

PROJECT INFORMATION:

PROJECT ADDRESS:

4466 DUNCAN AVE.
ST. LOUIS, MO 63110

PROJECT DESCRIPTION: INSTALLATION OF A 1.82 MW (DC) GRID-TIED PHOTOVOLTAIC SYSTEM ON A PARKING CANOPY ON THE ROOF OF A PARKING GARAGE AT A HEALTH CARE CAMPUS SITE . INVERTERS WILL BE LOCATED ON THE PARKING CANOPIES. AC SPLICE BOXES WILL COLLECT INVERTERS ALONG EACH CANOPY AND SOLAR LOAD CENTERS WILL COLLECT ALL AC SPLICE BOXES AT THE END OF EACH CANOPY. TWO MAIN SOLAR SWITCHBOARDS WILL BE LOCATED AT THE SOUTHWEST CORNER OF THE ROOF LEVEL PARKING GARAGE . THE POINT OF CONNECTION WILL BE AT A NEW UTILITY TRANSFORMER DEDICATED FOR SOLAR OUTPUT ONLY AT GROUND LEVEL. TWO SOLAR AC DISCONNECT SWITCHES WILL BE LOCATED ADJACENT TO / WITHIN 15 FT OF THE NEW UTILITY TRANSFORMER. ALL EQUIPMENT USED SHALL BE UL LISTED.

APPLICABLE CODES:

- 2015 INTERNATIONAL BUILDING CODE
- 2015 INTERNATIONAL FIRE CODE
- 2015 INTERNATIONAL ENERGY CONSERVATION CODE
- 2015 INTERNATIONAL MECHANICAL CODE
- 2015 INTERNATIONAL PLUMBING CODE
- 2014 NATIONAL ELECTRIC CODE

EQUIPMENT LIST:

- (4,547) LG SOLAR 400W SOLAR MODULES
- (157) PRO HARVEST 10 KW INVERTERS (480VAC)
- (53) PRO HARVEST AC SPLICE BOXES (480VAC)
- (6) 400 AMP PANEL BOARDS, 3Ø, 4W, 480VAC, NEMA 3R RATED
- (2) 250 AMP PANEL BOARDS, 3Ø, 4W, 480VAC, NEMA 3R RATED
- (2) 1200 AMP SWITCH BOARDS, 3Ø, 4W, 480VAC, NEMA 3R RATED
- (2) 1200 AMP AC DISCONNECT SWITCHES, 480 VAC, 3 POLE, KNIFE-BLADE, NEMA 3R, with 1200A FUSES.

SHEET INDEX

PV-1.0	COVER
PV-3.0	PV EQUIPMENT LAYOUT PLAN
PV-5.0	ELECTRICAL LINE DIAGRAM - ARRAY #1 (NORTH)
PV-5.1	ELECTRICAL LINE DIAGRAM - TYPICAL ARRAYS
PV-5.2	ELECTRICAL LINE DIAGRAM - ARRAY #5
PV-5.3	ELECTRICAL LINE DIAGRAM - ARRAY #6
PV-5.4	ELECTRICAL LINE DIAGRAM - ARRAY #8 (SOUTH)
PV-5.5	ELECTRICAL LINE DIAGRAM - SOLAR SWITCHBOARDS
PV-5.6	ELECTRICAL NOTES & CALCULATIONS
PV-6.0	SIGNAGE & SITE DIRECTORY
PV-7.0	EQUIPMENT SPEC SHEETS



DAY & NIGHT SOLAR

Contractors License #:

1605 EASTPORT PLAZA DRIVE
SUITE 135
COLLINSVILLE, IL 62234

PHONE: (618) 344-4001

PROJECT
PHOTOVOLTAIC INSTALLATION for
BJC CANOPY
4466 DUNCAN AVE.
ST. LOUIS, MO 63110

REVISIONS

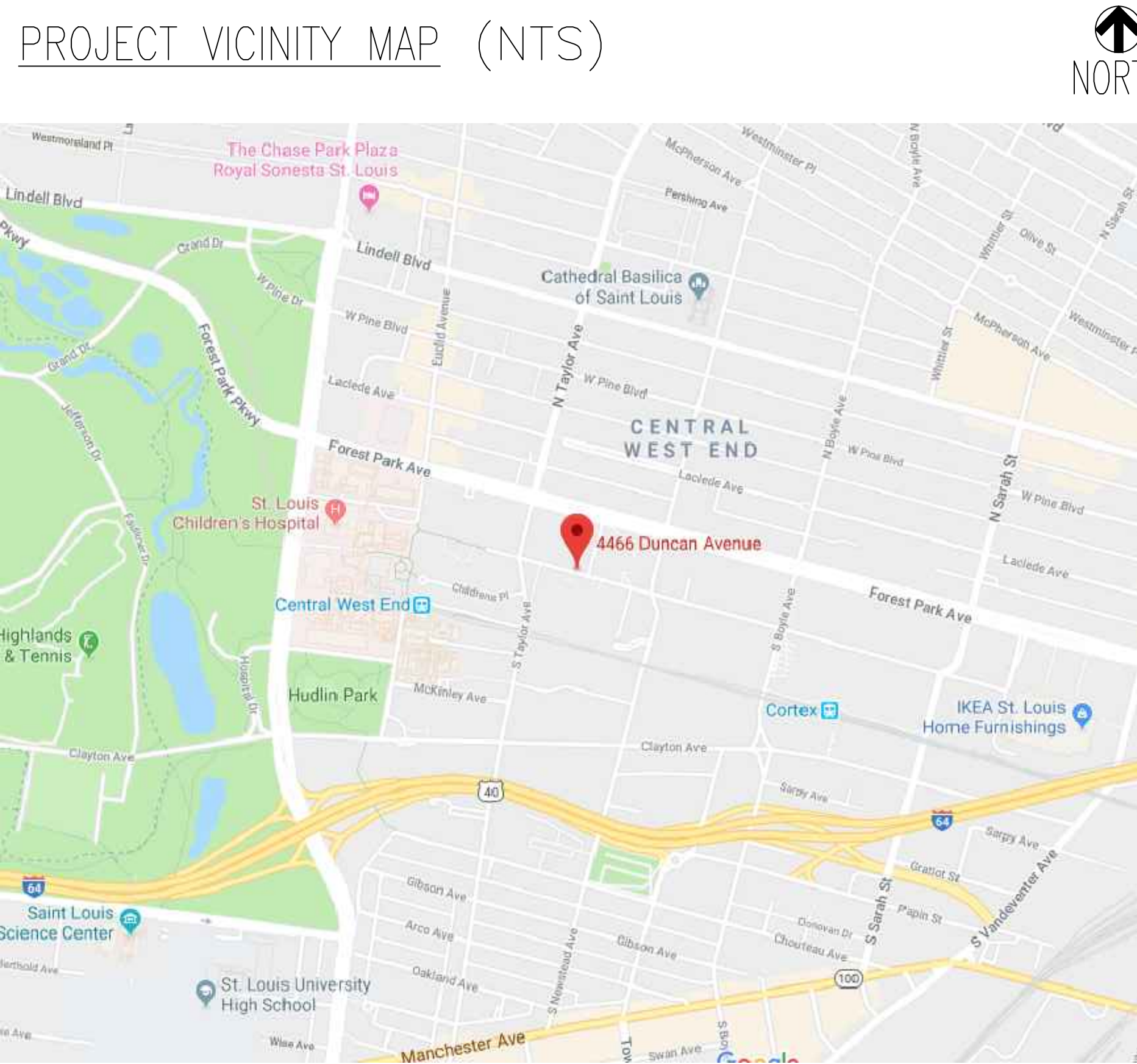
NO.	DATE	ISSUE
0	12/07/18	90% DESIGN SET

