

**NOTES:**

**PV SYSTEM:**  
 AZIMUTH: 180°  
 TILT ANGLE: 30°  
 PITCH (ROW-TO-ROW SPACING): 30°  
 PV MODULES: HANWHA Q.CELLS L-G4.1, 330W, MONOCRYSTALLINE PERC  
 TOTAL MODULES: 4,248  
 MODULES PER STRING: 18  
 TOTAL STRINGS: 236

**RACK CONFIGURATION:**  
 RBI GROUND MOUNT  
 EACH RACK CONSISTS OF [2] MODULES BY [9] MODULES IN PORTRAIT

**INVERTER INFORMATION:**  
 SUNGROW 60 KU-M (SG60KU-M)  
 66KW AC STRING INVERTER  
 62.5 KW AC MAX @ .95 LEADING PF  
 STRINGS PER INVERTER: 14 & 15  
 DC/AC RATIO @ POWER LIMIT: 1.402

**LEGEND:**

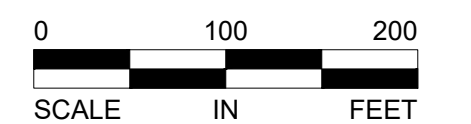
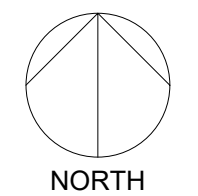
- PROPERTY LINE
- SOLAR MODULE (4,248)
- EQUIPMENT PAD (1): LV SWITCHGEAR, LOCUS METERING AND WEATHER STATION WITH SITE CAMERA, GROUNDING TRANSFORMER, AND XCEL BILLING AND PRODUCTION METER
- PROPOSED SITE ROAD (16')
- - - XCEL MV FEEDER
- OHU — EXISTING OVERHEAD LINES
- ⊙ EXISTING UTILITY POLE
- ⊙ PROPOSED POLE LOCATION
- SRC OUTLINE
- x - PERIMETER FENCE
- XCEL OWNED PAD MOUNTED PMH
- ▨ VEGETATIVE BUFFER



