



Innovative Design in Architecture

BIDDERS BULLETIN

PROJECT: Holyoke Community
 Childcare Initiative
 Holyoke, Colorado

BULLETIN NUMBER

BB-2

ISSUED BY:

Brian Jensen

PROJECT #: 21-1139

DATE ISSUED: March 8th, 2024

This bulletin is issued by the Architect to all known bidders before receipt of proposals, for the purpose of explaining, interpreting, or modifying the original plans and specifications. When enumerated by the bidder upon the proposal sheet, the information or instructions given hereon will be equally binding upon all parties as if included in the original plans and specifications.

BIDDER MUST ENTER THE NUMBER OF THIS BULLETIN ON HIS PROPOSAL SHEET

GENERAL INFORMATION

BB-2, ITEM #1; General

*Attached is the pre-bid sign in sheet of personal that attended the pre-bid meeting

*March 22nd will be the final addendum/bidder bulletin to be issued on this project.

THE FOLLOWING ITEMS ARE APPLICABLE TO THE SPECIFICATIONS

BB-2, ITEM #2; Substitutions

The following products and manufacturers will be considered approved equal for the products in which they are listed below. However, this does not relieve the supplier from providing equipment as specified, and if equipment is submitted which does not meet the intent of the specifications, it will in fact be rejected.

*None at this time

END OF BB-2

See attached for MEP addendum items

PRE-CONSTRUCTION SIGN-IN SHEET

PROJECT: Holyoke Community Childcare
New Daycare

DATE: 3-1-2024
 TIME: 1:00 PM MT

PROJECT #: 21-1139

	<u>Name</u>	<u>Company</u>	<u>Email & Phone</u>
1.	BRIAN JENSEN	CGID	brianjensen@cgidarch.com
2.	Jeremy Klima	SES	jklima@specializedeng.com
3.	Mike Smith	MSC Inc.	msscinc@pctelcom.coop
4.	Heath Weiss	Fetzer Electric	dfetzer@pctelcom.coop
5.	CHAD Deyle	4-D ELECTRIC	CHA@4DELECTRIC.NET
6.	Zach Anderson	Steele's Constr.	Zach@steelesconstruction.com
7.	Al Doolittle	Doolittle Concrete	doolittleconcrete@gmail.com
8.	Luke Garrett	Freedom Construction	lfreedomconstruction@gmail.com
9.	Tom Bennett	Boyd Munk	(970) 224-2464 thom@boymunk.net
10.	Joshua Herman	HCC	therman@chfa.info 970-218-4037
11.	Jeremy Thompson	CITY OF HOLYOKE	SUPT@CITYOFHOLYOKE-CO.GOV 970-854-2266
12.			
13.			
14.			
15.			
16.			
17.			
18.			
19.			
20.			

Bidder Bulletin 02



Date: 3/7/2024

Project Name: Holyoke Childcare Center

Project #: 19146

Electrical Drawing Items:

1. The following sheet(s) shall be modified:

A. E-601 – Electrical Details:

1. One-Line General Note A modified to reference coordination between PV system contractor and electrical contractor.

Electrical General Items:

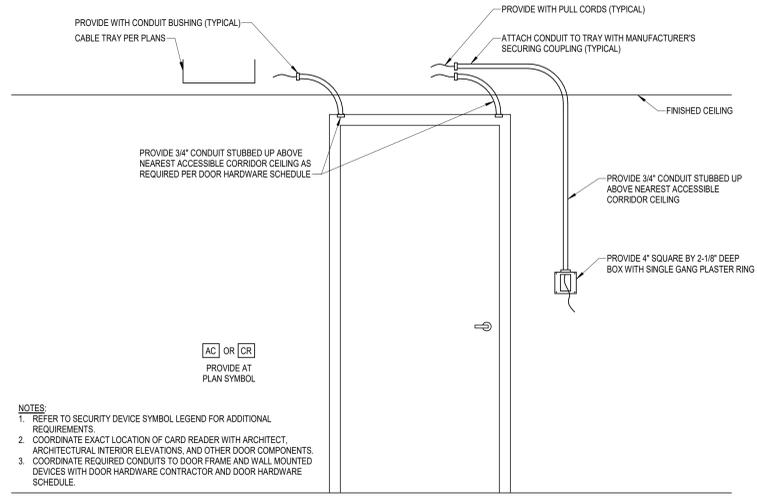
2. The preliminary PV Solar design developed by Owner vendor is being provided and shall be included in the project. Provide system as identified.

A. Contact Owner Vendor for pricing and questions.

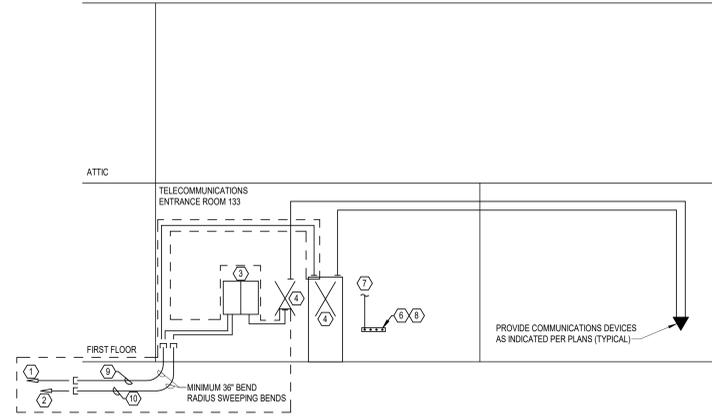
1. Expert Electric, LLC
PO Box 167
Sterling, CO 80751
Expertelectric@yahoo.com
970-522-1781

Submitted By: Rachel Cochran

jdr



1 ACCESS CONTROL ROUGH-IN
E-601/ NO SCALE



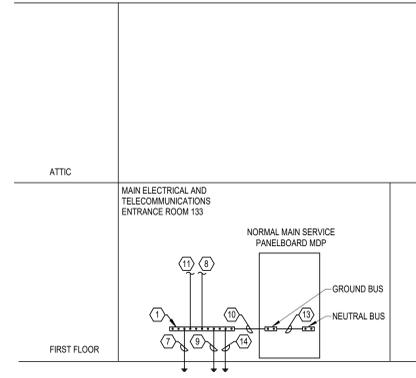
2 TELECOMMUNICATIONS ROUTING SCHEMATIC
E-601/ NO SCALE

TELECOMMUNICATIONS ROUTING SCHEMATIC SHEET NOTES:

1. PROVIDE 12 STRAND FIBER ENTRANCE BACKBONE. REFER TO SPECIFICATIONS FOR REQUIREMENTS.
2. PROVIDE 25 PAIR COPPER ENTRANCE BACKBONE. REFER TO SPECIFICATIONS FOR REQUIREMENTS.
3. PROVIDE SOLID STATE PRIMARY PROTECTION FOR EACH COPPER PAIR LOCATED WITHIN ENCLOSURE.
4. REFER TO TYPICAL COMMUNICATION TERMINATION - VOIP & DATA DETAIL (TYPICAL).
5. NOTE NOT USED.
6. TELECOMMUNICATIONS GROUND BAR. REFER TO SPECIFICATIONS FOR REQUIREMENTS.
7. BOND TO CABLE TRAY, TELECOM RACK MOUNTED EQUIPMENT, LOW VOLTAGE CABINETS, AND VOICE/DATA/CATV SERVICE DEMARCS WITH #6 COPPER IN ONE (1) 3/4" CONDUIT.
8. REFER TO GROUNDING SCHEMATIC FOR CONNECTIONS BETWEEN GROUND BARS (TYPICAL).
9. PROVIDE TWO (2) 4" CONDUITS, SCHEDULE 40 PVC, ROUTED FROM ROOM INDICATED TO PROPERTY LINE FOR CONNECTION TO COMMUNICATIONS UTILITIES. COORDINATE EXACT LOCATION AT PROPERTY LINE WITH UTILITY. REFER TO SITE P PACKAGE FOR APPROXIMATE ROUTING.
10. PROVIDE TWO (2) 4" CONDUITS, SCHEDULE 40 PVC, ROUTED FROM ROOM INDICATED TO PROPERTY LINE FOR CONNECTION TO COMMUNICATIONS UTILITIES. COORDINATE EXACT LOCATION AT PROPERTY LINE WITH UTILITY. REFER TO FUTURE SITE PLAN FOR APPROXIMATE ROUTING.