PROJECT
PHOTOVOLTAIC
INSTALLATION

BJC CANOPY
4466 DUNCAN AVE.
ST. LOUIS, MO 63110

DATE: 12/07/2018	SHEET SIZE: 30" x 42"
DRAWN: BL	
CHECKED: RD	SHEET NO.
VERSION: 1.0	
COVER SHEET	PV 1.0

PROJECT VICINITY MAP (NTS)



PROJECT LOCATION (NTS)



SYMBOLS

	DC-AC INVERTER		(N) ELEC. PANEL OR BOX
	METER		(E) ELEC. PANEL OR BOX
	FUSE		TRANSFORMER
	SWITCH		PHOTOVOLTAIC PANEL ARRAY
	FUSED SWITCH		EXISTING CONDUIT RUN, EXPOSED ON ROOF OR WALL
	CIRCUIT BREAKER		TRENCH AC CONDUIT
	EARTH GROUND		
	CHASSIS GROUND		
	FLEXIBLE CONDUIT		
	CONDUIT TURNED UP		
	CONDUIT TURNED DOWN		

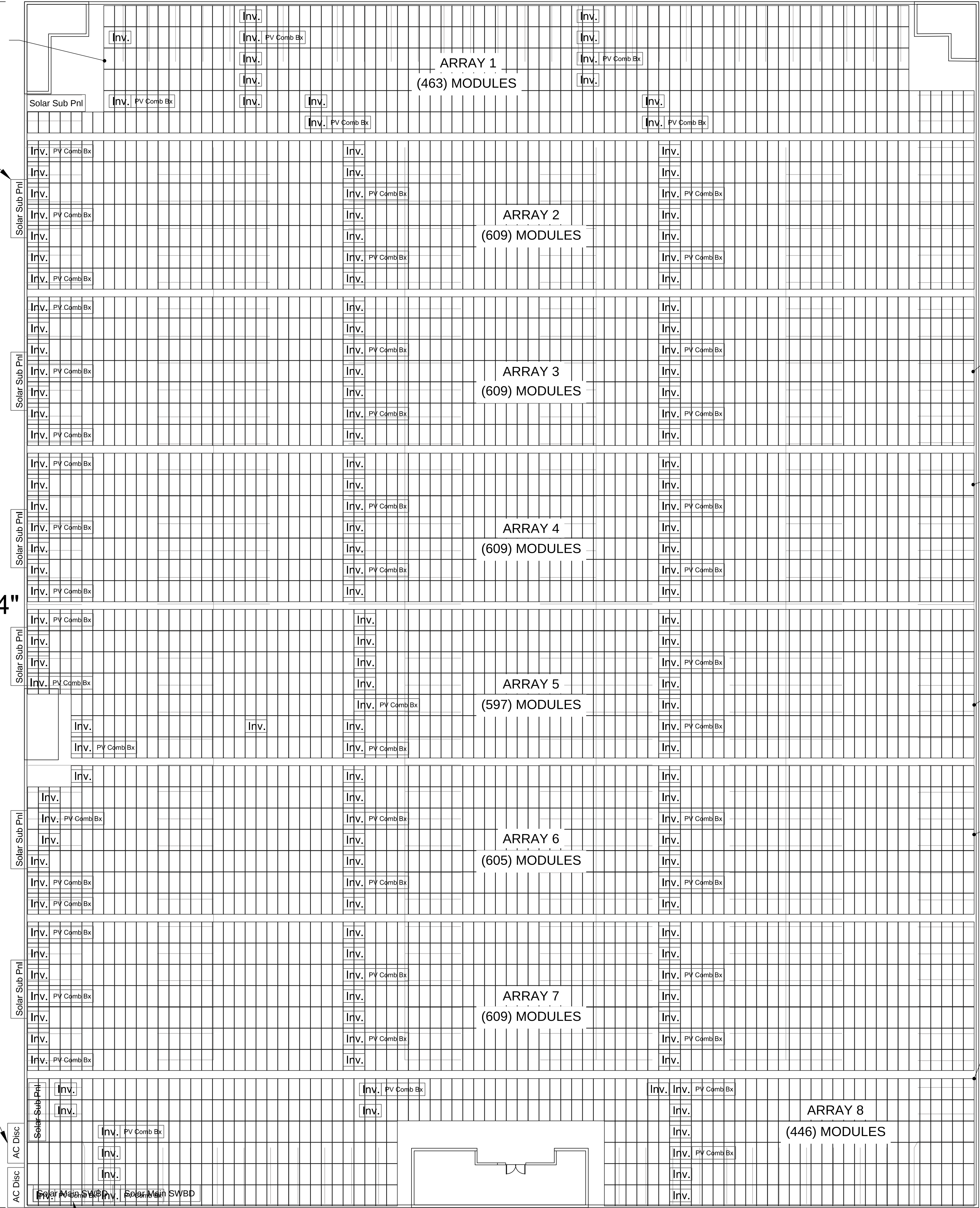
1 SOLAR CANOPY
SCALE: 1/16" = 1'

