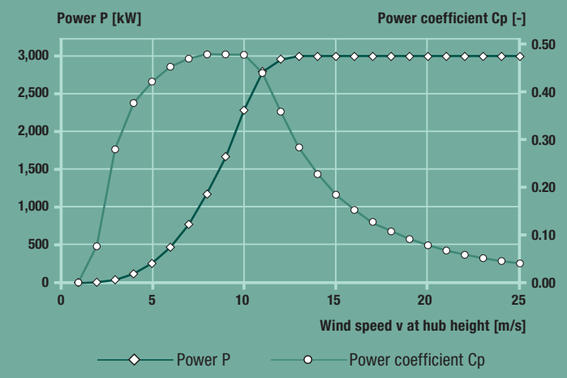
Appendix B

Equipment Specifications and Conceptual Plans

E-101

3,000 kW

Calculated power curve



Wind [m/s]	Power P [kW]	Power coefficient Cp [-]
1	0.0	0.000
2	3.0	0.076
3	37.0	0.279
4	118.0	0.376
5	258.0	0.421
6	479.0	0.452
7	790.0	0.469
8	1,200.0	0.478
9	1,710.0	0.478
10	2,340.0	0.477
11	2,867.0	0.439
12	3,034.0	0.358
13	3,050.0	0.283
14	3,050.0	0.227
15	3,050.0	0.184
16	3,050.0	0.152
17	3,050.0	0.127
18	3,050.0	0.107
19	3,050.0	0.091
20	3,050.0	0.078
21	3,050.0	0.067
22	3,050.0	0.058
23	3,050.0	0.051
24	3,050.0	0.045
25	3,050.0	0.040

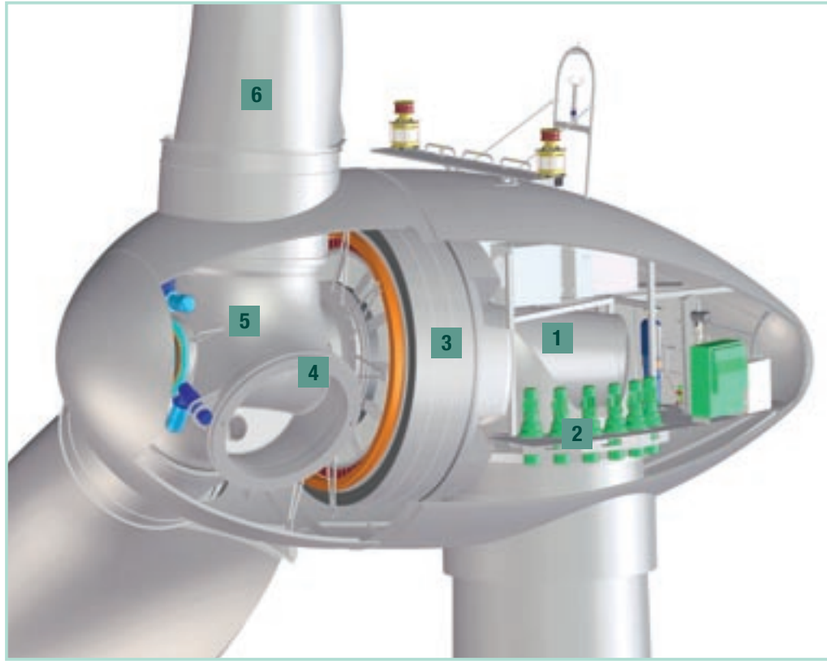
ρ = 1.225 kg/m³

For more information on the ENERCON power curve, please see the last page.

Technical specifications E-101

Rated power:	3,000 kW
Rotor diameter:	101 m
Hub height:	99 m / 135 m
Wind zone (DIBt):	WZ III
Wind class (IEC):	IEC/NVN IIA
WEC concept:	Gearless, variable speed Single blade adjustment
Rotor	
Type:	Upwind rotor with active pitch control
Rotational direction:	Clockwise
No. of blades:	3
Swept area:	8,012 m²
Blade material:	GRP (epoxy resin); Built-in lightning protection
Rotational speed:	Variable, 4–14.5 rpm
Pitch control:	ENERCON single blade pitch system; one independent pitch system per rotor blade with allocated emergency supply
Drive train with generator	
Hub:	Rigid
Main bearing:	Double-row tapered/cylindrical roller bearings
Generator:	ENERCON direct-drive annular generator
Grid feed:	ENERCON inverter
Brake systems:	– 3 independent pitch control systems with emergency power supply – Rotor brake – Rotor lock, latching (15°)
Yaw system:	Active via yaw gear, load-dependent damping
Cut-out wind speed:	28–34 m/s (with ENERCON storm control*)
Remote monitoring:	ENERCON SCADA

*For more information on the ENERCON storm control feature, please see the last page.

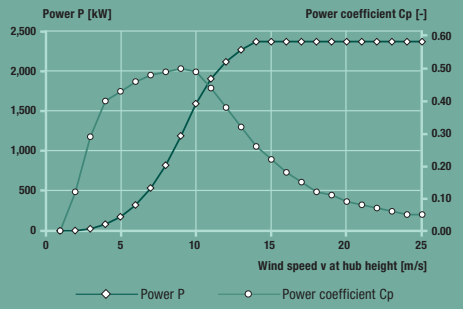


1 Main carrier
2 Yaw drive
3 Annular generator
4 Blade adapter
5 Rotor hub
6 Rotor blade

E82

2,300 kW

Calculated power curve



Wind [m/s]	Power P [kW]	Power coefficient Cp [-]
1	0.0	0.00
2	3.0	0.12
3	25.0	0.29
4	82.0	0.40
5	174.0	0.43
6	321.0	0.46
7	532.0	0.48
8	815.0	0.49
9	1,180.0	0.50
10	1,580.0	0.49
11	1,890.0	0.44
12	2,100.0	0.38
13	2,250.0	0.32
14	2,350.0	0.26
15	2,350.0	0.22
16	2,350.0	0.18
17	2,350.0	0.15
18	2,350.0	0.12
19	2,350.0	0.11
20	2,350.0	0.09
21	2,350.0	0.08
22	2,350.0	0.07
23	2,350.0	0.06
24	2,350.0	0.05
25	2,350.0	0.05

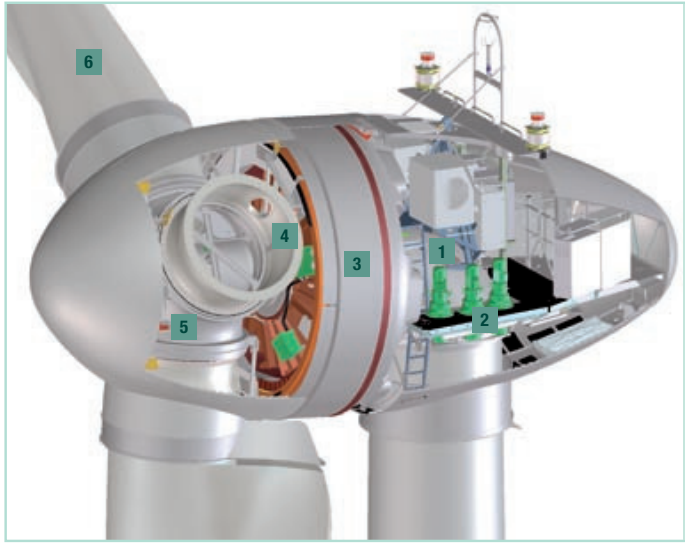
ρ = 1.225 kg/m³

For more information on the ENERCON power curve, please see the last page.