CLIENT



SCALE



PROJECT  
**HELEN SOLAR, LLC.**  
**SRC# 041082**

LOCATION  
**11567 BOONE RD,**  
**UNIT 1**  
**PLATO, MN 55370**

SHEET  
**PV SITE LAYOUT**

SUBMITTAL  
**INTERCONNECTION**

#	DATE	REVISION

PROFESSIONAL CERTIFICATION

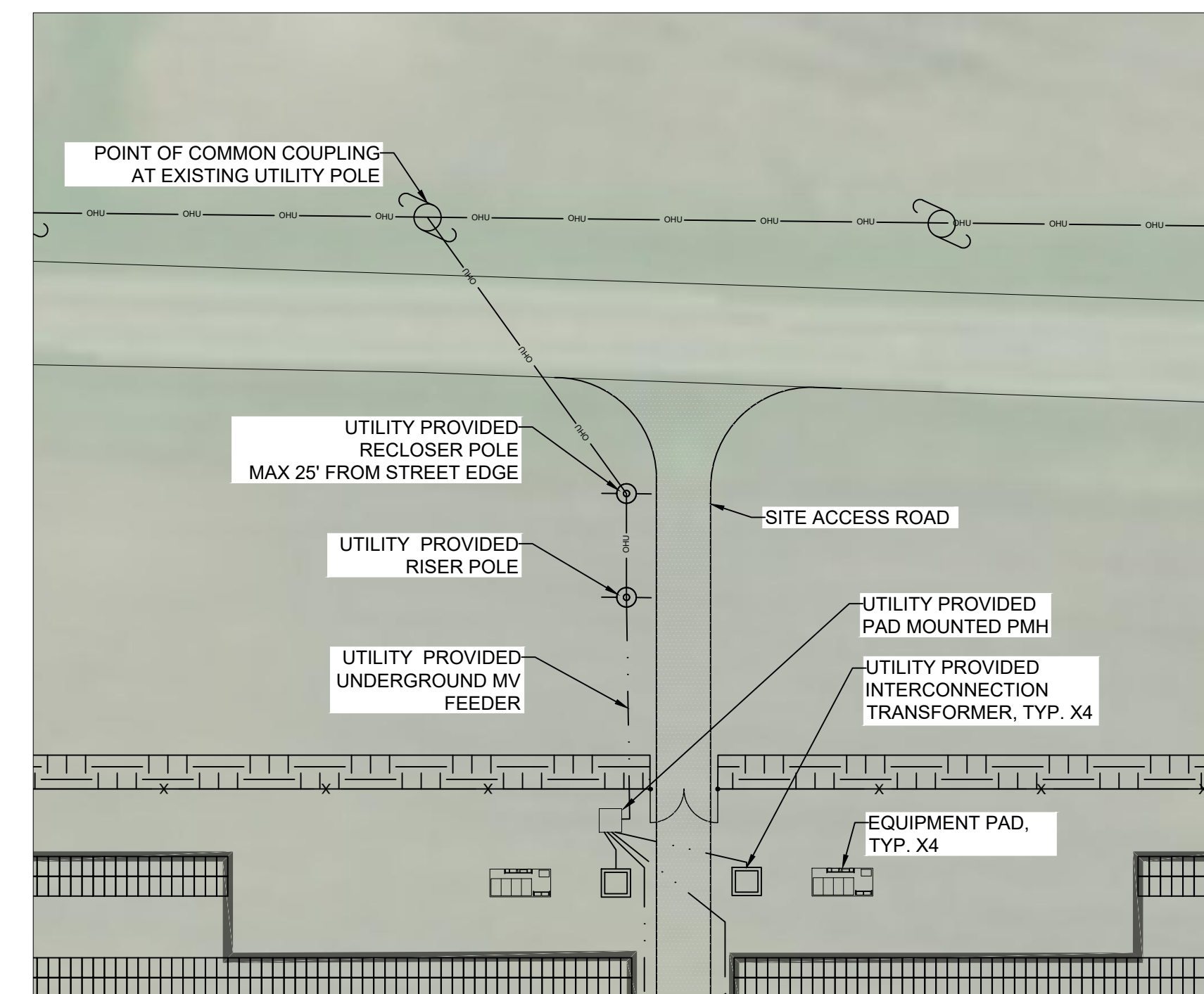
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G HART	K HAAB
DATE	PROJECT #
10.23.18	2018-084.1

SHEET NUMBER

**1 OF 4**

**1 SITE LAYOUT**  
 Scale: 1" = 100'

<b>PROJECT NAME</b>	HELEN SOLAR, LLC	<b>GARDEN OPERATOR NAME</b>	HELEN SOLAR, LLC
<b>APPLICATION MANAGER - PHONE</b>	(952)-486-1538	<b>APPLICATION MANAGER - EMAIL</b>	cindy.larsononeil@renesolapower.com
<b>SRC #</b>	SRC041082	<b>SRC ADDRESS</b>	11567 BOONE ROAD UNIT 1, PLATO, MN 55370
<b>SRC CAPACITY DC KW</b>	1402	<b>SRC CAPACITY AC KW</b>	1000
<b>SRC PV WATTS LOCATION</b>	(TMY3) MINNEAPOLIS-ST PAIL INT'L ARP, MN	<b>ARRAY-TILT</b>	30
<b>ARRAY-AZIMUTH</b>	180	<b>ARRAY-TRACKER TYP</b>	FIXED AXIS
<b>ARRAY - MOUNT LOCATION</b>	44.789°, -94.056°	<b>WILL SELL REC'S</b>	YES
<b>SRC EST COMPLETION DATE</b>		<b>SRC KWH/YR</b>	1,884,250