TELECOMMUNICATIONS ROUTING SCHEMATIC GENERAL NOTES:

- A. UTILIZE CONDUITS, SLEEVES, J-HOOKS, AND CABLE TRAY INDICATED PER PLANS FOR ROUTING AND SUPPORTING COMMUNICATIONS CABLEING.
- B. COORDINATE PROJECT PHASING WITH OWNER AND ARCHITECTURAL DOCUMENTS.
- C. CABLES ROUTING THRU OCCUPIED AREAS SHALL BE COORDINATED WITH ARCHITECT PRIOR TO WORK BEING STARTED.
- D. UTILIZE CORRIDORS FOR ROUTING COMMUNICATIONS CABLEING.
- E. COORDINATE OPENINGS THRU FLOORS AND CEILING WITH STRUCTURAL.
- F. VERTICAL ROUTED CABLES SHALL BE SUPPORTED AT 18" ON CENTER WHERE EXPOSED.
- G. COORDINATE TELECOMMUNICATIONS INFRASTRUCTURE AND TELECOMMUNICATIONS RACK LAYOUT WITH OWNER'S ISIT REPRESENTATIVE.

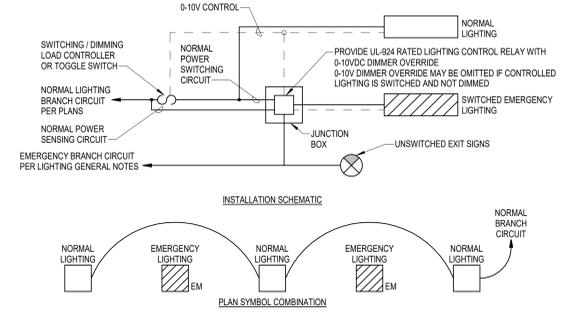


GROUNDING SCHEMATIC SHEET NOTES:

1. ELECTRICAL GROUND BAR. REFER TO SPECIFICATIONS FOR REQUIREMENTS.
2. NOTE NOT USED.
3. NOTE NOT USED.
4. NOTE NOT USED.
5. NOTE NOT USED.
6. NOTE NOT USED.
7. BOND TO GROUND ROD WITH #6 COPPER IN ONE (1) 3/4" CONDUIT. REFER TO SPECIFICATIONS FOR GROUND ROD REQUIREMENTS.
8. BOND TO WATER SERVICE ENTRANCE WITH #30 COPPER IN ONE (1) 1" CONDUIT. BOND SHALL BE WITHIN 5 FEET OF WATER SERVICE ENTRANCE TO BUILDING. PROVIDE BONDING JUMPER ACROSS WATER METER.
9. BOND TO UFER GROUND (CONCRETE-ENCASED GROUNDING ELECTRODE BUILDING FOOTING) WITH #4 COPPER IN ONE (1) 3/4" CONDUIT. REFER TO SPECIFICATIONS FOR CONCRETE-ENCASED GROUNDING ELECTRODE REQUIREMENTS.
10. BOND TO NORMAL MAIN SERVICE PANELBOARD GROUND BUS WITH #30 COPPER IN ONE (1) 1" CONDUIT.
11. BOND TO BUILDING STEEL WITH #30 COPPER IN ONE (1) 1" CONDUIT.
12. NOTE NOT USED.
13. MAIN BONDING JUMPER. BOND GROUND BUS AND NEUTRAL BUS AT NORMAL SERVICE MAIN DISCONNECT WITH #30 COPPER.
14. BOND TO GROUND RING WITH COPPER CONDUCTOR MATCHING GROUND RING CONDUCTOR SIZE.

GROUNDING SCHEMATIC GENERAL NOTES:

- A. REFER TO SPECIFICATIONS FOR ADDITIONAL REQUIREMENTS.
- B. ELECTRICAL CONNECTIONS SHALL BE FIRMLY BONDED AT ALL TERMINATIONS. REFER TO SPECIFICATIONS FOR ACCEPTABLE CONNECTION TYPES FOR GROUNDING SYSTEM COMPONENTS.
- C. BOND TO ALL GROUNDING ELECTRODES PRESENT WITHIN BUILDING.



NOTES:

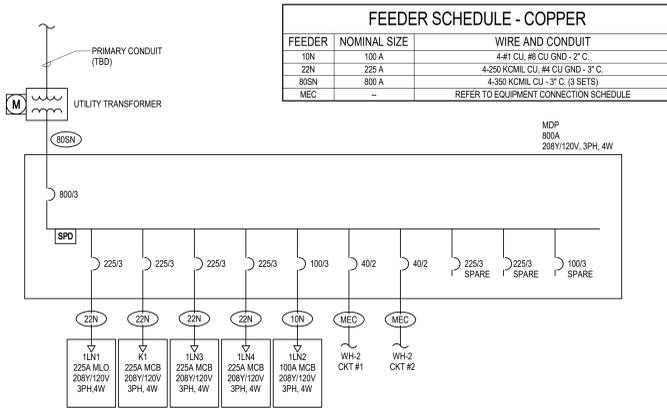
1. PROVIDE (1) UL-924 RATED LIGHTING CONTROL RELAY FOR EVERY CONTROLLED LIGHTING ZONE WHERE SWITCHED LIGHTING IS INDICATED TO BE FED FROM AN ALTERNATE POWER SOURCE.
2. SEE MANUFACTURER'S WIRING DIAGRAMS FOR WIRING UL-924 LIGHTING CONTROL RELAY AS A CONTROL DEVICE.
3. REFER TO LIGHTING GENERAL NOTES FOR EMERGENCY BRANCH CIRCUIT INFORMATION.
4. DURING NORMAL POWER CONDITIONS, IDENTIFIED EMERGENCY LIGHTING SHALL BE CONTROLLED WITH NORMAL LIGHTING.
5. UPON NORMAL POWER LOSS UL-924 DEVICE SHALL OVERRIDE EMERGENCY LIGHTING TO FULL BRIGHTNESS REGARDLESS OF LIGHTING CONTROL STATE.
6. INTEGRATE UL-924 DEVICE WITH FIRE ALARM SYSTEM. IN THE EVENT OF AN ALARM, UL-924 DEVICE SHALL OVERRIDE CONTROLLED LIGHTING TO FULL BRIGHTNESS.

3 GROUNDING SCHEMATIC
E-601/ NO SCALE

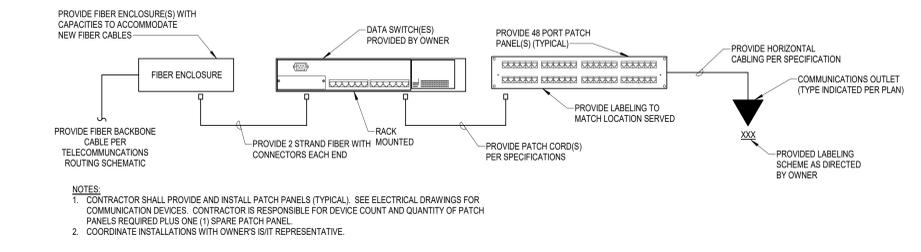
4 EMERGENCY LIGHTING CONTROL (PER ZONE)
E-601/ NO SCALE

ONE-LINE GENERAL NOTES:
(GENERAL NOTES SHALL APPLY TO ALL ONE-LINE SHEETS)

A. CONTRACTOR INSTALLING PV SYSTEM SHALL PERFORM SERVICE DISCONNECT LINE SIDE TAP. EC SHALL COORDINATE REQUIREMENTS WITH PV CONTRACTOR AND PROVIDE REQUIRED LUG KIT FOR TIE-IN.



