December 2010

REPORT

Noise Impact Assessment Moore Solar Farm, St. Clair, Ontario

Submitted to:
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REPORT

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Report Number: 08-1112-0185 (1021)

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Golder Associates

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1.0 INTRODUCTION

Golder Associates Ltd. (Golder) was retained by First Solar Development Canada Inc. (First Solar) to carry out a Noise Impact Assessment (NIA) in support of the Renewable Energy Approval (REA) application for the Moore Solar Farm Facility located in St. Clair, Ontario. First Solar, proposes to develop (construct, and operate) the Moore Solar Farm (Moore Farm), a renewable energy generation facility with a name plate capacity of up to 20 megawatts (MW).

The Moore Farm is composed of one (1) 20 MW solar farm that will supply electricity to the local electric grid. Noise sources associated with the solar farm include the transformers, inverters and exhaust fans installed on-site.

An area plan showing the site location and most sensitive Point(s) of Reception (POR(s)) is provided in Figure 1. A site layout plan showing the source locations is provided in Figure 2. A zoning map is provided in Appendix A.

The immediate surroundings of the site include agricultural land uses with isolated dwellings and a small community to the northwest. This area can be best described as Class 3 (Rural) in accordance with MOE guideline publication NPC-232.

For the purpose of this assessment, fifty-one (51) PORs were selected as being representative of the sensitive receptors in all directions around the site. These receptors are identified as POR001 through POR051. The nearest POR (POR043) is located to the south-west of the site, approximately 590 m from the nearest source.

For easy comprehension and understanding of this report, acoustical technical terms used in this report are explained in Appendix B.

1.1 Background

On September 24, 2009, Ontario Regulation 359/09 of the Environmental Protection Act received Royal Assent and on October 1, 2009 was filed and came into force. In Ontario, all solar farms were previously assessed using Ontario Ministry of Environment's Noise Pollution Control (NPC) guidelines. O. Reg. 359/09 now contains the current requirements for approval of renewable energy projects under the Renewable Energy Approval (REA) process.

According to the project classification scheme outlined in Part II (Classes of Renewable Energy Generation Facilities), Section 4 of O. Reg. 359/09; the Moore Solar Farm can be categorized as a Class 3 solar facility. A Class 3 solar facility is defined as a facility of solar panels situated at any location other than mounted on the roof or wall of a building with a name plate capacity greater than 10 kW. Also, O. Reg. 359/09 indicates that a Class 3 solar facility requires a Noise Study Report prepared in accordance with Appendix A of the MOE publication entitled "Basic Comprehensive Certificates of Approval" dated April 2004 and subsequent amendments.

This report has been prepared following the guidelines given in the above noted MOE documentation.

2.0 SITE OPERATIONS

The proposed site is located on the northwest corner of Rokeby Line and King's Highway No. 40, in St. Clair, Lambton County, Ontario. Upon final commissioning, the solar farm is expected to supply up to twenty (20) MW of power to the local grid. Noise sources associated with this facility include transformers, inverters and exhaust fans.

Two different scenarios have been considered in this report as described below:

> ***Scenario#1***: The Moore Farm will consist of 20 different transformer stations. Associated with each of transformer stations will be a concrete enclosure. Each enclosure will contain two (2) 500 kW Xantrex inverters with a cooling coil and exhaust opening on the wall for each inverter. There are also two room cooling intakes and two exhausts per enclosure. This scenario provides 9 different sources per transformer station location.
>
> ***Scenario#2***: The Moore farm will consist of 20 different transformer stations (same location and the same model transformers as above). The two Xantrex model inverters will be replaced by two (2) 500 kW SMA model inverters. There are also two room intakes and two exhausts per enclosure. There are no cooling coil and exhaust openings for the inverters. This scenario provides 5 different sources per transformer station location.

The solar farm will operate year-round during daylight hours. Due to the extended daylight hours during the summer season, it is expected that the facility will also be operating outside of typical daytime hours (i.e., 07:00 hours – 19:00 hours). These noise sources will be situated within the property boundary as shown in Figure 2. For the purpose of this assessment, Golder has conservatively assumed that the equipment will operate at 100% of rated capacity during a predictable worst case hour. A system operation diagram is provided in Appendix C.

The immediate surroundings of the site include agricultural lands with isolated dwellings. Golder has considered this area as Class 3 (Rural) in accordance with MOE publication NPC-232.

3.0 NOISE SOURCE SUMMARY

As discussed, the noise sources of concern associated with this site are the transformers, inverters and exhaust fans. The transformers will be on concrete pads. The inverters will be located inside concrete enclosures as described in Section 2 of this report (i.e., Scenarios #1 and #2). Drawings showing details of the concrete enclosure for both the Xantrex Inverters and the SMA inverters are attached in Appendix D. The Xantrex enclosures will be oriented such that the air intake for the enclosure and openings (intake and exhaust) for the inverters will be on north and south façades and exhaust openings for the enclosure will be on the east façade of each enclosure building. The SMA enclosures will be oriented such that the enclosure intake will be on the east façade and enclosure exhaust openings will be on the north and south façades. Thus the noise sources for each scenario are as follows:

Scenario #1: Xantrex Inverters
Transformer – point source at each transformer station (1 point source per station)
Inverter cooling openings - north and south façades (4 vertical area sources per station)
Room intake openings - north and south façades (2 vertical area sources per station)
Room exhaust fans – two on east façade (2 point sources per station)

Scenario #2: SMA Inverters
Transformer – point source at each transformer station (1 point source per station)
Room exhaust openings – north and south façades (2 vertical area sources per station)
Room intake openings – two on east façade (2 vertical area sources per station)
Noise associated with the inverters are included in the intake and exhaust openings of the enclosure.

In accordance with MOE guidelines, the resulting noise emissions associated with the transformers have been penalised by +5 dB to account for the distinct hum from the transformer coils. Also, based on Golder's noise measurements of the Xantrex inverters, a similar +5 dB penalty has been applied to the noise emissions from the inverters which displayed a tonal character. The same penalty was considered appropriate for the SMA inverters as well. Thus all sources associated with this farm include a tonal penalty of +5 dB.

All sources are summarized in Table 3. All source-specific sound pressure levels are summarized in Appendix E.

Table 1: Noise Source Summary

Source ID	Source Description	Overall Sound Power Level (dBA)	Source Location	Sound Characteristics	Noise Control Measures
T 0001 – T 020	Transformers	71	O	S,T[1]	U
Scenario #1 – Xantrex Inverters					
C1_001 – C1_020 and C2_001 – C2_020	Enclosure Exhaust Opening for Inverter Cooling	81	O	S,T[1]	U
C3_001 – C3_020 and C4_001 – C4_020	Enclosure Intake Opening for Inverter Cooling	82	O	S,T[1]	U
I1_001 – I1_020 and I2_001 – I2_020	Enclosure Inlet	77	O	S,T[1]	U
E1_001 – E1_020 and E2_001 – E2_020	Exhaust fan	80	O	S	U
Scenario #2 – SMA Inverters					
E1_001 – E1_020 and E2_001 – E2_020	Enclosure Exhaust Opening[2]	75	O	S,T[1]	U
I1_001 – I1_020 and I2_001 – I2_020	Enclosure Inlet[2]	67	O	S,T[1]	U

[1] As per MOE guidelines, for tonal sources, the resulting receptor levels have been penalised by 5 dB
[2] Noise from the inverters is included in the intake and exhaust numbers.

Source Location
O – located/installed outside the building, including on the roof
I – located/installed inside the building

Sound Characteristics
S – Steady
Q – Quasi Steady Impulsive
I – Impulsive
B – Buzzing
T – Tonal
C – Cyclic

Noise Control Measures
S – Silencer, acoustic louver, muffler
A – Acoustic lining, plenum
B – Barrier, berm, or screening
L – Lagging
E – Acoustic enclosure
O – Other
U – Uncontrolled

4.0 POINT(S) OF RECEPTION

As discussed previously, a total of 51 PORs were identified, as being potentially impacted by the noise emissions from the proposed Moore Farm. Among them POR043 has the highest overall levels and is considered in this assessment as the most critical POR.

Table 2: Point of Reception Summary

POR ID	POR Description	Location
POR001 – POR 039	Residential	Residences to the Northwest of the Solar Farm
POR040 – POR 044	Residential	Residences to the Southwest of the Solar Farm
POR045 – POR 051	Residential	Residences to the Southeast of the Solar Farm

5.0 ASSESSMENT CRITERIA (PERFORMANCE LIMITS)

The proposed solar farm is located in St. Clair, Ontario. The site is surrounded generally by agricultural and industrial lands with isolated dwellings all around and community settlement to the northwest. It is considered that all PORs are located in Class 3 areas.

In predicting the sound level at each POR due to the proposed solar farm, MOE publication NPC-232 requires the application of the principle of "predictable worst case" noise impact. The predictable worst case impact is defined as the largest noise excess produced by the facility over the applicable limit.

The background sound level is considered as traffic noise and other sounds in the area excluding the sound from the facility under assessment. The sound level limit for the residential receptors in a Class 3 area can be described as follows:

> *The energy averaged sound level (Leq) produced by a source at a receptor location in any one hour period should not exceed the greater of; the energy averaged background sound level in the same hour period, or 45 dBA in the daytime period of 07:00-19:00, or 40 dBA in the evening period of 19:00-23:00 and 40 dBA in the night-time period of 23:00-07:00.*

Based on Golder's experience of similar sites, the applicable sound level limits for this site are determined to be the exclusionary minimum sound levels for Class 3 areas as given in table 3.

Table 3: Performance Limits for All Points of Reception (PORs)

Time Period	Sound Level Limit for POR in Class 3 Area [dBA]
Day-time (07:00 – 19:00)	45
Evening (19:00 – 23:00)	40
Night-time (23:00 – 07:00)	40

6.0 IMPACT ASSESSMENT

6.1 Methodology

Sound intensity measurements for the sources were carried out on August 6, 2010 at a solar farm with similar equipment using a Larson Davis 3000+ sound level meter/realtime analyzer equipped with Larson and Davis intensity probe (model 2260). The calibration of the instrumentation was verified before and after the measurements. All measuring equipment used in this study meets the MOE requirements, and calibration certificates are provided in Appendix F.

All relevant sound level measurements taken during the site visit have been documented in 1/3 octave band level format and are summarized in Appendix G. Weather during the August, 2010 site visit included clear conditions with temperatures ranging between 20°C and 24°C. Winds were predominantly from the West at 7 to 17 km/h. Weather data can be found in Appendix H.

The predictions were made using the commercially available software package CadnaA V 4.0.135. Geometrical spreading, attenuation from barriers (if any), ground effect and air absorption were included in the analysis as determined from ISO 9613 (part 2), which is the current standard used for outdoor sound propagation predictions. It should be noted that this standard makes provisions to include a correction to address for downwind or ground based temperature inversion conditions. Conservatively, noise predictions have been made assuming a downwind or moderate temperature inversion conditions for all PORs, a design condition consistent with the accepted practice of the MOE.

All transformers were modelled as point sources. In scenario #1 all inverter related sources were modelled as point sources and vertical area sources, while in scenario #2 the inverter related sources were modelled as vertical area sources only.

All source-specific sound power levels are summarized in Appendix E.

6.2 Results

Tables 4 and 5 summarize the predicted sound pressure levels of Scenario #1 and #2 for each source at the PORs and the distance from each source to the identified PORs. The format for Table 4 and Table 5 are shown below, and the complete tables can be found on the attached CD. Sample calculations are also provided in the attached CD. The predicted results indicate that the sound emissions from the Moore Farm will meet the MOE noise level limits for Class 3 areas during night-time hours (i.e., 40 dBA).

Figure 3 and 4 show the noise contours for the study area for each scenario considered. Similarly, Tables 6 and 7 provide a summary of the overall predicted noise levels at the identified PORs for each scenario.

Table 4: Point of Reception Noise Impact – Scenario #1 (Xantrex Inverters)

Source ID	POR001		POR002		POR003		POR004		POR005	
	Distance (m)	Overall Sound Pressure Level (dBA)	Distance (m)	Overall Sound Pressure Level (dBA)	Distance (m)	Overall Sound Pressure Level (dBA)	Distance (m)	Overall Sound Pressure Level (dBA)	Distance (m)	Overall Sound Pressure Level (dBA)
T0001	Refer to attached CD for Table 4.									
T0002										
T0003										
T0004										
T0005										

Table 5: Point of Reception Noise Impact – Scenario #2 (SMA Inverters)

Source ID	POR001		POR002		POR003		POR004		POR005	
	Distance (m)	Overall Sound Pressure Level (dBA)	Distance (m)	Overall Sound Pressure Level (dBA)	Distance (m)	Overall Sound Pressure Level (dBA)	Distance (m)	Overall Sound Pressure Level (dBA)	Distance (m)	Overall Sound Pressure Level (dBA)
T0001	Refer to attached CD for Table 5.									
T0002										
T0003										
T0004										
T0005										

Table 6: Acoustic Assessment Summary – Scenario #1 (Xantrex Inverters)

Point of reception ID	Point of Reception (POR) Description	Overall SPL at POR (dBA)	Verified by Acoustic Audit (Yes/No)	Performance Limit (dBA)	Compliance with Performance Limit (Yes/No)
POR001 – POR 039	Residences to the Northwest of the Solar Farm	19 – 21	N/A	40	Yes
POR040 – POR 044	Residences to the Southwest of the Solar Farm	22 – 28	N/A	40	Yes
POR045 – POR 051	Residences to the Southeast of the Solar Farm	15 - 26	N/A	40	Yes

Table 7: Acoustic Assessment Summary – Scenario #2 (SMA Inverters)

Point of reception ID	Point of Reception (POR) Description	Overall SPL at POR (dBA)	Verified by Acoustic Audit (Yes/No)	Performance Limit (dBA)	Compliance with Performance Limit (Yes/No)
POR001 – POR 039	Residences to the Northwest of the Solar Farm	12 – 14	N/A	40	Yes
POR040 – POR 044	Residences to the Southwest of the Solar Farm	15 – 21	N/A	40	Yes
POR045 – POR 051	Residences to the Southeast of the Solar Farm	7 - 18	N/A	40	Yes

For both scenarios, the overall predicted noise levels for all identified PORs, based on site operations, comply with the performance limits for daytime and night-time operations. As a result, no additional mitigation will be required to ensure compliance with MOE noise guidelines.

7.0 CONCLUSIONS

Golder was retained by First Solar Development Canada Inc. to carry out a Noise Impact Assessment for the proposed Moore Solar Farm located in St. Clair, Ontario. As requested, Golder considered two different scenarios; one with all Xantrex model inverters (2 per station) and the other with all SMA model inverters (two per station). Based on the results presented in this report, it is concluded that the Moore Solar Farm will operate in compliance with MOE noise guidelines using either Xantrex or SMA inverters.

Report Signature Page

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Associate

SI/JT/ng

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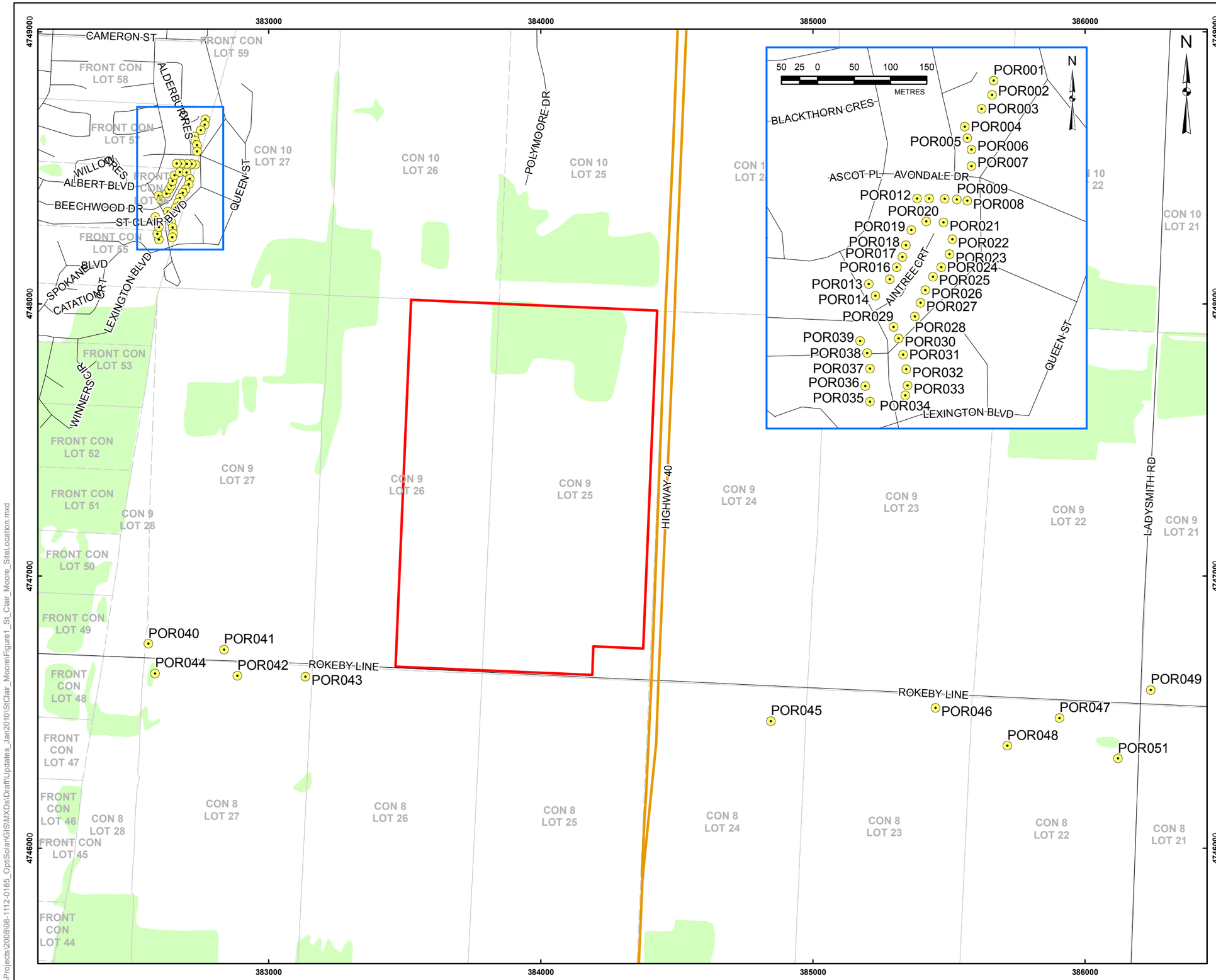
LIST OF FIGURES



LEGEND

- Point of Reception (POR)
- Principal Highway
- Major Road
- Local Road
- Lot and Concessions
- Wooded Area
- Property Boundary

REFERENCE

Base Data - MNR NRVIS, obtained 2004, CANMAP v2006.4
Produced by Golder Associates Ltd under licence from
Ontario Ministry of Natural Resources, © Queens Printer 2009
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 17

100 50 0 100 200 300
METRES

PROJECT
FIRST SOLAR - ST CLAIR MOORE

TITLE
AREA PLAN SHOWING SITE LOCATION AND POINTS OF RECEPTION

Golder Associates
Mississauga, Ontario

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GIS	ME	08 Jan. 2010		
CHECK		08 Jan. 2010		
REVIEW		08 Jan. 2010		

FIGURE: 1

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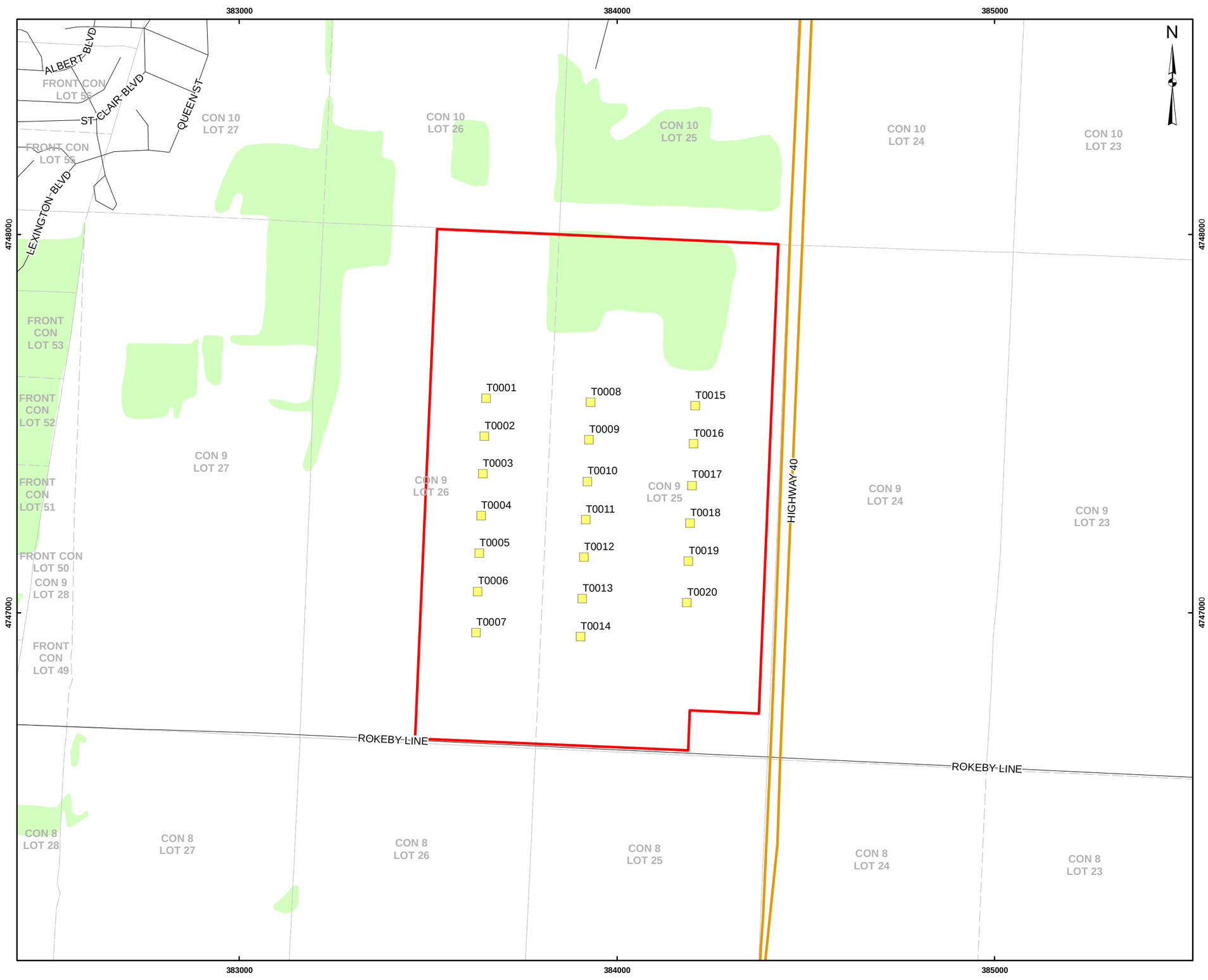

LEGEND

- Source Location
- Principal Highway
- Major Road
- Local Road
- Lot and Concessions
- Wooded Area
- Property Boundary

REFERENCE

Base Data - MNR NRVIS, obtained 2004, CANMAP v2006.4
Produced by Golder Associates Ltd under licence from
Ontario Ministry of Natural Resources, © Queens Printer 2009
Imagery Source: County of Lambton, 2006 30cm Orthophotography; © 2009
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 17

100 50 0 100 200 300
METRES

PROJECT
FIRST SOLAR - ST CLAIRE MOORE

TITLE
SITE PLAN SHOWING SOURCE LOCATIONS

Golder Associates
Mississauga, Ontario

PROJECT No.08-1112-0185			SCALE AS SHOWN	REV. 0.0
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GIS	ME	22 Feb. 2010		
CHECK		22 Feb. 2010		
REVIEW		22 Feb. 2010		

