3/13/2023 8:27:40 PM PROJECT NUMBER (E0) J:\2021\2021.028.01\Revit\Linwood Elem\_Solar Grant Project\_R2022.rvt

### SCHEMATIC SYMBOLS

AMP METER

M

<u>г — — </u>

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г — — — — — — — — 

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GFI

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AUTOMATIC TRANSFER SWITCH

#### AUTOMATIC TRANSFER SWITCH (4-POLE BYPASS ISOLATION)

#### CIRCUIT BREAKER

CIRCUIT BREAKER (GFI) CONTACT (N.C.) CONTACT (N.O.) CONTACT (REMOTE, N.C.) CONTACT (REMOTE, N.O.) DISCONNECT SWITCH ELECTRONIC INTERLOCK ENCLOSED CIRCUIT BREAKER FEEDER IDENTIFICATION FUSE

<u>POWER SYMBOLS</u>

0	CONDUIT DROP
0	CONDUIT RISE
	DISCONNECT SWITCH
	DISTRIBUTION PANEL
	ELECTRICAL PANEL
J	JUNCTION BOX
M	METER
$\sim$	MOTOR
$\boxtimes$	MOTOR STARTER
\$ €	MOTOR STARTER (MANUAL)
Ť	PUSH TYPE SWITCH
$\mathbf{\Phi}$	RECEPTACLE, 20 AMP DUPLEX
Ф	RECEPTACLE, CEILING MOUNTED
Ф	RECEPTACLE, CEILING 20 AMP DUPLEX
ф	RECEPTACLE, CEILING DUPLEX STANDBY POWER
ψ <sub>υ</sub>	RECEPTACLE, CEILING DUPLEX UPS BACKED

		SYMBOLS & ABBREVIAT	<b>IBOLS &amp; ABBREVIATIONS</b>		
>	FUSIBLE SWITCH GENERATOR GROUND GROUNDED WYE INDUCTOR LINE TAP METER	GENERAL SYMBOLS (#) KEY NOTE EQ.#) EQUIPMENT IDENTIFIER DETAIL NUMBER DETAIL REFERENCE SHEET NUMBER DETAIL NUMBER DETAIL REFERENCE MATCHED SHEET NUMBER CURRENT SHEET NUMBER MATCH LINE REFERENCE		ROOM NAME AND NUMBER CONNECTION TO EXISTING (#" INDICATES EXISTING SIZE) REVISION NUMBER - SECTION NUMBER SECTION REFERENCE - SHEET NUMBER NORTH ARROW	
	MOTOR PANELBOARD (# INDICATES NAME)	Sht # < MATCHED SHEET NUMBER	È	CENTER LINE	
PNL	PANEL OR CABINET	NOTE: SYMBOLS AND ABBREVIATIONS ON THE DRAWINGS SHALL BE INTERPRET WITH THE LEGENDS WHEREVER APPLICABLE. NOT ALL SYMBOLS AND AB LEGENDS ARE NECESSARILY USED FOR THE PROJECT. ALL SIZES ARE IN OTHERWISE NOTED.	TED IN AC <sup>,</sup> BREVIATI I INCHES,	CORDANCE ONS IN THE UNLESS	
>>	SEPARABLE CONNECTIONS				
0 0	SPACE IN PANELBOARD				
00	SWITCH	LINEWEIGHT LEGEND			
SPD	SURGE PROTECTION DEVICE	NEW WORK			
	TRANSFORMER	EXISTING TO REMAIN OR NOT IN CONTRACT			
⊘ =	VOLT METER				
		<b>ABBREVIATIONS</b>			
Ψ	RECEPTACLE, DUPLEX	Ø DIAMETER ABV ABOVE	LSI	INDICATES A BREAKER WITH TIME, SHORT TIME AND INST.	
$\Phi$	RECEPTACLE, DUPLEX FLOOR MOUNTED	AFF ABOVE FINISH FLOOR AFG ABOVE FINISH GRADE	LSIA	CHARACTERISTICS INDICATES A BREAKER WITH	
$\Phi_{G}$	RECEPTACLE, DUPLEX GFI	AL ALUMINUM AR AS REQUIRED		TIME, SHORT TIME, INSTANT	
$\mathbf{\Phi}$	RECEPTACLE, DUPLEX ISOLATED GROUND	ATS AUTOMATIC TRANSFER SWITCH	LSIG	INDICATES A BREAKER WITH	
Ŷ	RECEPTACLE, DUPLEX SWITCHED	C CONDUIT	ΜΔΧ		
Ŧ	RECEPTACLE, DUPLEX STANDBY POWER	CKT CIRCUIT	MFR	MANUFACTURER	
Ψ <sub>υ</sub>	RECEPTACLE, DUPLEX UPS BACKED	CO CONDUIT ONLY WITH 1/4" POLYPROPYLENE PULL ROPE	MMS		
Ŷ	RECEPTACLE, DUPLEX WITH USB	CT CURRENT TRANSFORMER	(N)		
<b>₽</b>	RECEPTACLE, QUAD	DIA DIAMETER DISC DISCONNECT	NL N.C.	NIGHT LIGHT NORMALLY CLOSED	