**2 XCEL EQUIPMENT LAYOUT**  
 Scale: 1" = 40'

**SYSTEM SIZE**  
**1.00MW AC / 1.40MW DC**



CLIENT



SCALE

PROJECT  
**HELEN SOLAR, LLC.**  
SRC# 041082

LOCATION  
**11567 BOONE RD,**  
**UNIT 1**  
**PLATO, MN 55370**

SHEET  
**ONE LINE DIAGRAM**

SUBMITTAL  
**INTERCONNECTION**

#	DATE	REVISION

PROFESSIONAL CERTIFICATION

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**G HART**

CHECKED BY  
**S IYENGAR**

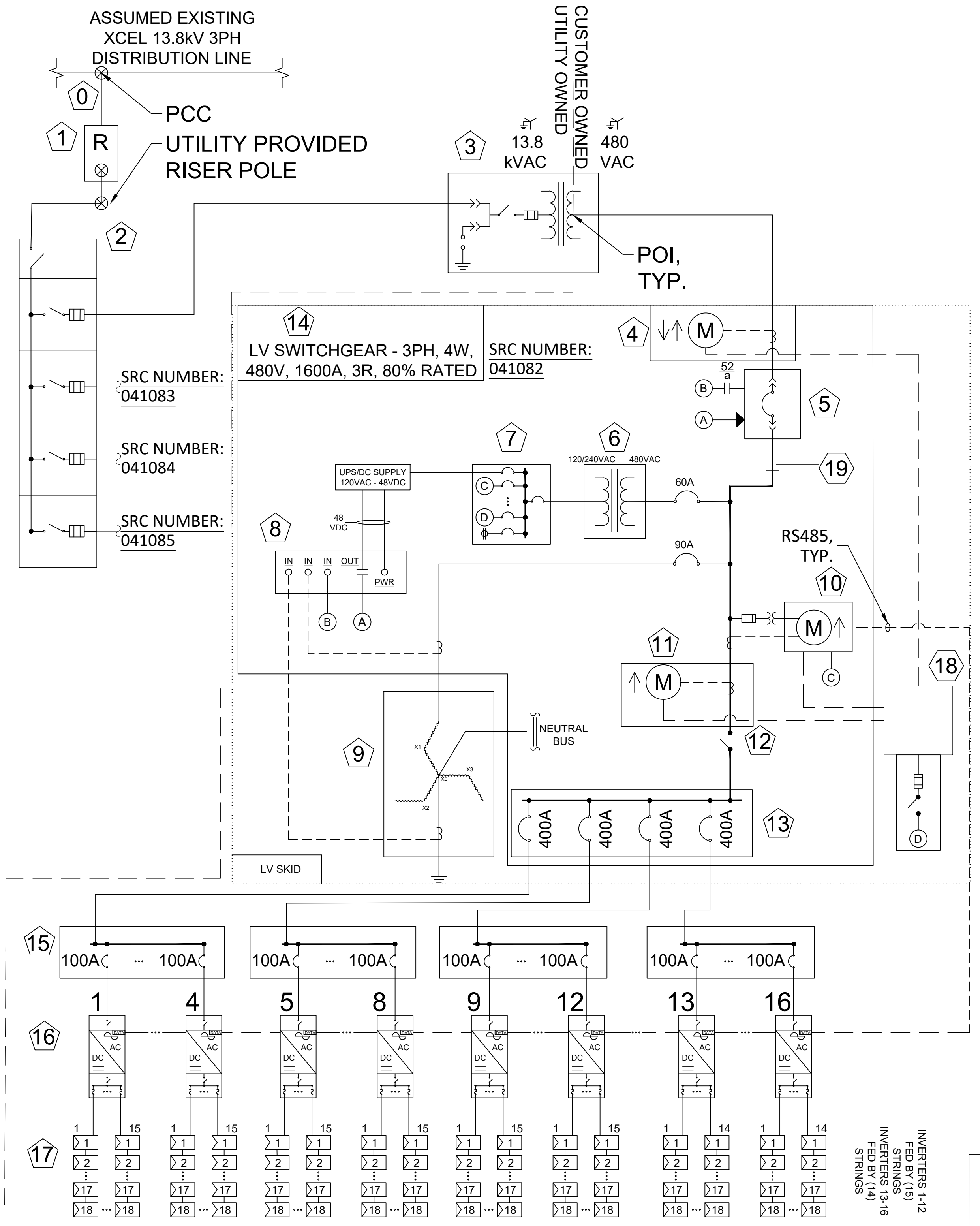
DATE  
**09.24.18**

PROJECT #  
**2018-084.1**

SHEET NUMBER  
**2 OF 4**

**1000kW AC BLOCK SCHEDULE**

ID #	QTY. (4 TOTAL ON SITE)	DESCRIPTION	LABEL SHEET NUMBERS (PAGE 3 OF 4)
0	1	UTILITY PROVIDED INTERCONNECTION POLE	
1	1	UTILITY PROVIDED RECLOSER POLE	
2	1	UTILITY OWNED FUSED PMH (4 FUSED INPUTS, 1 UNFUSED OUTPUT)	
3	1	UTILITY PROVIDED 1,000kVA XFMR, 13.8kV:480V Z=5.32%, GROUNDED WYE:GROUNDED WYE (TO BE SPECIFIED BY XCEL ENERGY)	16
4	1	XCEL BILLING METER W/ CT'S 3PH, 4W, 480V IN CUSTOMER PROVIDED METERING CABINET PER BLUE BOOK DRAWING TR-40 REQUIREMENTS	11,12,17
5	1	MAIN AC DISCONNECT 1600A DRAW-OUT STYLE MAIN CIRCUIT BREAKER W/ LSIG TRIP TO BE VISIBLE, LOCKABLE, READILY ACCESSIBLE, 80% RATED	2,4,6,8,10