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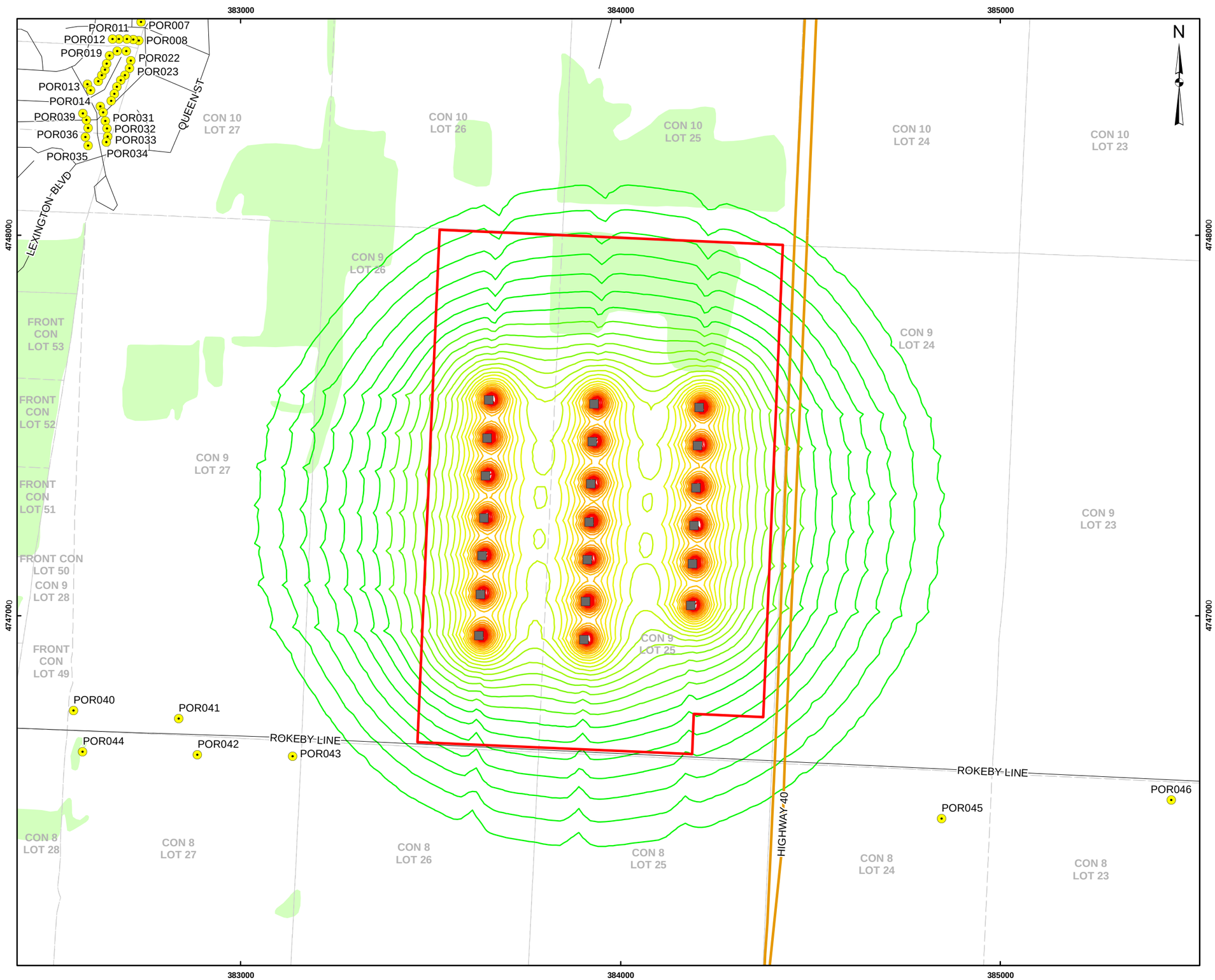

LEGEND

- Source Location
- Point of Reception (POR)
- > 56.0 dB
- > 54.0 dB
- > 52.0 dB
- > 50.0 dB
- > 48.0 dB
- > 46.0 dB
- > 44.0 dB
- > 42.0 dB
- > 40.0 dB
- > 38.0 dB
- > 36.0 dB
- > 0.0 dB
- Principal Highway
- Major Road
- Local Road
- Lot and Concessions
- Wooded Area
- Property Boundary

REFERENCE

Base Data - MNR NRVIS, obtained 2004, CANMAP v2006.4
Produced by Golder Associates Ltd under licence from
Ontario Ministry of Natural Resources, © Queens Printer 2009
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 17

100 50 0 100 200 300
METRES

PROJECT
FIRST SOLAR - ST CLAIR MOORE

TITLE
RESULTS SHOWING PREDICTED EQUIVALENT SOULD LEVEL CONTOURS - SCENARIO #1

Golder Associates
Mississauga, Ontario

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CHECK		22 Feb. 2010		
REVIEW		22 Feb. 2010		

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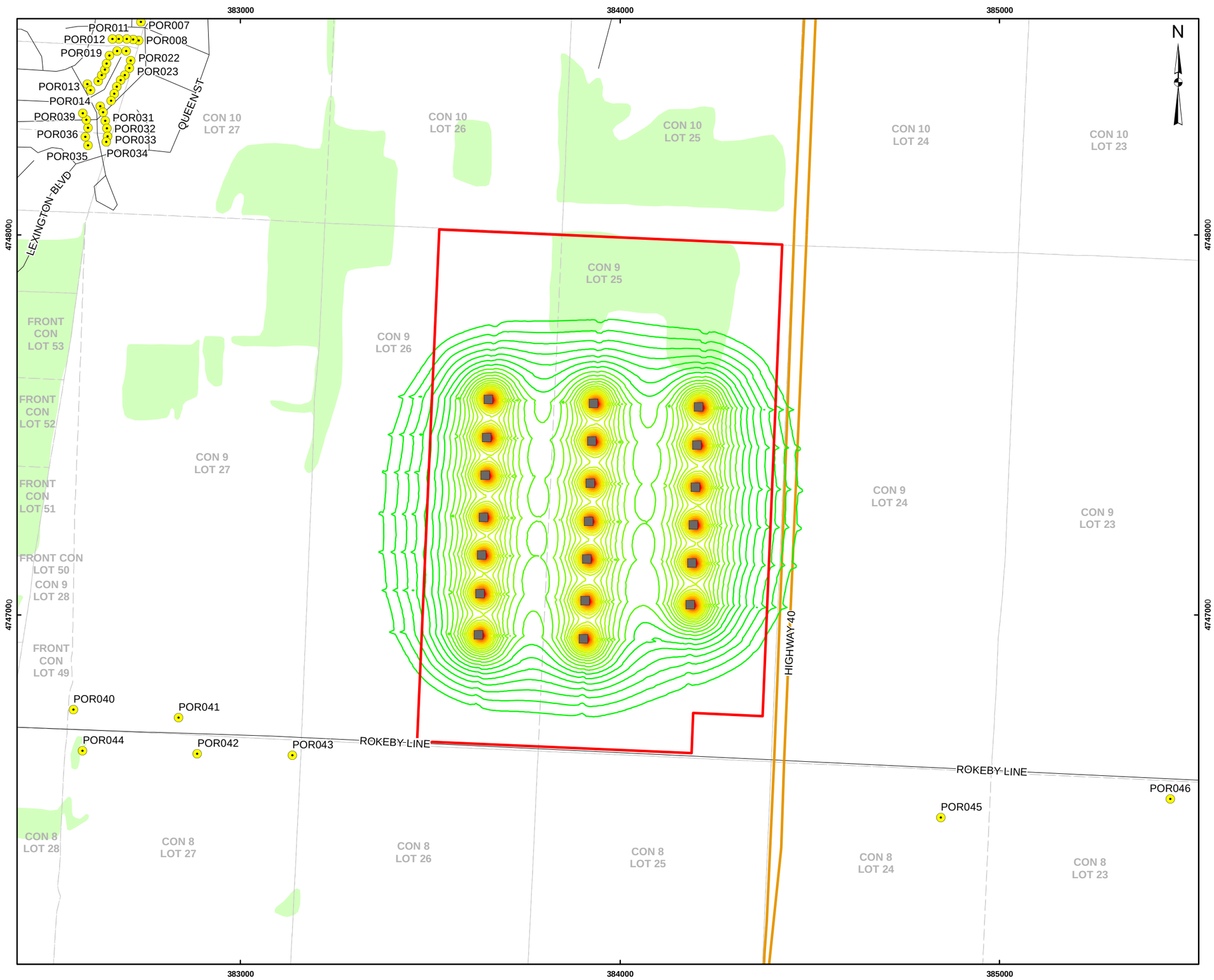

LEGEND

- Source Location
- Point of Reception (POR)
- > 56.0 dB
- > 54.0 dB
- > 52.0 dB
- > 50.0 dB
- > 48.0 dB
- > 46.0 dB
- > 44.0 dB
- > 42.0 dB
- > 40.0 dB
- > 38.0 dB
- > 36.0 dB
- > 0.0 dB
- Principal Highway
- Major Road
- Local Road
- Lot and Concessions
- Wooded Area
- Property Boundary

REFERENCE

Base Data - MNR NRVIS, obtained 2004, CANMAP v2006.4
Produced by Golder Associates Ltd under licence from
Ontario Ministry of Natural Resources, © Queens Printer 2009
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 17

100 50 0 100 200 300
METRES

PROJECT
FIRST SOLAR - ST CLAIR MOORE

TITLE
RESULTS SHOWING PREDICTED EQUIVALENT SOULD LEVEL CONTOURS - SCENARIO #2

Golder Associates
Mississauga, Ontario

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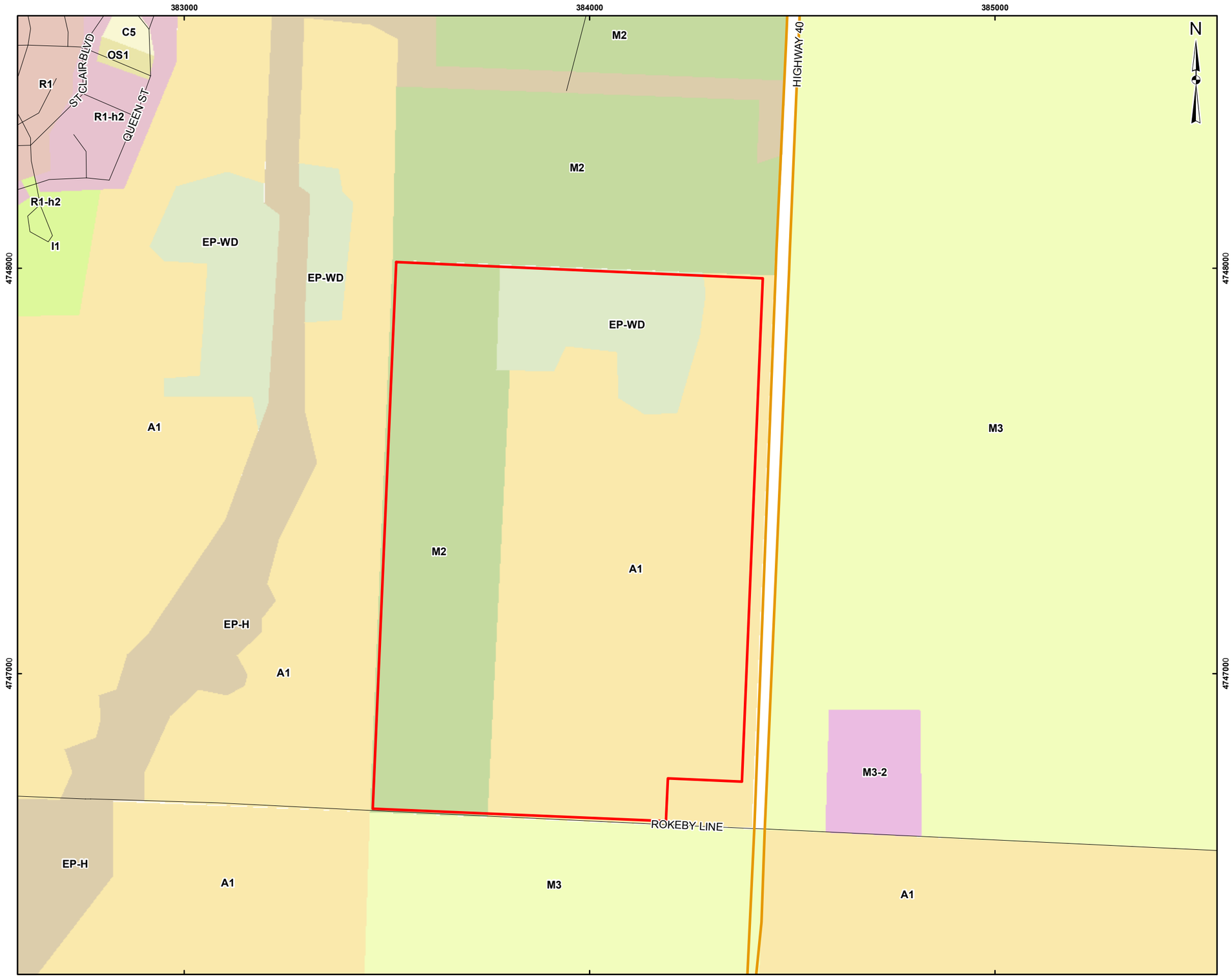
APPENDIX A

Land Use Zoning Plan



LEGEND

- Principal Highway
- Major Road
- Local Road
- Property Boundary

Zoning

- A1: Agricultural 1
- A1-4: Agricultural Exception
- C5: Neighbourhood Commercial
- EP-H: Environmental Protection - Hazard
- EP-WD: Environmental Protection - Woodlot
- I1: Institutional
- M2: Industrial - Type 2
- M3: Industrial - Type 3
- M3-2: Industrial - Type 3 Exception
- OS1: Open Space
- R1: Residential 1
- R1-h2: Residential 1 Holding

REFERENCE

Base Data - MNR NRVIS, obtained 2004, CANMAP v2006.4
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Ontario Ministry of Natural Resources, © Queens Printer 2009
Imagery Source: County of Lambton, 2006 30cm Orthophotography; © 2009
Zoning: County of Lambton, obtained Jan. 2009
Projection: Transverse Mercator Datum: NAD 83 Coordinate System: UTM Zone 17

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PROJECT
FIRST SOLAR - ST CLAIR MOORE

TITLE
ZONING PLAN

Golder Associates
Mississauga, Ontario

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GIS	JO	08 Jan. 2010		
CHECK		08 Jan. 2010		
REVIEW		08 Jan. 2010		

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APPENDIX B

Description of Technical Terms

DESCRIPTION OF TECHNICAL TERMS

To help understand the analysis and recommendations made in this report, the following is a brief discussion of technical terms.

The strength of a sound source is described in terms of either sound pressure level (SPL) or sound power level (PWL) and are expressed on a logarithmic scale with reference to the lowest possible sound pressure ($2x10^{-5}$ Pa) or power (10^{-12} W) level that human ear can hear. With this appropriate reference parameter the resulting logarithmic scale is referred to as "decibel" (dB). The SPL is thus represented as dB re $2x10^{-5}$ Pa and PWL as dB re 10^{-12}W.

Since the scale is logarithmic, a source that is twice the strength as another will have a level three decibels (3 dB) higher sound power. SPL attenuates at a rate of 6 dB per doubling of distance.

The sound data and analysis in this report have been given in terms of octave band frequency distribution. Typically, each octave band is expressed in terms of its centre frequency, namely 31. 5, 63, 125, 250, 500, 1000, 2000, 4000 and 8000 Hertz (Hz.).

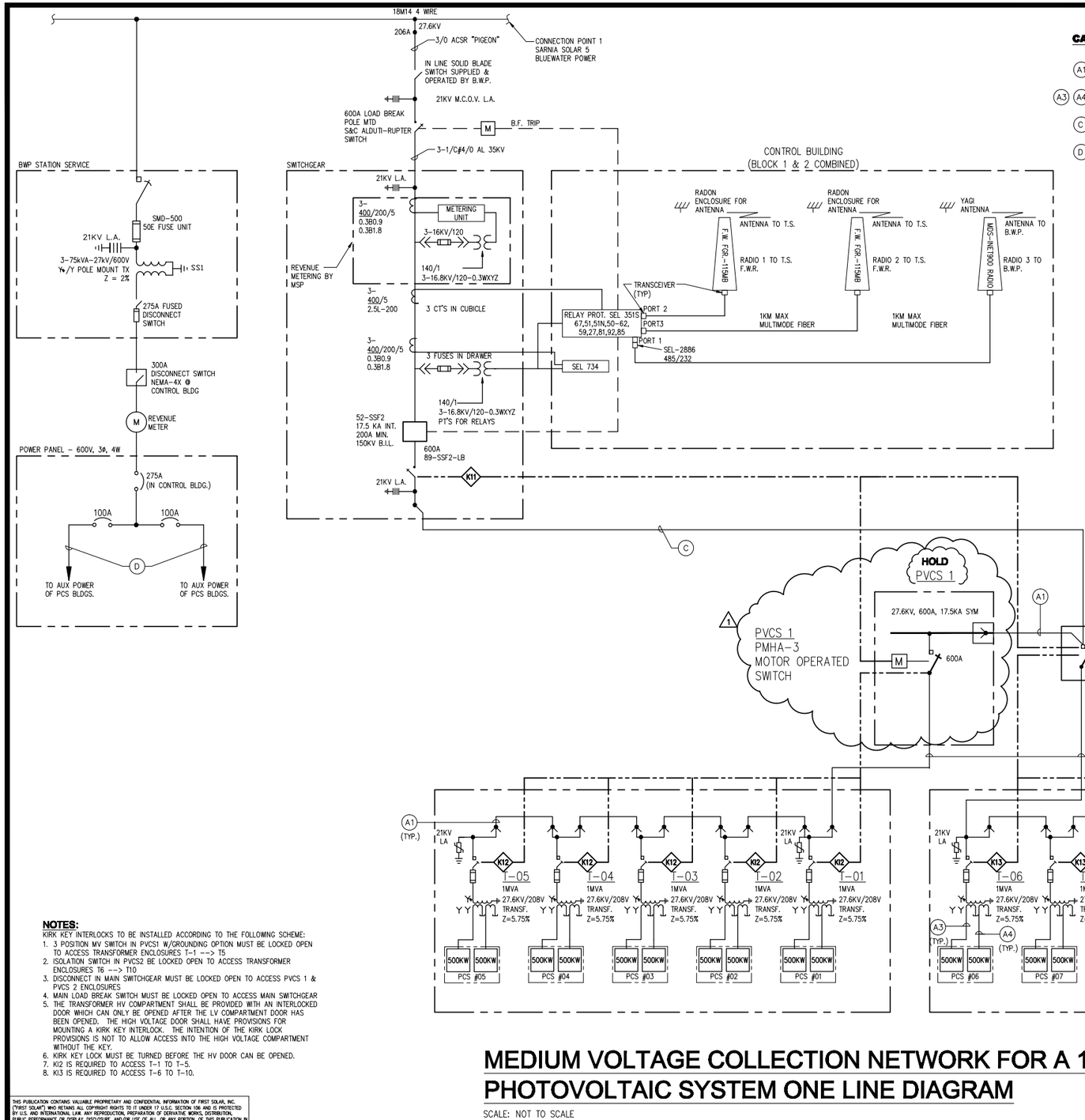
Human ears are most sensitive in the 500 to 4000 Hz frequency range, above and below this range; the ear is progressively less sensitive to sound. Therefore in order to express sound level more representative of the human hearing response, a weighting is typically applied to each octave band. The most commonly used weighting is called "A-weighting".

It is common practice to express the sound levels over the entire audible spectrum (i. e., 20 Hz to 20 kHz) as an overall sound level (a single number). The overall A-weighted sound level is often used as a criterion to indicate a maximum allowable sound level.

Environmental noise levels vary over time, and are described in terms of one hour energy equivalent sound level, L_{eq} [1 hour]. The Leq is the energy equivalent continuous sound level, which has the same energy as the time varying noise over a prescribed one hour period.

APPENDIX C

System Operation Diagram



MEDIUM VOLTAGE COLLECTION NETWORK FOR A 10MW AC PHOTOVOLTAIC SYSTEM ONE LINE DIAGRAM

SCALE: NOT TO SCALE

CABLE SCHEDULE:

- (A1) (3)-1/C #2/0 TRXLPE AL (28KV) DIRECT BURIAL CABLE WITH CONCENTRIC CU GND WIRE.
- (A3) (A4) 4 SETS OF CU. (3)-1/C #500kcmil & (1) #350kcmil CU BONDING CABLE FOR EACH 500 KW INVERTER.
- (C) 2 SETS OF (3)-1/C #2/0 TRXLPE AL (28KV) DIRECT BURIAL CABLE WITH CONCENTRIC CU GND WIRE.
- (D) 600V 3/C #500MCM CU. CABLE WITH #2 CU. GND DIRECT BURIAL CABLE.

NOTES:

1. THIS DRAWING REPRESENTS ONE PROPOSED ARRANGEMENT AND IS SUBJECT TO CHANGE BASED UPON THE DETAILED DESIGN.

LEGEND:

- 500KW — EQUIPMENT ENCLOSURE – METAL ENCLOSED OR METAL CLAD TYPICAL 500KW SOLAR PHOTOVOLTAIC INVERTER W/SHORT CIRCUIT & O/C PROTECTION CONFORMS TO UL-1741
- DUAL WINDING TRANSFORMER
- MEDIUM VOLTAGE FUSED DISCONNECT
- SURGE ARRESTER
- VACUUM FAULT INTERRUPTER OR CIRCUIT BREAKER
- M — METER (REVENUE) WITH REMOTE COMMUNICATION CAPABILITIES
- POTENTIAL TRANSFORMER (REVENUE)
- CURRENT TRANSFORMER (METERING)
- CURRENT TRANSFORMER (REVENUE)
- L.A. — LIGHTNING ARRESTOR, DISTRIBUTION CLASS
- Y — FLOATING WYE
- Y — GROUNDED WYE
- DEAD FRONT ELBOW CONNECTIONS
- MEDIUM VOLTAGE DEAD FRONT STRESS RELIEF TERMINATION
- 3 POSITION MV SWITCH W/GROUNDING OPTION
- 52 — SF6 1200A CIRCUIT BREAKER
- 27 — UNDERVOLTAGE RELAY
- 59 — OVERVOLTAGE RELAY
- 32 — DIRECTIONAL POWER RELAY
- 67 — AC DIRECTIONAL OVERCURRENT
- 50 — INSTANTANEOUS OVERCURRENT
- 51 — TIME OVERCURRENT
- 81 — FREQUENCY RELAY
- 85 — REMOTE TRIP RECIEVED FROM HYDRO ONE, AND L.E.O. SENT TO HYDRO ONE

PCS = POWER CONVERSION STATION

PVCS = PHOTOVOLTAIC SYSTEM COMBINING SWITCHGEAR

PVIS = PHOTOVOLTAIC SYSTEM INTERCONNECTION SWITCHGEAR

NOTES:

KIRK KEY INTERLOCKS TO BE INSTALLED ACCORDING TO THE FOLLOWING SCHEME:

1. 3 POSITION MV SWITCH IN PVCS1 W/GROUNDING OPTION MUST BE LOCKED OPEN TO ACCESS TRANSFORMER ENCLOSURES T-1 --> T5
2. ISOLATION SWITCH IN PVCS2 BE LOCKED OPEN TO ACCESS TRANSFORMER ENCLOSURES T6 --> T10
3. DISCONNECT IN MAIN SWITCHGEAR MUST BE LOCKED OPEN TO ACCESS PVCS 1 & PVCS 2 ENCLOSURES
4. MAIN LOAD BREAK SWITCH MUST BE LOCKED OPEN TO ACCESS MAIN SWITCHGEAR
5. THE TRANSFORMER HV COMPARTMENT SHALL BE PROVIDED WITH AN INTERLOCKED DOOR WHICH CAN ONLY BE OPENED AFTER THE LV COMPARTMENT DOOR HAS BEEN OPENED. THE HIGH VOLTAGE DOOR SHALL HAVE PROVISIONS FOR MOUNTING A KIRK KEY INTERLOCK. THE INTENTION OF THE KIRK LOCK PROVISIONS IS NOT TO ALLOW ACCESS INTO THE HIGH VOLTAGE COMPARTMENT WITHOUT THE KEY.
6. KIRK KEY LOCK MUST BE TURNED BEFORE THE HV DOOR CAN BE OPENED.
7. KI2 IS REQUIRED TO ACCESS T-1 TO T-5.
8. KI3 IS REQUIRED TO ACCESS T-6 TO T-10.