5 ELECTRICAL ONE-LINE
E-601/ NO SCALE



6 TYPICAL COMMUNICATION TERMINATION - VOIP & DATA (PATCH PANELS)
E-601/ NO SCALE

2023 © COPYRIGHT

PERMISSION TO REPRODUCE ANY PART OF THIS DOCUMENT IS HEREBY GRANTED SOLELY FOR THE PURPOSE OF THE CONSTRUCTION OF THE PROJECT OR THE ARCHIVING OF THIS PROJECT. UNAUTHORIZED USE OF THIS DOCUMENT WITHOUT THE WRITTEN PERMISSION OF SPECIALIZED ENGINEERING SOLUTIONS IS PROHIBITED BY COPYRIGHT LAW.

DO NOT SCALE DRAWING. ALL DIMENSIONS AND CLEARANCES SHALL BE VERIFIED FROM APPROPRIATE SOURCES. ALL WORK SHALL BE COORDINATED PRIOR TO INSTALLATION. SEE SPECIFICATIONS.

10300 Ellison Circle
Omaha, NE 68134
Phone: 402.991.5520
www.specializedeng.com

SPECIALIZED ENGINEERING SOLUTIONS

SES PROJECT # 19146

NO. DATE REVISIONS
2 07/24 BR42

SEAL

OMAHA REGISTERED PROFESSIONAL ENGINEER
42357
12/12/2023

AGENCIAS

3119 East Francis, Suite 101
NORTH PLATTE, NE 69101
308.532.0412

Structural Engineer
1221 N Street, Suite 600
LINCOLN, NE 68508
402.476.9700

Mechanical Engineer
5000 South 100th Street
Omaha, NE 68134
Phone: 402.991.5520

Electrical Engineer
Specialized Engineering Solutions
10300 Ellison Circle
Omaha, NE 68134
Phone: 402.991.5520

Civil Engineer

Interior Design

CG-ID
Innovative Design in Architecture

CG ID
3119 East Francis,
Suite 101
North Platte, NE
69101

PHONE: 308.532.0412
FAX: 308.532.1202

SPECIALIZED ENGINEERING SOLUTIONS

SES

Electrical Details

Hollyoke Community Healthcare Initiative
Hollyoke, Colorado 80734

PROJECT NUMBER: 21-1139

DRAWN BY: REC

CHECKED BY: JLK

DATE: 12/12/2023

SHEET NUMBER: E-601

SOLAR DESIGN DRAWINGS

DC SYSTEM SIZE: 50.40 KW DC
 AC SYSTEM SIZE: 54.32 KW AC
 ENERGY STORAGE SYSTEM 36.86 KWH ESS

ELECTRICAL- NEC 2020

FOR (01) SOL-ARK 30K-3P-208V-N (208V) INVERTER
 (56) REC SOLAR REC420AA PURE-R (420W) MODULES
 WITH (56) TIGO TS4-A-F RAPID SHUTDOWN DEVICES
 (08) STRINGS OF (07) MODULES CONNECTED IN SERIES
FOR (64) ENPHASE IQ8H-3P-72-E-US (208V) MICROINVERTERS
 WITH (64) REC SOLAR REC420AA PURE-R (420W) MODULES
 (04) STRINGS OF (13) MODULES
 (01) STRING OF (12) MODULES



EXPERT ELECTRIC, LLC
 P.O. BOX 167/20151 K & H ST.
 STERLING, CO 80751, USA
 PHONE NO: (970) 522-1781
 LICENSE NO: CO 7643

PROJECT NAME & ADDRESS
HOLYOKE DAYCARE
 HOLYOKE, CO 80734,
 USA.

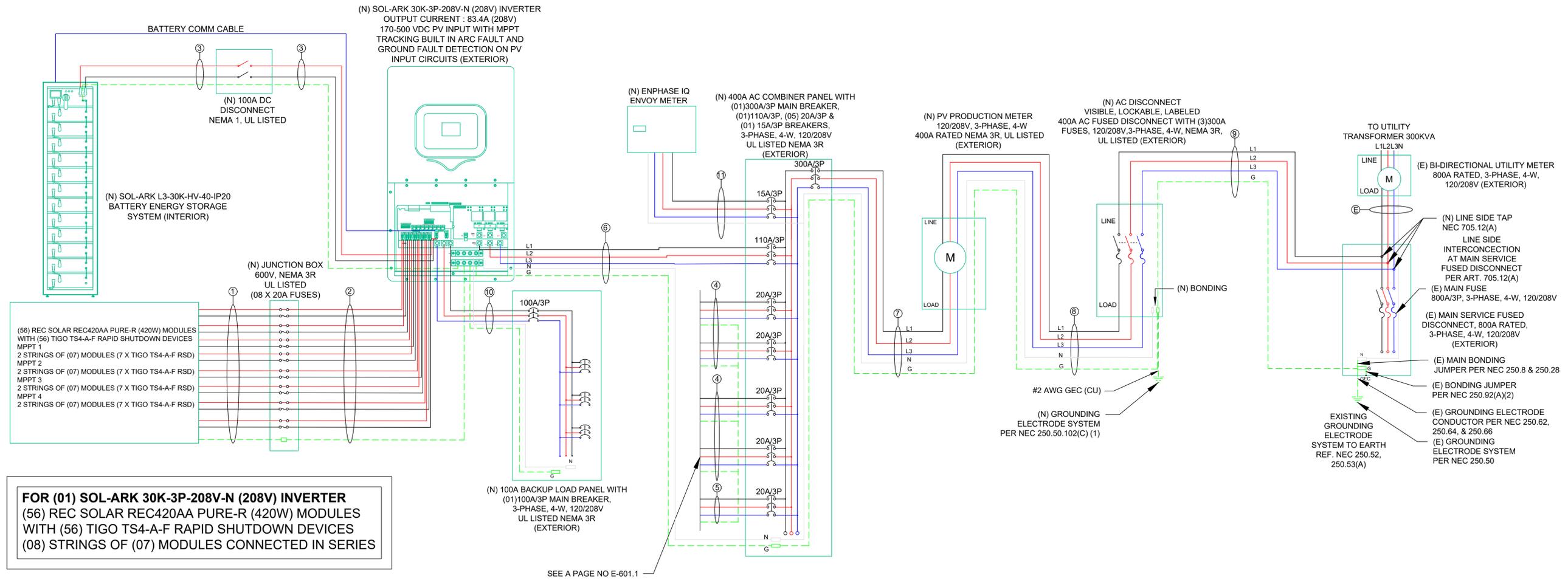
SIGNATURE WITH SEAL

REVISIONS	DESCRIPTION	DATE
REV	WIRE DIAGRAM	11/23/2023
A.0		

SHEET TITLE
LINE DIAGRAM

DRAWN DATE 11-23-2023
 DRAWN BY GK
 REVIEWED BY JVK

SHEET NUMBER
E-601



FOR (01) SOL-ARK 30K-3P-208V-N (208V) INVERTER
 (56) REC SOLAR REC420AA PURE-R (420W) MODULES
 WITH (56) TIGO TS4-A-F RAPID SHUTDOWN DEVICES
 (08) STRINGS OF (07) MODULES CONNECTED IN SERIES

$$V_{max} = V_{oc} + ((T_{Low} - T_{Stc}) \times (V_{ocCoef} \times V_{oc}/100))$$

$$V_{max} = 59.4 + ((-20^{\circ}C - 25^{\circ}C) \times (-0.24 \times 59.4/100))$$