6	1	AUX XFMR-10kVA, 1PH, 480 L-L :120/240V W/ 60A CB	
7	1	HOUSE POWER 40A LOAD CENTER 120/240V	
8	1	SEL 751 GROUNDING TRANSFORMER RELAY	
9	1	ZIG-ZAG GROUNDING TRANSFORMER	
10	1	LOCUS LGATE 360 DATA ACQUISITION SYSTEM (DAS) W/ CUSTOMER-PROVIDED CHECK METER 480V, 3PH, 4W	
11	1	XCEL SECONDARY PRODUCTION METER 480V, 3PH, 4W IN CUSTOMER PROVIDED METERING CABINET PER BLUE BOOK DRAWING TR-40 REQUIREMENTS	1,11,12,13
12	1	CUSTOMER PROVIDED UTILITY AC DISCONNECT 1600A, VISIBLE BLADE, LOCKABLE, READILY ACCESSIBLE, 80% RATED	2,4,6,8,9
13	1	1600A LV SWITCHGEAR 480V, 3PH, 4W, NEMA 3R W/ 1600A MLO PANEL, AUXILIARY POWER PANEL, DRAWOUT CIRCUIT BREAKER AND METER CABINETS 80% RATED	7,11,12,13, 15,16
14	1	1600A MLO PANEL 480V, 3PH, 4W, NEMA 3R W/ (4) 400A FEEDER BREAKERS, 80% RATED	2,6,7,11,12, 13, 15,16
15	4	400A MLO PANEL 480V, 3PH, 4W, NEMA 3R, W/ (4) 100A FEEDER BREAKERS 80% RATED	2,7,14
16	16	SUNGROW SG60KU-M 66kW/66KVA, 480V INVERTER W/ INTEGRATED DC AND AC DISCONNECTS, 4 FUSED MPPT, 15A + & -. ALL INVERTERS WILL BE PROGRAMMED TO LIMIT OUTPUT AT 62.5 kW, PF=0.95 LEADING.	3,5
17	4248	HANWHA Q.PLUS L-G4.1 330W	
18	1	UTILITY PROVIDED SCADA CABINET	
19	1	SINGLE PHASE TESTING DEVICE	



