms



Photo #6: Waveguide Bridge



Photo #7: Waveguide Post Grounding Typical



Photo #8: Site Buildings



Photo #9: Anti-Climb



Photo #10: Damaged Fencing North Side



Photo #11: Outside Outlets



Photo #12: Photocell



Photo #13: Access Lighting on Tower



Photo #14: Access Lighting on Building



Photo #15: Open Access Gates



Photo #16: Surface Corrosion at Base of Building



Photo #17: Damaged Grout



Photo #18: Surface Corrosion Typical



Photo #19: Air Conditioning Control Box



Photo #20: Corroded Electrical Connection

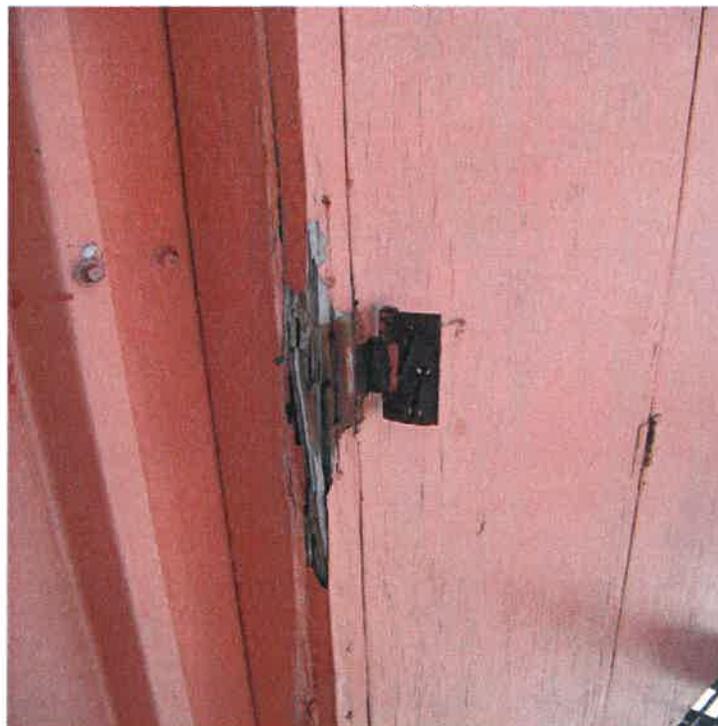


Photo #21: Damaged Door Frame



Photo #22: Surface Corrosion on Bolts Typical Throughout



Photo #23: Surface Corrosion on Eave of Building



Photo #24: Surface Corrosion from Building Vent



Photo #25: Exhaust Pipe



Photo #26: Electrical Conduit



Photo #27: Corroded Hardware



Photo #28: Broken Bracket



Photo #29: Corroded Electrical Box



Photo #30: Corroded Electrical Connectors



Photo #31: Broken Conduit

**APPENDIX B
GENERAL NOTES**

USE OF INFORMATION IN THIS REPORT

This report was prepared by Tiller Engineering Inc. for the client noted for purposes described in the "Scope of Work" in this report. The material reflects Tiller Engineering Inc.'s best judgment based on the information made available, at the time of report preparation and the time allocated to complete the work. This inspection is not a guarantee or warranty of the installation.

Any use which a third party makes of this report or reliance on or decisions made based on it, are the responsibility of such third parties. Tiller Engineering Inc. accepts no responsibility for damages, if any, suffered by any third party or use of the report information by anyone, outside the specific indicated scope, as a result of decisions made or actions based on this report. Further, any use outside the specific indicated scope is done at the full responsibility of the user. Maximum liability pursuant to this report is the total fee received.