FIRST SOLAR DEVELOPMENT (CANADA)
5115 BLACKWELL SIDEROAD
SARNIA, ONTARIO
N7T 7H3

elecsar
Elecsar Engineering Co. Limited
1140 Vanier Rd., Suite 1001
Sarnia, Ontario
N7T 3Y6

SARNIA SOLAR
PHOTOVOLTAIC
POWER PLANT
SITE PLAN CONTROL
AGREEMENT

REV	DATE	DESCRIPTION
1	7-15-09	ISSUED FOR CONSTRUCTION
0	7-08-09	ISSUED FOR CONSTRUCTION
A	6-25-09	IFB ISSUED FOR BID
		ISSUE 2-28-08

PROJ NO: 5025-0106-22
CAD DWG FILE: E-100-1
DRAWN BY: RICK BRADY
CHECKED BY: KC
SCALE: NTS
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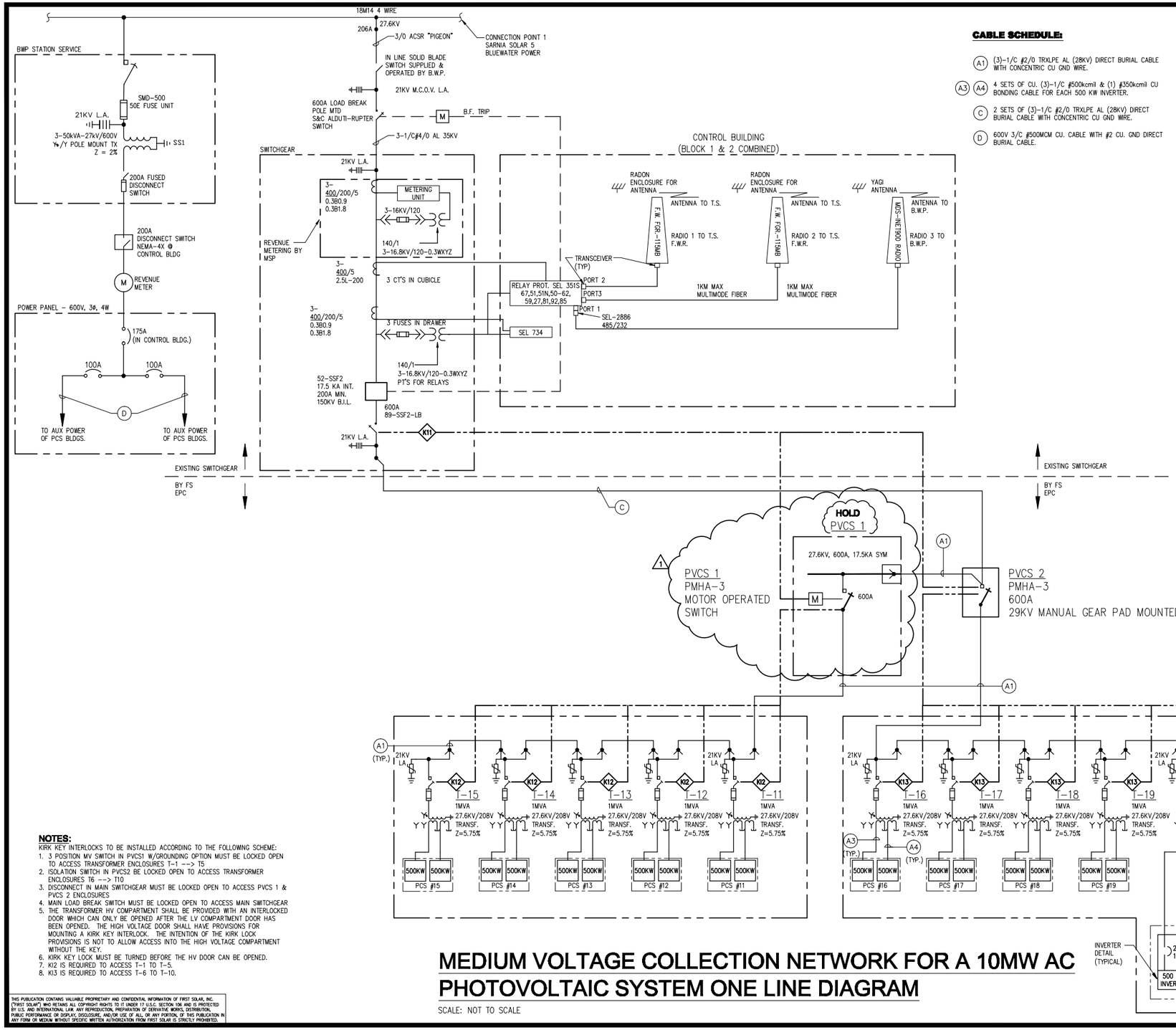
SHEET TITLE

BLOCK-1
M.V. ONE LINE DIAGRAM

E-100-1

SHEET OF



CABLE SCHEDULE:

- (A1) (3)-1/C #2/0 TRXLPE AL (28KV) DIRECT BURIAL CABLE WITH CONCENTRIC CU GND WIRE.
- (A3) (A4) 4 SETS OF CU. (3)-1/C #500kcmil & (1) #350kcmil CU BONDING CABLE FOR EACH 500 KW INVERTER.
- (C) 2 SETS OF (3)-1/C #2/0 TRXLPE AL (28KV) DIRECT BURIAL CABLE WITH CONCENTRIC CU GND WIRE.
- (D) 600V 3/C #500MCM CU. CABLE WITH #2 CU. GND DIRECT BURIAL CABLE.

NOTES:

1. THIS DRAWING REPRESENTS ONE PROPOSED ARRANGEMENT AND IS SUBJECT TO CHANGE BASED UPON THE DETAILED DESIGN.

LEGEND:

- 500KW — EQUIPMENT ENCLOSURE – METAL ENCLOSED OR METAL CLAD TYPICAL 500KW SOLAR PHOTOVOLTAIC INVERTER W/SHORT CIRCUIT & O/C PROTECTION CONFORMS TO UL-1741
- DUAL WINDING TRANSFORMER
- MEDIUM VOLTAGE FUSED DISCONNECT
- SURGE ARRESTER
- VACUUM FAULT INTERRUPTER OR CIRCUIT BREAKER
- M — METER (REVENUE) WITH REMOTE COMMUNICATION CAPABILITIES
- POTENTIAL TRANSFORMER (REVENUE)
- CURRENT TRANSFORMER (METERING)
- CURRENT TRANSFORMER (REVENUE)
- L.A. — LIGHTNING ARRESTOR, DISTRIBUTION CLASS
- FLOATING WYE
- GROUNDED WYE
- DEAD FRONT ELBOW CONNECTIONS
- MEDIUM VOLTAGE DEAD FRONT STRESS RELIEF TERMINATION
- 3 POSITION MV SWITCH W/GROUNDING OPTION
- 52 — SF6 1200A CIRCUIT BREAKER
- 27 — UNDERVOLTAGE RELAY
- 59 — OVERVOLTAGE RELAY
- 32 — DIRECTIONAL POWER RELAY
- 67 — AC DIRECTIONAL OVERCURRENT
- 50 — INSTANTANEOUS OVERCURRENT
- 51 — TIME OVERCURRENT
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6. KIRK KEY LOCK MUST BE TURNED BEFORE THE HV DOOR CAN BE OPENED.
7. KI2 IS REQUIRED TO ACCESS T-1 TO T-5.
8. KI3 IS REQUIRED TO ACCESS T-6 TO T-10.

MEDIUM VOLTAGE COLLECTION NETWORK FOR A 10MW AC PHOTOVOLTAIC SYSTEM ONE LINE DIAGRAM

SCALE: NOT TO SCALE

FIRST SOLAR DEVELOPMENT (CANADA)
5115 BLACKWELL SIDEROAD
SARNIA, ONTARIO
N7T 7H3

elecsar
Elecsar Engineering Co. Limited
1149 Vanier Rd., Suite 1001
Sarnia, Ontario
N7T 8Y6

SARNIA SOLAR
PHOTOVOLTAIC
POWER PLANT
SITE PLAN CONTROL
AGREEMENT

REV	DATE	DESCRIPTION
1	7-15-09	ISSUED FOR CONSTRUCTION
O	7-08-09	ISSUED FOR CONSTRUCTION
E	6-25-09	IFB- ISSUED FOR BID
D	6-22-09	ISSUED ESA PERMIT
C	6-5-09	UPDATED PER ELECSAR COMMENTS
B	5-29-09	ISSUED - ESA PERMIT
A	5-21-09	ISSUED FOR ESA REVIEW
		ISSUE FB – ISSUED FOR BID

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CAD DWG FILE: E-100-2
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CHECKED BY: KC
SCALE: NTS
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SHEET TITLE

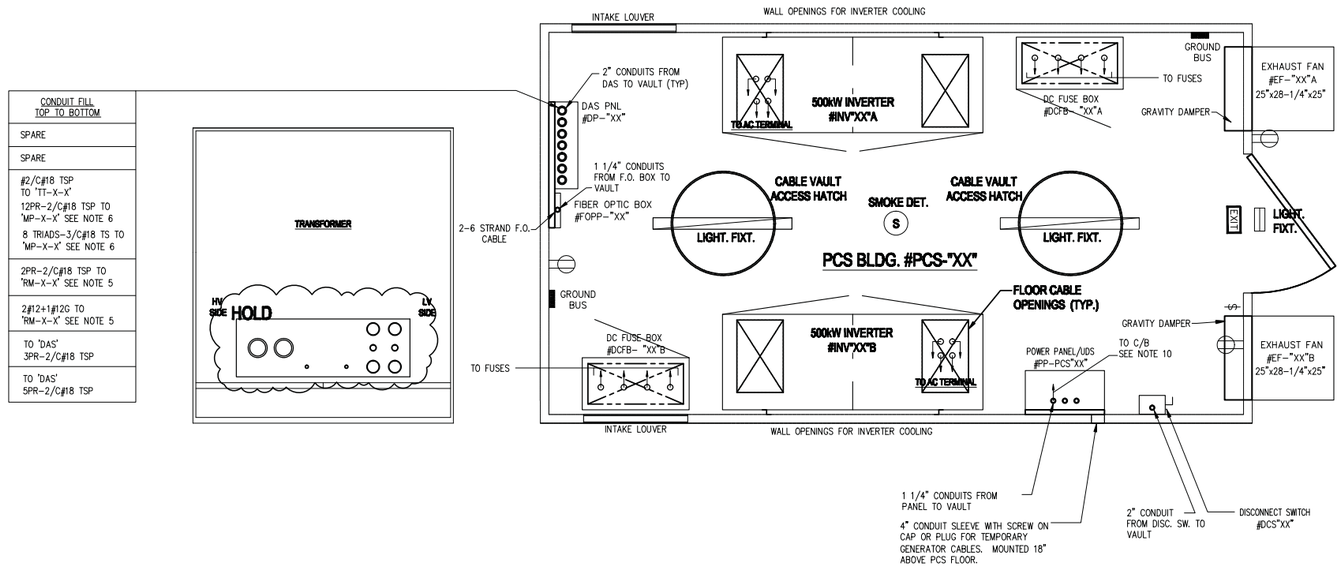
BLOCK 2
M.V. ONE LINE DIAGRAM

E-100-2

SHEET OF

APPENDIX D

Concrete Enclosure Details



CONDUIT FILL TOP TO BOTTOM
SPARE
SPARE
#2/C#18 TSP TO 'TT-X-X' 12PR-2/C#18 TSP TO 'MP-X-X' SEE NOTE 6 8 TRIADS-3/C#18 TS TO 'MP-X-X' SEE NOTE 6
2PR-2/C#18 TSP TO 'RM-X-X' SEE NOTE 5
2#12+1#12G TO 'RM-X-X' SEE NOTE 5
TO 'DAS' 3PR-2/C#18 TSP
TO 'DAS' 5PR-2/C#18 TSP

N

TYPICAL PCS BLDG. ELECTRICAL FLOOR PLAN

SCALE: 1/2" = 1'-0"

POWER PANEL/UDS TAG. NO.: PP-PCS"XX"
MANUFACTURER: CUTLER-HAMMER
MODEL/CAT. NO.: MINI POWER CENTER

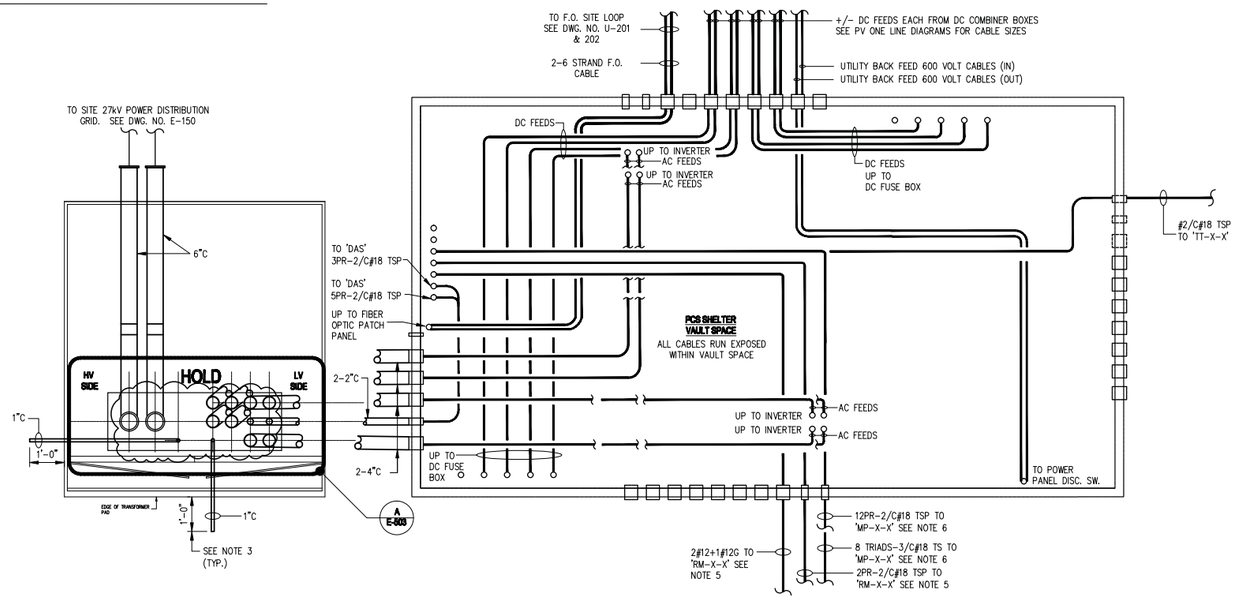
TRANSFORMER RATING: 22.5KVA, 3ø

PANELBOARD RATING:
MAIN BREAKER SIZE: 100A

A B C

CKT. NO.	BKR. SIZE	LOAD	LOAD (VA)	TOTAL (VA)	TOTAL (VA)	LOAD (VA)	LOAD	BKR. SIZE	CKT. NO.
1	20A 3P	INVERTER 'A'	6000	1200	320		LIGHTS – INTERIOR	20A	2
3				1200	43		LIGHTS – EXTERIOR & INT. EXIT	20A	4
5				1200	360		CONV. RECEPT. (INT. & ROOF)	20A	6
7	20A 3P	INVERTER 'B'	6000	1200	700		DAS PANEL	20A	8
9				1200	50		HVAC CONTROL RELAY	20A	10
11				1200	100	500	SMOKE DETECTOR	20A	12
13	20A	EXH. FAN-1		500			SPARE	20A	14
15	20A	LOUVER-1		600			SPACE	–	16
17	20A	EXH. FAN-2		500			SPACE	–	18
19	20A	LOUVER-2		600			SPACE	–	20

LOADS (VA):		LOADS (A):	
PHASE A (VA):	4620	PHASE A (AMPS):	38.50
PHASE B (VA):	3953	PHASE B (AMPS):	29.53
PHASE C (VA):	3840	PHASE C (AMPS):	29.00



N

TYPICAL PCS BLDG. ELECTRICAL UNDERGROUND PLAN

SCALE: 1/2" = 1'-0"

REFERENCE STANDARD SPECIFICATION:

1. DWG NO. E-001
   ELECTRICAL TYPICAL NOTES, SYMBOLS & ABBREVIATIONS
2. DWG NOs. S-301 THRU S-304
   TYPICAL PCS BUILDING PLANS AND DETAILS

NOTES:

1. WORK THIS DWG. WITH THE STANDARD SPECIFICATION SS-17000 AND ALL OTHER DRAWINGS LISTED UNDER ATTACHMENTS.
2. FOR EQUIPMENT WIRING AND INTERCONNECTION DIAGRAM, SEE THE BLOCK WIRING DIAGRAM ON DWG NO. E-710.
3. DISTANCE OF UNDERGROUND CONDUIT TO EXTEND BEYOND PAD EDGE.
4. ALL ELECTRICAL WORK ON THIS DWG IS TYPICAL FOR ALL PCS SHELTERS, UNLESS OTHERWISE NOTED.
5. ALL CABLES ASSOCIATED WITH 'RM-X-X' IS ONLY TYPICAL FOR PCS SHELTER #'s AS FOLLOWS:
   PCS-01, PCS-03, PCS-05, PCS-11, PCS-13 AND PCS-15,
6. ALL CABLES ASSOCIATED WITH 'MP-X-X' IS ONLY TYPICAL FOR PCS SHELTER #'s AS FOLLOWS:
   PCS-03 & PCS-13
7. ALL DAS EQUIPMENT CABLES ARE ENTERING VIA CONDUITS TO PCS SHELTER BLDG..
8. REFER TO STRUCTURAL DWGS. FOR EXACT LOCATION OF PCS SHELTER AND TRANSFORMER.
9. REFER TO THE FOLLOWING DRAWINGS FOR THE DC CABLING FROM DC COMBINER BOX TO DC FUSE BOX:
   A) PV ONE LINE DIAGRAMS
      DWGS. NOs. E-102-1 & E-102-2.
10. REFER TO PANEL SCHEDULE IN THIS DWG. FOR CIRCUITS:

FIRST SOLAR DEVELOPMENT (CANADA)
5115 BLACKWELL SIDEROAD
SARNIA, ONTARIO
N7T 7H3

elecsar
Elecsar Engineering Co. Limited
1149 Vanier Rd., Suite 1001
Sarnia, Ontario
N7T 3Y6

REV	DATE	DESCRIPTION
O	7-15-09	ISSUED FOR CONSTRUCTION
D	6-25-09	ISSUED FOR BID
C	6-22-09	ISSUED FOR ESA PERMIT
B	5-29-09	ISSUED FOR ESA PERMIT
A	5-29-09	ISSUED FOR ESA PERMIT
	ISSUE: 2-28-08	

SARNIA SOLAR
PHOTOVOLTAIC POWER PLANT
SITE PLAN CONTROL AGREEMENT

PROJ NO: 5025-0106-22
CAD DWG FILE: E-500
DRAWN BY: RICK BRADY
CHECKED BY: AP
SCALE: NTS
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SHEET TITLE
TYP. PCS BLDG. ELECTRICAL PLAN

E-500

SHEET OF

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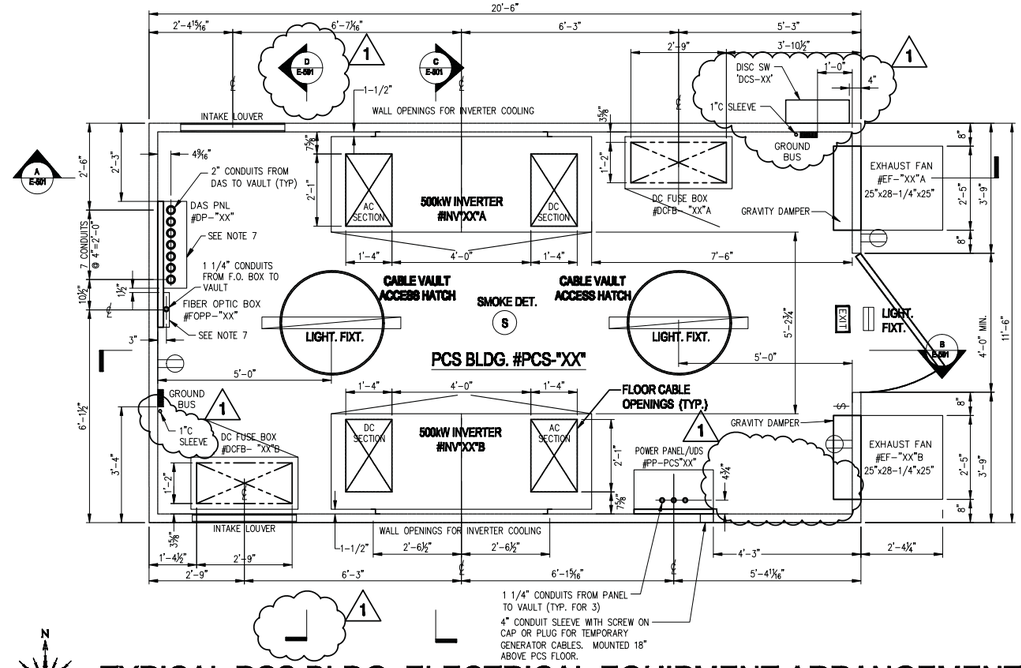
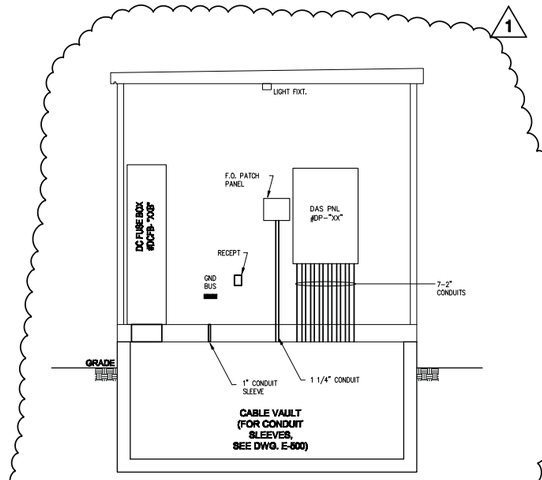


TYPICAL PCS BLDG. ELECTRICAL EQUIPMENT ARRANGEMENT PLAN

SCALE: 1/2" = 1'-0"



D E-501 SECTION
PCS BUILDING ELEVATION

SCALE: NTS

REFERENCE STANDARD SPECIFICATION:

1. DRAWING NO. E-100
   ELECTRICAL TYPICAL NOTES, SYMBOLS & ABBREVIATIONS
2. DRAWING NOS. S-301 THRU S-304
   TYPICAL PCS BUILDING PLANS AND DETAILS

NOTES:

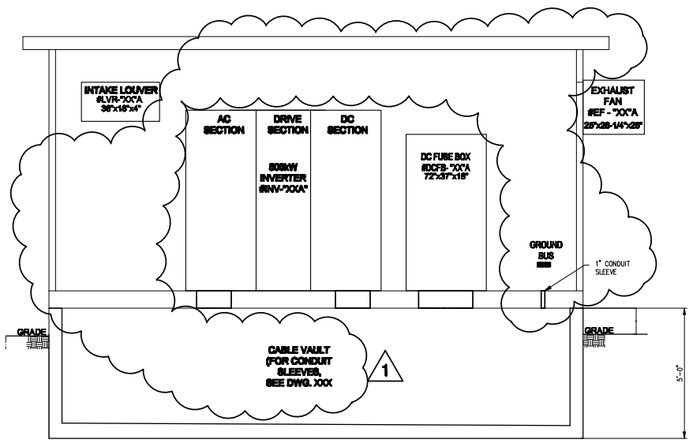
1. WORK THIS DWG. WITH THE STANDARD SPECIFICATION SS-17000 AND ALL OTHER DRAWINGS LISTED UNDER ATTACHMENTS.
2. FOR EQUIPMENT WIRING AND INTERCONNECTION DIAGRAM, SEE THE BLOCK WIRING DIAGRAM ON DWG. NO. E-711.
3. DISTANCE OF UNDERGROUND CONDUIT TO EXTEND BEYOND PAD EDGE.
4. ALL ELECTRICAL WORK ON THIS DWG. IS TYPICAL FOR ALL PCS SHELTERS, UNLESS OTHERWISE NOTED.
5. ALL CABLES ASSOCIATED WITH "RM-X-X" IS ONLY TYPICAL FOR PCS SHELTER #'s AS FOLLOWS:

   PCS-01, PCS-03, PCS-05, PCS-16, PCS-18, PCS-20, PCS-21, PCS-23, PCS-25, PCS-31, PCS-35, PCS-40, PCS-41, PCS-43 & PCS-45
6. ALL CABLES ASSOCIATED WITH "MP-X-X" IS ONLY TYPICAL FOR PCS SHELTER #'s AS FOLLOWS:

   PCS-03, PCS-16, PCS-21, PCS-40 & PCS-45
7. ALL CABLING TO ENTER EQUIPMENT THROUGH EXISTING PCS SHELTER CONDUITS AS INDICATED.
8. REFER TO STRUCTURAL DWGS. FOR EXACT LOCATION OF PCS SHELTER AND TRANSFORMER.
9. REFER TO THE FOLLOWING DRAWINGS FOR THE DC CABLING FROM DC COMBINER BOX TO DC FUSE BOX:

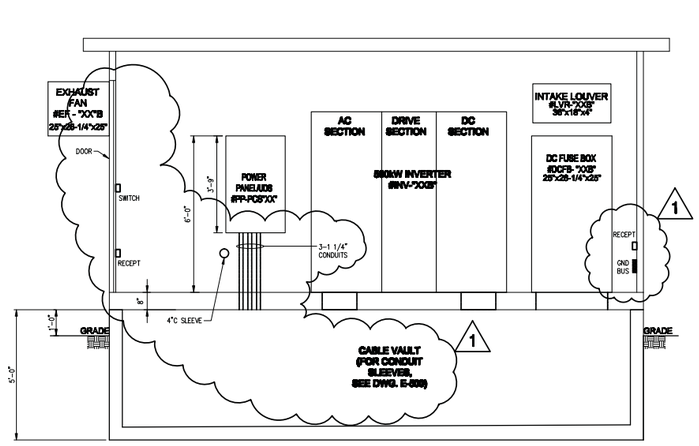
   A) PV ONE LINE DIAGRAMS
      DWGS. NO. E-101 THROUGH E-108

   B) UTILITY PLANS
      DWGS. NO. E-111 THROUGH E-123 AND DWGS. NO. E-132 THROUGH E-144



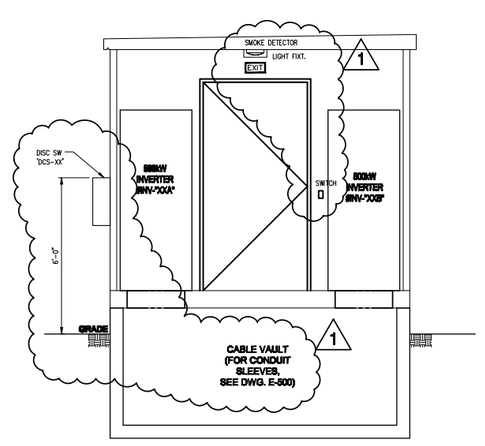
A E-501 SECTION
PCS BUILDING ELEVATION

SCALE: NTS



B E-501 SECTION
PCS BUILDING ELEVATION

SCALE: NTS



C E-501 SECTION
PCS BUILDING ELEVATION

SCALE: NTS

FIRST SOLAR DEVELOPMENT (CANADA)
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SARNIA, ONTARIO
N7T 7H3

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Sarnia, Ontario
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SARNIA SOLAR
PHOTOVOLTAIC
POWER PLANT
SITE PLAN CONTROL
AGREEMENT

REV	DATE	DESCRIPTION
1	8-5-09	REISSUED FOR CONSTRUCTION
0	7-15-09	ISSUED FOR CONSTRUCTION

ISSUE: 7-28-08

PROJ NO: 5025-0106-22
CAD DWG FILE: E-501
DRAWN BY: GC
CHECKED BY: GN
SCALE: AS SHOWN
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SHEET TITLE

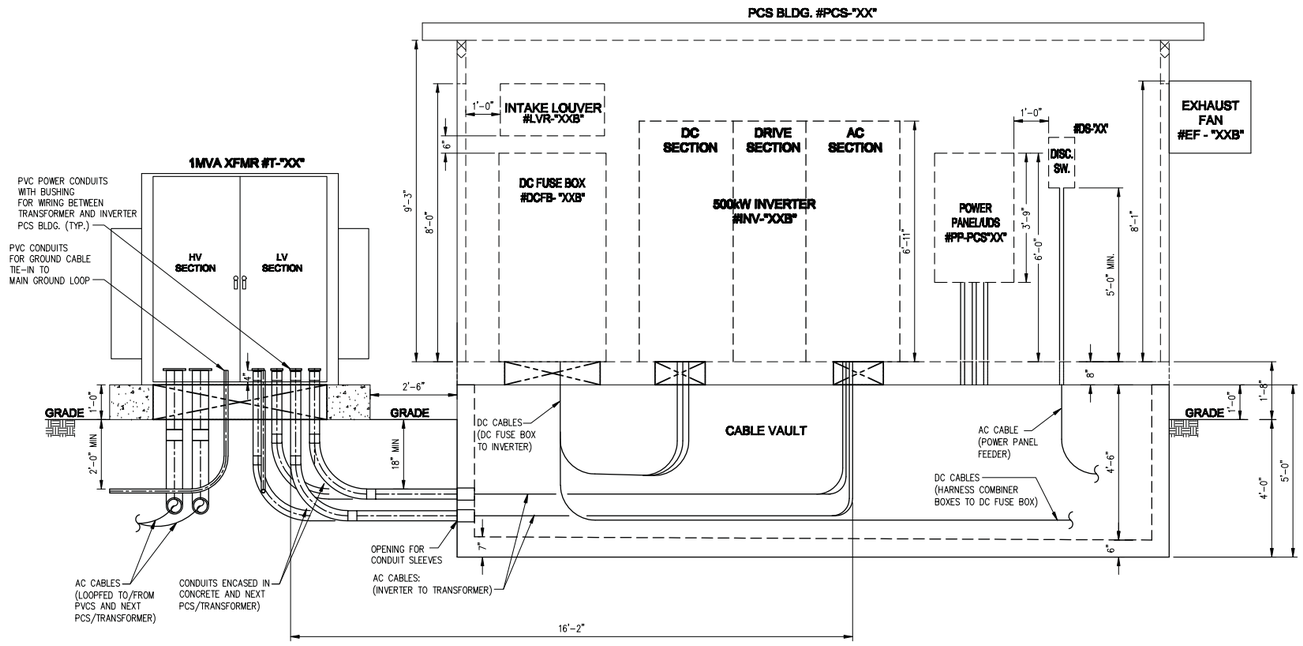
TYP. PCS BLDG. ELECTRICAL EQUIP. ARRANGEMENT PLAN

E-501

SHEET OF

REFERENCE STANDARD SPECIFICATION:

1. DWG NO. E-001
   ELECTRICAL TYPICAL NOTES, SYMBOLS & ABBREVIATIONS
2. DWG NOs. S-301 THRU S-304
   TYPICAL PCS BUILDING PLANS AND DETAILS
3. DWG NO. E-503
   TYP. PCS BLDG. ELECTRICAL EQUIP. ARRANGEMENT PLAN



TRANSFORMER & PCS BUILDING ELEVATION VIEW (SHOWING INVERTER "B")

SCALE: 1/2" = 1'-0"

2' 1' 0 2' 6"

FIRST SOLAR DEVELOPMENT (CANADA)
5115 BLACKWELL SIDEROAD
SARNIA, ONTARIO
N7T 7H3

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Elecsar Engineering Co. Limited
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Sarnia, Ontario
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SARNIA SOLAR
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A	7-10-09	ISSUED FOR REVIEW
	ISSUE: 2-28-08	

PROJ NO: 5025-0106-22
CAD DWG FILE: E-504
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SCALE: AS NOTED
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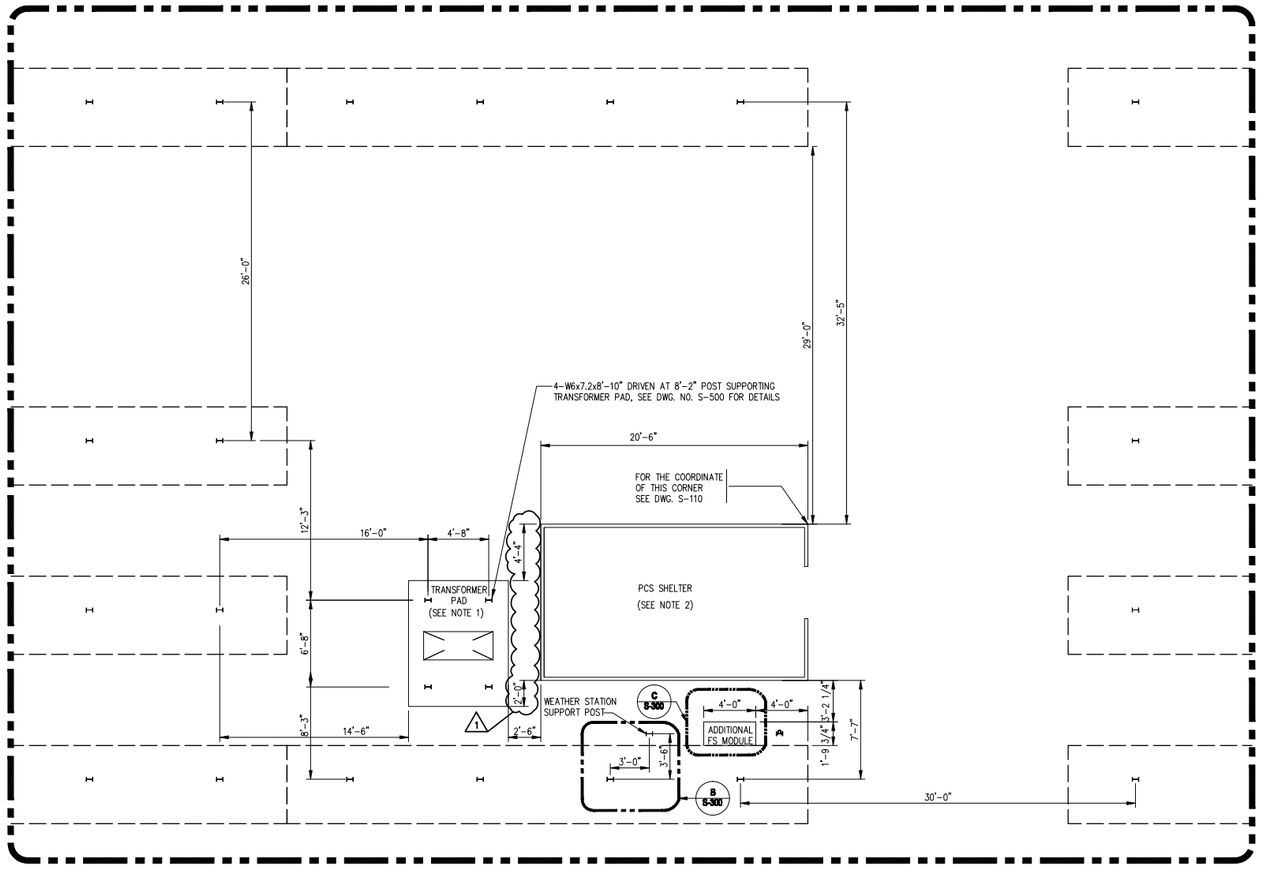
SHEET TITLE

TYPICAL PCS BUILDING SECTION & DETAIL

E-504

SHEET OF



N

DETAIL "A"
TYPICAL PCS SHELTER & TRANSFORMER PAD LAYOUT

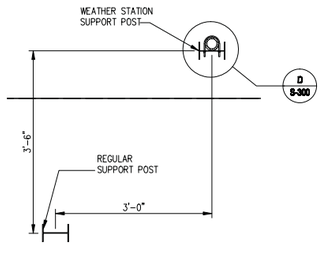
5'-4" 2'-8" 0 5'-4" 16'-0"

REFERENCE DRAWINGS:

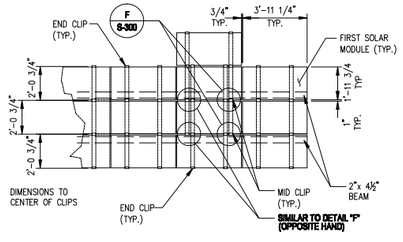
1. DWG. NO. S-000
   NOTES, SYMBOLS & ABBREVIATIONS
2. DWG. NO. S-100
   OVERAL SITE KEY PLAN
3. DWG. NO. S-112
   TYPICAL POST LAYOUT ARRAY TYPE II
4. DWG. NO. S-110
   SCHEDULE OF COORDINATES & ELEVATIONS
5. DWG. NO. S-200
   TYPICAL TABLES PLANS & ELEVATIONS
6. DWG. NO. S-201
   ASSEMBLY DETAILS

NOTES:

1. FOR THE DETAILED INFORMATION OF THE TRANSFORMER PAD, SEE DWG. NO. S-500
2. FOR THE DETAILED INFORMATION OF THE PCS SHELTER, SEE DWG. NO. S-301 TO S-304



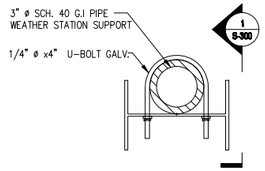
DETAIL "B"
WEATHER STATION SUPPORT POST
FOR ARRAYS N0. 3 & 13)



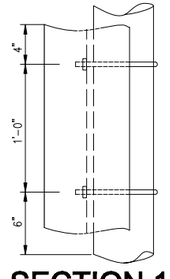
NOTES:

FOR DETAIL VIEW PERPENDICULAR TO MODULE SURFACE
SEE DETAIL "A" ON DWG. NO. S-200 FOR TYPICAL DIMENSIONS

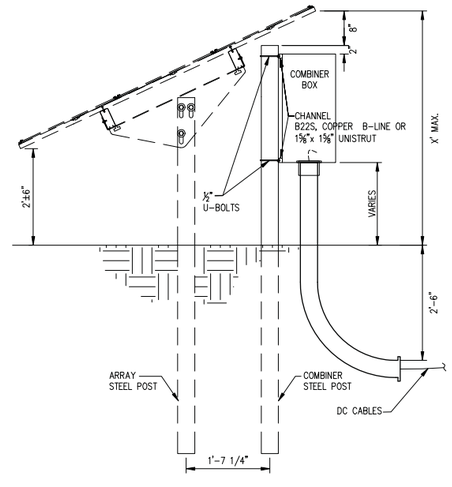
DETAIL "C"
ADDITIONAL PANEL FOR PERFORMANCE MONITORING
(FOR ARRAYS N0. 1, 3, 5, 11, 13 & 15)



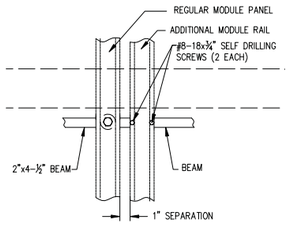
DETAIL "D"
SCALE: N.T.S



SECTION 1
SCALE: N.T.S



DETAIL "E"
SCALE: N.T.S



DETAIL "F"
SCALE: N.T.S

REV	DATE	REVISION DESCRIPTION	BY	CHK	APP
1	07-15-2009	REISSUED FOR CONSTRUCTION	GC	HBC	MPP
0	07-08-2009	ISSUED FOR CONSTRUCTION	GC	HBC	MPP
B	07-06-2009	ISSUED FOR REVIEW	GC	HC	MPP
A	06-22-2009	ISSUED FOR REVIEW	GC	HC	MPP

First Solar

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409 SOMERSET CORPORATE BLVD.
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FIRST SOLAR DEVELOPMENT (CANADA)
5115 BLACKWELL SIDEROAD
SARNIA, ONTARIO N7T 7H3
SARNIA SOLAR PHOTOVOLTAIC POWER PLANT

PROJECT: SARNIA SOLAR 2

DRAWING: TYPICAL PCS SHELTER & TRANSFORMER PAD LAYOUT

PROJ. MGR.	PROJ. ENGR.	DR. BY	CHK. BY	SCALE:
KEITH SYMMERS	PHIL NONEMAKER	GC	HBC	AS NOTED

PROJ. DIRECTOR: MARK LANGDON
DRAWING NO.: S-300
REV.: 1
FS ELEC. JOB No: 5025-0106-22

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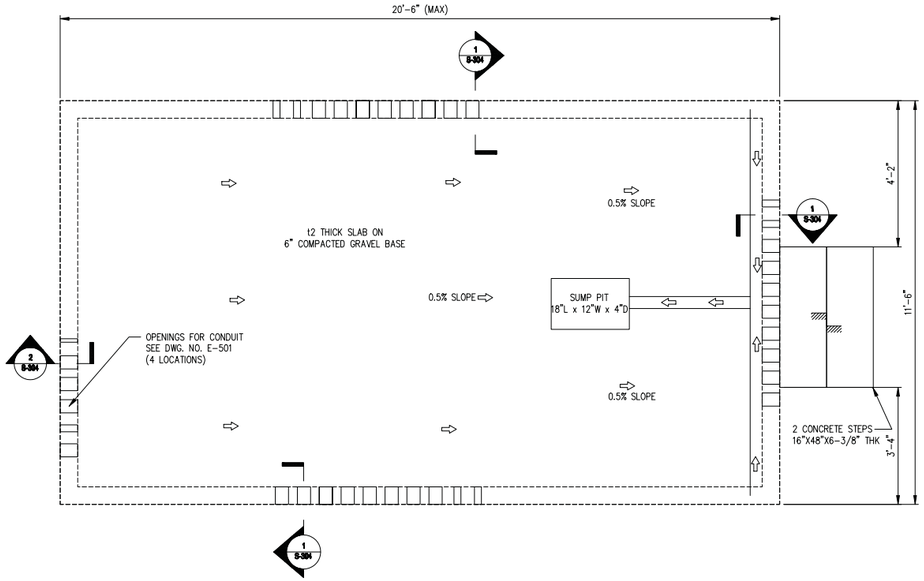
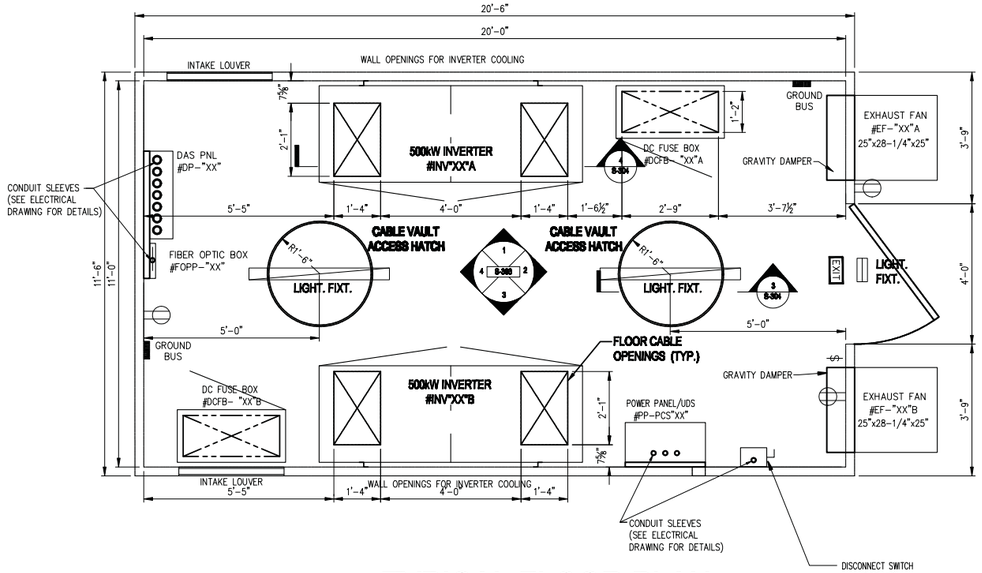
X:\Applications Engineering\Projects\2009\0112-0101-20 Sarnia, Ontario Canada\FS Drawings\Active Drawing Files\5025-0106-22-S-300.dwg - 1:1 - Michael Arva - 7/16/2009 9:45 AM



TYPICAL FRONT ELEVATION/VAULT PLAN

NOTES:

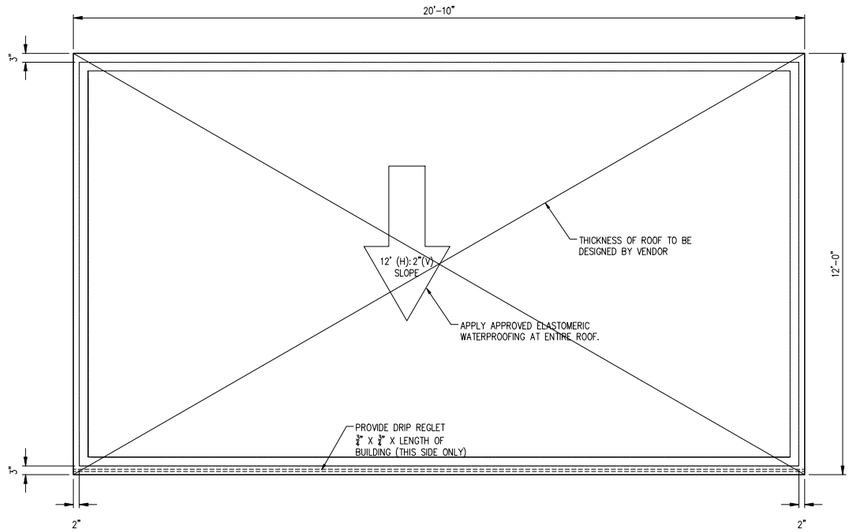
A1. PCS VAULT/FOUNDATION SHALL BE OF PRECAST CONCRETE, THICKNESS OF SLAB AND WALLS SHALL BE DESIGNED BY THE VENDOR. ASSUME MIN. BEARING CAPACITY AT 2,000 PSF.
A2. 16"X48"X7" THK CONCRETE STEP SHALL BE ATTACHED TO THE VAULT MONOLITHICALLY OR APPROVED METHOD
A3. GRAVEL BASE AND OTHER SITEWORKS SHALL BE PERFORMED BY OTHERS.
A4. SEE DRAWING E-501 FOR FOUNDATION WALL OPENINGS.



TYPICAL FLOOR PLAN

NOTES:

B1. FLOOR CONSTRUCTION:
FLOOR OF THE SHELTER SHALL BE OF PRECAST CONCRETE, THICKNESS SHALL BE DESIGNED BY THE VENDOR BASED FROM THE SPECIFIED DESIGN CRITERIA.
B2. PROVIDE OPENING ON FLOOR AS INDICATED.