$$V_{max} = 59.4 + (-45 \times -0.143)$$

$$V_{max} = 65.84$$

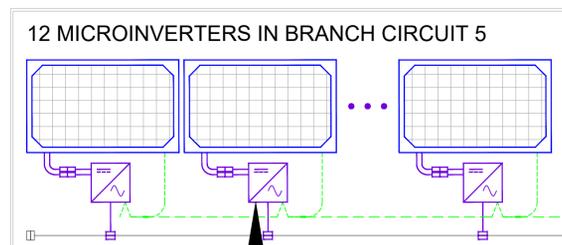
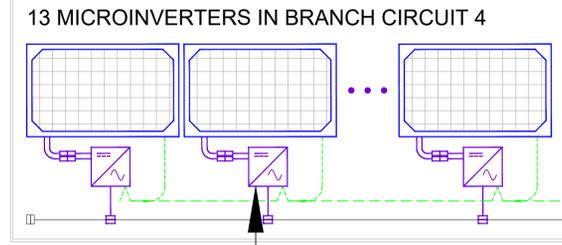
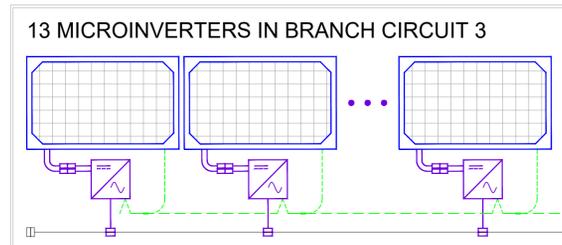
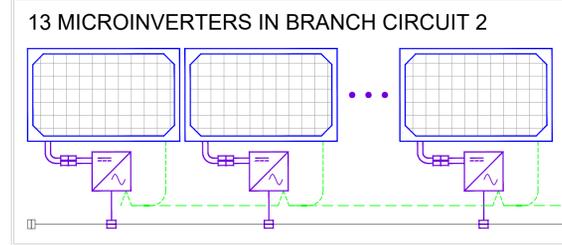
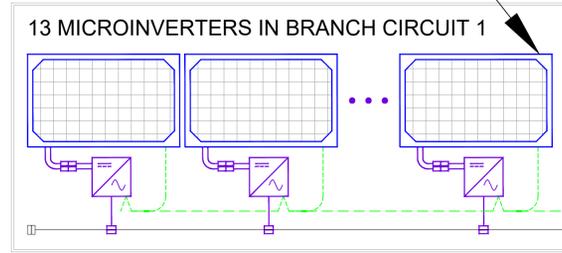
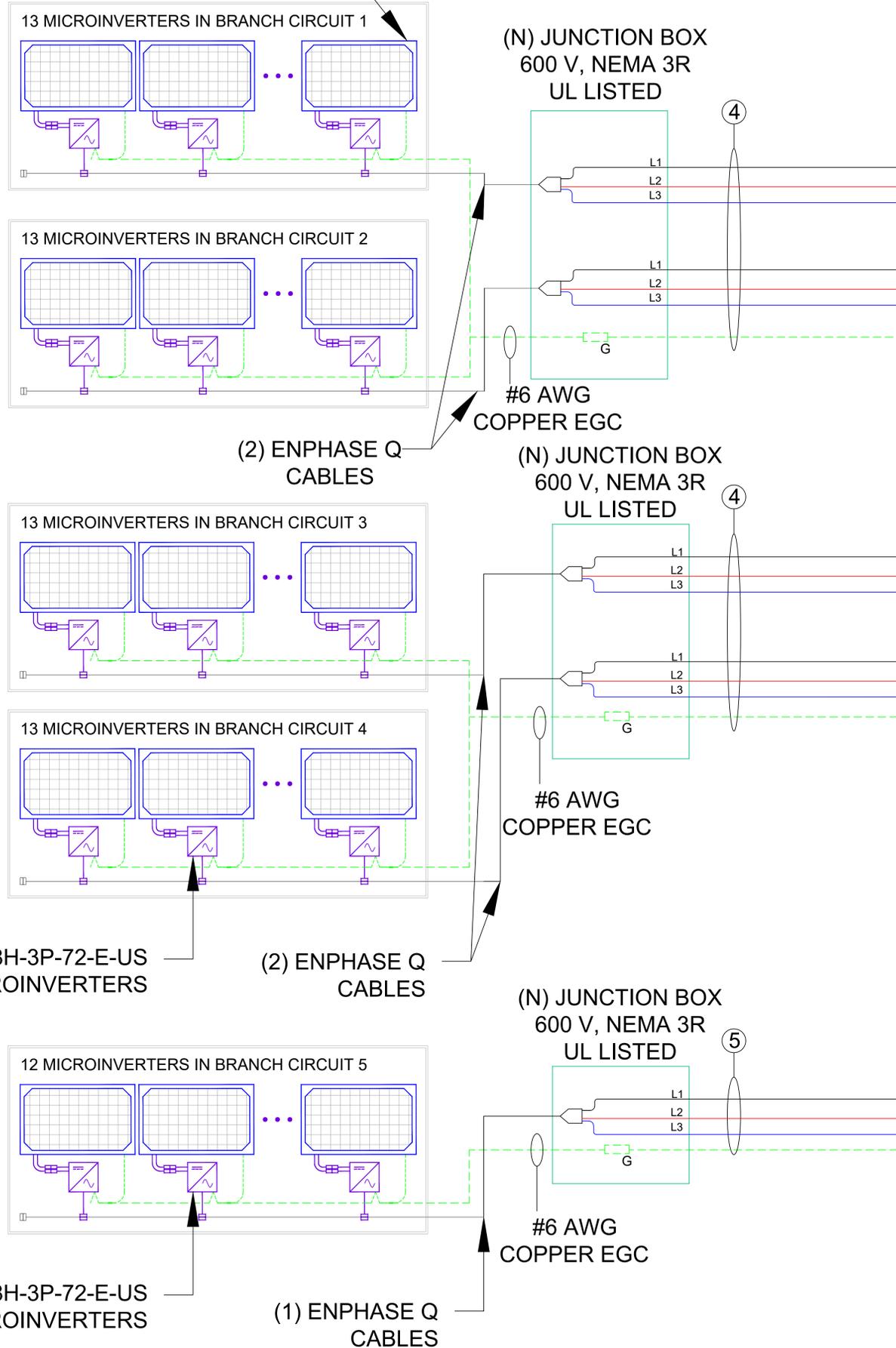
$$= 500 / 65.84$$

$$= 7.59 \text{ (MAXIMUM NUMBER OF MODULES IN SERIES)}$$

ID	PARALLEL FEEDER	PHASE CONDUCTOR QTY, SIZE AND TYPE PER CONDUIT	NEUTRAL	GROUND CONDUCTOR QTY, SIZE AND TYPE PER CONDUIT	CONDUIT SIZE	CONDUIT TYPE
1	1	16 AWG #10 PV-WIRE/USE-2,CU	N/A	1 AWG #6 BARE,COPPER EGC	NA	FREE AIR
2	1	16 AWG #8 THWN-2,COPPER	N/A	1 AWG #10 THWN-2,COPPER EGC	1-1/2"	EMT
3	1	2 AWG #6 THWN-2,COPPER	N/A	1 AWG #10 THWN-2,COPPER EGC	3/4"	EMT
4	1	6 AWG #10 THWN-2,COPPER	N/A	1 AWG #10 THWN-2,COPPER EGC	3/4"	EMT
5	1	3 AWG #10 THWN-2,COPPER	N/A	1 AWG #10 THWN-2,COPPER EGC	3/4"	EMT
6	1	3 AWG #2 THWN-2,COPPER	1 AWG #2 THWN-2,COPPER	1 AWG #6 THWN-2,COPPER EGC	1-1/4"	EMT
7	1	3 MCM #300 THWN-2,COPPER	1 MCM #300 THWN-2,COPPER	1 AWG #4 THWN-2,COPPER EGC	2-1/2"	EMT
8	1	3 MCM #300 THWN-2,COPPER	1 MCM #300 THWN-2,COPPER	1 AWG #4 THWN-2,COPPER EGC	2-1/2"	EMT
9	1	3 MCM #300 THWN-2,COPPER	N/A	1 AWG #4 THWN-2,COPPER EGC	2-1/2"	EMT
10	1	3 AWG #2 THWN-2,COPPER	1 AWG #2 THWN-2,COPPER	1 AWG #8 THWN-2,COPPER EGC	1-1/4"	EMT
11	1	3 AWG #10 THWN-2,COPPER	1 AWG #10 THWN-2,COPPER	N/A	3/4"	EMT
E			EXISTING			

FOR (64) ENPHASE IQ8H-3P-72-E-US (208V) MICROINVERTERS
 WITH (64) REC SOLAR REC420AA PURE-R (420W) MODULES
 (04) STRINGS OF (13) MODULES
 (01) STRING OF (12) MODULES

(N) REC SOLAR REC420AA
 PURE-R (420W) MODULES



(N) ENPHASE IQ8H-3P-72-E-US
 (208V) MICROINVERTERS

(2) ENPHASE Q
 CABLES

(N) ENPHASE IQ8H-3P-72-E-US
 (208V) MICROINVERTERS

(1) ENPHASE Q
 CABLES

TO AC COMBINER
 SEE A PAGE NO E-601



CONTRACTOR



EXPERT ELECTRIC, LLC
 P.O. BOX 167/20151 K & H ST.
 STERLING, CO 80751, USA
 PHONE NO: (970) 522-1781
 LICENSE NO: CO 7643

PROJECT NAME & ADDRESS
 HOLYOKE DAYCARE
 HOLYOKE, CO 80734,
 USA.