DIST

DWG DX (E)

DIV

FM

GA

GND

- RECEPTACLE, QUAD  $\blacksquare$ RECEPTACLE, QUAD FLOOR MOUNTED RECEPTACLE, FLOORBOX. 'X' INDICATES THE QUANTITY OF DUPLEX OUTLETS TO BE INSTALLED. 'Y' INDICATES THE FLOORBOX TYPE. REFER TO SHEET EXXX FOR DETAILS ON EACH TYPE. RECEPTACLE, SINGLE Φ
- RECEPTACLE, SPECIAL RECEPTACLE, SPECIAL FLOOR MOUNTED Т TRANSFORMER CONCEALED CONDUIT: UNLESS OTHERWISE INDICATED, DENOTES 3/4"C-2#12+1#12G
- SURFACE MOUNTED RACEWAY

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ABOVE		TIME, SHORT TIME AND INSTA
ABOVE FINISH FLOOR		CHARACTERISTICS
ABOVE FINISH GRADE	LSIA	INDICATES A BREAKER WITH F
ALUMINUM		TIME, SHORT TIME, INSTANTA
AS REQUIRED		FAULT ALARM TRIP CHARACTE
AUTOMATIC TRANSFER SWITCH	LSIG	INDICATES A BREAKER WITH F
BUILDING		TIME, SHORT TIME, INSTANTAL
CONDUIT		FAULT TRIP CHARACTERISTIC
CIRCUIT	MAX	MAXIMUM
CIRCUIT	MFR	MANUFACTURER
CEILING	MIN	MINIMUM
CONDUIT ONLY WITH 1/4" POLYPROPYLENE PULL ROPE	MMS	MANUAL MOTOR STARTER
CHROME PLATED	MNT	MOUNT(ED)
CURRENT TRANSFORMER	(N)	NEW
COPPER	N	NEUTRAL
DIAMETER	NL	NIGHT LIGHT
DISCONNECT	N.C.	NORMALLY CLOSED
DISTRIBUTION	NIC	NOT IN CONTRACT
DIVISION	N.O.	NORMALLY OPEN
DRAWING	NORM	NORMAL
DUPLEX	UNO	UNLESS NOTED OTHERWISE
EXISTING TO REMAIN	PNL	PANEL
EACH	QIG	QUAD ISOLATED GROUND
EMERGENCY	REQ'D	REQUIRED
FLOOR, OR FLOOR MOUNTED	RM	ROOM
FEET	SIM	SIMILAR
GROUND	SPST	SINGLE POLE/SINGLE THROW
GAUGE	SS	STAINLESS STEEL
GROUND FAULT INTERRUPT	SW	SWITCH
GROUND	Т	TAMPER PROOF RECEPTACLE
HIGH	TYP	TYPICAL
HEIGHT	W	WIDE
ISOLATED GROUND	W/	WITH
INCHES	W/IN	WITHIN
LONG	W/O	WITHOUT
INDICATES A BREAKER WITH FULLY ADJUSTABLE LONG	WP	WEATHERPROOF, RECEPTACL
TIME AND INSTANTANEOUS TRIP CHARACTERISTICS	Х	EXISTING DEVICE TO BE REPL
		AT SAME LOCATION
	XFMR	TRANSFORMER

### **ANNOTATION**



TH FULLY ADJUSTABLE LONG STANTANEOUS TRIP I FULLY ADJUSTABLE LONG ANEOUS AND GROUND TANEOUS AND GROUND CTERISTICS 'H FULLY ADJUSTABLE LONG TANEOUS AND GROUND

V SWITCH

CLES TO BE GFI PLACED WITH NEW DEVICE



3/13/2023 8:27:40 PM PROJECT NUMBER (E1) J:\2021\2021.028.01\Revit\Linwood Elem\_Solar Grant Project\_R2022.rvt