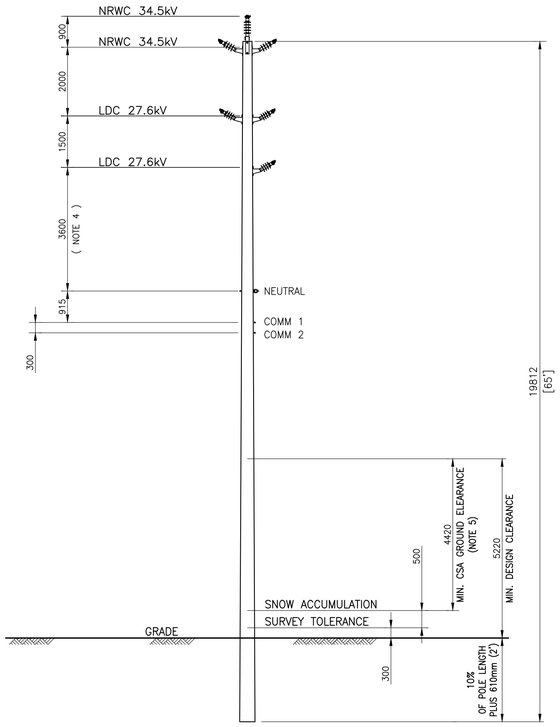
Technical specifications E-82 E2

Rated power:	2,300 kW
Rotor diameter:	82 m
Hub height:	78 m / 85 m / 98 m / 108 m / 138 m
Wind zone (DIBt):	WZ III
Wind class (IEC):	IEC/NVN IIA
WEC concept:	Gearless, variable speed Single blade adjustment
Rotor	
Type:	Upwind rotor with active pitch control
Rotational direction:	Clockwise
No. of blades:	3
Swept area:	5,281 m²
Blade material:	GRP (epoxy resin); Built-in lightning protection
Rotational speed:	Variable, 6–18 rpm
Pitch control:	ENERCON single blade pitch system; one independent pitch system per rotor blade with allocated emergency supply
Drive train with generator	
Hub:	Rigid
Main bearing:	Double-row tapered/cylindrical roller bearings
Generator:	ENERCON direct-drive annular generator
Grid feed:	ENERCON inverter
Brake systems:	– 3 independent pitch control systems with emergency power supply – Rotor brake – Rotor lock
Yaw system:	Active via yaw gear, load-dependent damping
Cut-out wind speed:	28–34 m/s (with ENERCON storm control*)
Remote monitoring:	ENERCON SCADA

*For more information on the ENERCON storm control feature, please see the last page.

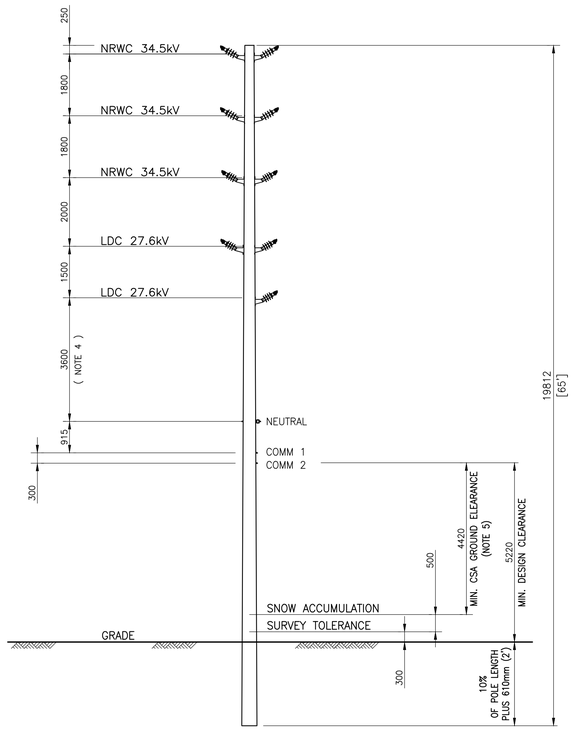


1 Main carrier
2 Yaw drive
3 Annular generator
4 Blade adapter
5 Rotor hub
6 Rotor blade



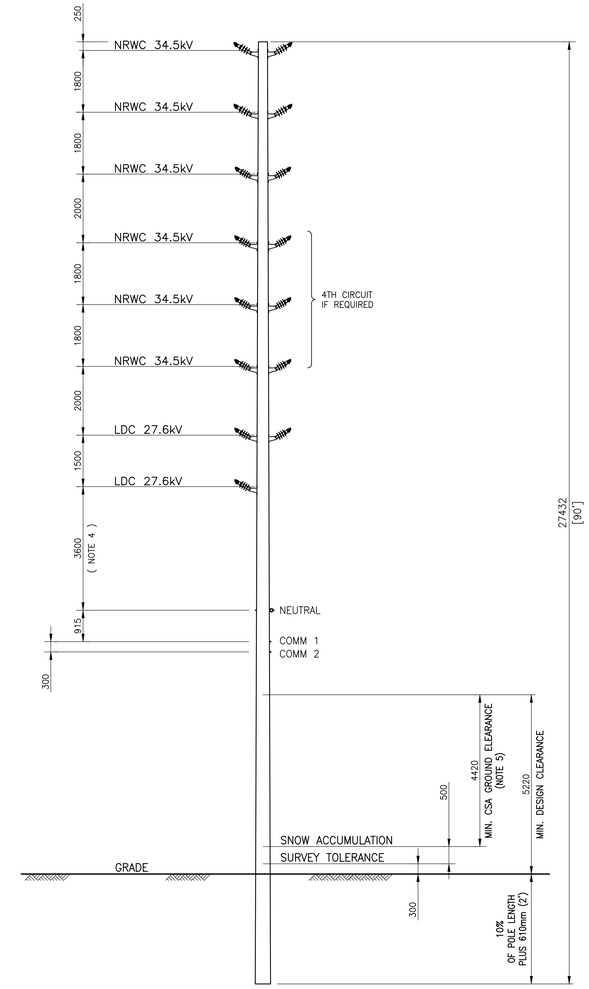
DETAIL 1

SINGLE COLLECTION CIRCUIT
WITH UTILITY UNDER–BUILD
TYPICAL FRAMING



DETAIL 2

DOUBLE COLLECTION CIRCUIT
WITH UTILITY UNDER–BUILD
TYPICAL FRAMING



DETAIL 3

THREE & FOUR COLLECTION CIRCUIT
WITH UTILITY UNDER–BUILD
TYPICAL FRAMING

NOTES:

1. TYPICAL RULING SPAN IS 60 METRES (200'). MAX SPAN IS 75 METRES.
2. LOCAL DISTRIBUTION COMPANY REQUIREMENTS SHOWN FOR 27.6kV. ACTUAL UNDERBUILD VOLTAGE MAY BE LESS.
3. FOR SINGLE CIRCUIT WITHOUT UNDERBUILD, POLE MAY BE REDUCED TO 16765 (55').
4. UNDERBUILD EQUIPMENT SPACE (3600mm) SHOWN TO HONI STANDARDS. POLE HEIGHT AND CONFIGURATION WILL BE ADJUSTED TO CONFORM WITH APPLICABLE LOCAL DISTRIBUTION COMPANY REQUIREMENTS.
5. CLEARANCES SHOWN ARE CSA MINIMUM. POLE HEIGHTS AND CLEARANCES WILL BE ADJUSTED, DEPENDING UPON LOCATION (eg. ROAD CROSSINGS).
6. WOOD POLES SHOWN. CONCRETE POLES MAY BE SUBSTITUTED FOR POLE HEIGHTS ABOVE 65'.
7. INSTALLATION AND CLEARANCES SHALL BE IN ACCORDANCE WITH SECTION 75 OF THE OESC.
8. THESE ARE TYPICAL DETAILS ONLY. DESIGN MAY BE FURTHER REFINED BASED ON REQUIREMENTS FROM LOCAL DISTRIBUTION COMPANIES.
9. NEUTRAL ATTACHMENT POINT TO BE A MINIMUM OF 7.31m (24') ABOVE GRADE.

NRWC – NIAGARA REGION WIND CORPORATION

LDC – LOCAL DISTRIBUTION COMPANY

COMM 1 – NRWC COMMUNICATION

COMM 2 – UTILITY COMMUNICATION

0 1.5 3.0 4.5 6.0m
Scale 1:75

PRELIMINARY
NOT FOR CONSTRUCTION

DRAWING NO.	DRAWING TITLE
REFERENCE DRAWINGS	

NO.	DESCRIPTION	CHK'D	APP'D	DATE
REVISIONS				

REV.	ISSUE FOR	AUTH. BY	DATE
A	RENEWABLE ENERGY ASSESSMENT		12-09-18
ISSUE AUTHORIZATION			

HATCH™

DESIGNED BY: G. HOLDEN, DATE 12-09-14	DRAWN BY: L. MONTEAN, DATE 12-09-14
CHECKED BY: H. ZIEMANN, DATE	DISCIP. ENGR.: L. Dahlke, DATE
PROJ. DES. COORD., DATE	PROJ. ENGR.: B. Buggeln, DATE
PROJ. MGR.: A. O'MARA, DATE	PROJECT NUMBER: H-339580

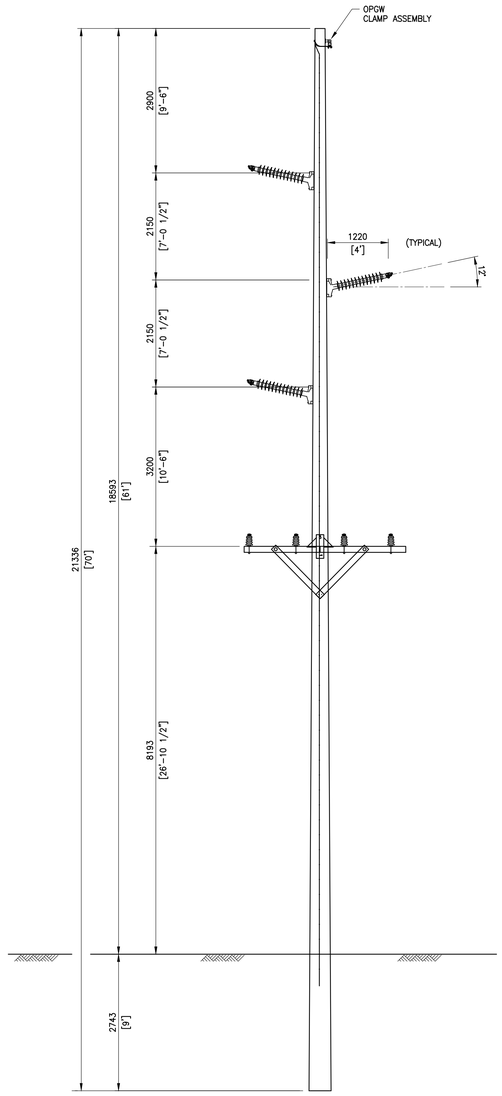
NIAGARA REGION WIND CORP.

NIAGARA REGION WIND PROJECT

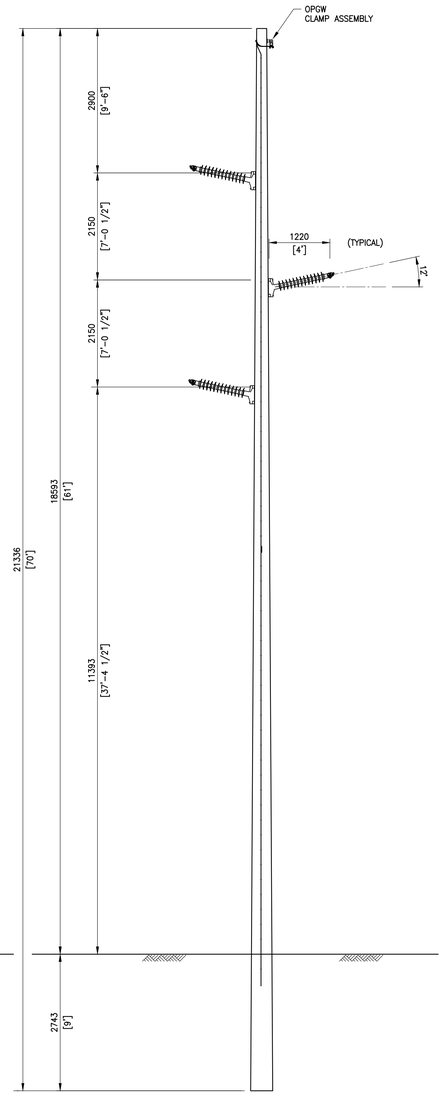
230MW NRWP WIND FARM
34.5kV COLLECTOR LINE
JOINT USE WITH
LOCAL DISTRIBUTION COMPANY
TYPICAL TANGENT FRAMING