SIGNATURE WITH SEAL

REV	DESCRIPTION	DATE	REVISIONS	
			WIRE DIAGRAM	
A.0		11/23/2023		

SHEET TITLE	
LINE DIAGRAM	
DRAWN DATE	11-23-2023
DRAWN BY	GK
REVIEWED BY	JVK
SHEET NUMBER	
E-601.1	

SOLAR MODULE SPECIFICATIONS	
MANUFACTURER / MODEL #	REC SOLAR REC420AA PURE-R MODULES (420W)
VMP	50.00 V
IMP	8.4 A
VOC	59.4 V
ISC	8.88 A
TEMP. COEFF. VOC	-0.24 %/°C
PTC RATING	402.5 W
MODULE DIMENSION	68.10 x 44 x 1.2 (IN INCHES)

INVERTER #1 SPECIFICATIONS	
MANUFACTURER / MODEL #	SOL-ARK 30K-3P-208V-N (208V)
NOMINAL AC POWER	30000 W
NOMINAL OUTPUT VOLTAGE	208 VAC
NOMINAL OUTPUT CURRENT	83.4 A

AMBIENT TEMPERATURE SPECS	
RECORD LOW TEMP	-20 °C
AMBIENT TEMP (HIGH TEMP 2%)	32 °C
CONDUIT HEIGHT	0.5"
ROOF TOP TEMP	32 °C
CONDUCTOR TEMPERATURE RATE	90 °C

INVERTER #2 SPECIFICATIONS	
MANUFACTURER / MODEL #	ENPHASE IQ8H-3P-72-E-US (208V)
NOMINAL AC POWER	380 W
NOMINAL OUTPUT VOLTAGE	208 VAC
NOMINAL OUTPUT CURRENT	1.83 A

MLPE: TIGO TS4-A-F RAPID SHUTDOWN DEVICES	
MAXIMUM INPUT VOLTAGE	80 VDC
MAXIMUM INPUT CURRENT	25 ADC

PERCENT OF VALUES	NUMBER OF CURRENT CARRYING CONDUCTORS IN EMT
0.80	4-6
0.70	7-9
0.50	10-20



CONTRACTOR



EXPERT ELECTRIC, LLC
P.O. BOX 167/20151 K & H ST.
STERLING, CO 80751, USA
PHONE NO: (970) 522-1781
LICENSE NO: CO 7643

PROJECT NAME & ADDRESS

HOLYOKE DAYCARE,
HOLYOKE, CO 80734,
USA.

SIGNATURE WITH SEAL

DC WIRE CALCULATION

WIRE ID	PARALLEL FEEDERS	EXPECTED WIRE TEMP (In Celsius)	TEMP. CORRECTION PER TABLE 310.15(B)(2)(a)	NO. OF CURRENT CARRYING CONDUCTORS	CONDUIT FILL CORRECTION PER CEC 310.15(B)(3)(a)	CIRCUIT CONDUCTOR SIZE	CIRCUIT CONDUCTOR AMPACITY @75°(PER FEEDER SET)	CIRCUIT CONDUCTOR AMPACITY @90°(PER FEEDER SET)	REQUIRED CIRCUIT CONDUCTOR AMPACITY PER NEC 690.8(A&B) 1.56 X I _{sc}	DERATED AMPACITY OF CIRCUIT CONDUCTOR PER CEC TABLE 310.16 TEMP. CORRECTION PER TABLE (310.16) X CONDUIT FILL CORRECTION PER NEC 310.15(B)(2)(a) X CIRCUIT CONDUCTOR AMPACITY @90°(PER FEEDER SET)	DERATED AMPACITY OF CIRCUIT CONDUCTOR IS GREATER THAN REQUIRED	ESTIMATED DISTANCE (FT)	EXPECTED VOLTAGE DROP (%)
1	1	32°	0.96	16	1	#10 AWG	35A	40A	13.86A	38.4A	YES	60	0.40
2	1	32°	0.96	16	0.5	#8 AWG	50A	55A	13.86A	26.4A	YES	50	0.22
3	1	32°	0.96	2	1	#6 AWG	65A	75A	62.5A	72A	YES	20	0.25
TOTAL DC VOLTAGE DROP (%) (FOR WIRE TAG 1 & 2)													0.62

AC WIRE CALCULATION

WIRE ID	PARALLEL FEEDERS	EXPECTED WIRE TEMP (In Celsius)	TEMP. CORRECTION PER TABLE 310.15(B)(2)(a)	NO. OF CURRENT CARRYING CONDUCTORS	CONDUIT FILL CORRECTION PER NEC 310.15(B)(3)(a)	CIRCUIT CONDUCTOR SIZE	CIRCUIT CONDUCTOR AMPACITY @75°(PER FEEDER SET)	CIRCUIT CONDUCTOR AMPACITY @90°(PER FEEDER SET)	REQUIRED CIRCUIT CONDUCTOR AMPACITY PER NEC 690.8(A&B) 1.25 X I _{sc}	DERATED AMPACITY OF CIRCUIT CONDUCTOR PER NEC TABLE 310.16 TEMP. CORRECTION PER TABLE (310.16) X CONDUIT FILL CORRECTION PER NEC 310.15(B)(2)(a) X CIRCUIT CONDUCTOR AMPACITY @90°(PER FEEDER SET)	DERATED AMPACITY OF CIRCUIT CONDUCTOR IS GREATER THAN REQUIRED	ESTIMATED DISTANCE (FT)	EXPECTED VOLTAGE DROP (%)
4	1	32°	0.96	6	0.8	#10 AWG	35A	40A	17.17A	30.72A	YES	50	0.85
5	1	32°	0.96	3	1	#10 AWG	35A	40A	15.85A	30.72A	YES	50	0.78
6	1	32°	0.96	3	1	#2 AWG	115A	130A	104.25A	124.8A	YES	10	0.17
7	1	32°	0.96	3	1	#300 MCM	285A	320A	250.65A	307.2A	YES	10	0.11
8	1	32°	0.96	3	1	#300 MCM	285A	320A	250.65A	307.2A	YES	10	0.11
9	1	32°	0.96	3	1	#300 MCM	285A	320A	250.65A	307.2A	YES	10	0.11
10	1	32°	0.96	3	1	#2 AWG	115A	130A	100A	124.8A	YES	10	0.17
TOTAL AC VOLTAGE DROP (%) (ADD TAG 4, 7, 8 & 9)													1.18

REVISIONS	DESCRIPTION	DATE	WIRE DIAGRAM
REV	A.0	11/23/2023	

SHEET TITLE
ELECTRICAL CALCULATIONS

DRAWN DATE	11-23-2023
DRAWN BY	GK
REVIEWED BY	JVK

SHEET NUMBER
E-602

SOLAR'S MOST TRUSTED 

REC ALPHA PURE-R SERIES

PRODUCT SPECIFICATIONS



COMPACT PANEL SIZE

9 A MODULE CURRENT COMPATIBLE WITH MLPE

430 WP
20.7 W/FT²
22.3% EFFICIENCY

 **ELIGIBLE**

 **LEAD-FREE ROHS COMPLIANT**

 **EXPERIENCE PERFORMANCE**

REC ALPHA PURE-R SERIES

PRODUCT SPECIFICATIONS



GENERAL DATA

Cell Type: 80 half-cut REC bifacial heterojunction cells with lead-free passivation technology