SINGLE LINE DIAGRAM ON SHEET E3 FOR DETAILS. 2. PROVIDE UNISTRUT SUPPORT STRUCTURE FOR DC COMBINER BOX, PV INVERTER, AND ECB-PV. EQUIPMENT LOCATED ON LOWER ROOF. 3. COORDINATE EXPOSED ROOF CONDUIT FROM UPPER ROOF TO LOWER ROOF AND COMBINER BOX.  $(\mathbf{G})$  $(\mathbf{H})$ ( **K** )  $(\mathbf{J})$ ( L ≬ M ( N 0 0 0 0 0 0 \_\_\_\_\_ (4) 5 6 (7)  $\searrow$ 8 - 9 (9) <u>10</u> G H J K LM N

- 1. ROUTE CONDUIT FOR PV SYSTEM TO MECH YARD 002. REFER TO SHEET E2
- DETAIL #2 AND #3 FOR EQUIPMENT LOCATION AND ROUTING. SEE PV

- # KEY NOTES:
- 3. COORDINATE STRING ARRANGEMENT PRIOR TO ROUGH-IN.
- ROOF PER NEC STANDARDS AND TO MINIMIZE TRIPPING HAZARDS.
- PARAPET WALLS AND MECHANICAL ROOF TOP EQUIPMENT. 2. CONDUIT PATHWAYS NOT SHOWN FOR CLARITY. ROUTE CONDUITS ABOVE

GENERAL NOTES: 1. SOLAR PV ARRAY TO MAINTAIN MINIMUM CLEARANCE OF 5' OFF ALL





2 LEVEL 2 - PARTIAL FLOOR PLAN - ELECTRICAL



# 3 LEVEL 1 - PARTIAL FLOOR PLAN - ELECTRICAL



GENERAL NOTES:

- SOLAR PV ARRAY TO MAINTAIN MINIMUM CLEARANCE OF 5' OFF ALL PARAPET WALLS AND MECHANICAL ROOF TOP EQUIPMENT.
- 2. CONDUIT PATHWAYS NOT SHOWN FOR CLARITY. ROUTE CONDUITS ABOVE ROOF PER NEC STANDARDS AND TO MINIMIZE TRIPPING HAZARDS.
- 3. COORDINATE STRING ARRANGEMENT PRIOR TO ROUGH-IN.

# KEY NOTES:

- 1. PROVIDE UNISTRUT SUPPORT STRUCTURE FOR DC COMBINER BOX AND PV INVERTER. EQUIPMENT LOCATED ON LOWER ROOF.
- 2. SOLAR PV DISCONNECT SWITCH TO BE A LOCKABLE, BLADE TYPE, VISUAL OPEN, DISCONNECT SWITCH. PROVIDE SEPARATE METER BASE FOR NET METERING BY AVISTA UTILITIES. REFER TO AVISTA BLUE BOOK FOR DETAILS AND ADDITIONAL REQUIREMENTS.
- 3. ROUTE CONDUIT FROM ROOF THROUGH LEVEL 2 ELECTRICAL ROOM 242A TO LEVEL 1 TELECOM 142A. ROUTE CONDUIT TO ELECTRICAL EQUIPMENT YARD FOR CONNECTION TO METER/DISCONNECT. SEE SINGLE-LINE DIAGRAM ON E3 FOR ADDITIONAL DETAILS.
- 4. SEE SINGLE-LINE DIAGRAM ON SHEET E3 FOR ADDITIONAL DETAILS.
- 5. PROVIDE 1" CONDUIT FOR DATA FROM INVERTER TO BOOK STORAGE 232 FOR PV ARRAY MONITORING AND DATA EXPORT. ROUTE TO EXISTING ZHONE ZNID 2804D 4-PORT POE+ OPTICAL NETWORK TERMINAL MOUNTED TO WALL ABOVE ACCESSIBLE CEILING SPACE FOR CONNECTION TO BUILDING NETWORK. SEE MANUFACTURER INSTALLATION INSTRUCTIONS FOR DETAILS.
- EXISTING ROOF FALL RESTRAINT. MAINTAIN CLEARANCE AROUND RESTRAINT.
- 7. ROUTE CONDUITS ACROSS CORRIDOR 100W CONCEALED ABOVE ACCESSIBLE CEILING.