SCALE 1:75 | DRAWING NO. H339580-0000-70-042-0004 | REVISION A

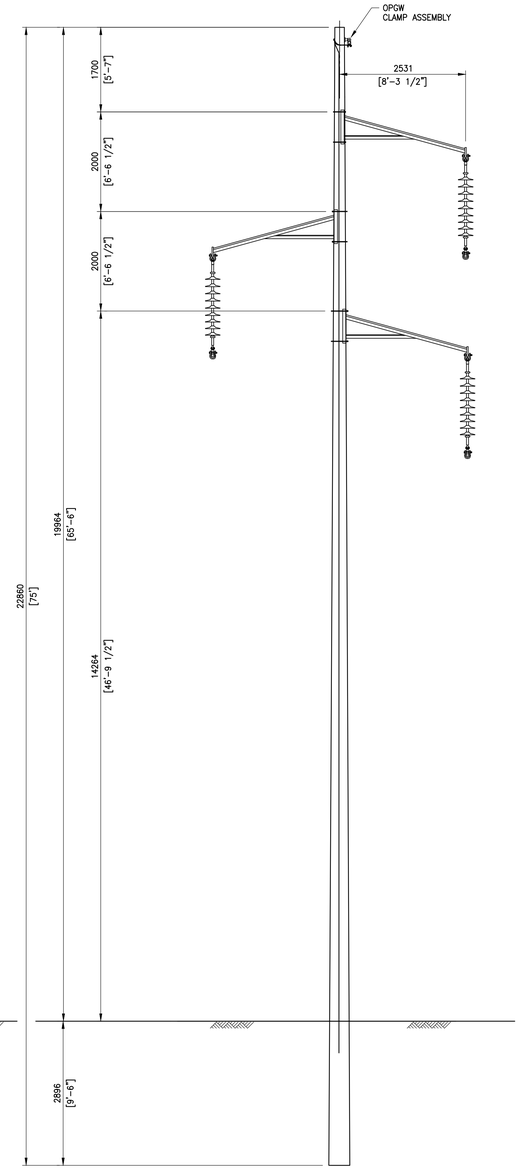
CIVIL | ELECTRICAL | MECHANICAL | GEOTECHNICAL | HYDROTECHNICAL | ARCHITECTURAL | OTHER



115kV TRANSMISSION LINE
TYPICAL TANGENT STRUCTURE
WITH UNDERBUILD



115kV TRANSMISSION LINE
TYPICAL TANGENT STRUCTURE



115kV TRANSMISSION LINE
TYPICAL TANGENT STRUCTURE
FOR WIDE ROW

0 1 2 3 4m
Scale 1:50

PRELIMINARY
NOT FOR CONSTRUCTION

THIS DRAWING IS FOR ESTIMATING USE ONLY
ALL RATINGS AND SIZES OF EQUIPMENT, CONCRETE, STEEL, AND MATERIALS, SHOWN ON THIS DRAWING ARE APPROXIMATIONS ONLY AND MUST NOT BE CONSIDERED AS FINAL DESIGN REQUIREMENTS.
DO NOT USE FOR CONSTRUCTION

DRAWING NO.	DRAWING TITLE

REFERENCE DRAWINGS

NO.	DESCRIPTION	CHK'D	APP'D	DATE
B	OPGW ADDED			12-11-02

REVISIONS

REV.	ISSUE FOR	AUTH. BY	DATE
B	LEAVE TO CONSTRUCT APPLICATION		12-11-02
A	LEAVE TO CONSTRUCT APPLICATION		12-08-24

ISSUE AUTHORIZATION

HATCH

DESIGNED BY: F. LIU	DRAWN BY: R PELAEZ/L MONTEAN
CHECKED BY: H. ZAKARIA	DISCIP. ENGR: L. DAHLKE
PROJ. DES. COORD.	PROJ. ENGR: B. BUGGELN
PROJ. MGR: A. O'MARA	PROJECT NUMBER: H-339580

NIAGARA REGION WIND CORP.