Glass: 3.2mm (0.125in) solar glass with anti-reflective surface technology in accordance with IEC 61215

Backsheet: Highly resistant polymer (black)

Frame: Anodized aluminum (black)

Junction box: 4 port 4000 watt diodes, lead-free (IP68-rated, in accordance with IEC 61709)

Connectors: Subulk MC4 PV 4814 (KS14 1/2 AWG) in accordance with IEC 61215 and IEC 61709

Cable: 12 AWG (4 mm²) PV wire, 67 x 67 x (1.7-1.7) in, in accordance with NIS 6089

Dimensions: 68.1 x 44.0 x 1.2 in (2077.7" x 1730.0" x 118.0") (L x W x H)

Weight: 47.4 lbs (21.5 kg)

Origin: Made in Singapore

Measurements in inches [mm]

ELECTRICAL DATA

	Product Code: REC-xxAA PURE-R	REC-xxAA PURE-R	REC-xxAA PURE-R
Power Output - P _{max} (Wp)	400	400	430
Max Class Setting (W)	0/10	0/10	0/10
Nominal Power Voltage - V _{oc} (V)	48.8	49.4	50.5
Nominal Power Current - I _{sc} (A)	8.20	8.30	8.40
Open Circuit Voltage - V _{oc} (V)	58.9	59.2	59.7
Short Circuit Current - I _{sc} (A)	8.80	8.84	8.91
Power Density (W/m ²)	19.26	19.74	20.70
Panel Efficiency (%)	20.7	21.2	21.8
Power Output - P _{max} (Wp)	365	372	377
Nominal Power Voltage - V _{oc} (V)	46.0	46.6	47.6
Nominal Power Current - I _{sc} (A)	6.64	6.70	6.80
Open Circuit Voltage - V _{oc} (V)	55.5	55.8	56.0
Short Circuit Current - I _{sc} (A)	7.11	7.16	7.20
Power Output - P _{max} (Wp)	320	320	327
Nominal Power Voltage - V _{oc} (V)	46.0	46.6	47.6
Nominal Power Current - I _{sc} (A)	6.64	6.70	6.80
Open Circuit Voltage - V _{oc} (V)	55.5	55.8	56.0
Short Circuit Current - I _{sc} (A)	7.11	7.16	7.20

CERTIFICATIONS

IEC 61215:2016, IEC 61730:2016, UL 61730, IEC 62804 PID, IEC 61701 Salt Mist, IEC 62716 Ammonia Resistance, UL 61730 Fire Type 2, IEC 62782 Dynamic Mechanical Load, IEC 62053:2016 Halation (60min), IEC 62021 Lead Free: to RoHS (EU 609/2005), ISO 14001, ISO 9001, IEC 65001, IEC 62041

TEMPERATURE RATINGS

Nominal Module Operating Temperature: 45°C (113°F)
Temperature coefficient of P_{max}: -0.24%/°C
Temperature coefficient of V_{oc}: -0.04%/°C
Temperature coefficient of I_{sc}: 0.04%/°C

DELIVERY INFORMATION

Standard: 33
Panels per pallet: 60/26 (pallet)
Panels per 53 ft truck: 60/26 (pallet)

LOW LIGHT BEHAVIOUR

Typical low irradiance performance of module at STC

Available from: 

Sol-Ark

30K-3P-208V-N

Spec Sheet

Solar

Max Allowed PV Power: 39,000W
Max PV Power Delivered to Battery & AC Outputs: 30,000W
Max DC Voltage (Voc): 500V @ 36A
MPPT Voltage Range: 170-500V
Starting Voltage: 150V
Number of MPPT: 4
Max Solar Strings Per MPPT: 2
Max DC Current per MPPT (Self Limiting): 36A
Max AC Coupled Input (Micro/String Inverters): 56,000W | 150A @ 120V x 3

Input Power 39,000W

AC Output Power 30kW On-Grid & Off-Grid

Connections: 208V Three Phase
Continuous AC Power to Grid (On-Grid): 30,000W 83.4A (208V)
Continuous AC Power to Load (Off-Grid): 30,000W 83.4A (208V) TBD
Surge AC Power 10sec: 45,000VA 125A (208V)
Surge AC Power 100ms: TBD
Parallel Stacking: Yes—Up to 12
Frequency: 60/50Hz
Continuous AC Power with Grid or Generator: 72,000W 200A L-L (208V)
36,000W 200A L-N (120V)
CEC Efficiency: 96.5% (Peak 97.5%)
Idle Consumption Typical—No Load: TBD
Self Back Power Modes: Limited to Household/Fully Grid-Tied
Design (DC to AC): Transformerless DC
Response Time (Grid-Tied to Off-Grid): Sms
Power Factor: +/- 0.8 - 1.0

Battery (optional) Output Power 30,000W

Type Number of Inputs	Li-Ion 2 Inputs
Nominal DC Input	> 300V
Capacity	50 — 9900Ah
Voltage Range	150V — 550V
Continuous Battery Charging Output	100A (50A per Input)
Charging Curve	3-Stage w/ Equalization
Grid to BATT Charging Efficiency	96.0%
External Temperature Sensor	Included
Current Shunt for Accurate % SOC	Integrated
External Gen Start Based on Voltage or %SOC	Integrated
Communication to Lithium Battery	CanBus & RS485

General

Dimensions (H x W x D): 35.2" x 20.8" x 11.6"
Weight: 172 lbs
Enclosure: IP65 / NEMA 3R
Ambient Temperature: -40° to 60°C, -45°C Derating
Installation Style: Wall-Mounted
Wi-Fi & LAN Communication: Included
Standard Warranty (verified by HALT Testing): 10 years

Protections & Certifications

Electronics Certified Safety by SGS Labs to NEC & UL Specs - NEC 690.48 & NEC 705.4/6: Pending
Grid Sell Back — UL1741-2010/2018, IEE-1547a-2003/2014, FCC 15 Class B, UL174158, CA Rule 21, HECO Rule 14H: Pending
PV DC Disconnect Switch — NEC 240.15: Integrated
Ground Fault Detection — NEC 690.5: Integrated
PV Rapid Shutdown Control — NEC 690.12: Integrated
PV Arc Fault Detection — NEC 690.11: Integrated
PV Input Lightning Protection: Integrated
PV String Input Reverse Polarity Protection: Integrated
Surge Protection: DC Type II / AC Type II

Tigo

TS4-A-F

Module-level PV Rapid Shutdown

The TS4-A-F (Fire Safety) is the advanced add-on rapid shutdown solution that brings smart module functionality to standard PV modules for higher reliability. Ensure safety by upgrading existing PV systems or by adding safety features to new installations.

The TS4-A-F complies with NEC 2017, 2020 & 2023 690.12 Rapid Shutdown specifications when installed with the Tigo RSS Transmitter or an inverter with built-in Tigo certified transmitter.

Features

- High input current rating — Now rated for 20A Imp/ 25A Isc to better accommodate bifacial and high current modules
- Simple, Fast Installation — Snap to standard PV module frame or remove clips for rack mounting
- PLC Signaling — Rapid shutdown signaling over PV conductors
- Automatic Shutdown — PV array enters rapid shutdown mode in the event of AC grid loss
- PVRS Certified — Tested and certified with hundreds of top inverter models
- 25-year warranty

Quick Specs

	15A	25A
Height/width/depth	139.7 x 138.4 x 22.9mm (5.5 x 5.4 x 0.9in)	
Weight	490g (1.1lbs)	
Max Current (Imp/IsC)*	15A/NA	20A/25A
Max Power	700W	

 tigoenergy.com
PN: 002-00093-00 | Rev. 3.2 | 2023.06.26

Tigo

Electrical Data

	15A	25A
Maximum input voltage	90V	80V
Operating voltage range	16 - 90V	16 - 80V
Maximum input current (Isc)	N/A	25A
Maximum input current (Imp)	15A	20A
Maximum wattage	700W	700W

Connections

Module Conductor lengths: 0.12m, 0.62m options available¹ | 0.62m options available¹