**ELECTRICAL RATING OF INVERTERS ON SITE**

INVERTER	NOMINAL VOLTS	AC CURRENT OUTPUT	TOTAL HARMONIC DIST.	UTILITY CONNECTION	P.F. (LEADING)	FREQ.	QTY.	TOTAL KWAC
SUNGROW SG60KU-M	480V	80A	<3%	480V VAC 3PH, 4W	0.95	60	16	1000

**DRAWING NOTES:**

- INVERTERS TO BE EFFECTIVELY GROUND AS PER XCEL REQUIREMENTS
- ALL LABELS TO BE RED WITH WHITE LETTERING, FOR DETAILS PLEASE REFER TO SHEET 3/3
- "WHITE DOT" ON MAIN BILLING CT SHALL BE POLARITY MARKED AND WILL BE PLACED ON THE LINE-SIDE.
- "WHITE DOT" ON PV PRODUCTION CT SHALL BE POLARITY MARKED AND WILL BE PLACED ON THE PV-GENERATION SIDE
- THE MAIN BILLING AND PV PRODUCTION METER SOCKETS SHALL BE MARKED WITH A STAMPED PLASTIC/VINYL, BRASS, ALUMINUM OR STAINLESS STEEL TAG, INDICATING ADDRESS IN ACCORDANCE WITH THE REQUIREMENTS FOR " METER IDENTIFICATION " AS STATED IN 4.14.15.

**LEGEND**

	PV MODULE		FUSE
	INVERTER W/ INTEGRATED DC AND AC DISCONNECTS		DRAW-OUT STYLE CIRCUIT BREAKER
	CIRCUIT BREAKER		SURGE ARRESTOR
	DISCONNECT SWITCH		WYE-GROUND
	SINGLE PHASE HOOK SWITCH		EQUIPMENT SCHEDULE ID TAG
	METER		OVERHEAD POLE
	CURRENT TRANSFORMER (CT)		RECLOSER
	POTENTIAL TRANSFORMER (PT)		IDENTIFICATION TAG

**GENERAL NOTES:**

- EQUIPMENT USED SHALL BE UL-LISTED AS PER STANDARDS LISTED BELOW -
  - INVERTERS : UL1741
  - MODULES : UL1703
  - RACKING : UL2703 OR 3703
  - COMBINERS : UL1741
- EQUIPMENT SELECTION, PV-SYSTEM DESIGN AND INSTALLATION WILL BE AS PER NEC 2014 STANDARDS THE PROPOSED SYSTEM IS A UTILITY INTERACTIVE SYSTEM AND SHALL BE DESIGNED, INSTALLED AND OPERATED IN COMPLIANCE WITH APPROPRIATE STANDARDS SUCH AS - FERC, OATT, NEC AND IEEE.

**SPECIFIC NOTES:**

- THE PROPOSED SYSTEM IS A UTILITY INTERACTIVE SYSTEM IN COMPLIANCE WITH NEC 690 AND IEEE 1547.
- BILLING METER** WITH CT'S AND PT'S PROVIDED BY XCEL PER BLUE BOOK DRAWING PM-10 REQUIREMENTS.
- DATA ACQUISITION SYSTEM (DAS)** WITH 480V, 3PH, 4W CUSTOMER CHECK METER AND COMMUNICATIONS LINE PROVIDED BY CONTRACTOR.
- PRODUCTION METER** WITH CT'S AND PT'S PROVIDED BY XCEL, CONTRACTOR PROVIDED SWITCHGEAR CABINET TO HOUSE PRODUCTION METER CT'S AND PT'S PER BLUE BOOK DRAWING TR-40 REQUIREMENTS.
- SUNGROW INVERTERS**, MAXIMUM AC POWER 66,000 WATTS/66,000VA, MAXIMUM CURRENT 80 A; PROGRAMMED TO LIMIT POWER OUTPUT TO 62.5 kW AT PF 0.95 LEADING.
- PV MODULES** 330 WATTS EACH, 18 MODULES PER STRING 1000VDC (UL), IP65 OR IP 67 RATED.
- LOCATION OF A TEMPORARY DEVICE FOR TESTING "LOSS OF PHASE"**. LOSS OF PHASE SHOULD BE EXPERIENCED BY THE GROUNDING TRANSFORMER ALSO. THIS DEVICE SHOULD BE REMOVED AFTER COMPLETION OF TEST. SEE PAGE 4 FOR DEVICE SCHEMATIC