MAINTENANCE REVIEW SAMPLING PROCEDURES

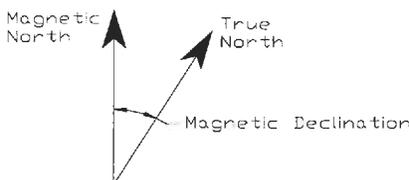
The tower inspection is limited to a random visual sampling of the steel tower members, bolts, connections, antennas, anchors, appurtenances and associated equipment. Sampling is defined as a set of observations and/or measurements on a subset of the whole that may be considered characteristic of the structure as a whole. It provides the ability to analyze the entire system and comment on general conformance. The size of the sample is based on the scope of work as defined by the client, previous information that is made available, and knowledge of the structure and systems. All inspections are performed in accordance with CSA Standard S37-01, Antennas, Towers, and Antenna-Supporting Structures. This sampling generally conforms to the guidelines noted in Appendix D of CSA Standard S37-01, Antennas, Towers, and Antenna-Supporting Structures. This inspection is not a guarantee or warranty of conformance of either component of the installation.

The inspection sampling refers to surface inspection observations only, except as noted otherwise. The foundation, guys and anchor hardware inspection is limited to an above grade surface inspection of these systems. No subsurface investigation was performed.

DISTINCTION BETWEEN TRUE AND MAGNETIC NORTH

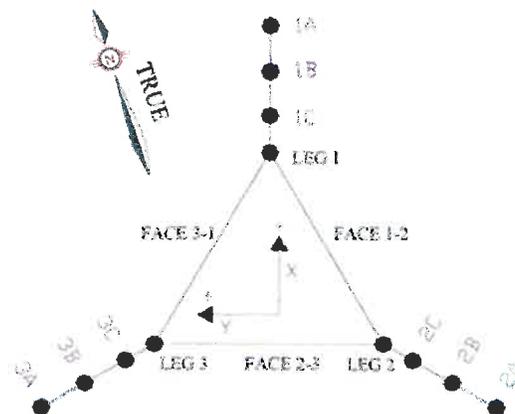
Magnetic North is the direction in which a compass points as determined by the Earth's magnetic field. This direction is constantly changing with time. True (or Geographic) North is the direction to the North Pole and is the basis for most maps because it is constant. The difference between True North and Magnetic North is called Magnetic Declination. According to Natural Resources Canada the Magnetic Declination in St. John's, Newfoundland and Labrador for the year 2008 is roughly 20° 3' West.

In all reports and calculations created by Tiller Engineering Inc. True North is used unless otherwise specified.



INSPECTION REFERENCES**Tower Orientation:**

1. The tower legs and anchors are referenced clockwise from true north with Tower Leg 1 and Anchor 1 being the first clockwise from North.
2. If a guyed tower has only one anchor at each azimuth, anchors B and C at each azimuth can be omitted.
3. A face is labeled according to the legs between which it lies. For example, Face 1-2 is the face between Leg 1 and Leg 2.
4. When there is a torsion resistor at a guy elevation and therefore two guys at that level, the left and right guys are as observed from the anchor base, facing the tower.

**Tower Alignment and Twist:**

1. Measurements of deflections in the X and/or Y directions are measured from behind the anchor furthest from the base of the tower (Anchors 1A, 2A and 3A).
2. Counter clockwise tower rotation is taken as positive. (i.e. A tower leg as viewed from the associated anchor has moved to the right)

Guy Tensions:

1. Tensions are measured using a pulse or swing technique as per CSA Standard S37-01, Antennas, Towers, and Antenna-Supporting Structures.
2. Guy tension measurements are adjusted for the temperature at the time of making the measurements.
3. Initial tension is between 8% to 15% of the breaking strength, typically 10%, unless noted.

Antenna Schedule:

1. All antenna azimuths are from field measurements unless noted.
2. All elevations are to the center of the antenna unless noted. VHF and whips are referenced to their base unless noted. FM and TV antennas are referenced to bottom and top out to out unless noted.

Tower Mast:

1. Face width is the horizontal distance bolt to bolt unless noted.
2. Panel height is the vertical distance bolt to bolt of horizontals unless noted.
3. All elevations are referenced from the bottom of the tower leg (above star/tapered base).