



January 18, 2013

Telecom Company  
123 Main Street  
Toronto, ON  
M2V 2P6

Analysis of the existing 81.36 ft. pole tower located at Toronto, Ontario.

**Telecom Company Site Code:** C5218

**Telecom Company Project Name:** LTE Rollout

**Trylon Current File Number:** 1234

**Tower Original File:** Drawings by Engineering Company

Dear Mr. John Smith:

We are pleased to present our structural analysis report for the existing 81.4 ft. pole tower located at Toronto, ON. The existing and proposed antennas/lines are shown in Table 1.

The following design parameters have been used in our analysis:

**Design Standard:** CSA-S37-01

**Wind Pressure:** 10.86 (psf) - 520 (Pa) per original tower design

**Ice Thickness:** 0.98 (in) - 25 (mm)

**Importance Factor:** 1.00

**Serviceability Factor:** 0.85

**TABLE 1 – Antennas and Transmission Lines**

Height		Antenna			Transmission Lines		Status
ft.	m	Type	Qty	Azimuth (° True North)	Size	Qty	
84.0	25.6	KRE 101 1916/1	3	50/170/290	LDF4P-50A	6	
78.0	23.8	KRE 101 1916	3	50/170/290	VXL5	6	Existing
78.0	23.8	TMA	2	50/170/290	LDF2P-50A	6	Existing
78.0	23.8	Kathrein 800 10692	3	50/170/290	Composite	6	Proposed
78.0	23.8	RRU	6	50/170/290	Composite	6	Proposed
71.0	21.6	VHLP3	1	-	LDF2P-50A	1	Existing



## **ASSUMPTIONS AND LIMITATIONS OF ANALYSIS ON EXISTING TOWER**

Please note the following assumptions and limitations inherent in this analysis and report:

1. Trylon has not obtained, reviewed, or carried out an inspection of this structure to determine its current condition as required by the CSA S37-01 standard. Clause 3.5.2. We have assumed that this tower is in good, undamaged and non-corroded condition in accordance with the records shown in drawings by Engineering Company fax dated February 26, 1997. The new analysis is in accordance with CSA S37-01.
2. We did not review the following items due to lack of the required information. The tower as-built drawings were not available to us when this analysis was performed.
  - a. The pole connection at elevation 51.83' (15.8 m);
  - b. The pole to base plate connection at tower base.
3. We considered the existing and proposed antennas/lines are as indicated in Table 1.
4. The existing loads are as per our audit report dated December 11, 2012.
5. The proposed loads & antenna are as per Telecom Company document "C5188\_T11PP\_MAIN ST & RINGWOOD DR.\_3950-500\_Civil Sub.doc" dated November 19, 2012.
6. We reviewed the foundations being constructed based on the information shown on Engineering Company drawings fax dated February 26, 1997 per normal dry soil condition assumptions as follows. The soil report was not available to us when this analysis was performed.
  - a. Un-submerged cohesion-less soil density: 110 pcf
  - b. Internal Angle of Friction: 30°
  - c. Passive Earth Pressure Coefficient: 3
  - d. Allowable Bearing Pressure: 4000 psf
7. We did not review the effect of the added tower foundation loads from the proposed antennas/Transmission lines on the adjacent building foundations due to lack of required information.
8. We have used the latest CAN/CSA-S16-09 standard for anchor bolt calculations.
9. The items reviewed were as follows:
  - a. Axial load and bending moment resistance of pole shells
  - b. Splice resistances
  - c. Foundation and anchor bolts.



**ANALYSIS RESULTS**

**TABLE 2 – Maximum Factored Load (% of Resistance)**

Member	Elevation (ft.)	Description of critical member	Max. Factored Load (% of Resistance)	Critical Mode
<b>12-Sided Shell 44W</b>	81.36-51.83	38 OD x 1/4 (in)	28	Bending
	51.83-22.31	44 OD x 5/16 (in)	38	
	28.87-0.00	49 OD x 3/8 (in)	45	
<b>Splice</b>	51.83	63.7" Overlap Slip Joint	29	OTM
	28.87	78.7" Overlap Slip Joint	39	OTM
<b>Foundation</b>	Anchor Bolts (Fu=75 ksi)	(6) 2 1/4"Ø x 94.5" Lg. Norsco Anchors	52	Tension
	Base Plate (44 ksi)	62.8" Ø x 2.25" Thick	63	Yielding
	Caisson	6.2'Ø x 28.4' Lg. Bearing at 27.4" Below Grade	77	OTM

Notes:

\* Overstress up to 5% tolerable.

\*\* Overstress more than 5% needs reinforcement.

**TABLE 3 – Serviceability – Max. Angular Rotations (Serviceability = 0.85)**

Height		Antenna			Max. Angular Rotation (°)	Status
ft.	m	Type	Qty	Azimuth (° True North)		
71.0	21.6	VHLP3	1	-	0.47	Telecom Company

**CONCLUSIONS & RECOMMENDATIONS:**

The existing 81.36 ft. pole tower located at Toronto, Ontario conforms to CSA S37-01 Standard for the reviewed items when subject to the antenna and transmission line loading outlined in Table 1 and assumptions made in this report.