TYPICAL PCS ROOF FRAMING PLAN

NOTE:

E1. ROOF CONSTRUCTION:
ROOF OF THE SHELTER SHALL BE OF PRECAST CONCRETE, THICKNESS SHALL BE DESIGNED BY THE VENDOR BASED FROM THE SPECIFIED DESIGN CRITERIA.
E2. TAPER ROOF TO MAINTAIN A SLOPE OF 12 FT. (H): 2" (V) FROM NORTH DRAINING TO SOUTH SIDE.
E3. PROVIDE REGLET 1" X 1" X BUILDING LENGTH AT THE UNDERSIDE OF THE 3" OVERHANG AT SOUTH SIDE ONLY.
E4. PROVIDE OPENING AT ROOF AS NEEDED.

REFERENCE NOTES:

1. DWG NO. E-501
PCS ELECTRICAL EQUIPMENT PLAN.

GENERAL NOTES:

1. WORK THIS DWG. WITH THE STANDARD SPECIFICATION.
2. VENDOR TO COORDINATE OPENING LOCATIONS WITH ELECTRICAL DRAWINGS.
3. VAULT EXTERIOR MEASUREMENTS SHALL MATCH WITH PCS BUILDING EXTERIOR MEASUREMENTS.
4. VENDOR SHALL PRE-FIT/PRE-ASSEMBLE VAULT AND PCS SHELTER AND PROVIDE MATCH MARKINGS TO ASSURE PERFECT ALIGNMENT OF VAULT AND PCS SHELTER ONCE DELIVERED AND ERECTED AT THE JOBSITE.
5. VENDOR SHALL BE RESPONSIBLE FOR THE LOADING, TRUCKING TO THE JOBSITE, AND COORDINATION WITH THE OWNER DURING THE DELIVERY OF VAULTS AND PCS SHELTER TO THE JOBSITE.
6. OWNER SHALL BE RESPONSIBLE FOR THE SUPPLY OF LIFTING EQUIPMENT, LABOR AND MISCELLANEOUS TOOLS AND MATERIALS DURING THE UNLOADING AND ERECTION OF THE VAULTS AND PCS SHELTER.
7. VENDOR SHALL BE RESPONSIBLE FOR THE FOLLOWING EQUIPMENT AND ACCESSORIES AFTER THE ERECTION OF THE VAULTS AND PCS SHELTER BY THE OWNER, AS FOLLOWS:
A. INSTALLATION OF SEISMIC/CONNECTING PLATES FOR VAULTS AND SHELTER.
B. ENGINEER/DESIGN, SUPPLY AND ERECT HVAC UNITS INCLUDING ELECTRICAL HOOK-UPS.
C. ENGINEER/DESIGN, SUPPLY AND INSTALLATION OF AIR TERMINALS.
D. SUPPLY AND INSTALL PATCHING AT DEPRESSIONS FOR ALL LIFTING LUG LOCATIONS IN ANY PART OF THE VAULT OR PCS SHELTER AND APPLY FINAL COATINGS OR FINISH SURFACE WITH MATERIAL SIMILAR TO THE ADJACENT AREA.
E. SUPPLY AND APPLY SEALANT/MASTIC/CAULKS AT ALL POSSIBLE ENTRY POINTS OF WATER INCLUDING BUT NOT LIMITED TO THE JOINTS BETWEEN THE VAULTS AND THE PCS SHELTER, ATTACHMENT OF EXTERNAL EQUIPMENT AND ACCESSORIES, ETC.

STRUCTURAL DESIGN CRITERIA :

CODE EDITIONS USED – OBC 2006, CAN/CSA-S16-01, CAN/CSA-S136-01

OCCUPANCY GROUP – S-2

OCCUPANCY CATEGORY: III

TYPE CONSTRUCTION – VB

LAND USE ZONE – RENEWABLE ENERGY

SQUARE FOOTAGE/ALLOWABLE AREA – 224.25 SF

HEIGHT – 11'-6" (APPROX.) ABOVE GRADE

OCCUPANT LOAD (PCS) – 1

FLOOR LIVE LOAD – 150 PSF (7.18 kPa) MAXIMUM

FLOOR EQUIPMENT LOAD – 6,000 LBS

WIND REFERENCE PRESSURES – q50 = 11.5 PSF (0.55 kPa) MAXIMUM
Iw = 1.25

NET SPECIFIED WIND LOAD – P = 11.8 kN ACTING PERPENDICULAR TO LONG WALL
P = 9.7 kN ACTING PERPENDICULAR TO SHORT WALL

GROUND SNOW LOADS – 39.2 PSF (1.875 kPa) MAXIMUM
BASED ON – Ss = 1.1 kPa, Sr = 0.4 kPa, Is = 1.25

ROOF LIVE LOAD (REDUCEABLE) – 20 PSF

SEISMIC DESIGN CRITERIA –
SITE CLASSIFICATION "C"
Ta = 0.2 s IN EACH DIRECTION
Fa = 1.0; Fv = 1.0
FOR ONTARIO: Sa(0.2) = 0.36, Sa(0.5) = 0.18, Sa(1.0) = 0.063, Sa(2.0) = 0.02
S(T) = 0.36
Ie = 1.5, Mv = 1.0, Rd = 2.0, Ro = 1.3

CONCRETE: F'C = 5,000 PSI @ 28 DAYS

REINFORCING STEEL: ASTM A-615, GRADE 60

WIRE MESH: ASTM A-496 OR A-497

REV	DATE	REVISION DESCRIPTION	BY	CHK	APP
0	07-15-2009	ISSUED FOR CONSTRUCTION	G.C	KDK	TZ
B	06-04-2009	UPDATED DRAWING NUMBER	G.C	KDK	TZ
A	05-19-2009	ISSUED FOR PROPOSAL	G.C	KDK	TZ

First Solar.
FIRST SOLAR
400 SOMERSET CORPORATE BLVD.
SUITE 501
BRIDGEWATER, NEW JERSEY 08807
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FAX: (888) 888-4888

FIRST SOLAR DEVELOPMENT (CANADA)
5115 BLACKWELL SIDEROAD
SARNIA, ONTARIO N7T 7H3
SARNIA SOLAR PHOTOVOLTAIC POWER PLANT

PROJECT: SARNIA SOLAR 2

DRAWING:
PCS SHELTER FLOOR AND VAULT PLANS

PROJ. MGR.	PROJ. ENGR.	DR. BY	CHK. BY	SCALE:
KEITH SYMMERS	PHIL NONEMAKER	G.C	KDK	1/2"=1'-0"

PROJ. DIRECTOR: MARK LANGDON
FS ELEC. JOB Nbr: 5025-0106-22
DRAWING NO.: S-301
REV.: 0

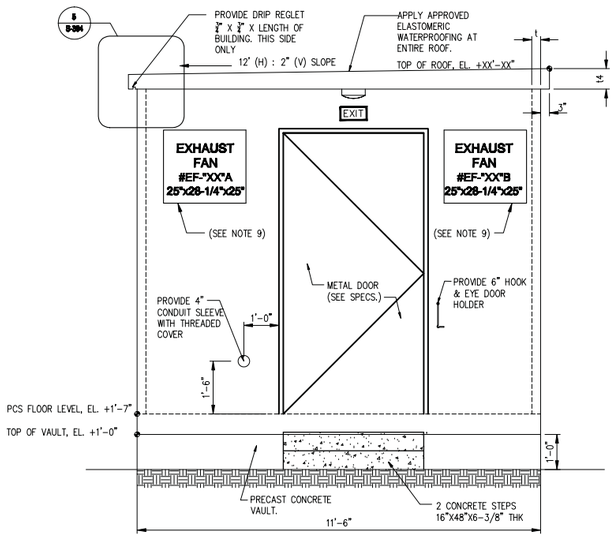
THIS PRINT IS NOT TO BE USED FOR CONSTRUCTION UNLESS NOTED AND SIGNED OK FOR CONSTRUCTION ABOVE LAST REVISION.

2' 1' 0 2' 6"

X:\Applications Engineering\Projects\2009\0112-0101-20 Sarnia, Ontario Canada\FS Drawings\Active Drawing Files\5025-0106-22-S-301.dwg - 1:1 - Michael Arva - 7/15/2009 6:32 PM

NOTES:

1. SEE DWG S-301 FOR ADDITIONAL NOTES.



TYPICAL FRONT ELEVATION

2' 1' 0 2' 6"

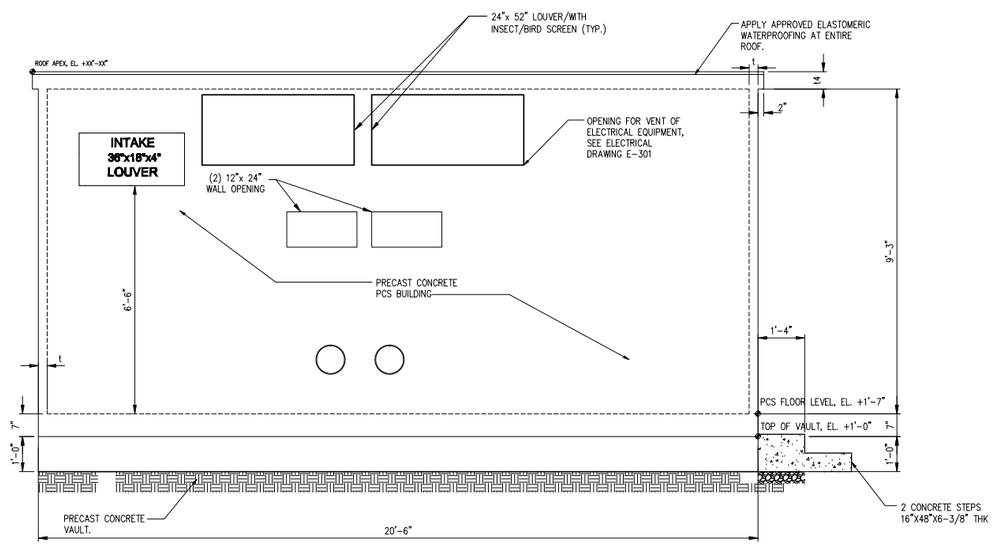
NOTES:

D1. WALL CONSTRUCTION:
WALL OF THE SHELTER SHALL BE OF PRECAST CONCRETE, THICKNESS SHALL BE DESIGNED BY THE VENDOR BASED FROM THE SPECIFIED DESIGN CRITERIA.

D2. EXTERIOR WALL SHALL BE PLAIN CEMENT FINISHED PAINTED WHITE.

D3. PROVIDE OPENING ON WALLS AS INDICATED.

D4. PROVIDE SEALANT AT ALL JOINTS/CONECTIONS.



TYPICAL LEFT ELEVATION

2' 1' 0 2' 6"

NOTES:

D1. WALL CONSTRUCTION:
WALL OF THE SHELTER SHALL BE OF PRECAST CONCRETE, THICKNESS SHALL BE DESIGNED BY THE VENDOR BASED FROM THE SPECIFIED DESIGN CRITERIA.

D2. EXTERIOR WALL SHALL BE PLAIN CEMENT FINISHED PAINTED WHITE.

D3. PROVIDE OPENING ON WALLS AS INDICATED.

D4. PROVIDE SEALANT AT ALL JOINTS/CONECTIONS.

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0	07-15-2009	ISSUED FOR CONSTRUCTION	G.C	KDK	TZ
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A	05-19-2009	ISSUED FOR PROPOSAL	G.C	KDK	TZ

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FAX: (000) 000-0000

FIRST SOLAR DEVELOPMENT (CANADA)
5115 BLACKWELL SIDEROAD
SARNIA, ONTARIO N7T 7H3
SARNIA SOLAR PHOTOVOLTAIC POWER PLANT

PROJECT: SARNIA SOLAR 2

DRAWING: **PCS SHELTER EXTERIOR ELEVATIONS**

PROJ. MGR.	PROJ. ENGR.	DR. BY	CHK. BY	SCALE:
KEITH SYMMERS	PHIL NONEMAKER	G.C	KDK	AS NOTED

PROJ. DIRECTOR: MARK LANGDON

FS ELEC. JOB No: **5025-0106-22**

DRAWING NO. **S-302** REV. **0**

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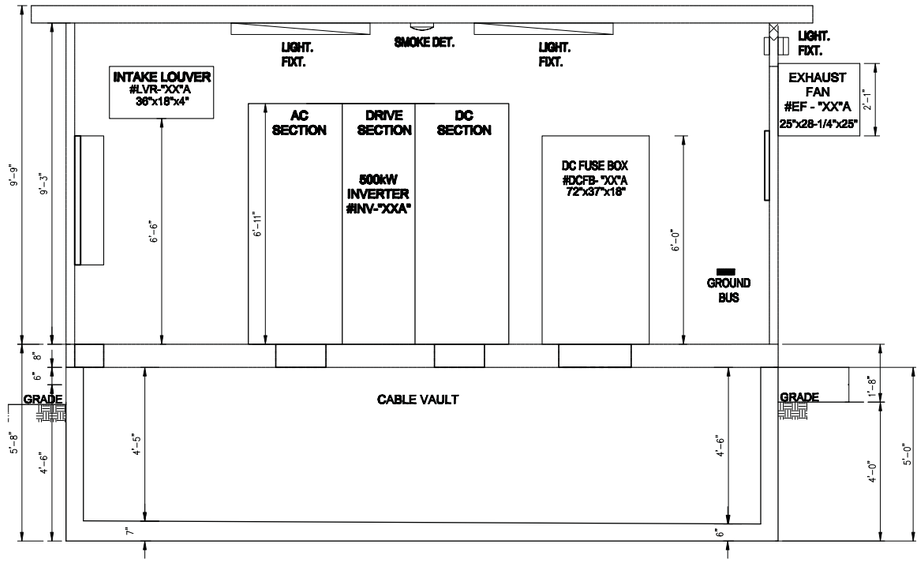
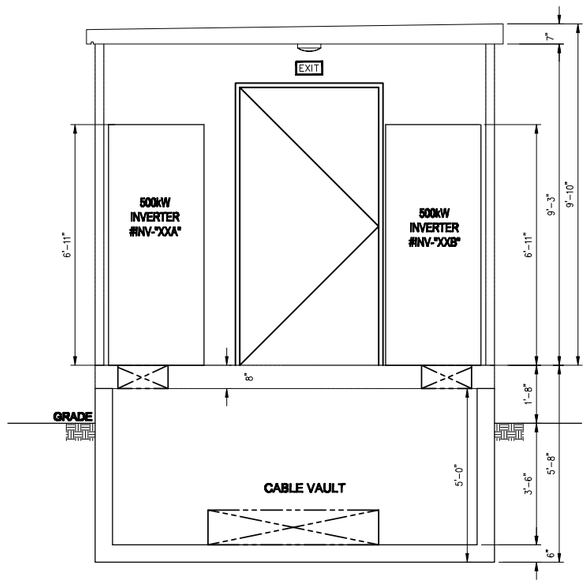
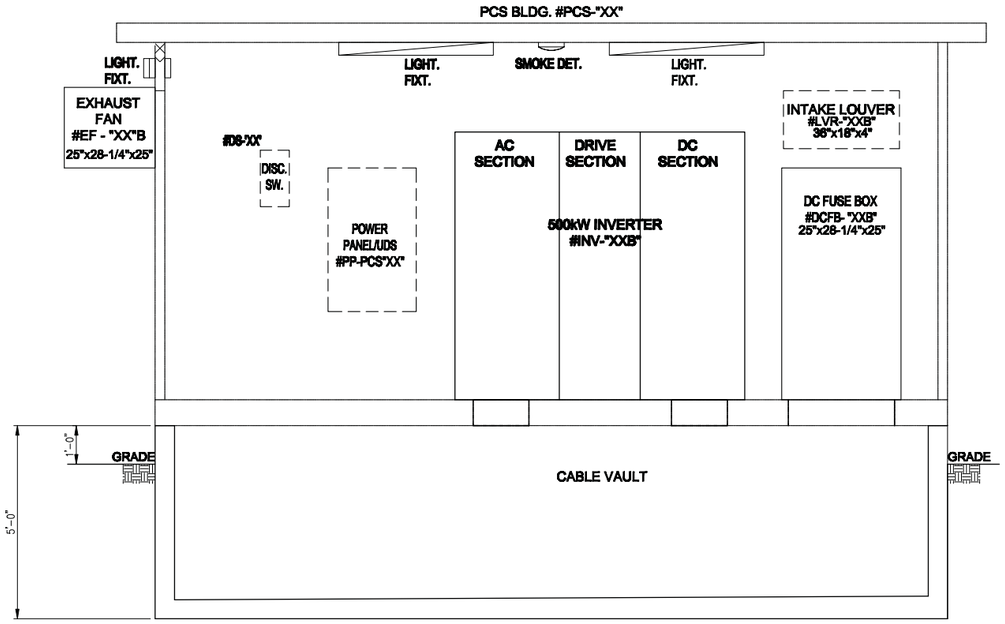


TRANSFORMER & PCS BUILDING (SHOWING INVERTER "A")
LOOKING NORTH

1 WALL INTERIOR ELEVATION



2 WALL INTERIOR ELEVATION



3 WALL INTERIOR ELEVATION

NOTES:

1. SEE DWG SS-17000-SK-S01 FOR ADDITIONAL NOTES.

REV	DATE	REVISION DESCRIPTION	BY	CHK	APP
0	07-15-2009	ISSUED FOR CONSTRUCTION	RTB	KDK	TZ
B	06-04-2009	UPDATED DRAWING NUMBER	G.C	KDK	TZ
A	05-19-2009	ISSUED FOR PROPOSAL	G.C	KDK	TZ

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5115 BLACKWELL SIDEROAD
SARNIA, ONTARIO N7T 7H3
SARNIA SOLAR PHOTOVOLTAIC POWER PLANT

PROJECT: SARNIA SOLAR 2

DRAWING: PCS SHELTER INTERIOR ELEVATIONS

PROJ. MGR.	PROJ. ENGR.	DR. BY	CHK. BY	SCALE:
KEITH SYMMERS	PHIL NONEMAKER	G.C	KDK	1/2"=1'-0"

PROJ. DIRECTOR: MARK LANGDON
DRAWING NO.: S-303
REV.: 0
FS ELEC. JOB No: 5025-0108-22

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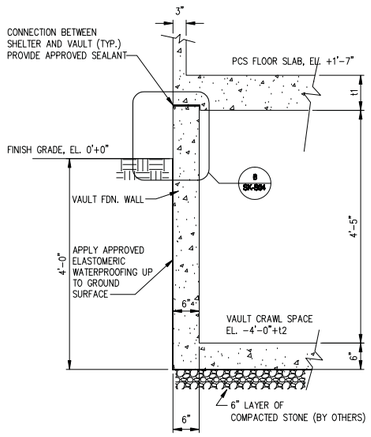
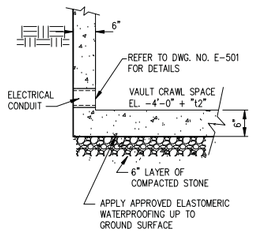
NOTES:

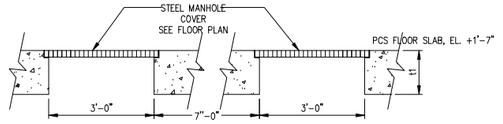
1. SEE DWG S-301 FOR ADDITIONAL NOTES.



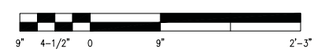
1 SECTION

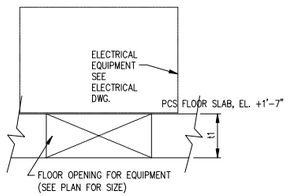


2 SECTION

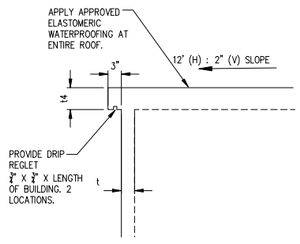


3 SECTION

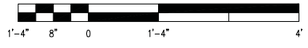


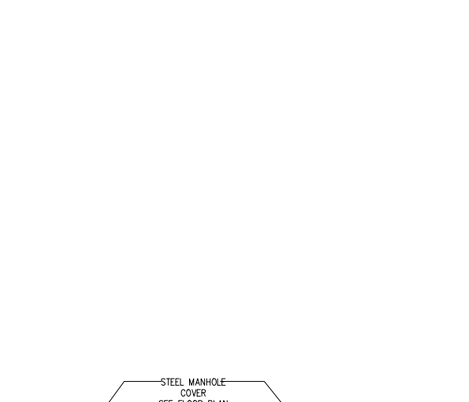


4 SECTION

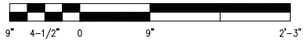


5 DETAIL





6 DETAIL



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5115 BLACKWELL SIDEROAD
SARNIA, ONTARIO N7T 7H3
SARNIA SOLAR PHOTOVOLTAIC POWER PLANT

PROJECT: SARNIA SOLAR 2

DRAWING: **PCS SHELTER DETAILS AND SECTIONS**

PROJ. MGR.	PROJ. ENGR.	DR. BY	CHK. BY	SCALE:
KEITH SYMMERS	PHIL NONEMAKER	GC	KDK	AS NOTED

PROJ. DIRECTOR	DRAWING NO.	REV.
MARK LANGDON	S-304	0
FS ELEC. JOB No: 5025-0106-22		

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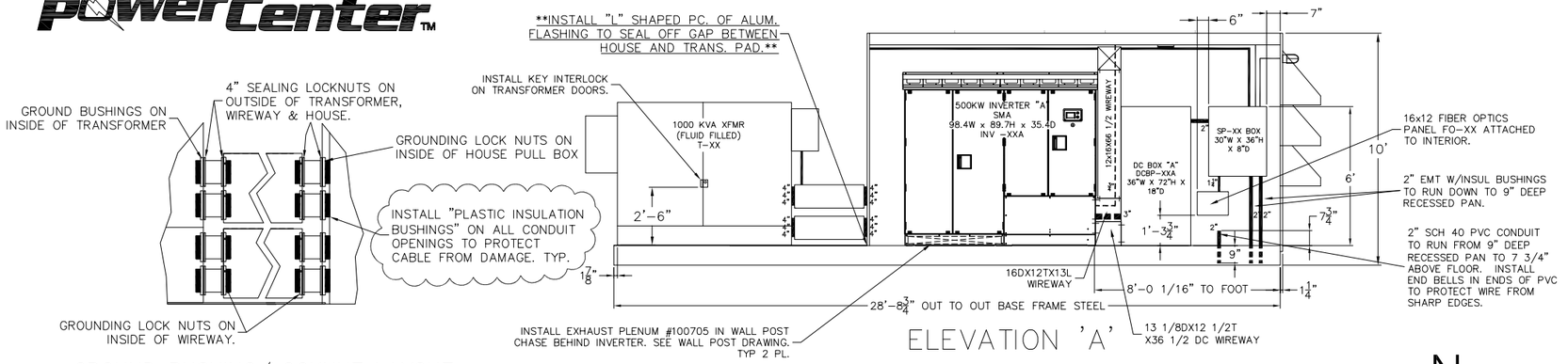
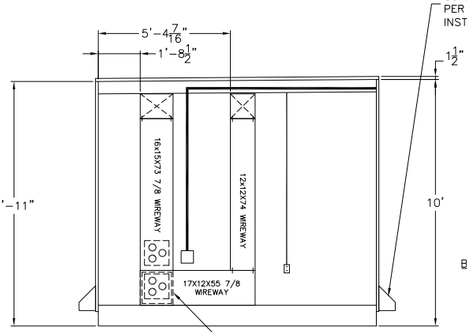
Enclosure Options:
1. Pueblo Tan Stucco Embossed Aluminum Siding w/ Painted Siding Screws.
2. 1" Black Skid Guard Floors
3. Purchased Metal Doors.
4. Pueblo Tan Stucco Embossed Aluminum Standing Seam Roof.
5. Insulated Walls & Ceiling (R4.2) .
6. All Siding Seams To Be Caulked.
7. Floor To Be Covered w/ Removable Vinyl/Masonite Type Material For Protection During Installation.
8. (8) 1/4" Painted Anchor Plates to Ship Loose with each unit.