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S'IONAL EN 04-04-2023 **⊕** B the second sec  $\langle \rangle$ AR ADDITION 99208 MA Б S Ð Ľ Sp Φ FZ > 4 D ELEMEN 906 W Weile A LINWOOD **NOR** ARGED FLO ELECTR Z Ш DWN BY: CHK BY: SCALE: DATE: JEL JRE AS NOTED 04-04-2023 E2

Mat V







approx. 80mm





		WIRE SCHEDULE		
	FEEDER MARK	DESCRIPTION	CONDUIT AND WIRE	
	$\langle 1 \rangle$	STRING ARRAY FEED	6#10 (USE 2) + #8G BARE CU	
	2	DC FEED FOR COMBINER	1-1/4"C - 2#4 THWN-2 + #6G	
	3	THREE PHASE AC FEED	2"C - 4#1 THWN-2 + #6G	
	$\langle 4 \rangle$	DATA/DAS	3/4"C - CAT6 ETHERNET CABLE WITH RJ45 CONNECTORS	
NOTES: 1. INDICATED WIRE SIZES ARE AWG. 2. DATA CABLE TO BE INDOOR/OUTDOOR RATED.		<u>3:</u> ATED WIRE SIZES ARE AWG. CABLE TO BE INDOOR/OUTDOOR RATED.		

INVERTER SPECIFICATION		
BASIS OF DESIGN	SOLAREDGE SE66.6KUS	
MAXIMUM DC POWER	90000 kW	
MAXIMUM INPUT VOLTAGE	1000 V	
MINIMUM INPUT VOLTAGE	180 V	
NUMBER OF INDEPENDENT MPP INPUTS/ STRING PER MPP INPUT	2/2	
NOMINAL AC VOLTAGE	480/277 V	
AC POWER FREQUENCY / RANGE	50 Hz, 60 Hz/ -6 Hz    +5 Hz	
MAXIMUM OUTPUT CURRENT	80 A	
EFFICIENCY (%)	98.5%	
DC DISCONNECT DEVICE	INTEGRATED	
DATA EXPORT/DISPLAY	SEE SPECS	

PHOTOVOLTAIC MODULE SPECIFICATION			
BASIS OF DESIGN	SILFAB SIL-490 HN STC		
NOMINAL POWER (Wp)	490 W		
VOLTAGE @ PEAK POWER (Vmp)	45.23 V		
CURRENT @ PEAK POWER (Imp)	10.83 A		
OPEN CIRCUIT VOLTAGE (Voc)	53.96 V		
SHORT CIRCUIT CURRENT (Isc)	11.36 A		
MAXIMUM SYSTEM VOLTAGE	1500 V		

**2 PV SYSTEM - BASIS OF DESIGN, SYSTEM CALCULATIONS** N.T.S.

#### GENERAL NOTES:

- 1. SCOPE OF WORK IS INDICATED IN SINGLE LINE DIAGRAM. CONTRACTOR IS RESPONSIBLE FOR ALL WORK DEPICTED IN DRAWINGS.
- 2. THE SYSTEM SHALL INCLUDE A RAPID SHUTDOWN SYSTEM PER NEC 690.12. SOLAREDGE
- 66.6LUS INVERTER PROVIDED WITH INTEGRAL RAPID SHUTDOWN.
- 3. CONDUIT PATHWAYS NOT SHOWN FOR CLARITY. ROUTE CONDUITS ABOVE ROOF PER NEC STANDARDS AND TO MINIMIZE TRIPPING HAZARDS.
- 4. ALL PV ARRAYS MUST BE BONDED TOGETHER WITH AN EQUIPMENT GROUND CONDUCTOR.

# KEY NOTES:

NATIONAL RENEWABLE ENERGY LABORATORY (NREL)

LOCATION: 47.73°NORTH, 117.42° WEST, ELEVATION 2053

NOMINAL POWER OF THE PV SYSTEM: 68 KW
MINIMUM QUANTITY OF PV PANELS: 68 KW / 0.490 KW = 138

\*NOTE: ANNUAL ENERGY YEILD MAY RANGE FROM 69,713 kWh TO 77,052 kWh DEPENDING ON WEATHER CONDITIONS AND ACTUAL SOLAR RADIATION INCEDENT

ESTIMATES OF PV GENERATION (BASE BID):

ESTIMATED PV SYSTEM LOSSES: 14%

• ESTIMATED ANNUAL ENERGY YEILD: 73,383kWh\*

FEET A.S.L.,

PV MOUNTING ANGLE = 0°

ON THE SITE.