*Please note that the soil report was not available to us when this tower analysis was performed. The tower foundation was reviewed based normal dry soil condition assumptions made in this report which needs to be confirmed by a professional geotechnical engineer. Also, there are some unchecked items as stated in this report due to lack of the required information. Our engineer office should be notified for a further tower review when the required information is available.*

The owner of the dish antennas shall verify that the rotations given in Table 3 are acceptable for their needs.

Should you have any questions, comments or require additional information, please do not hesitate to call.

Sincerely,

Tower analysis performed by:

Reviewed by:

Adrian Mihai  
Designer

Weiyan Tan, P. Eng.  
Design Engineer



Height		Antenna				Transmission Lines		Status
(ft)	(m)	No	Type	Azimuth(°)	Owner	No	Size	
84.00	25.6	3	KRE 101 1916/1	50/170/290	TC	6	LDF4P-50A	Existing
78.00	23.8	3 2	KRE 101 1916 TMA	50/170/290	TC	6 6	VXL5 LDF2P-50A	Existing
78.00	23.8	3 6	Kathrein 800 10692 RRU	50/170/290	TC	6	Composite	Proposed
71.00	21.6	1	VHLP3	-	TC	1	LDF2P-50A	Existing

SECTION	1	2	3
LENGTH (ft)	28.87	29.53	35.26
TOP WIDTH (in)	42.11	36.80	30.31
BOT. WIDTH (in)	48.21	44.07	38.47
THICKNESS (in)	0.3750	0.3125	0.2500
OVERLAP (ft)	6.57	5.73	0.00
SECTION WT. (lbs)	5000.94	3776.45	3070.13

MATERIAL GRADE -300W

EL. = 81.36'

EL. = 51.83'

EL. = 28.87'

EL. = 0'

LADDER & SAFETY RAIL

POLE CROSS SECTION

Load Case	Axial Load (Kips)	Shear (Kips)	Moment (Kipsft)	Torque (Kipsft)
Maximum Download	43.71	15.35	773.98	-5.32
Maximum Moment	21.25	19.77	1028.21	-2.32
Maximum Shear	21.25	19.77	1028.21	-2.32
Maximum Torque	43.71	17.69	879.45	6.2

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<p>NOTES: DESIGN STANDARD: CSA-S37-01 WIND PRESSURE: 10.9 (psf) [520 (Pa)] ICE THICKNESS: 0.98 (in) [25.00 (mm)] IMPORTANCE FACTOR: 1 SERVICEABILITY FACTOR: 0.85 MAX MW ROTATION AT 10.9 (psf) : 0.47'</p>	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td>REV.</td> <td>REV. BY:</td> <td>CHK. BY:</td> <td>DESCRIPTION</td> <td>DATE</td> </tr> <tr> <td> </td> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </table>	REV.	REV. BY:	CHK. BY:	DESCRIPTION	DATE					
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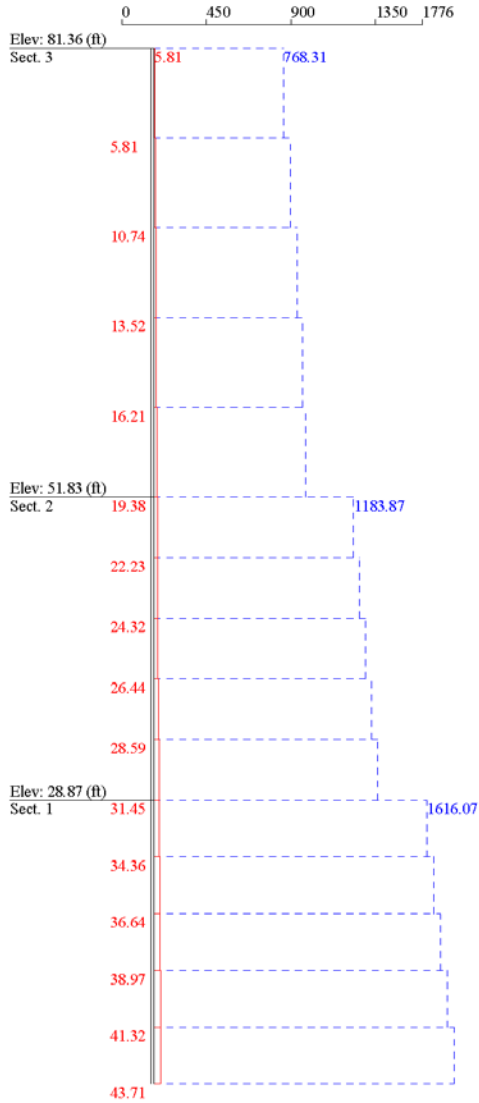
CUSTOMER: Telecom Company	SITE: YOUNG & QUEENSVILLE, ON.
DATE: 18 JAN 13	SCALE: 15
BY: AM	CHK:
APP:	DRAWING NO. 1586
TITLE: 81.4' SLIP-FIT MONOPOLE	



File No. : 1586  
 Customer: Young & Queensville, ON.  
 Project: Young & Queensville, ON.

Engineer: AM  
 Date: 18/01/2013  
 Page No. : Diagrams 1

Maximum Leg Compression (Kips)



Maximum Bending Moment (Kipsft)