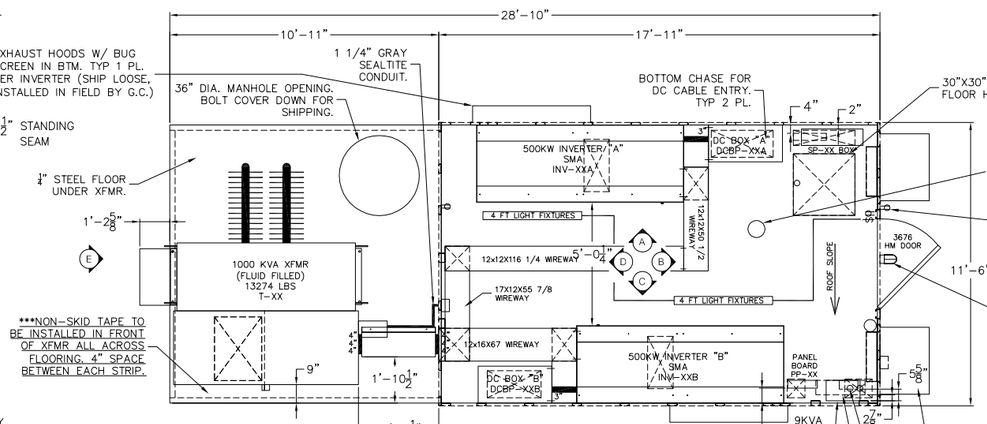


ELEVATION 'A'

GROUND BUSHING/LOCKNUT LAYOUT
(6) 4" PER WIREWAY

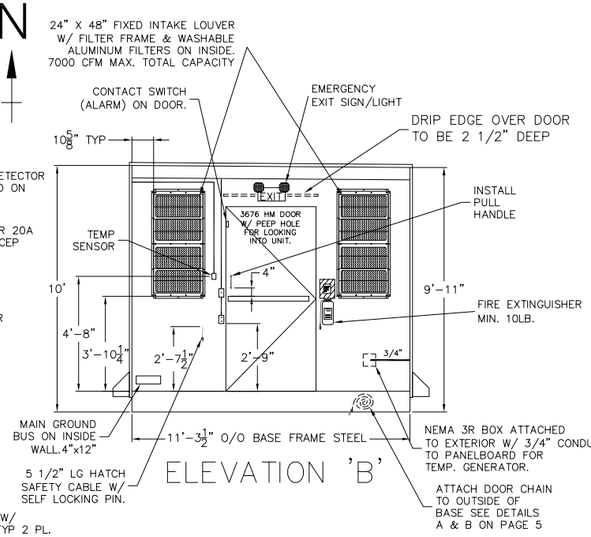


ELEVATION 'D'

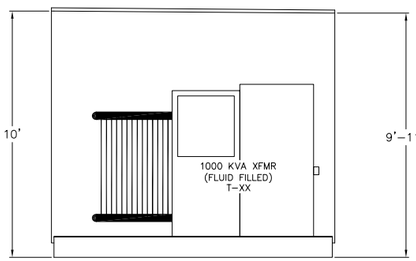


PLAN VIEW

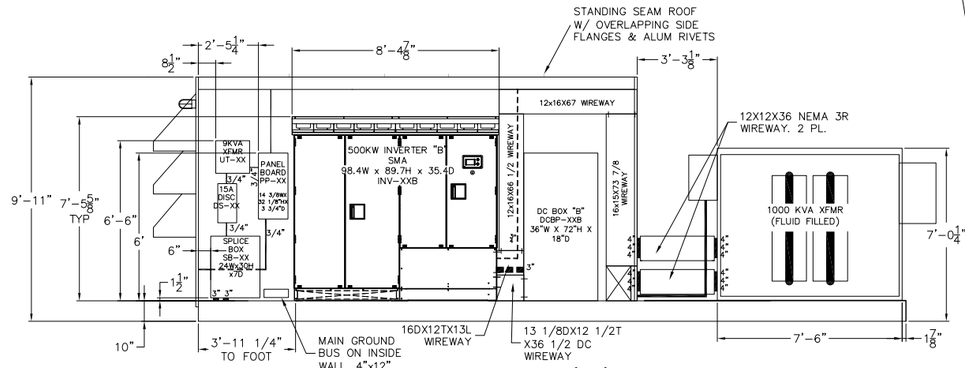
N



ELEVATION 'B'



ELEVATION 'E'
(VIEW FROM OUTSIDE END)



ELEVATION 'C'

(8) 1/4" ANCHOR PLATES #100729 TO BE PAINTED GRAY AND TO SHIP LOOSE WITH EACH UNIT.

SHIPPING DIMS:
30'-1"L X 11'-8 1/2"W X10'-2"H
APPROX WGT: 37,800 LBS

REVISION RECORD			
REV	DATE	BY	DESCRIPTION
0	20 APR 2010	GC	RELEASED FOR PRODUCTION
1	30 JUL 2010	GC	REMOVED RAILING & LIGHTNING PROTECT. ADDED SPLICE BOX & XFMR LOCK. CHGD XFMR SIZE & WW LAYOUT
2	18 AUG 2010	GC	ADDED NOTE FOR IPLASTIC INSULATION BUSHINGS.

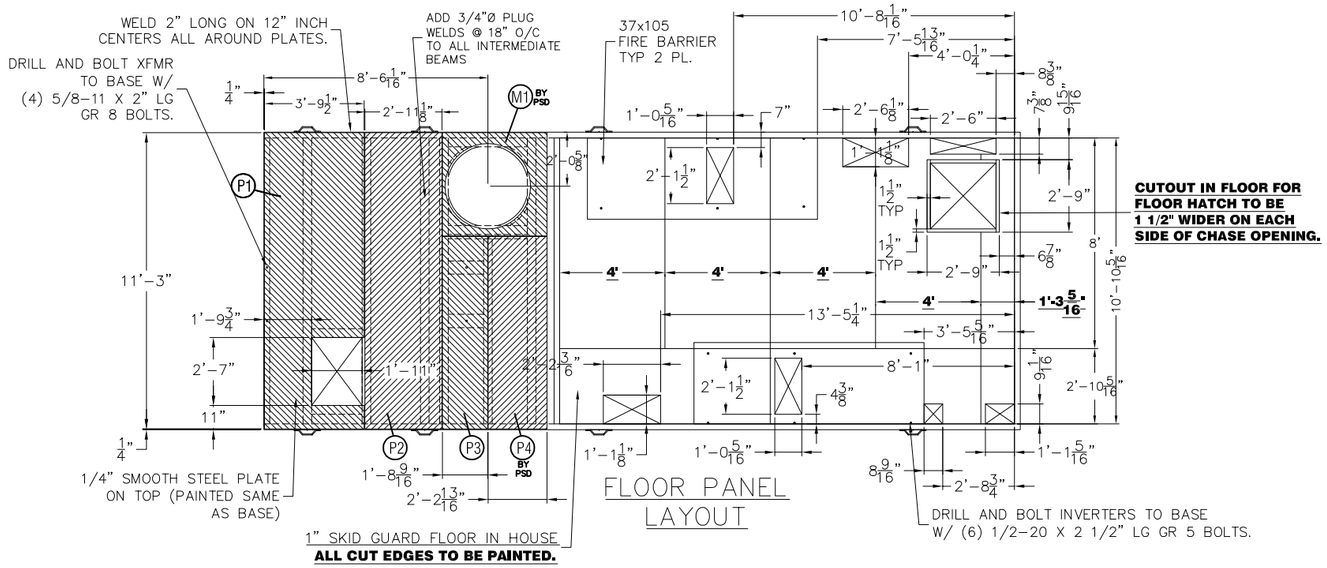
PROJECT	PROJECT # 5032-0101-23	PROJECT NAME
LOCATION	TILBURY, ONTARIO, CANADA	TILBURY 5
PRODUCT	# S-T-M-1-CEC-3-1-SS-0-0-1.0	
	PCS-M4	
DRAWING TITLE	PCS SHELTER SKID OUTLINE DRAWING	DRAWING # HP-S-100

FIRST SOLAR
PCS - POWER CONVERSION STATION

HILL PHOENIX EXCELLENCE
A DOVER COMPANY
709 SIGMAN ROAD
CONYERS, GA 30013
PHONE (770) 285-3100 FAX (770) 285-3076

DRAWN BY:	GC
ENG. APPROVAL:	
DATE:	20 APR 2010
SCALE:	NONE
JOB NUMBER	58820-ED
SHEET:	1 OF 5

CAD FILE NAME: G:\EDP JOB FILES\58820-58825 TILBURY FIRST SOLAR\STRUCTURAL DRAWINGS\58820-ED HP-S-100 M4 REV 1.DWG-LAYOUT1



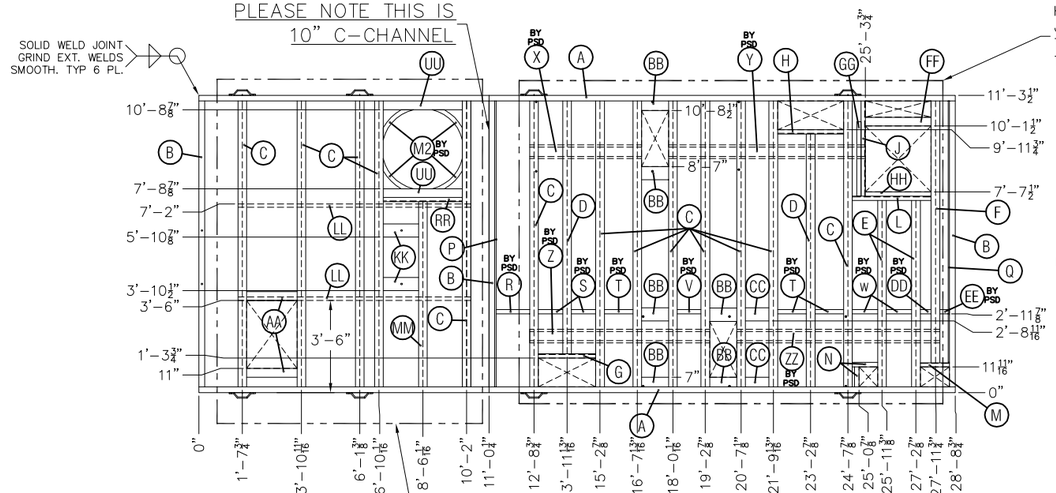
ITEM	DESCRIPTION	WT/FT.	REQ.	FT.	IN.	DWG #	
A	10" CHANNEL	15.3	2	28	8 3/4		
B	10" CHANNEL	15.3	3	11	3		
C	6" WIDE FLANGE IBEAM	9	13	11	3		
D	6" WIDE FLANGE IBEAM	9	2	9	9 9/16		
E	6" WIDE FLANGE IBEAM	9	2	7	5		
F	6" WIDE FLANGE IBEAM	9	1	10	1 5/8		
MM	6" WIDE FLANGE IBEAM	9	1	7	2 3/4		
AA	STD. 4" CHANNEL	5.4	2	1	11		
FF	STD. 4" CHANNEL	5.4	1	2	6		
LL	STD. 4" CHANNEL	5.4	2	8	10 1/2		
UU	STD. 4" CHANNEL	5.4	2	3	0		
G	STD. 6" CHANNEL	8.2	1	2	5 7/8		
H	STD. 6" CHANNEL	8.2	1	2	9 13/16		
J	STD. 6" CHANNEL	8.2	1	3	9 3/4		
L	STD. 6" CHANNEL	8.2	1	3	3 9/16		
M	STD. 6" CHANNEL	8.2	1	1	5 1/2		
BB	STD. 6" CHANNEL	8.2	6	1	0 5/16		
CC	STD. 6" CHANNEL	8.2	2	0	10 3/4		
RR	STD. 6" CHANNEL	8.2	1	3	3 11/16		
KK	STD. 6" CHANNEL	8.2	2	1	4		
P	3"X 3"X 1/4" ANGLE	4.9	1	10	10		
Q	3"X 3"X 1/4" ANGLE	4.9	1	10	0		
N	2" X 2" X 3/16" ANGLE	2.44	2	0	11 1/2		
GG	2" X 2" X 3/16" ANGLE	2.44	1	2	10		
HH	2" X 2" X 3/16" ANGLE	2.44	1	2	6		
R	2" X 2" X 3/16" ANGLE	2.44	1	1	3 3/16		
S	2" X 2" X 3/16" ANGLE	2.44	2	0	11 1/16		
T	2" X 2" X 3/16" ANGLE	2.44	3	1	0 15/16		
V	2" X 2" X 3/16" ANGLE	2.44	1	0	10 3/4		
W	2" X 2" X 3/16" ANGLE	2.44	2	0	11 1/2		
DD	2" X 2" X 3/16" ANGLE	2.44	1	0	4 7/8		
EE	2" X 2" X 3/16" ANGLE	2.44	1	0	3 3/4		
X	2 7/8 X 4 7/16 HAT SECTION	11 GA.	1	4	2 1/2	100692	
Y	2 7/8 X 4 7/16 HAT SECTION	11 GA.	1	7	5	100693	
Z	2 7/8 X 4 7/16 HAT SECTION	11 GA.	1	6	9 1/2	100694	
ZZ	2 7/8 X 4 7/16 HAT SECTION	11 GA.	1	7	8	100695	
	ANCHOR PLATE, PAINTED GRAY	1/4	8		8"x13"x1/4"	100729	SHIP LOOSE
	LIFT LUGS		8				
	1" SKID GUARD FLOORING						

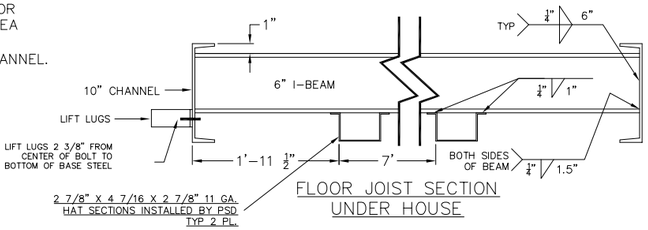
FLOOR PLATE CUT LIST		
QTY.	1/4" STEEL SMOOTH PLATE	ITEM
1	3'-9 1/2" X 11'-3"	P1
1	2'-11 1/8" X 11'-3"	P2
1	1'-8 9/16" X 7'-7 3/4"	P3
1	2'-2 13/16" X 7'-7 3/4"	P4

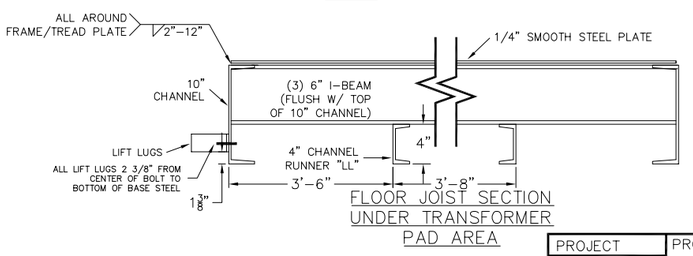
PAINT & SHIP P4 LOOSE TO PSD. PSD TO INSTALL.

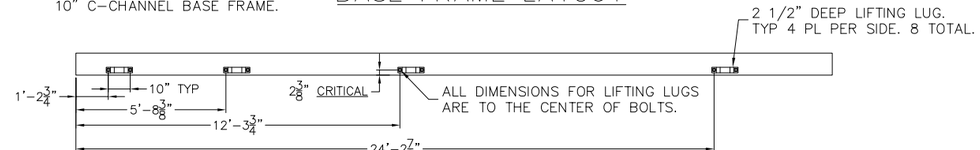
MANHOLE PARTS LIST		
QTY.	1/4" STEEL SMOOTH PLATE	ITEM
1	3'-11 5/8" X 3'-11"	M1
4	13 3/4"X13 3/4" CORNER PC	M2
1	3'-2 3/4" DIA.	M3

PART #100894









LIFTING LUG LOCATIONS ARE CRITICAL. CUSTOMER HAS PRE-DRILLED HOLES THAT ARE TO LINE-UP WITH THEM.

REVISION RECORD			
REV	DATE	BY	DESCRIPTION
0	20 APR 2010	GC	RELEASED FOR PRODUCTION
1	30 JUL 2010	GC	REMOVED RAILING & LIGHTNING PROTECT. ADDED SPLICE BOX & XFMR LOCK. CHGD XFMR SIZE & WW LAYOUT
2	18 AUG 2010	GC	ADDED NOTE FOR IPLASTIC INSULATION BUSHINGS.

PROJECT	PROJECT # 5032-0101-23
PROJECT NAME	TILBURY 5
LOCATION	TILBURY, ONTARIO, CANADA
PRODUCT	# S-T-M-1-CEC-3-1-SS-0-0-1.0
	PCS-M4
DRAWING TITLE	PCS SHELTER BASE FRAME LAYOUT DRAWING
DRAWING #	HP-S-100

FIRST SOLAR
PCS - POWER CONVERSION STATION

HILL PHOENIX EXCELLENCE
A DOVER COMPANY
709 SIGMAN ROAD
CONYERS, GA 30013
PHONE (770) 285-3100 FAX (770) 285-3076

DRAWN BY:	GC
ENG. APPROVAL:	
DATE:	20 APR 2010
SCALE:	NONE
JOB NUMBER	58820-ED
SHEET:	2 OF 5

CAD FILE NAME: G:\EDP JOB FILES\58820-58825 TILBURY FIRST SOLAR\STRUCTURAL DRAWINGS\58820-ED HP-S-100 M4 REV 1.DWG-LAYOUT1

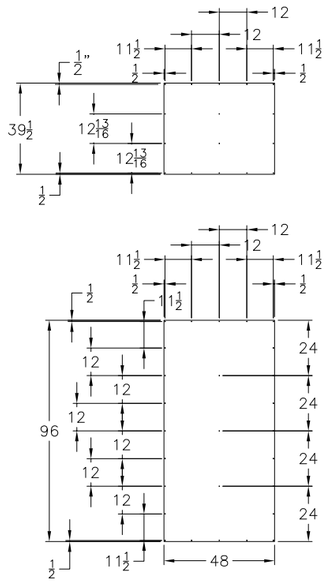
WALL/ROOF FRAME CUT LIST

DESCRIPTION	QTY.	LENGTH	
6" X 14 GA. Z-BRACKET	4	106 1/4	
6" X 14 GA END Z-BRACKET	2	135 3/8	
6" Z-BRACKET SPLICE PLATE	2	10	
3 1/2" X 5 1/8" 16GA C-ROOF BOW	10	135 1/4	
3" X 16 GA STRIPS	3	120	
3" X 16 GA STRIPS	3	92 1/4	
4 1/2" WALL POST X 14 GA	11	112 7/8	
4 1/2" WALL POST X 14 GA	2	50 1/2"	
4 1/2" WALL POST X 14 GA	2	99 5/16"	
4 1/2" WALL POST X 14 GA	2	98 5/16"	
4 1/2" WALL POST X 14 GA	12	111 7/8	
4 1/2" WALL POST X 14 GA	4	24 1/4	
4 1/2" WALL POST X 14 GA	1	8 1/4	
4 1/2" WALL POST X 14 GA	2	46 3/8	
2 1/8" X 4 1/2" WALL POST X 14 GA	1	13 5/8	100924
4 1/2" WALL POST X 14 GA	2	112 1/2	
4 1/2" WALL POST X 14 GA	1	8 7/8	
3" X 4 1/2" WALL POST X 14 GA	1	112 1/8	101000
3" X 4 1/2" WALL POST X 14 GA	1	112 5/16	101001
2 3/8" x 4 1/2" WALL POST X 14 GA	2	111 7/8	100956
7 3/16" WALL POST X 14 GA	1	111 7/8	100709
7 3/16" WALL POST X 14 GA	1	112 5/8	100713
4" WALL POST X 14 GA	1	99 5/16"	100707
4" WALL POST X 14 GA	1	98 5/16"	100708
3" WALL POST X 14 GA	2	50 1/2"	100726
2 7/8" WALL POST X 14 GA	1	111 7/8	100710
2 7/8" WALL POST X 14 GA	1	112 7/16	100714
3 1/2" WALL POST X 14 GA	1	111 7/8	100740
3 1/2" WALL POST X 14 GA	1	112 7/16	100741
4 1/2" X 2 1/8" DOOR POST	1	112 1/16	100711
4 1/2" X 2 1/8" DOOR POST	1	112 7/16	100712
4 1/2"X2 1/8" DOOR HEADER-14 GA	1	44"	100706
EXHAUST PLENUMS, INVERTER BTM REAR-14 GA	2	5 7/8 X 50 7/16	100705
PAN, SP-1 & FIBER OPTIC CHASE FILLER	1	26 15/16X49 6/16	100812
20 X 32 7/8 RAIN HOOD TOP W/BIRD SCREEN	2	32 7/8	100715-17
20 X 32 7/8 RAIN HOOD BTM W/BIRD SCREEN	4	32 7/8	100718-20
12 X 57 1/2 RAIN HOOD W/BUG SCREEN	2	57 1/2	100721-25
FILTER FRAME PANEL, 14 GA.	2	24 1/16 X 51 1/4	100727
Z-BRKT, FILTER FRAME, 14 GA.	4	23 3/8	100665
HAT-SHAPED BRKT, FILTER FRAME, 14 GA.	2	23 13/16	100668
FILTER END COVER, 14 GA.	2	50 1/2	100670
17X3X16 WIREWAY W/(3) CUTOUTS	1	17X3X16	101002
17X12X55 7/8 WIREWAY W/CUTOUT	1	55 7/8	101003(1),1004(1),0837(2)
16X15X73 7/8 WIREWAY W/(3) CO	1	73 7/8	101006(1),1007(1),1008(2)
SUPPORT, EXT. WIREWAY	1	36X31 7/16	101009

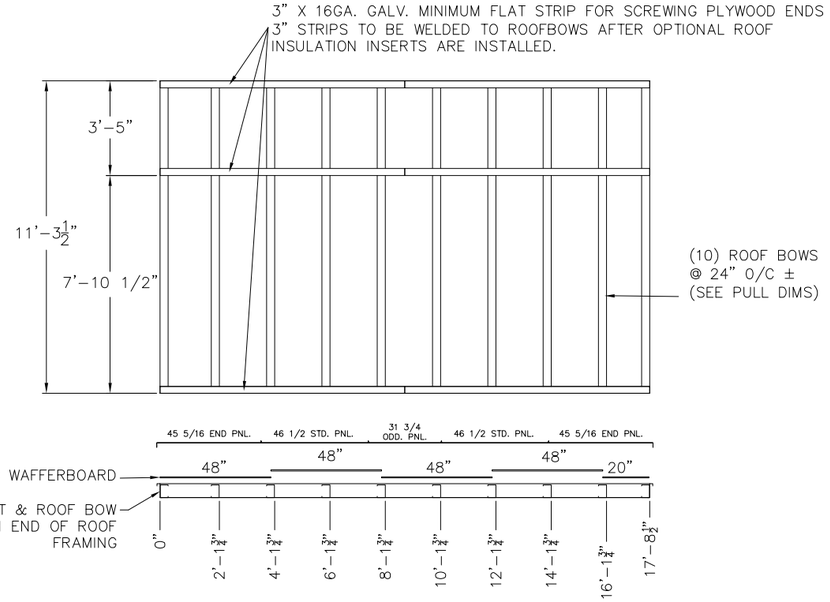
STD 1" WALL & ROOF INSULATION W/SOLID LINERS

PUEBLO TAN EMBOSSED ALUM. WALL & ROOF SKINS

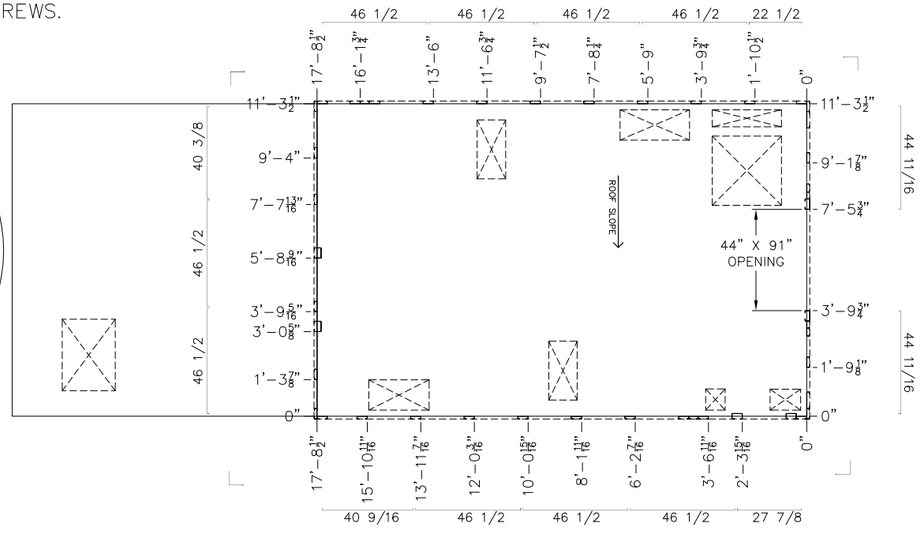
STD. 5/8" OSB WAFFERBOARD ROOF UNDERLAYMENT



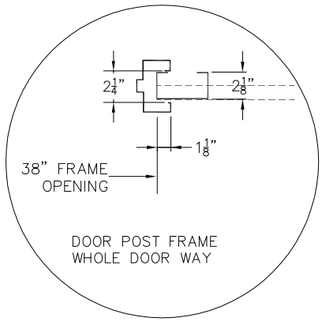
WAFFERBOARD FASTENING DETAILS
(SCREW HEADS TO BE FLUSH OR
BELOW SURFACE OF WAFFERBOARD)
USE #8 MINIMUM SCREWS.