NIAGARA REGION WIND PROJECT

115kV TRANSMISSION LINE
TYPICAL TANGENT
STRUCTURES

SCALE	DRAWING NO.	REVISION
1:50	H339580-0000-70-042-0001	B

CIVIL | ELECTRICAL | MECHANICAL | GEOTECHNICAL | HYDROTECHNICAL | ARCHITECTURAL | OTHER

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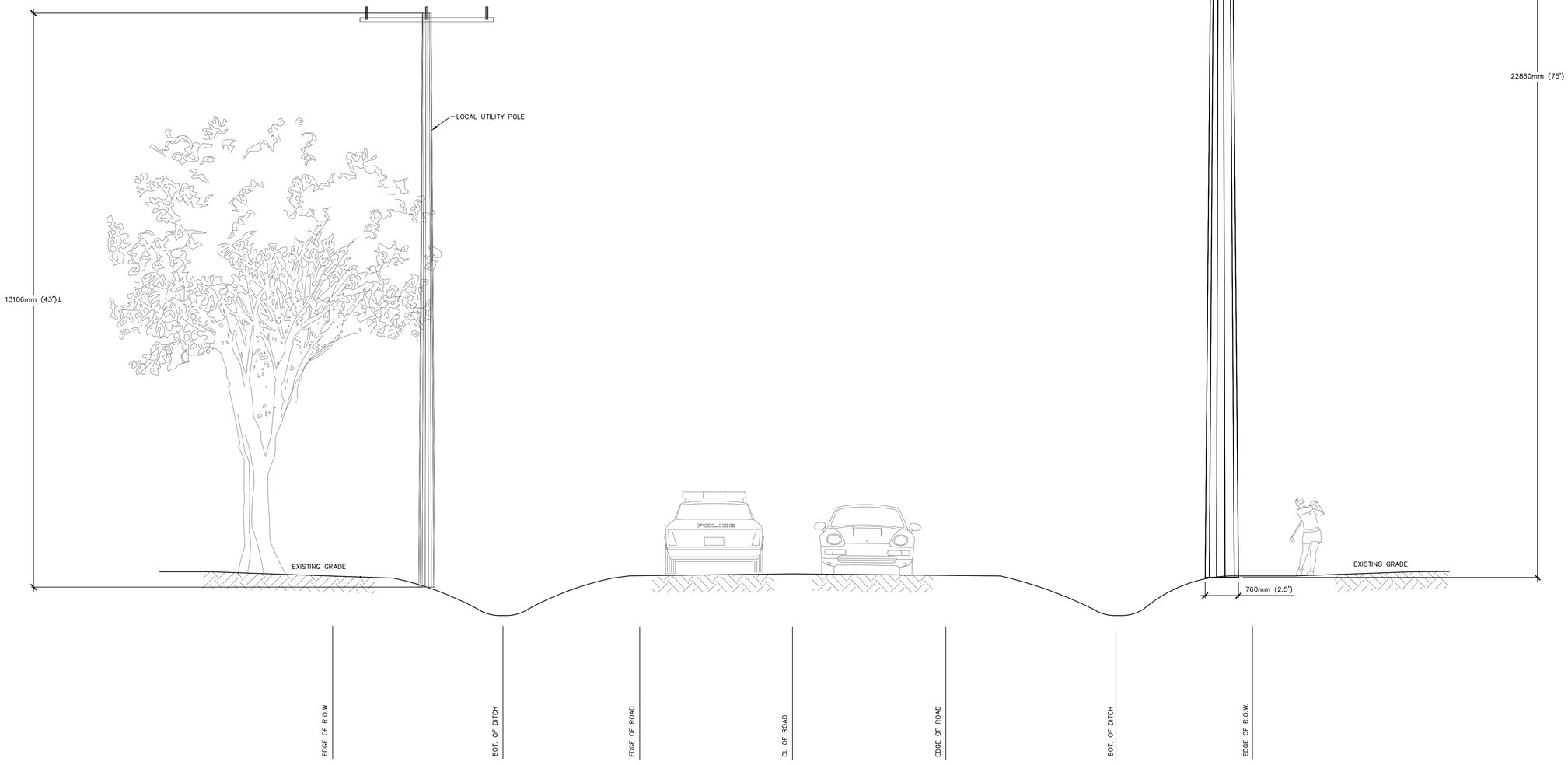


Stantec Consulting Ltd.
49 Frederick Street
Kitchener ON Canada
N2H 6M7
Tel. 519.579.4410
Fax. 519.579.6733
www.stantec.com

Notes

Revision	By	Appd.	YY.MM.DD
B FINAL DRAFT ISSUE	JR	LG	13.03.12
A ISSUED FOR ROAD OCCUPANCY PERMIT	JR	LG	13.03.04
Issued	By	Appd.	YY.MM.DD
File Name: 161011196_E304	JR Dwn.	LG Chkd.	JR Dsgn.	13.03.01 YY.MM.DD

Permit-Seal

PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

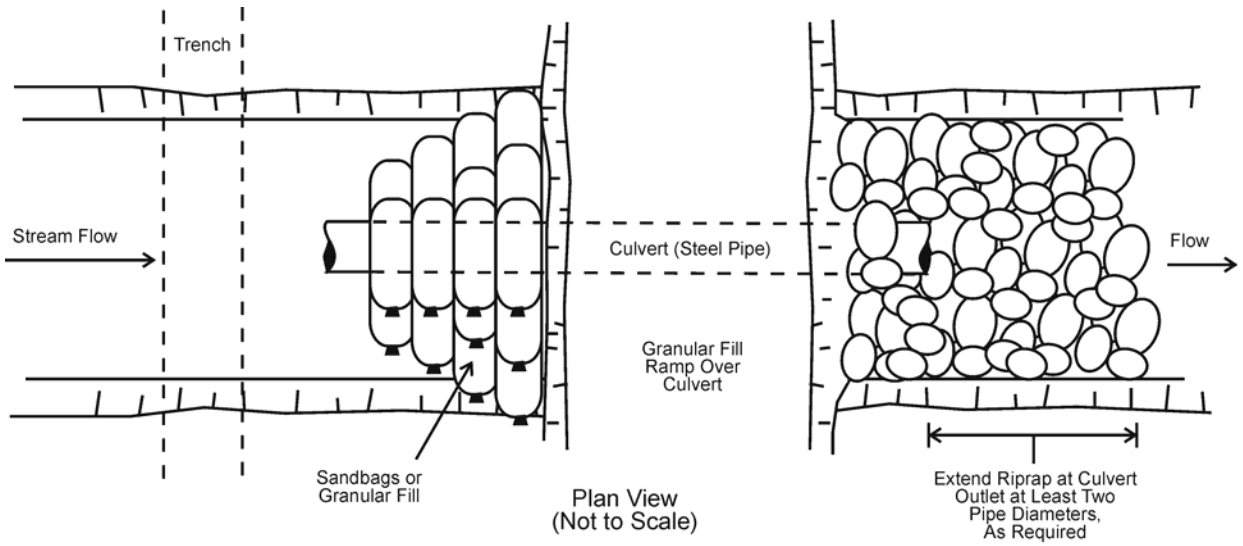
Client/Project
NIAGARA REGION WIND CORPORATION
277 Lakeshore Road East, Suite 211, Oakville, ON

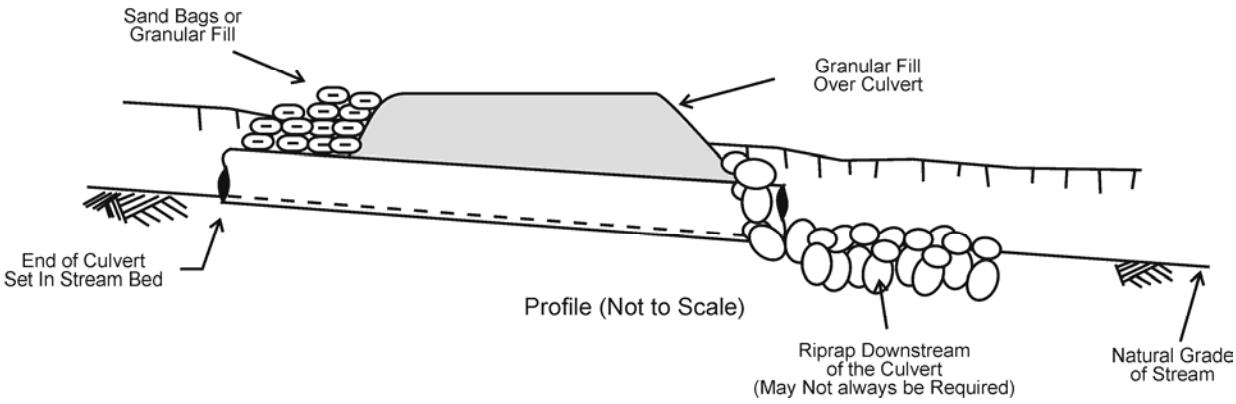
NIAGARA REGION WIND FARM
230 MW
Niagara Region and Haldimand County, Ontario