String Conductor lengths: 1.2m, options available¹

Connectors: MC4, EVO2, options available¹

General Data

Operating temperature range: UL: -30°C to +75°C (-22°F to +167°F) | UL/IEC: -40°C to +85°C (-40°F to +176°F)
IEC: -40°C to +85°C (-40°F to +185°F)

Storage temperature range: -40°C to +85°C (-40°F to +185°F) | -40°C to +85°C (-40°F to +185°F)

Recommended fuse rating: 20A | 30A

Outdoor protection rating: IP68, NEMA 3R | IP68

Maximum altitude: 2000m | 3000m

Efficiency: 99.6% | 99.9%

Communication: PLC

Rapid Shutdown Time Limit: 30 secs or less¹

Conductor AWG Range: 10-12 AWG

PVRS Controlled Conductors: ≤30 Vdc, ≤240VA, ≤8A¹

Ordering Information

459-00252-32	TS4-A-F, 15A, 700W, 1500V UL / 1000V IEC, 0.12/1.2m Cable, MC4
481-00252-02	TS4-A-F, 15A, 700W, 1500V UL / 1000V IEC, 0.62/1.2m Cable, MC4
481-00261-32	TS4-A-F, 15A, 700W, 1500V UL / IEC, 0.12/1.2m Cable, EVO2
481-00261-62	TS4-A-F, 15A, 700W, 1500V UL / IEC, 0.62/1.2m Cable, EVO2
486-00252-32	TS4-A-F, 25A, 700W, 1500V UL / 1000V IEC, 0.12/1.2m Cable, MC4
486-00252-62	TS4-A-F, 25A, 700W, 1500V UL / 1000V IEC, 0.62/1.2m Cable, MC4
486-00261-32	TS4-A-F, 25A, 700W, 1500V UL / IEC, 0.12/1.2m Cable, EVO2
486-00261-62	TS4-A-F, 25A, 700W, 1500V UL / IEC, 0.62/1.2m Cable, EVO2
488-00252-32	TS4-A-F, 25A, 700W, 1000V IEC, 0.12/1.2m Cable, MC4
488-00252-62	TS4-A-F, 25A, 700W, 1000V IEC, 0.62/1.2m Cable, MC4
488-00261-32	TS4-A-F, 25A, 700W, 1500V IEC, 0.12/1.2m Cable, EVO2
488-00261-62	TS4-A-F, 25A, 700W, 1500V IEC, 0.62/1.2m Cable, EVO2

Additional resources

 tigoenergy.com
PN: 002-00093-00 | Rev. 3.2 | 2023.06.26

Sol-Ark

L3 Series LimitLess Lithium™ Battery Energy Storage System

Technical Specifications: 208V Outdoor and Indoor

Battery Model: L3 30K-HV-60-IP55 | L3 30K-HV-40-IP20

System Data

	Outdoor	Indoor
Compatible Inverter	Sol-Ark 30K-3P-208V-N	
Environmental Rating	Outdoor	Indoor
Cell Chemistry	Lithium Iron Phosphate	
Battery Cabinet Capacity	61.44kWh	40.96kWh
System Usable Energy ¹	55.30kWh	36.86kWh
Inverter Grid/Gen/Load OCPD Rating	200A	
Backup Capability Per Inverter	30 kWac	
Max DC-Coupled Solar Per Inverter	39 kWac	
Max AC-Coupled Solar Per Inverter	54 kWac	
Max Battery Cabinets Per Inverter	6	
Min Battery Cabinets Per Inverter	1	
Inverter Stacks in Parallel	6 ²	8
Recommend Depth of Discharge	90%	
System Nominal Voltage	307V	410V
System Operating Voltage	249.6V-350.4V	332.8V-467.2V
Charge/Discharge Current ²		
• Recommend	100A	50A
• Nominal/Continuous	100A	100A
• Peak Discharge (2 mins, 25°C)	125A	125A
Combined Battery + Inverter Efficiency	90% (25C, 0.5C)	
Dimension (feet)	2.5W/3.5D/7.4H	1.9W/1.9D/5.3H
Weight	2095lbs	1384lbs
Operating Temperature ⁴	-22°F to 131°F	-4°F to 131°F
Humidity	5% - 85%RH	
Altitude	±2000m	
Storage Temperature	-4°F to 95°F	
Seismic Zone	4	
Communication Port	CAN20/RS485	

Battery Module Specifications

	6s2p	8
Battery Modules in Series Per Cabinet	6s2p	8
Battery Module Energy	5.12kWh	5.12V
Battery Module Nominal Voltage	51.2V	100Ah
Battery Module Nominal Capacity	100Ah	
Battery Module Qty Per Cabinet		

Warranty and Certification

Cycle Life	>6000 Cycles (77°F±7°F 0.5C/0.5C, EOL70%)
Warranty ⁵	10 Years
Certification	UL9540, UL9540a, UN38.3, CEC, JA12, IEC62477, IEC62619, VDE-AR-N 4105, IEC62109, VDE2510-50

1. DC usable energy, test conditions: 90% DOD, 0.3C charge and discharge at 25°C. System usable energy may vary due to system configuration parameters.
2. For larger outdoor installations, use the Sol-Ark Mega Ark.
3. The current is affected by temperature and SOC.
4. Charging disconnects below 32°F. Derating occurs above 113°F. Ambient temperature may exceed operating range on IP55 model if using included climate controls. See Sol-Ark technical sales for planning outdoor sites outside of operating temperature range.
5. Battery warranty expires at 6000 cycles or 10-year term, whichever occurs first. 5-year extended warranty option available for inverter only.

sol-ark.com | (972) 575-8875



GREENTECH RENEWABLES

CONTRACTOR



EXPERT ELECTRIC, LLC
P.O. BOX 167/20151 K & H ST.
STERLING, CO 80751, USA
PHONE NO: (970) 522-1781
LICENSE NO: CO 7643

PROJECT NAME & ADDRESS

HOLYOKE DAYCARE
HOLYOKE, CO 80734,
USA.

SIGNATURE WITH SEAL

REVISIONS	DESCRIPTION	DATE
REV	A.0	11/23/2023
WIRE DIAGRAM		

SHEET TITLE

RESOURCE DOCUMENT

DRAWN DATE: 11-23-2023
DRAWN BY: GK
REVIEWED BY: JVK

SHEET NUMBER

R-001



DATA SHEET



IQ8 Commercial Microinverters

The high-powered, smart grid-ready Enphase IQ8P-3P and IQ8H-3P Microinverters are specifically designed for 208 V three-phase interconnection for small commercial solutions.

Each microinverter integrates with the IQ Gateway Commercial 2 and the Enphase App monitoring and analysis software.

With simplified design, improved energy harvesting, and advanced monitoring, microinverters offer true peace of mind during operation and maintenance.



The IQ Series Microinverters extend the reliability standards set forth by previous generations and undergo over a million hours of power-on testing, enabling Enphase to provide an industry-leading warranty of up to 25 years.*

* 25-year warranty is valid, provided an internet-connected IQ Gateway is installed. © 2023 Enphase Energy. All rights reserved. Enphase, the e and CC logos, IQ, and certain other marks listed at <https://enphase.com/trademark-usa> are trademarks of Enphase Energy, Inc. in the US and other countries. Data subject to change.