**GROUNDING TRANSFORMER RATINGS:**

- X0 = 0.13138 Ω
- R0 ≤ 0.02956 Ω
- CONTINUOUS NEUTRAL RATING > 255 AMPS
- 5-SECOND FAULT WITHSTAND RATING > 2914 AMPS

**DIVISION OF RESPONSIBILITY:**

- MV TRANSFORMER PROVIDED AND INSTALLED BY UTILITY
- PRODUCTION AND BILLING METER CT & PT HOUSING PROVIDED BY CONTRACTOR
- PRODUCTION AND BILLING METER CT'S & PT'S PROVIDED BY XCEL
- CONTRACTOR TO FOLLOW XCEL 'BLUE BOOK' DRAWING TR-40 FOR CT HOUSING SPECIFICATIONS
- COMMUNICATION LINE FOR METERS PROVIDED BY CONTRACTOR.
- SCADA EQUIPMENT AND WIRING PROVIDED BY CONTRACTOR

**SYSTEM SIZE**  
**1.00MW AC/1.40MW DC**

1  
3  
4  
5  
6  
7  
2

**1 PRODUCTION METER**

**WARNING**  
ELECTRIC SHOCK HAZARD  
THE DC CONDUCTORS OF THIS PHOTOVOLTAIC SYSTEM ARE UNGROUNDED AND MAY BE ENERGIZED

**WARNING**  
ELECTRIC SHOCK HAZARD  
DO NOT TOUCH THESE TERMINALS, TERMINALS ON BOTH LINE AND LOAD SIDES MAY BE ENERGIZED IN THE OPEN POSITION

**WARNING**  
ELECTRIC SHOCK HAZARD  
WHEN A GROUND FAULT IS ACTIVE CONDUCTORS THAT ARE NORMALLY GROUNDED MAY BE UNGROUNDED AND ENERGIZED