Title
OVERHEAD PROFILE DETAILS
TANGENT POLE STANDARD

Project No.	Scale	
161011196	1:50	
Drawing No.	Sheet	Revision
E304	1 of 6	B

ORIGINAL SHEET – ARCH D





Notes:

1. Install ramp and culverts to allow vehicles to cross relatively narrow watercourses where sedimentation must be minimized or fish passage allowed.
2. Design culverts to handle 150% of maximum anticipated flows or to a five year flood level and according to specific guidelines where fish passage (i.e., migration) is required. Contact government authorities for minimum water depth specifications, and maximum water velocities. Ensure dam is impermeable.
3. Place ends of culverts below the natural grade of watercourse at an angle that does not exceed normal watercourse gradient. Depth of placement is dependent upon bed type, culvert size and expected flow conditions.
4. Remove temporary culverts and ramp materials when no longer required. Remove culvert and ramp prior to freeze-up (summer construction) and prior to spring break-up (winter construction).
5. Restore and stabilize bed and banks.

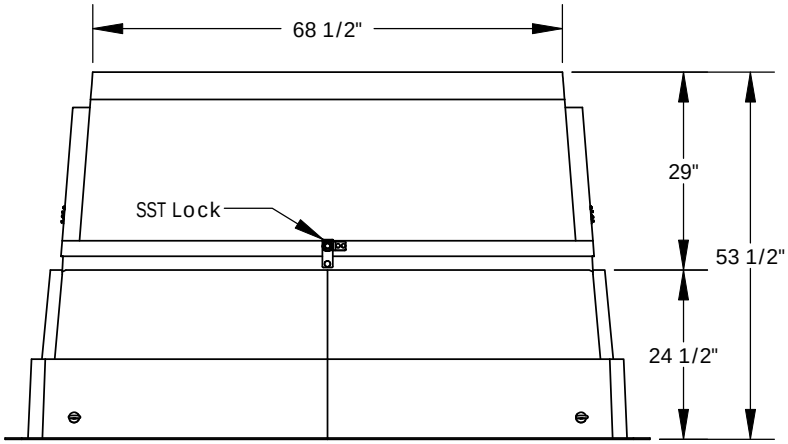
Source: Alliance 1998

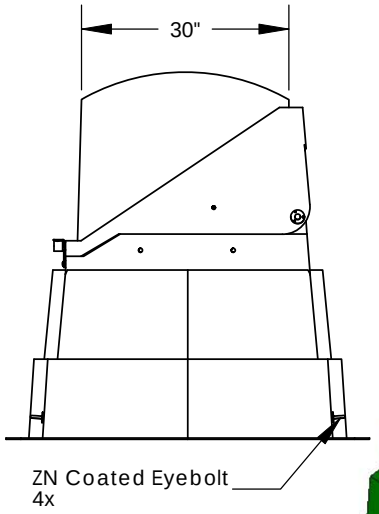
VEHICLE CROSSING – TYPICAL RAMP AND CULVERT

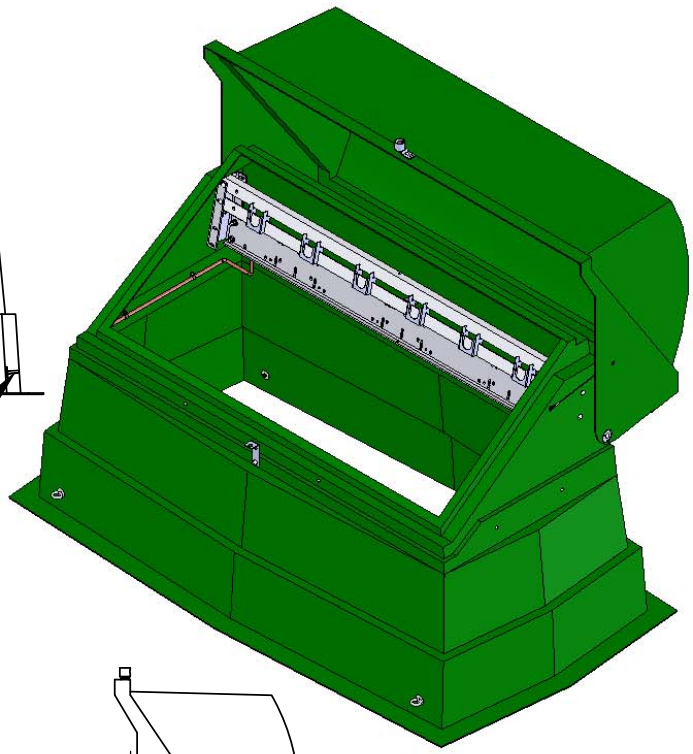
CAPP • CEPA • CCGI

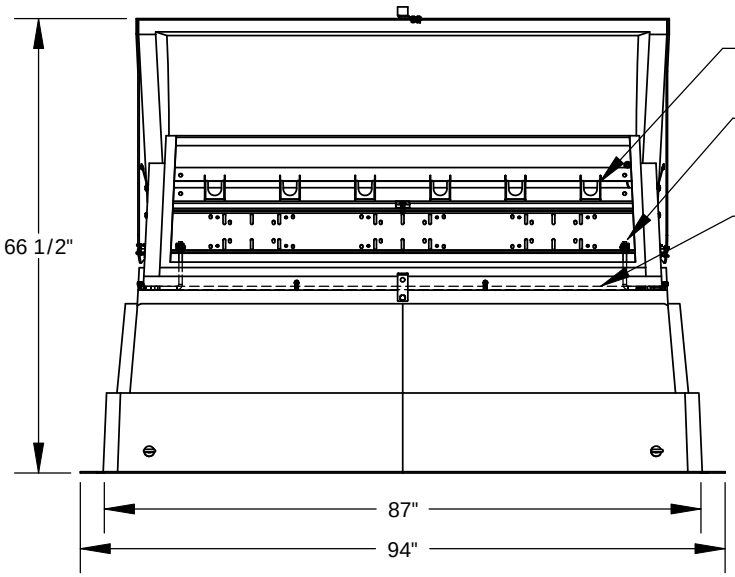
Third Edition
October 2005
DWG. NO. 14

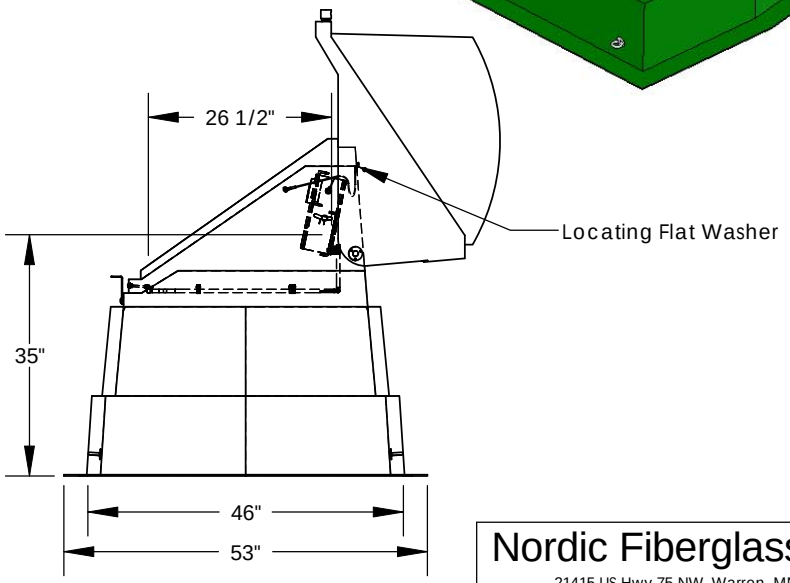
REVISIONS			
REV.	DESCRIPTION	DATE	APPROVED











Customer Name: N/A

DIMENSIONS ARE IN INCHES
TOLERANCES: ANGLES ± 1°
FRACTIONAL ± 1/2
ONE PLACE DECIMAL ±.060
TWO PLACE DECIMAL ±.030
THREE PLACE DECIMAL ±.015

MATERIAL

	NAME	DATE
DRAWN	R.L.J.	10/24/08
CHECKED	-.-.-	--/--/--

Nordic Fiberglass, Inc.
21415 US Hwy 75 NW, Warren, MN 56762
www.nordicfiberglass.com
218-745-5095 ph. --- 218-745-4990 fax

ND-683054-MG-PA71-X-W3E

SIZE	ITEM ID:	REV.
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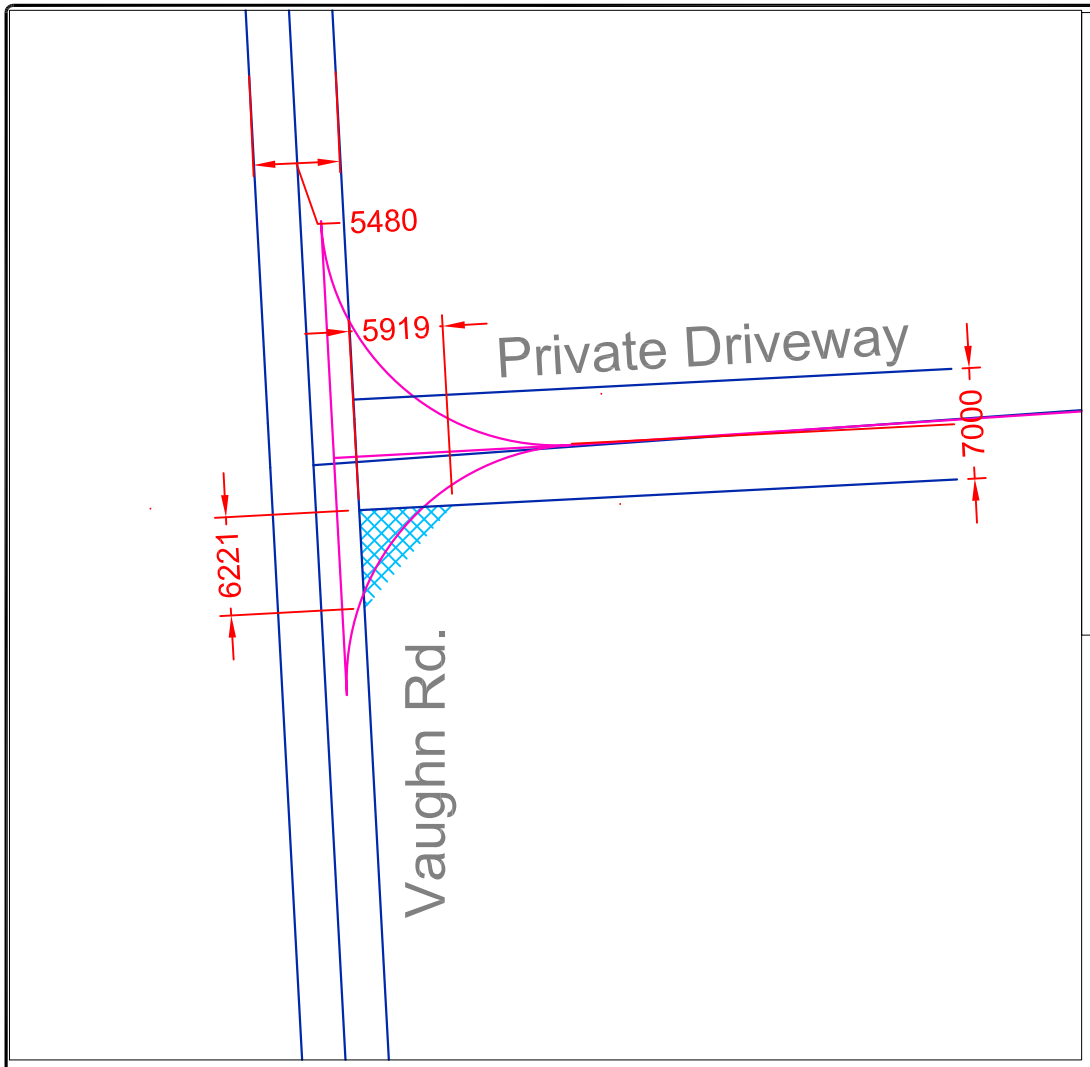
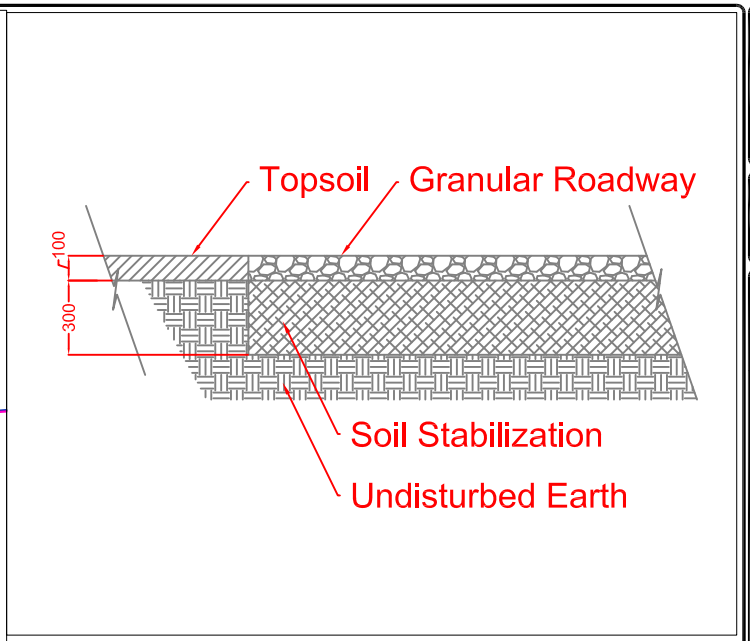