ROOF FRAME LAYOUT



WALL POST LAYOUT



REVISION RECORD			
REV	DATE	BY	DESCRIPTION
0	20 APR 2010	GC	RELEASED FOR PRODUCTION
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2	18 AUG 2010	GC	ADDED NOTE FOR IPLASTIC INSULATION BUSHINGS.

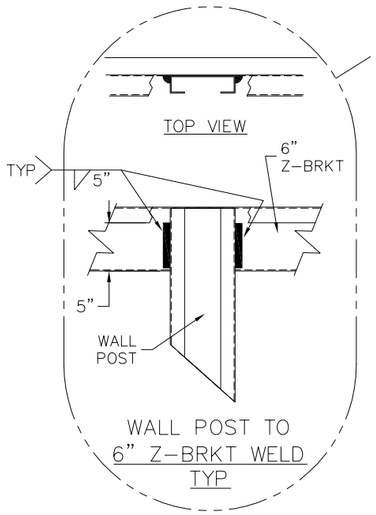
PROJECT	PROJECT # 5032-0101-23	PROJECT NAME
LOCATION	TILBURY, ONTARIO, CANADA	TILBURY 5
PRODUCT	# S-T-M-1-CEC-3-1-SS-0-0-1.0	
PCS-M4		
DRAWING TITLE		DRAWING #
PCS SHELTER WALL & ROOF DETAILS		HP-S-100

FIRST SOLAR
PCS - POWER CONVERSION STATION

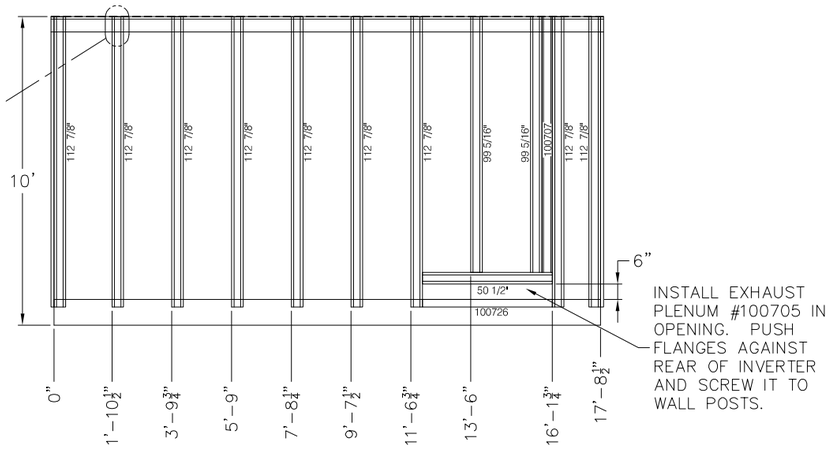
DRAWN BY: GC
ENG. APPROVAL:
DATE: 20 APR 2010
SCALE: NONE
JOB NUMBER: 58820-ED
SHEET: 3 OF 5

HILL PHOENIX EXCELLENCE
A DOVER COMPANY
709 SIGMAN ROAD
CONYERS, GA 30013
PHONE (770) 285-3100 FAX (770) 285-3076

CAD FILE NAME:
G:\EDP JOB FILES\58820-58825 TILSBURY FIRST SOLAR\STRUCTURAL DRAWINGS\58820-ED HP-S-100 M4 REV 1.DWG-LAYOUT1

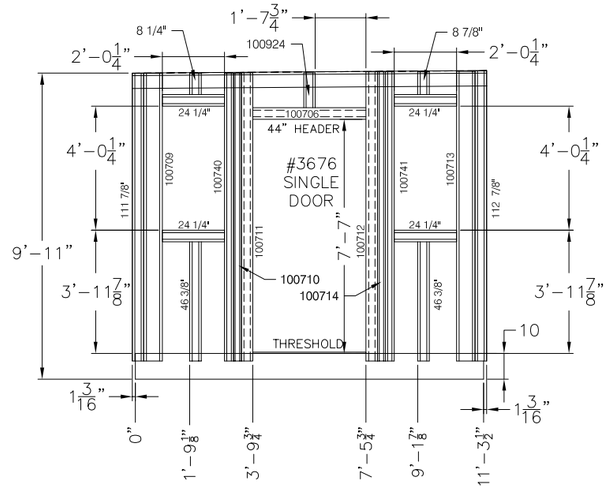


WALL POST TO
6" Z-BRKT WELD
TYP



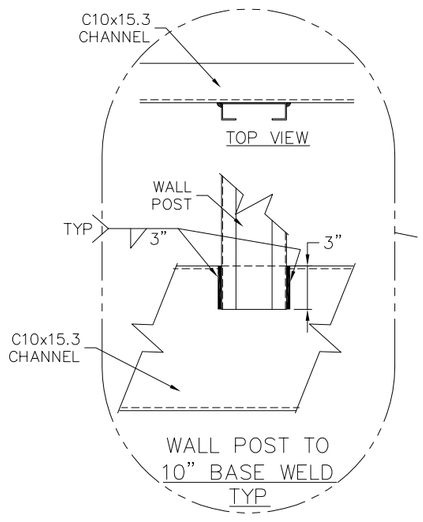
INSTALL EXHAUST PLENUM #100705 IN OPENING. PUSH FLANGES AGAINST REAR OF INVERTER AND SCREW IT TO WALL POSTS.

EXTERIOR VIEW 'A'
(FRONT)

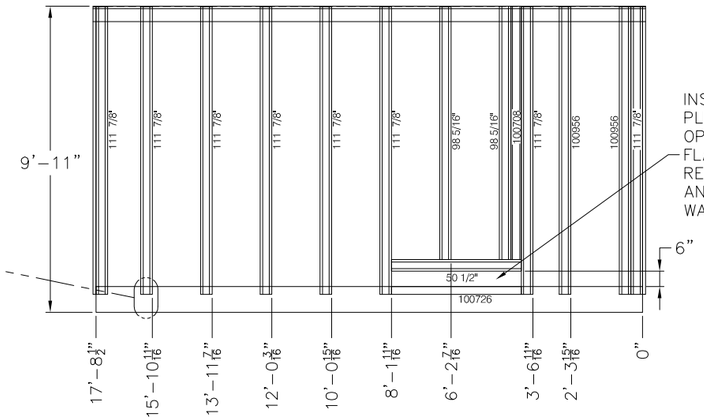


(ADD DRIP ANGLE ABOVE DOOR)

EXTERIOR VIEW 'B'
(RIGHT END)

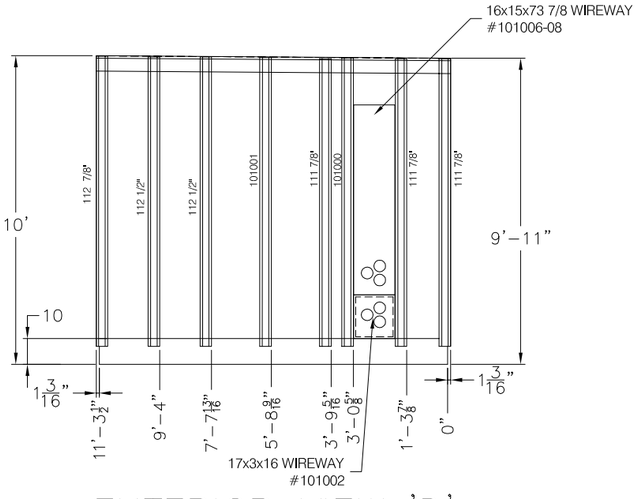


WALL POST TO
10" BASE WELD
TYP



INSTALL EXHAUST PLENUM #100705 IN OPENING. PUSH FLANGES AGAINST REAR OF INVERTER AND SCREW IT TO WALL POSTS.

EXTERIOR VIEW 'C'
(REAR)



EXTERIOR VIEW 'D'
(LEFT END)

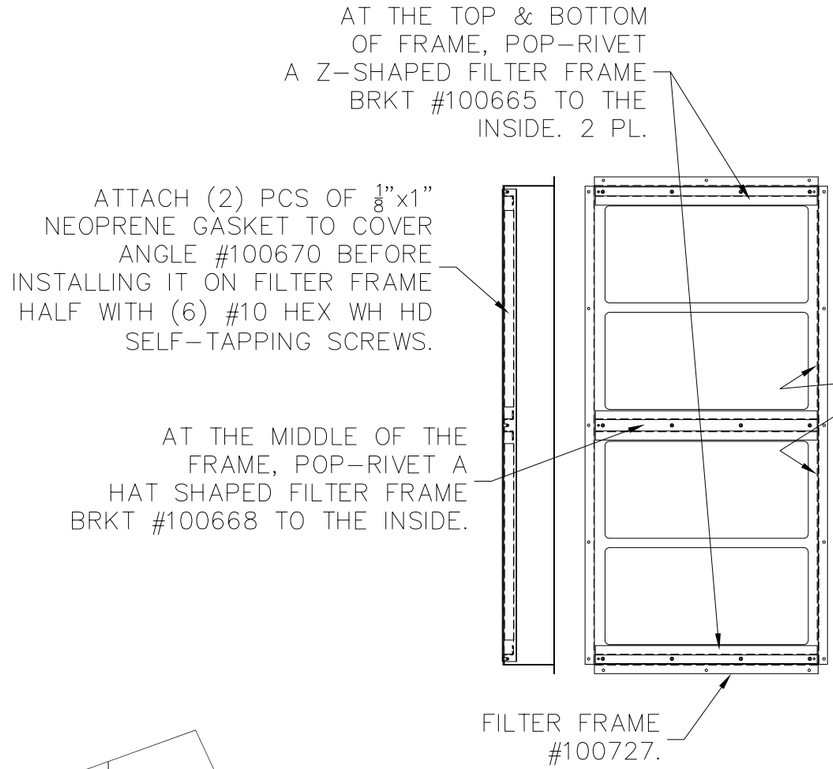
REVISION RECORD			
REV	DATE	BY	DESCRIPTION
0	20 APR 2010	GC	RELEASED FOR PRODUCTION
1	30 JUL 2010	GC	REMOVED RAILING & LIGHTNING PROTECT. ADDED SPLICE BOX & XFMR LOCK. CHGD XFMR SIZE & WW LAYOUT
2	18 AUG 2010	GC	ADDED NOTE FOR IPLASTIC INSULATION BUSHINGS.

PROJECT: PROJECT # 5032-0101-23 | PROJECT NAME: TILBURY 5
LOCATION: TILBURY, ONTARIO, CANADA
PRODUCT: # S-T-M-1-CEC-3-1-SS-0-0-1.0
PCS-M4
DRAWING TITLE: PCS SHELTER WALL EXTERIOR VIEWS | DRAWING #: HP-S-100

FIRST SOLAR
PCS - POWER CONVERSION STATION

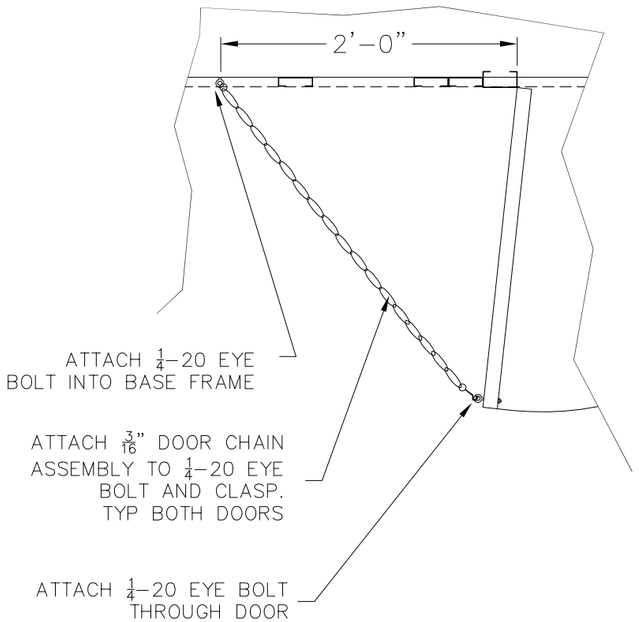
HILL PHOENIX EXCELLENCE
A DOVER COMPANY
709 SIGMAN ROAD
CONYERS, GA 30013
PHONE (770) 285-3100 FAX (770) 285-3076

DRAWN BY: GC
ENG. APPROVAL:
DATE: 20 APR 2010
SCALE: NONE
JOB NUMBER: 58820-ED
CAD FILE NAME: G:\EDP JOB FILES\58820-58825 TILBURY FIRST SOLAR\STRUCTURAL DRAWINGS\58820-ED HP S-100 M4 REV 1.DWG-LAYOUT1
SHEET: 4 OF 5

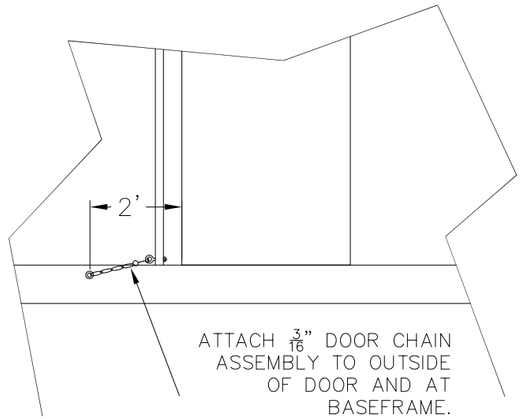


FILTER FRAME ASSY

ASSY'S NEEDED: 2



DETAIL A



DETAIL B

REVISION RECORD			
REV	DATE	BY	DESCRIPTION
0	20 APR 2010	GC	RELEASED FOR PRODUCTION
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2	18 AUG 2010	GC	ADDED NOTE FOR IPLASTIC INSULATION BUSHINGS.

PROJECT: PROJECT # 5032–0101–23 | PROJECT NAME: TILBURY 5

LOCATION: TILBURY, ONTARIO, CANADA

PRODUCT: # S–T–M–1–CEC–3–1–SS–0–0–1.0

PCS-M4

DRAWING TITLE: PCS SHELTER FILTER FRAME ASSEMBLY | DRAWING #: HP-S-100

FIRST SOLAR
PCS - POWER CONVERSION STATION

DRAWN BY: GC
ENG. APPROVAL:
DATE: 20 APR 2010
SCALE: NONE
JOB NUMBER: 58820-ED
SHEET: 5 OF 5

HILL PHOENIX EXCELLENCE
A DOVER COMPANY
709 SIGMAN ROAD
CONYERS, GA 30013
PHONE (770) 285-3100 FAX (770) 285-3076

CAD FILE NAME: G:\EDP JOB FILES\58820-58825 TILBURY FIRST SOLAR\STRUCTURAL DRAWINGS\58820-ED HP-S-100 M4 REV 1.DWG-LAYOUT1

APPENDIX E

Source Sound Levels

Estimated Source PWL from Measurement data, dB re. $20x10^{-12}$ W

Description	Data Source	31.5	63	125	250	500	1000	2000	4000	8000	dBA
Pauwels 1000 kVA 27600Y/15935 2X 208Y/120 Transformer	Measured (Appendix G)	71	74	72	71	68	64	60	61	57	**70**
Xantrex Inverter Enclosure	Measured (Appendix G)	84	81	84	85	85	84	80	75	85	**89**
SMA Inverter	Measured (Appendix G)	80	81	75	79	79	73	75	77	72	**83**

APPENDIX F

Equipment Calibration

CERTIFICATE of CALIBRATION

Make :	PCB Piezotronics	Reference # :	88771
Model :	377A60A	Customer :	Golder Associates Ltd Mississauga, ON
Descr. :	Microphone		
Serial # :	1022	P. Order :	Stefan
Asset # :	MS000008		

Cal. status : Received in spec's, no adjustment made.
Tested with L&D LS3000+ s# 182

JOLA Instruments Inc. certifies that the above listed instrument was calibrated on date noted and was released from this laboratory performing in accordance with the specifications set forth by the manufacturer.

Unless otherwise noted in the calibration report a 4:1 accuracy ratio was maintained for this calibration.

Our calibration system complies with the requirements of ISO-17025 standard, working standards used for calibration are certified by or traceable to the National Research Council of Canada or the National Institute of Standards and Technology.

Calibrated : Jan 06, 2009 By : J. Raposo

Cal. Due : Jan 06, 2010

Temperature : 23 °C ± 2 °C Relative Humidity : 45 % ± 20 %

Standards used : J-129 J-163 J-216

JOLA Instruments Inc.

REPAIR AND CALIBRATION TRACEABLE TO NRC AND NIST

88 Judge Rd. Toronto, ON, M8Z 5B4 http: // www.jola.com
Phone : 416 234 0354 Fax: 416 234 9562 e-Mail: jola @ jola.com

CERTIFICATE of CALIBRATION

Make :	Larson Davis	Reference # :	88581
Model :	3000+	Customer :	Golder Associates Ltd Mississauga, ON
Descr. :	Analyzer FFT 2ch, SLM type 1		
Serial # :	182	P. Order :	Stefan
Asset # :	MS000009		

Cal. status : Received in spec's, no adjustment made.
With PRM902s#3553 and PCB 377A60 s#1022

JOLA Instruments Inc. certifies that the above listed instrument was calibrated on date noted and was released from this laboratory performing in accordance with the specifications set forth by the manufacturer.

Unless otherwise noted in the calibration report a 4:1 accuracy ratio was maintained for this calibration.

Our calibration system complies with the requirements of ISO-17025 standard, working standards used for calibration are certified by or traceable to the National Research Council of Canada or the National Institute of Standards and Technology.

Calibrated : Jan 05, 2009 By : J. Raposo

Cal. Due : Jan 05, 2010

Temperature : 23 °C ± 2 °C Relative Humidity : 45 % ± 20 %

Standards used : J-203 J-215 J-216

JOLA Instruments Inc.

REPAIR AND CALIBRATION TRACEABLE TO NRC AND NIST

88 Judge Rd. Toronto, ON, M8Z 5B4 http: // www.jola.com
Phone : 416 234 0354 Fax: 416 234 9562 e-Mail: jola @ jola.com

West Caldwell Calibration Laboratories Inc.

Certificate of Calibration

for

CALIBRATOR

Manufactured By:	**BRUEL & KJAER**
Model No.:	**4230**
Serial No.:	**565639**
Calibration Recall No.:	**C6270**

Submitted by:

Customer:

Company: **Golder Associates Ltd.**
Address:

The subject instrument was calibrated to the indicated specification using standards traceable to the National Institute of Standards and Technology or to accepted values of natural physical constants. This document certifies that the instrument met the following specification upon its return to the submitter.

West Caldwell Calibration Laboratories Specification No. **4230 B&K** **(see attached)**

Upon receipt for Calibration, the instrument was found to be:

Within (X) see attached Report of Calibration

the tolerance of the indicated specification.

West Caldwell Calibration Laboratories' calibration control system meets the following requirements, ISO 10012-1 MIL-STD- 45662A, ANSI/NCSL, Z540-1, IEC Guide 25, ISO 9001:2000 and ISO/IEC 17025:2005

Note: With this Certificate, Report of Calibration is included.

Approved by:

Calibration Date: 08 March 2007

Certificate No: C6270 -4

Stanley Christopher
Quality Manager

West Caldwell Calibration Laboratories, Inc.
uncompromised calibration
220 Rutherford Rd. S., Unit 210, Brampton, Ontario L6W 3J6 Canada

ISO 9001:2000
Registered Company

Calibration Traceable
To N. I. S. T.

ACCREDITATION ISO/IEC 17025
ACCREDITED
1533.02

Phone: (905) 595-1107 Fax: (905) 595-1108

PCB PIEZOTRONICS
A PCB GROUP COMPANY

Certificate of Calibration and Conformance

Certificate Number 2009-120808

Instrument Model 2260, Serial Number 0263, was calibrated on 04AUG2009. The instrument meets factory specifications per Procedure D0001.8089.

New Instrument
Date Calibrated: 04AUG2009
Calibration due:

Calibration Standards Used

MANUFACTURER	MODEL	SERIAL NUMBER	INTERVAL	CAL. DUE	TRACEABILITY NO.
Hewlett Packard	34401A	US36015216	12 Months	06MAY2010	4342531
Larson Davis	LDSigGn / 2209	0097 / 0118	12 Months	20JUL2010	2009-120295

Reference Standards are traceable to the National Institute of Standards and Technology (NIST)

Calibration Environmental Conditions

Temperature: 24 ° Centigrade

Relative Humidity: 29 %

Affirmations

This Certificate attests that this instrument has been calibrated under the stated conditions with Measurement and Test Equipment (M&TE) Standards traceable to the U.S. National Institute of Standards and Technology (NIST). All of the Measurement Standards have been calibrated to their manufacturers' specified accuracy / uncertainty. Evidence of traceability and accuracy is on file at Provo Engineering & Manufacturing Center. An acceptable accuracy ratio between the Standard(s) and the item calibrated has been maintained. This instrument meets or exceeds the manufacturer's published specification unless noted.

This calibration complies with the requirements of ISO 17025 and ANSI Z540. The collective uncertainty of the Measurement Standard used does not exceed 25% of the applicable tolerance for each characteristic calibrated unless otherwise noted.