**CAUTION**  
PHOTOVOLTAIC SYSTEM CIRCUIT IS BACKFED

**WARNING**  
TURN OFF DISCONNECT PRIOR TO WORKING INSIDE PANEL

**2 PHOTOVOLTAIC POWER SOURCE**

**8 DO NOT DISCONNECT UNDER LOAD**

**9 UTILITY AC DISCONNECT**

**10 MAIN AC DISCONNECT**

**11 CAUTION PHOTOVOLTAIC GENERATION SYSTEM CONNECTED**

**12 WARNING DUAL POWER SOURCE. SECOND SOURCE IS A PV SYSTEM**

**13 CAUTION**  
MAXIMUM OPERATING CURRENT 1600 A  
MAXIMUM OPERATING AC VOLTS 480 V

**17 MAIN SERVICE METER**

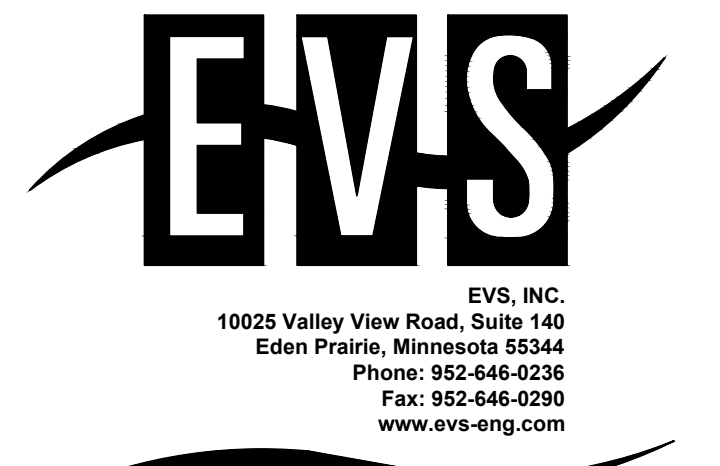
**LABEL NOTES:**  
1. PLACARDS SHALL BE PROVIDED TO CLEARLY SHOW THE MAIN SERVICE METER AND PRODUCTION METER PAIRS  
2. ALL LABELS TO BE WEATHERPROOF, DURABLE AND PERMANENTLY MOUNTED  
3. ALL LABELS TO BE NEC COMPLIANT

**14 CAUTION**  
NOMINAL OPERATING AC VOLTAGE 480 V  
NOMINAL OPERATING AC FREQUENCY 60 Hz  
MAXIMUM AC POWER 250kW  
MAXIMUM AC CURRENT 320 A  
OVERCURRENT PROTECTION RATING 400 A

**15 CAUTION**  
NOMINAL OPERATING AC VOLTAGE 480 V  
NOMINAL OPERATING AC FREQUENCY 60 Hz  
MAXIMUM AC POWER 1000kW  
MAXIMUM AC CURRENT 1280 A  
OVERCURRENT PROTECTION RATING 1600 A

**16 CAUTION**  
480V SECONDARY FAULT CURRENT = 22,609 AMPS

LABEL LOCATIONS/DETAILS	
1	PV PRODUCTION METER
2	UTILITY AC DISCONNECT, MAIN AC DISCONNECT, LV SWITCHGEAR
3	DC DISCONNECTS, INVERTERS
4	UTILITY AC DISCONNECT, MAIN AC DISCONNECT
5	DC DISCONNECTS, INVERTERS
6	MAIN AC DISCONNECT LOAD & LINE SIDE, UTILITY AC DISCONNECT, LV SWITCHGEAR
7	LV SWITCHGEAR
8	UTILITY AC DISCONNECT, MAIN AC DISCONNECT
9	UTILITY AC DISCONNECT
10	MAIN AC DISCONNECT
11	LV SWITCHGEAR, PRODUCTION METER, MAIN SERVICE BILLING METER
12	LV SWITCHGEAR, PRODUCTION METER, MAIN SERVICE BILLING METER
13	LV SWITCHGEAR, PRODUCTION METER
14	AC COMBINER PANEL (4 INVERTER INPUT)
15	LV SWITCHGEAR (16 INVERTER INPUT)
16	UTILITY TRANSFORMER AND LV SWITCHGEAR
17	MAIN SERVICE BILLING METER