- Easy to install**
- Lightweight and compact with plug-and-play connectors
 - Power line communication (PLC) between components
 - Faster installation
- High productivity and reliability**
- More than one million cumulative hours of testing
 - Class II double-insulated enclosure
 - Optimized for the latest high-powered PV modules
- Smart Grid Ready**
- Complies with the latest advanced grid support
 - Remote automatic updates for the latest grid requirements
 - Configurable to support a wide range of grid profiles
 - Meets CA Rule 21 (UL 1741-SA) and IEEE 1547 (UL 1741-SB) requirements

IQ8P-3P-H-DSH-00236-1.0-EN-US-2023-10-19

IQ8 Commercial Microinverters

INPUT DATA (AC)	UNITS	IQ8P-3P-72-E-US	IQ8H-3P-72-E-US
Commonly used modules for pairing ⁽¹⁾	W	380-640	320-540
Module compatibility ⁽²⁾		54-cell/108 half-cell, 60-cell/120 half-cell, 66-cell/132 half-cell and 72-cell/144 half-cell	
Maximum input DC voltage	V		63
Peak power tracking voltage	V	35.5-53	28.5-45
Operating range	V		16-63
Min./Max. start voltage	V		20/63
Max. DC continuous current (module I _M)	A		14
Max. input DC short-circuit current	A		25
Max. DC short circuit current (module I _{SC})	A		20
Overvoltage class DC ports			II
DC port backfeed current	A		0
PV array configuration		1x 1 ungrounded array; no additional DC side protection required; AC side protection requires max 20A per branch circuit	
OUTPUT DATA (AC)	UNITS	IQ8P-3P-72-E-US	IQ8H-3P-72-E-US
Peak output power	VA	460	384
Maximum continuous output power	VA	475	390
Nominal (L-L) voltage/range ³	V	208/193-229	220/198-242
Maximum continuous output current	A	2.28	2.36
Nominal frequency	Hz		60
Extended frequency range	Hz		47-68
Maximum microinverters per 20A 3 Phase branch circuit ⁴		12	12
Overvoltage class AC port			III
Power factor setting			1.0
Power factor (adjustable)		0.85 leading - 1.0 lagging	
EFFICIENCY	IQ8P-3P-72-E-US	IQ8H-3P-72-E-US	
Peak efficiency	%	97.7	97.2
CEC weighted efficiency	%	97.5	97
MECHANICAL DATA			
Ambient temperature range	-40°C to +65°C (-40°F to +149°F)		
Relative humidity range	4% to 100% (condensing)		
DC connector type ⁵	Enphase EN4 bulkhead, ECA-EN4-322; EN4 (TE PV4-S SOLARLOCK) 150 mm/5.9" to Staibil MC4 adapter cable pair (Default supply) ⁶		
Dimensions (H x W x D)	265 mm x 200 mm x 35 mm (10.4" x 7.8" x 1.4") without bracket		
Weight	1.56 kg (3.4 lbs)		
Cooling	Natural convection		
Approved for wet locations	Yes		
Enclosure	Class II double-insulated, corrosion resistant polymeric enclosure		
Environmental category/UV exposure rating	IP67/sunlight resistant		
FEATURES			
Communication	Power line communication (PLC)		
Monitoring	Enphase App monitoring and analysis software. Both options require installation of an IQ Gateway Commercial 2.		
Compliance	CA Rule 21 (UL 1741-SB), UL 62109-1, ULTR/IEEE1547, FCC Part 15 Class B, ICES-0003 Class B, CAN/CSA-C22.2 NO. 1071-01. This product is UL-Listed as PV rapid shutdown equipment and conforms with NEC 2014, NEC 2017, and NEC 2020 section 690.12 and C22.2-2018 Rule 64-018 rapid shutdown of PV systems for AC and DC conductors, when installed according to manufacturer's instructions.		
<small>(1) Pairing PV modules with wattage above the limit may result in additional clipping losses. See the compatibility calculator at https://tilk.enphase.com/. (2) Module compatibility (3) Nominal voltage range can be configured (required) by the utility (3) Units are vary. Refer to local requirements to define the number of microinverters per branch in your area. (4) Enphase IQ8P-3P and IQ8H-3P Microinverter bulkhead and adapter cable mate. Female DC connectors must only be mated with the identical type and manufacturer brand of male female connector. (5) Qualified per UL subject 9703. (6) IQ8P-3P-H-DSH-00236-1.0-EN-US-2023-10-19</small>			

Data Sheet
Enphase Networking

Enphase IQ Commercial Envoy

The **Enphase IQ Commercial Envoy™** gateway delivers solar production and energy consumption data to Enphase Enlighten™ monitoring and analysis software for comprehensive, remote maintenance and management of three-phase Enphase IQ Systems.

With integrated production metering and optional consumption monitoring, the Envoy IQ is the platform for total energy management and integrates with the IQ Microinverters™ and Enphase IQ Battery™.



- Smart**
- Enables web-based monitoring and control
 - Bidirectional communications for remote upgrades
 - Supports power export limiting and zero-export applications

- Simple**
- Easy system configuration using Enphase Installer Toolkit™ mobile app
 - Flexible networking with Wi-Fi, Ethernet, or cellular

- Reliable**
- Designed for installation indoors or outdoors in an enclosure
 - Five-year warranty



To learn more about Enphase offerings, visit enphase.com



Enphase IQ Commercial Envoy

MODEL NUMBERS	
Enphase IQ Commercial Envoy™ ENV-IQ-AM3-3P	Three-phase communications gateway with integrated PV production metering (+/- 0.5%) and optional consumption monitoring (+/- 2.5%). Includes three 200A continuous rated production CTs.
ACCESSORIES (order separately)	
Enphase Mobile Connect™	Plug and play industrial grade cellular modem with five-year data plan (expandable to 12 years) for systems up to 60 microinverters (expandable). Available in the US, Canada, Mexico, Puerto Rico, and the US Virgin Islands, where there is adequate cellular service in the installation area.
CELLMODEM-M1 (4G LTE Category M1)	
CELLMODEM-M1-B (4G LTE Category M1)	
Consumption Monitoring CTs CT-200-SPLIT (order three or six, as needed)	Split-core current transformers enable consumption metering.
POWER REQUIREMENTS	
Power requirements	208Y/120 VAC three-phase 220Y/127 VAC three-phase Max 20 A overcurrent protection required
Typical Power Consumption	5W
CAPACITY	
Number of microinverters polled	Up to 300
MECHANICAL & ELECTRICAL DATA	
Dimensions (WxHxD)	21.3 x 12.6 x 4.5 cm (8.4" x 5" x 1.8")
Weight	17.6 oz (498 g)
Ambient temperature range	-40° to 65° C (-40° to 149° F)
Environmental rating	IP30. For installation indoors or in an NRTL-certified, NEMA type 3R enclosure.
Altitude	To 2000 meters (6,560 feet)
Production CTs	- Are limited to 200A of continuous current / 250A OCPD - 72kW AC - Allow for parallel connected CTs for up to 500A - 144kW AC (if possible) - Internal aperture measures 19.36mm to support 250MCM THWN conductors (max) - Accuracy of +/- 0.5% for production metering
Consumption CTs	- For electrical services to 250A with parallel runs up to 500A - Internal aperture measures 0.84" x 0.96" (21.33mm x 24.38mm) to support 3/0 THWN conductor - CT wire insulation rating of 600V - Accuracy of +/- 2.5% for consumption monitoring
INTERNET CONNECTION OPTIONS	
Integrated Wi-Fi	802.11b/g/n
Ethernet	802.3, Cat5E (or Cat 6) UTP Ethernet cable, not included
Mobile	Optional, CELLMODEM-M1 (LTE), CELLMODEM-01 (3G), or CELLMODEM-03 (4G), not included
COMPLIANCE	
Compliance	UL 916 CAN/CSA C22.2 No. 61010-1 47 CFR, Part 15, Class B, ICES 003 IEC/EN 61010-1:2010, EN50065-1, EN61000-4-5, EN61000-6-1, EN61000-6-2

To learn more about Enphase offerings, visit enphase.com

© 2021 Enphase Energy. All rights reserved. Enphase, the Enphase logo, IQ Commercial Envoy, and other trademarks or service names are the trademarks of Enphase Energy, Inc. Data subject to change. 07-12-2021



CONTRACTOR



EXPERT ELECTRIC, LLC
P.O. BOX 167/20151 K & H ST.
STERLING, CO 80751, USA
PHONE NO: (970) 522-1781
LICENSE NO: CO 7643

PROJECT NAME & ADDRESS

HOLYOKE DAYCARE
HOLYOKE, CO 80734,
USA.

SIGNATURE WITH SEAL

REV	DESCRIPTION	DATE	REVISIONS	
			DATE	DESCRIPTION
A.0	WIPE DIAGRAM	11/23/2023		

SHEET TITLE RESOURCE DOCUMENT

DRAWN DATE	11-23-2023
DRAWN BY	GK
REVIEWED BY	JVK

SHEET NUMBER
R-002