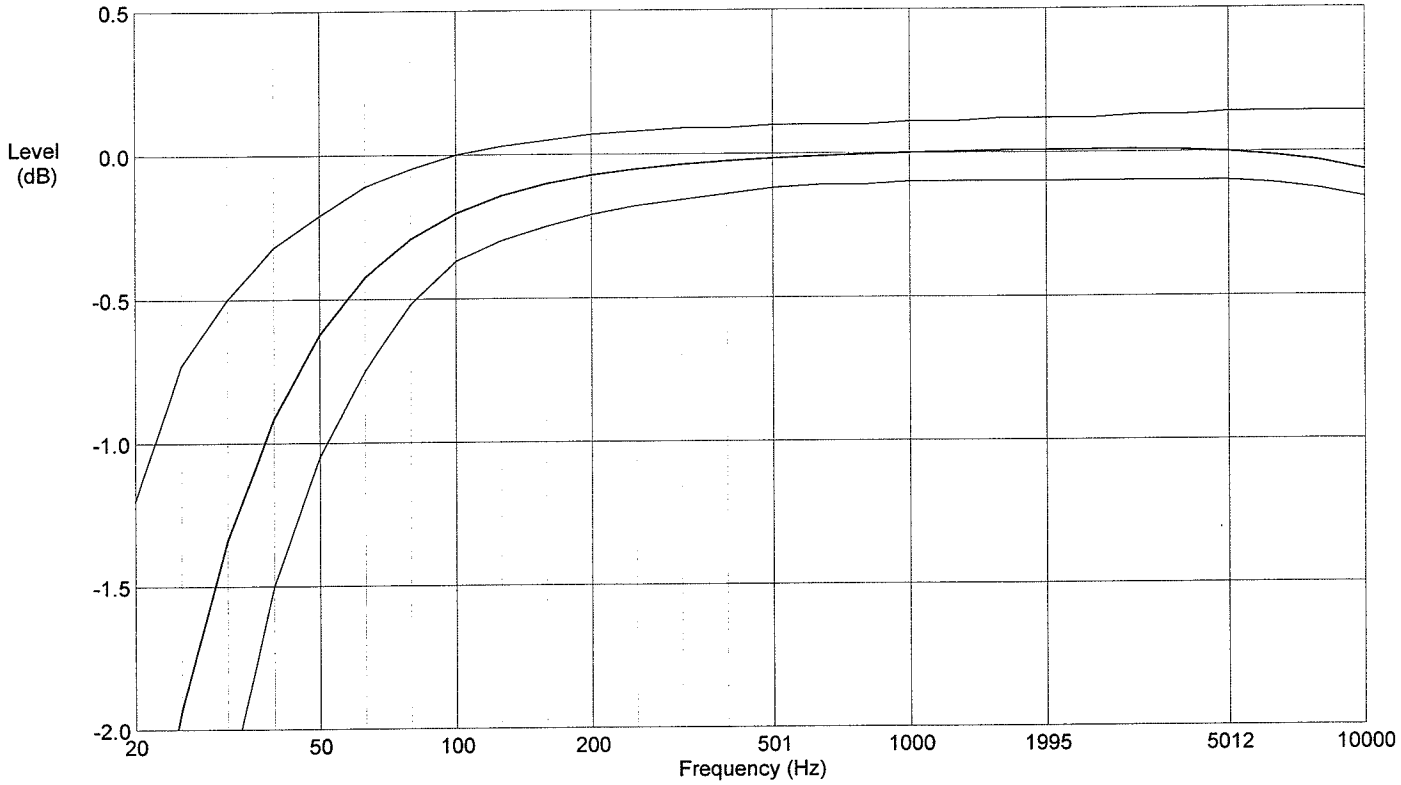
The results documented in this certificate relate only to the item(s) calibrated or tested. A one year calibration is recommended, however calibration interval assignment and adjustment are the responsibility of the end user. This certificate may not be reproduced, except in full, without the written approval of the issuer.

Signed: _____
Technician: Jason Grace

Provo Engineering and Manufacturing Center, 1681 West 820 North, Provo, Utah 84601
Toll Free: 888.258.3222 Telephone: 716.926.8243 Fax: 716.926.8215
ISO 9001-2000 Certified

Preamplifier Model: 2260-Low Serial Number: 0263
Certificate of Electrical Conformance

Frequency response of this model 2260-Low preamplifier was tested at a level of 1 Vrms with 18pF microphone capacitance and driving a short cable. Output level at 1kHz is 0.8914 Vrms (-0.999 dBV), uncertainty 0.033 dB. Results are displayed relative to the level at 1kHz.



Freq (Hz)	Measured (dB)	Uncert (dB)	Tolerance (dB)
2.51	-16.84	0.075	n/a n/a
3.16	-15.07	0.058	n/a n/a
3.98	-13.28	0.058	n/a n/a
5.01	-11.47	0.036	n/a n/a
6.31	-9.71	0.036	n/a n/a
7.94	-8.01	0.036	n/a n/a
10.00	-6.42	0.016	n/a n/a
12.59	-4.99	0.016	n/a n/a
15.85	-3.75	0.016	n/a n/a
19.95	-2.73	0.016	-1.20, -5.00
25.12	-1.93	0.016	-0.73, -3.30
31.62	-1.34	0.016	-0.50, -2.20
39.81	-0.92	0.016	-0.32, -1.50
50.12	-0.62	0.016	-0.21, -1.05
63.10	-0.43	0.016	-0.11, -0.75
79.43	-0.29	0.016	-0.05, -0.52
100.00	-0.20	0.016	+0.00, -0.37
125.89	-0.14	0.016	+0.03, -0.30
158.49	-0.10	0.016	+0.05, -0.25
199.53	-0.07	0.016	+0.07, -0.21
251.19	-0.05	0.016	+0.08, -0.18
316.23	-0.04	0.016	+0.09, -0.16
398.11	-0.03	0.016	+0.09, -0.14
501.19	-0.02	0.016	+0.10, -0.12
630.96	-0.01	0.016	+0.10, -0.11
794.33	-0.00	0.016	+0.10, -0.11
1000.00	0.00	0.016	+0.11, -0.10
1258.90	0.00	0.016	+0.11, -0.10
1584.90	0.01	0.016	+0.12, -0.10
1995.30	0.01	0.016	+0.12, -0.10
2511.90	0.01	0.016	+0.12, -0.10
3162.30	0.01	0.016	+0.13, -0.10
3981.10	0.01	0.016	+0.13, -0.10
5011.90	0.00	0.016	+0.14, -0.10
6309.60	-0.01	0.016	+0.14, -0.11
7943.30	-0.03	0.016	+0.14, -0.13
10000.00	-0.07	0.016	+0.14, -0.16
12589.00	-0.11	0.016	n/a n/a
15849.00	-0.20	0.016	n/a n/a
19953.00	-0.33	0.016	n/a n/a
25250.00	-0.54	0.022	n/a n/a
31500.00	-0.84	0.022	n/a n/a
39750.00	-1.32	0.022	n/a n/a
50000.00	-2.00	0.022	n/a n/a
63000.00	-2.93	0.047	n/a n/a
79500.00	-4.12	0.047	n/a n/a
100000.00	-5.51	0.047	n/a n/a
126000.00	-7.10	0.063	n/a n/a

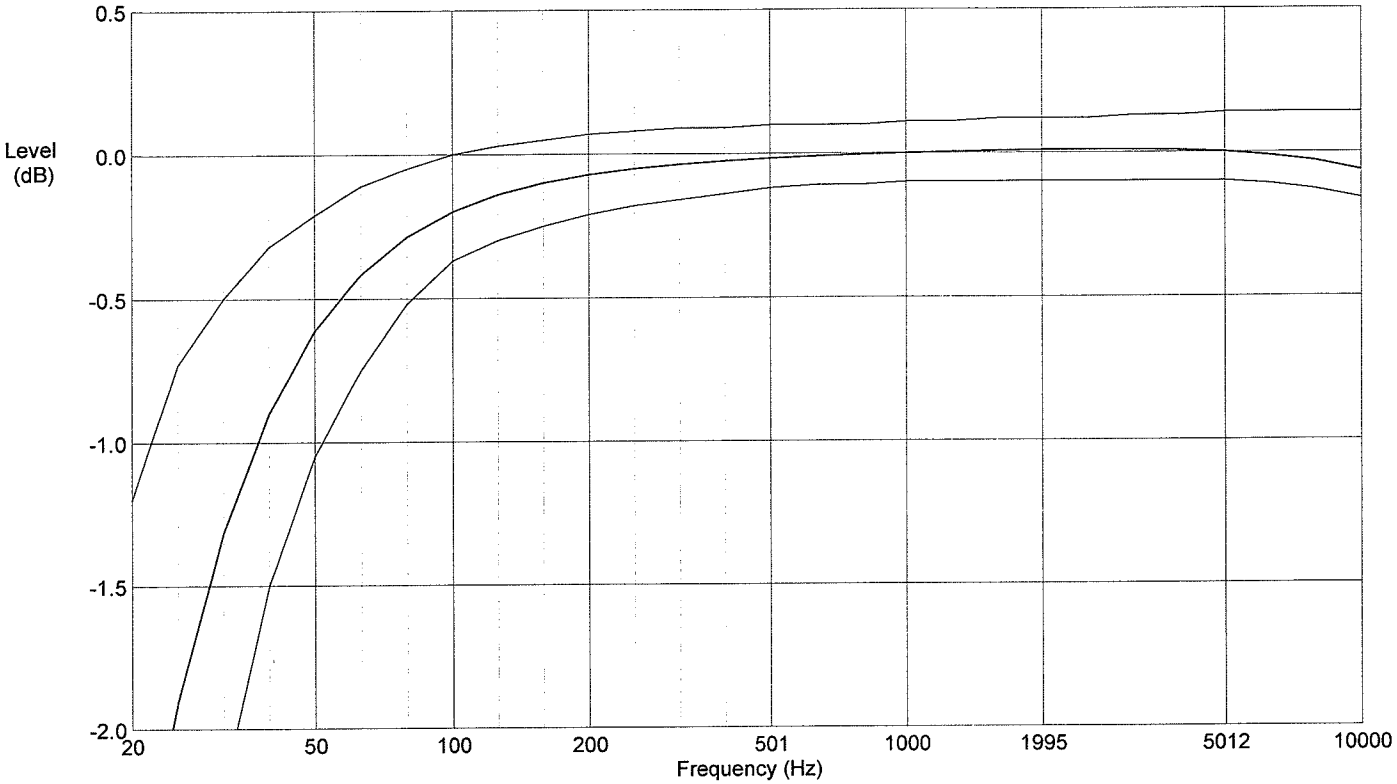
Noise floor data: 1kHz (1/3 Octave) = 0.60 uV, -4.4 dBuV, uncertainty = 0.47 dB
Flat (20Hz-20kHz) = 5.0 uV, 13.9 dBuV, uncertainty = 0.47 dB
Awt = 2.7 uV, 8.7 dBuV, uncertainty = 0.46 dB

Uncertainties are given as expanded uncertainty at ~95% confidence interval (k = 2).

Technician: Jason Grace Test Date: 04AUG2009

Preamplifier Model: 2260-High Serial Number: 0263
Certificate of Electrical Conformance

Frequency response of this model 2260-High preamplifier was tested at a level of 1 Vrms with 18pF microphone capacitance and driving a short cable. Output level at 1kHz is 0.9005 Vrms (-0.910 dBV), uncertainty 0.033 dB. Results are displayed relative to the level at 1kHz.



Freq (Hz)	Measured (dB)	Uncert (dB)	Tolerance (dB)
2.51	-16.94	0.075	n/a n/a
3.16	-15.12	0.058	n/a n/a
3.98	-13.29	0.058	n/a n/a
5.01	-11.46	0.036	n/a n/a
6.31	-9.67	0.036	n/a n/a
7.94	-7.96	0.036	n/a n/a
10.00	-6.37	0.016	n/a n/a
12.59	-4.94	0.016	n/a n/a
15.85	-3.70	0.016	n/a n/a
19.95	-2.69	0.016	-1.20, -5.00
25.12	-1.90	0.016	-0.73, -3.30
31.62	-1.32	0.016	-0.50, -2.20
39.81	-0.90	0.016	-0.32, -1.50
50.12	-0.61	0.016	-0.21, -1.05
63.10	-0.42	0.016	-0.11, -0.75
79.43	-0.29	0.016	-0.05, -0.52
100.00	-0.20	0.016	+0.00, -0.37
125.89	-0.14	0.016	+0.03, -0.30
158.49	-0.10	0.016	+0.05, -0.25
199.53	-0.07	0.016	+0.07, -0.21
251.19	-0.05	0.016	+0.08, -0.18
316.23	-0.04	0.016	+0.09, -0.16
398.11	-0.03	0.016	+0.09, -0.14
501.19	-0.02	0.016	+0.10, -0.12

Freq (Hz)	Measured (dB)	Uncert (dB)	Tolerance (dB)
630.96	-0.01	0.016	+0.10, -0.11
794.33	-0.01	0.016	+0.10, -0.11
1000.00	0.00	0.016	+0.11, -0.10
1258.90	0.00	0.016	+0.11, -0.10
1584.90	0.01	0.016	+0.12, -0.10
1995.30	0.01	0.016	+0.12, -0.10
2511.90	0.01	0.016	+0.12, -0.10
3162.30	0.01	0.016	+0.13, -0.10
3981.10	0.01	0.016	+0.13, -0.10
5011.90	0.00	0.016	+0.14, -0.10
6309.60	-0.01	0.016	+0.14, -0.11
7943.30	-0.03	0.016	+0.14, -0.13
10000.00	-0.06	0.016	+0.14, -0.16
12589.00	-0.11	0.016	n/a n/a
15849.00	-0.20	0.016	n/a n/a
19953.00	-0.32	0.016	n/a n/a
25250.00	-0.53	0.022	n/a n/a
31500.00	-0.83	0.022	n/a n/a
39750.00	-1.29	0.022	n/a n/a
50000.00	-1.96	0.022	n/a n/a
63000.00	-2.88	0.047	n/a n/a
79500.00	-4.05	0.047	n/a n/a
100000.00	-5.43	0.047	n/a n/a
126000.00	-7.01	0.063	n/a n/a

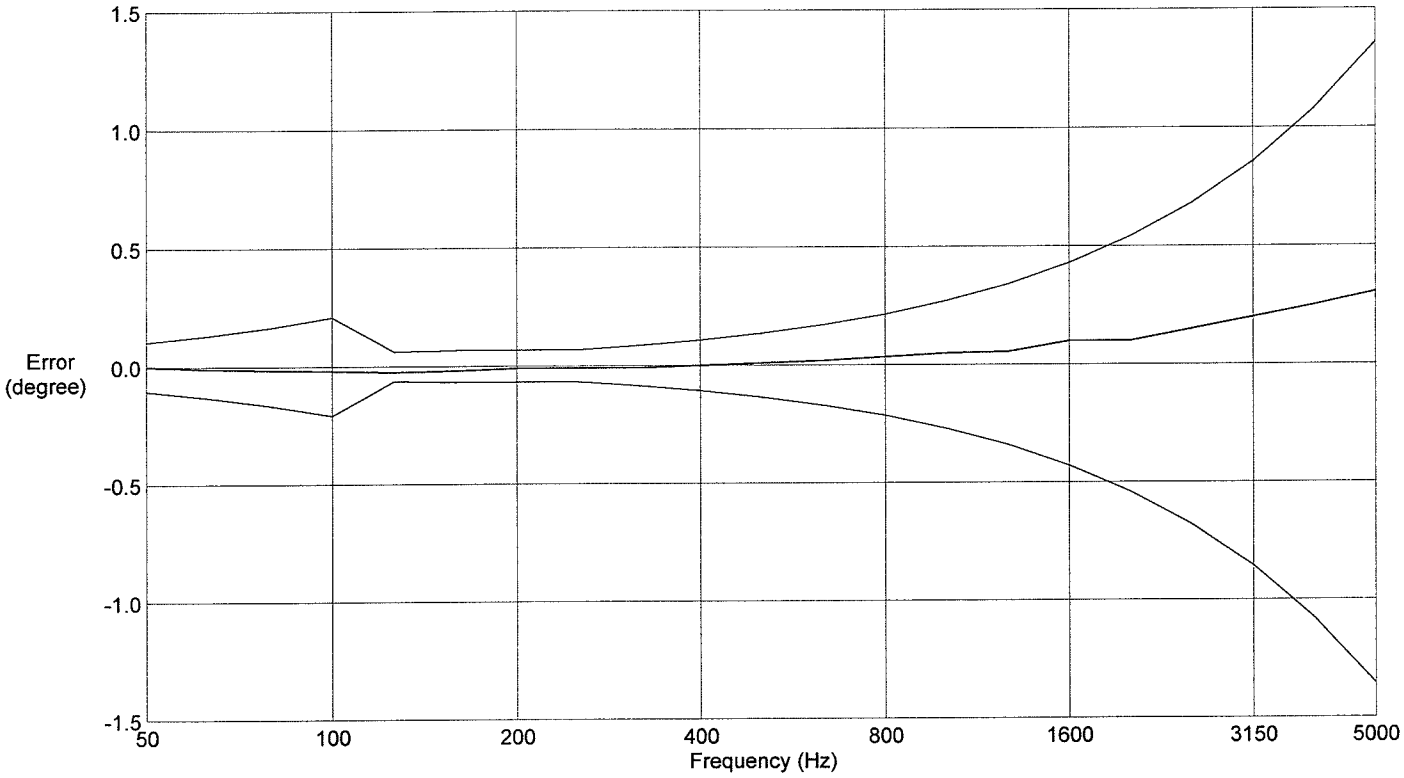
Noise floor data: 1kHz (1/3 Octave) = 0.62 uV, -4.1 dBuV, uncertainty = 0.47 dB
Flat (20Hz-20kHz) = 5.2 uV, 14.3 dBuV, uncertainty = 0.47 dB
Awt = 2.8 uV, 9.0 dBuV, uncertainty = 0.46 dB

Uncertainties are given as expanded uncertainty at ~95% confidence interval (k = 2).

Technician: Jason Grace Test Date: 04AUG2009

Model: 2260-Phase Serial Number: 0263
CH 1 Mic: 2640 1436
CH 2 Mic: 2640 1345

Phase errors for the probe. This Class 1 Intensity Probe was tested with a Residual-intensity calibrator model CAL 291. This data was taken after the probe was adjusted for phase with the two adjustors on the side of the probe handle.



Freq (Hz)	Measured (degree)	LD Tolerance (degree)	Spacer (mm)	Freq (Hz)	Measured (degree)	LD Tolerance (degree)	Spacer (mm)
50.12	0.0000	+0.1047, -0.1047	50	631.00	0.0200	+0.1711, -0.1711	12
63.10	-0.0100	+0.1318, -0.1318	50	794.30	0.0350	+0.2153, -0.2153	12
79.43	-0.0150	+0.1660, -0.1660	50	1000.00	0.0500	+0.2711, -0.2711	12
100.00	-0.0200	+0.2089, -0.2089	50	1259.00	0.0550	+0.3413, -0.3413	12
125.90	-0.0250	+0.0631, -0.0631	12	1585.00	0.1000	+0.4297, -0.4297	12
158.50	-0.0200	+0.0681, -0.0681	12	1995.00	0.1000	+0.5409, -0.5409	12
199.50	-0.0100	+0.0681, -0.0681	12	2512.00	0.1500	+0.6810, -0.6810	12
251.20	-0.0100	+0.0681, -0.0681	12	3162.00	0.2000	+0.8574, -0.8574	12
316.20	-0.0100	+0.0857, -0.0857	12	3981.00	0.2500	+1.0800, -1.0800	12
398.10	0.0000	+0.1079, -0.1079	12	5012.00	0.3050	+1.3590, -1.3590	12
501.20	0.0100	+0.1359, -0.1359	12				

Limits are the smallest of ANSI S1.9-1996 table 7 or IEC 1043-1993 table 2 Class 1.

Technician: Jason Grace Test Date: 04AUG2009

APPENDIX G

Measurements

(Measured sound pressure level (L_{EQ}) in one third octave band format is given in this appendix. The data are given in dB re 20 x 10^{-6} Pa. The measurements were taken as a scan of the surface)

Frequency (Hz)	Transformer	Transformer	Transformer	Xantrex Intake	Xantrex Exhaust	Xantrex Cooling1	Xantrex Cooling2	SMA intake	SMA exhaust
25	51	52	51	72	75	68	70	55	69
31.5	52	55	52	66	72	63	68	55	69
40	50	51	50	62	70	65	68	59	76
50	50	53	51	59	69	64	67	62	75
63	56	58	58	65	67	67	70	58	74
80	51	48	45	65	66	69	71	55	73
100	53	50	44	66	65	69	71	55	71
125	56	55	58	73	73	72	73	61	66
160	46	41	37	68	70	70	70	55	65
200	55	45	39	70	65	72	73	51	63
250	53	54	51	74	66	71	75	56	69
315	51	48	45	74	74	72	78	64	76
400	51	50	47	72	78	70	73	57	74
500	52	51	44	70	69	68	70	61	70
630	46	47	41	69	69	68	70	56	71
800	47	46	37	74	69	74	76	52	66
1000	50	40	36	65	66	67	70	53	63
1250	44	38	35	69	67	68	73	54	68
1600	45	38	35	69	67	67	72	54	67
2000	41	35	34	63	66	64	71	52	63
2500	45	37	39	60	64	62	69	54	71
3150	48	37	44	58	63	59	67	55	75
4000	32	33	28	56	61	57	65	46	59
5000	36	42	40	61	58	59	66	45	57
6300	43	39	40	78	62	76	81	55	70
8000	34	34	34	59	52	59	66	42	56
10000	34	31	29	50	44	51	55	41	55

APPENDIX H

Weather Data

Weather Data

Source: Environment Canada, Climate Data Online, www.climate.weatheroffice.ec.gc.ca/climateData/canada_e.html

Station: LONDON INT'L AIRPORT Latitude: 43° 1.8' N Longitude: 82° 9' W

Date/Time	Time	Temp (°C)	Dew Point Temp (°C)	Rel Hum (%)	Wind Dir (10's deg)	Wind Spd (km/h)	Visibility (km)	Stn Press (kPa)	Wind Chill	Weather
8/6/2010	0:00	19	15	78	34	13	24	97.61		Clear
8/6/2010	1:00	18	15	81	29	6	24	97.65		Clear
8/6/2010	2:00	17	14	84	32	4	24	97.67		Mainly Clear
8/6/2010	3:00	17	14	81	29	7	24	97.67		Mostly Cloudy
8/6/2010	4:00	18	12	68	32	7	24	97.68		Mainly Clear
8/6/2010	5:00	17	12	71	34	6	24	97.74		Mostly Cloudy
8/6/2010	6:00	17	12	73	32	4	24	97.76		Mostly Cloudy
8/6/2010	7:00	18	13	71	31	6	24	97.81		Mainly Clear
8/6/2010	8:00	19	12	62	35	9	24	97.85		Mostly Cloudy
8/6/2010	9:00	20	12	60	28	7	24	97.90		Mainly Clear
8/6/2010	10:00	22	12	52	28	7	24	97.90		Mostly Cloudy
8/6/2010	11:00	22	12	53	29	13	24	97.92		Mostly Cloudy
8/6/2010	12:00	23	15	62	26	15	24	97.91		Mostly Cloudy
8/6/2010	13:00	23	13	52	27	17	24	97.86		Mostly Cloudy
8/6/2010	14:00	24	13	50	27	17	24	97.82		Mostly Cloudy
8/6/2010	15:00	24	14	53	28	24	24	97.81		Mostly Cloudy
8/6/2010	16:00	24	14	54	31	15	24	97.81		Mostly Cloudy
8/6/2010	17:00	24	14	54	31	15	24	97.86		Mostly Cloudy
8/6/2010	18:00	22	13	55	31	13	24	97.87		Mainly Clear
8/6/2010	19:00	21	12	58	33	17	24	97.92		Mainly Clear
8/6/2010	20:00	19	11	62	26	11	24	97.99		Mainly Clear
8/6/2010	21:00	17	11	67	1	7	24	98.10		Mainly Clear
8/6/2010	22:00	16	11	71	36	6	24	98.12		Clear
8/6/2010	23:00	14	11	78	3	9	24	98.15		Clear

At Golder Associates we strive to be the most respected global group of companies specializing in ground engineering and environmental services. Employee owned since our formation in 1960, we have created a unique culture with pride in ownership, resulting in long-term organizational stability. Golder professionals take the time to build an understanding of client needs and of the specific environments in which they operate. We continue to expand our technical capabilities and have experienced steady growth with employees now operating from offices located throughout Africa, Asia, Australasia, Europe, North America and South America.

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