CLIENT  
**ReneSola**

SCALE

PROJECT  
**HELEN SOLAR, LLC.**  
SRC# 041082

LOCATION  
**11567 BOONE RD,  
UNIT 1  
PLATO, MN 55370**

SHEET  
**XCEL LABELS &  
SIGNS**  
SUBMITTAL  
**INTERCONNECTION**

#	DATE	REVISION

PROFESSIONAL CERTIFICATION

DRAWN BY **S IYENGAR** CHECKED BY **S DAS**  
DATE **09.24.18** PROJECT # **2018-084.1**

SHEET NUMBER  
**3 OF 4**

CLIENT

**ReneSola**

SCALE

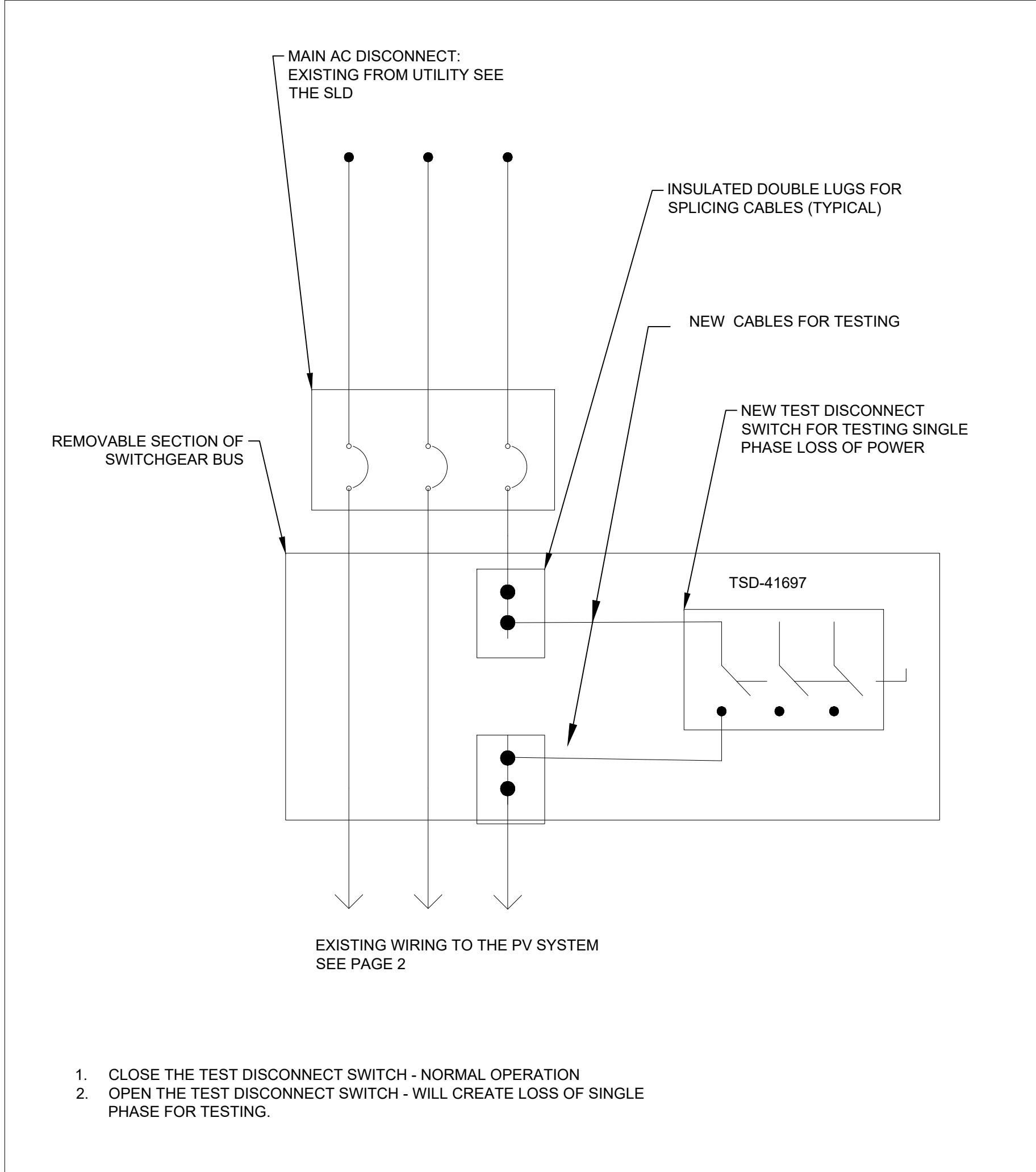
PROJECT  
**HELEN SOLAR, LLC.**  
**SRC# 041082-5**

LOCATION  
**11567 BOONE RD,**  
**UNIT 1-4**  
**PLATO, MN 55370**

SHEET  
**SINGLE PHASE**  
**TESTING EQUIPMENT**  
 SUBMITTAL  
**INTERCONNECTION**

#	DATE	REVISION

PROFESSIONAL CERTIFICATION



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**G HART      S IYENGAR**

DATE            PROJECT #  
**09.24.18      2018-084.1**

SHEET NUMBER

**4 OF 4**