Typical Entrance



Typical Road Makeup

PCL
CONSTRUCTION LEADERS
TORONTO DISTRICT
2085 Hurontario Street, Suite 400
Mississauga, Ontario, L4S 4G1
Phone: 905-276-7600

PCL RENEWABLE ENERGY

Legend

Temporary Road
Area = Varies

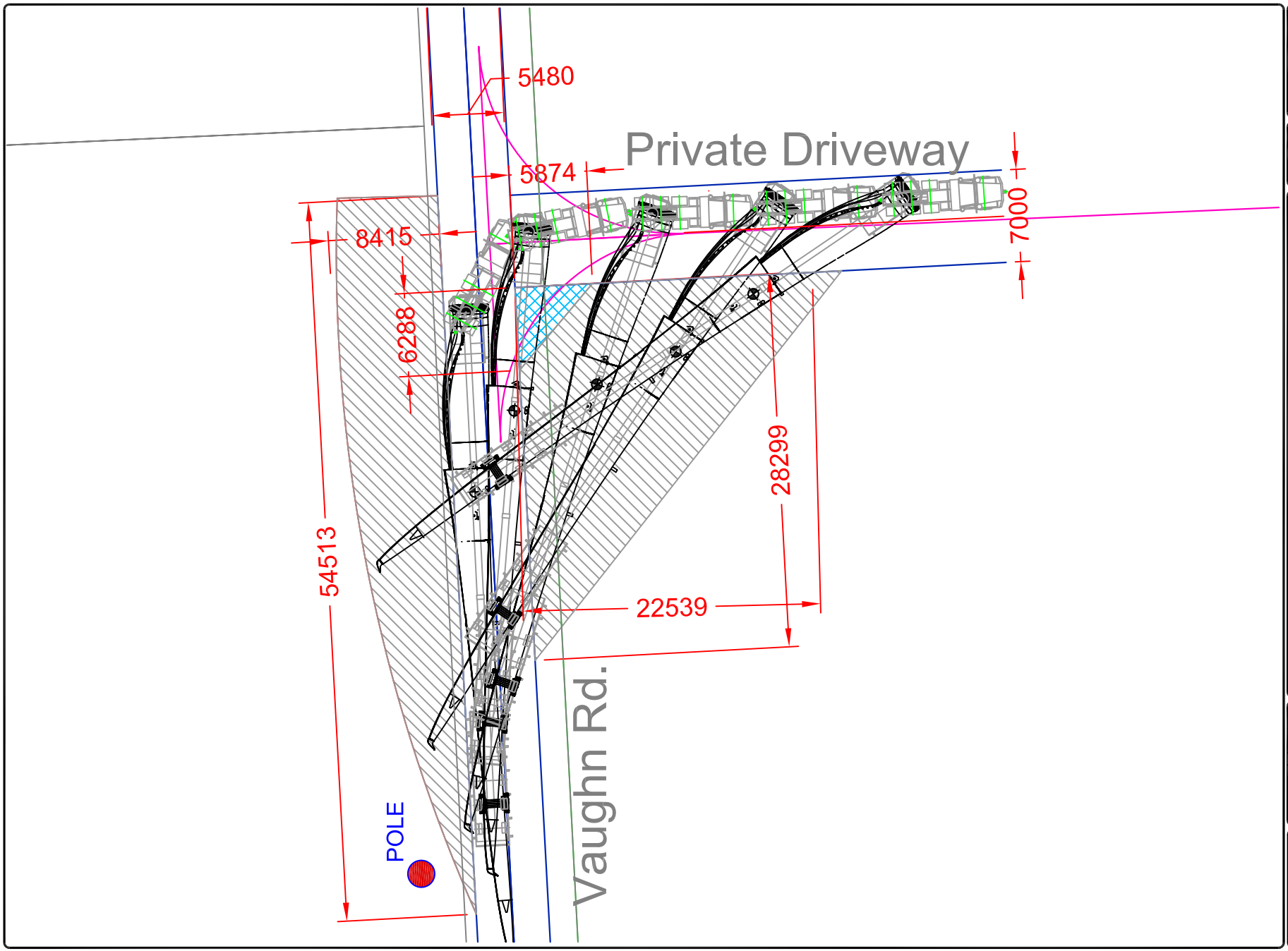
Rev. No.	Initials	Date	Description

Plot Scale: AS SHOWN
Date: Jan. 25, 2013
Drawn By: S.S.H
Checked By: ----.

Sheet Title: Niagara Region Wind Corp. Turbine Access Typical

PCL Job No.:

Sheet No.: PCL-ENT-000



PCL
CONSTRUCTION LEADERS
TORONTO DISTRICT
2085 Hurontario Street, Suite 400
Mississauga, Ontario, L4S 4G1
Phone: 905-276-7600

PCL RENEWABLE ENERGY

Legend

Clear Area

Proposed Build Out
Area = 19m²

Interferences
SS - Stop Sign
RS - Road Sign
DIR - Directional Sign

ENT T78H

Rev. No.	Initials	Date	Description
0	SSH	11/11/1212	ISSUED FOR REVIEW

Plot Scale: AS SHOWN
Date: Sept. 11,2012
Drawn By: S.S.H
Checked By: ----.
Sheet Title: Niagara Region Wind Corp. Turbine Access T78H
PCL Job No.:
Sheet No.: PCL-ENT-024