- 1. PROVIDE 1" CONDUIT FOR DATA FROM INVERTER TO BOOK STORAGE 232 FOR PV ARRAY MONITORING AND DATA EXPORT. ROUTE TO EXISTING ZHONE ZNID 2804D 4-PORT POE+ OPTICAL NETWORK TERMINAL MOUNTED TO WALL ABOVE ACCESSIBLE CEILING SPACE FOR CONNECTION TO BUILDING NETWORK. SEE MANUFACTURER INSTALLATION INSTRUCTIONS FOR DETAILS.
- 2. SOLAR PV DISCONNECT SWITCH TO BE A LOCKABLE, BLADE TYPE, VISUAL OPEN, DISCONNECT SWITCH. PROVIDE SEPARATE METER BASE FOR NET METERING BY AVISTA UTILITIES. REFER TO AVISTA BLUE BOOK FOR DETAILS AND ADDITIONAL REQUIREMENTS.
- 3. PROVIDE NEW 3P-100A CIRCUIT BREAKER IN EXISTING SPACE IN (E)MSBH.

ESTIMATED SOLAR RADITION AND AC ENERGY OUTPUT SUMMARY (BASE BID)		
MONTH	SOLAR RADIATION (kWh / m² / DAY)	AC ENERGY (kWh)
JAN	1.04	1786
FEB	2.02	3076
MAR	3.15	5524
APR	4.81	7667
MAY	6.15	10,024
JUN	6.50	10,060
JUL	7.37	11,228
AUG	6.27	9551
SEP	4.53	6838
ОСТ	2.61	4236
NOV	1.22	1950
DEC	0.89	1443
AVERAGE	3.88	6115
TOTAL FOR YEAR	46.56	73,383

NEC SAMPLE CALCULATION:

- 1. ADJUSTING Voc
   (NEC ARTICLE 690.7)

   MINIMUM HISTORICAL TEMPERATURE = -17 °C
- PV MODULE VOLTAGE TEMPERATURE COEFFICIENT B(%/°C) = -0.28 • PV MODULE OPEN CIRCUIT VOLTAGE (Voc) = 53.96 V
- a. TEMPERATURE CORRECTION FACTOR ( $\alpha$ ) = 1.18 PER NEC TABLE 690.7 • ADJUSTED Voc = α x Voc = 1.18 X 53.96 = 63.67 V DC
- 2. STRING ANALYSIS

 MAXIMUM NUMBER OF MODULES IN SERIES = MAXIMUM ALLOWABLE SYSTEM VOLTAGE / ADJUSTED Voc = 1500 / 63.67 = 23.56 USE MAXIMUM OF (23) MODULES IN SERIES PER STRING

- a. NUMBER OF PV MODULES ON ROOF = 138 MODULES b. PROVIDE (2) SUB-ARRAYS
- SUB-ARRAY (A): (3) PARALLEL STRINGS OF (23) MODULES.
   SUB-ARRAY (B): (3) PARALLEL STRINGS OF (23) MODULES.
- 3. <u>PV SOURCE CIRCUITS</u>
   PV MODULE SHORT CIRCUIT CURRENT (Isc) = 11.36 A
   NUMBER OF MODULES WIRED IN PARALLEL PER SOURCE CIRCUIT (STRING) = 1 MAXIMUM PV SOURCE CIRCUIT CURRENT (Imax)
- (NEC ARTICLE 690.8(A)(1) = NUMBER OF MODULES WIRED IN PARALLEL PER STRING x lsc x 1.25
- = 1 x 11.36 x 1.25 = 14.2 A • OCPD SIZE / SOURCE CIRCUIT = Imax x 1.25 (NEC ARTICLE 690.8(B)(1)(a)
- = 14.2 x 1.25 = 17.75 Å
- CONDUCTOR AMPACITY/ SOURCE CIRCUIT = Imax x 1.25 (NEC ARTICLE 690.8(B)(2) = 14.2 x 1.25 = 17.75 Å
- PROVIDE #10AWG USE-2 CABLE, 90 °C RATED MAXIMUM AMBIENT TEMPERATURE = 38 °C
- TEMPERATURE CORRECTION FACTOR FOR 38 °C = 0.91 (NEC TABLE 690.31(E))
- CORRECTED AMPACITY = 30 x 0.91 = 27.3 A > 17.75 A
- INVERTER OUTPUT CIRCUIT
   OCPD FOR 66.6 KW INVERTER OUTPUT CIRCUIT
   INVERTER AC OUTPUT CURRENT x 1.25 (NEC ARTICLE 690.8(B)(1)(a) = 80 A x 1.25 = 100 A PROVIDE 100 A BACKFEED RATED CIRCUIT BREAKER