ARRAY 1 (NORTH): FOR ELECTRICAL
WIRING DIAGRAM REFER TO PV-5.0

A SOLAR SUB PANEL WILL BE
LOCATED AT THE WEST END
OF EACH ARRAY, LOCATED
ON COLUMNS, TYP. OF (8).

381'-4"

301'-11"



(2) SOLAR SWITCHBOARDS LOCATED AT SOUTHWEST CORNER OF ROOF
NEMA 3R, PAD MOUNTED, AND PROTECTED BY BOLLARDS

- LEGEND
- CONDUIT
 - Inv. INVERTER
 - PV Comb Bx SOLAR AC COMBINER BOX
 - Solar Sub Pnl SOLAR PANEL BOARD
 - AC Disc AC DISCONNECT SWITCH (FOR UTILITY)
 - Solar Main SWBD SOLAR MAIN SWITCHBOARD

NOTE: EQUIPMENT SYMBOLS ARE FOR DIAGRAM
PURPOSES AND DO NOT REFLECT ACTUAL PHYSICAL
SIZE. EXACT EQUIPMENT LOCATIONS AND CONDUIT
RUNS WILL BE VERIFIED IN THE FIELD.

TYPICAL ARRAYS 2, 3, 4 AND 7: FOR ELECTRICAL
DIAGRAM REFER TO PV-5.1

2
PV-3

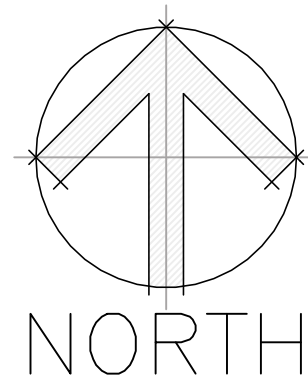
ARRAY 5 (SOUTH): FOR ELECTRICAL
DIAGRAM REFER TO PV-5.2

ARRAY 6 (SOUTH): FOR ELECTRICAL
DIAGRAM REFER TO PV-5.3

ARRAY 8 (SOUTH): FOR ELECTRICAL
DIAGRAM REFER TO PV-5.4

(N) (2) SOLAR AC DISCONNECT
SWITCHES FOR UTILITY USE,
LOCATED NEAR, WITHIN 15'
OF MAIN SWITCHBOARD

(E) UTILITY TRANSFORMER
LOCATED AT GROUND LEVEL



DAY & NIGHT SOLAR

Contractors License #:

1605 EASTPORT PLAZA DRIVE
SUITE 135
COLLINSVILLE, IL 62234

PHONE: (618) 344-4001

PROJECT
PHOTOVOLTAIC INSTALLATION for
BJC CANOPY
4466 DUNCAN AVE.
ST. LOUIS, MO 63110

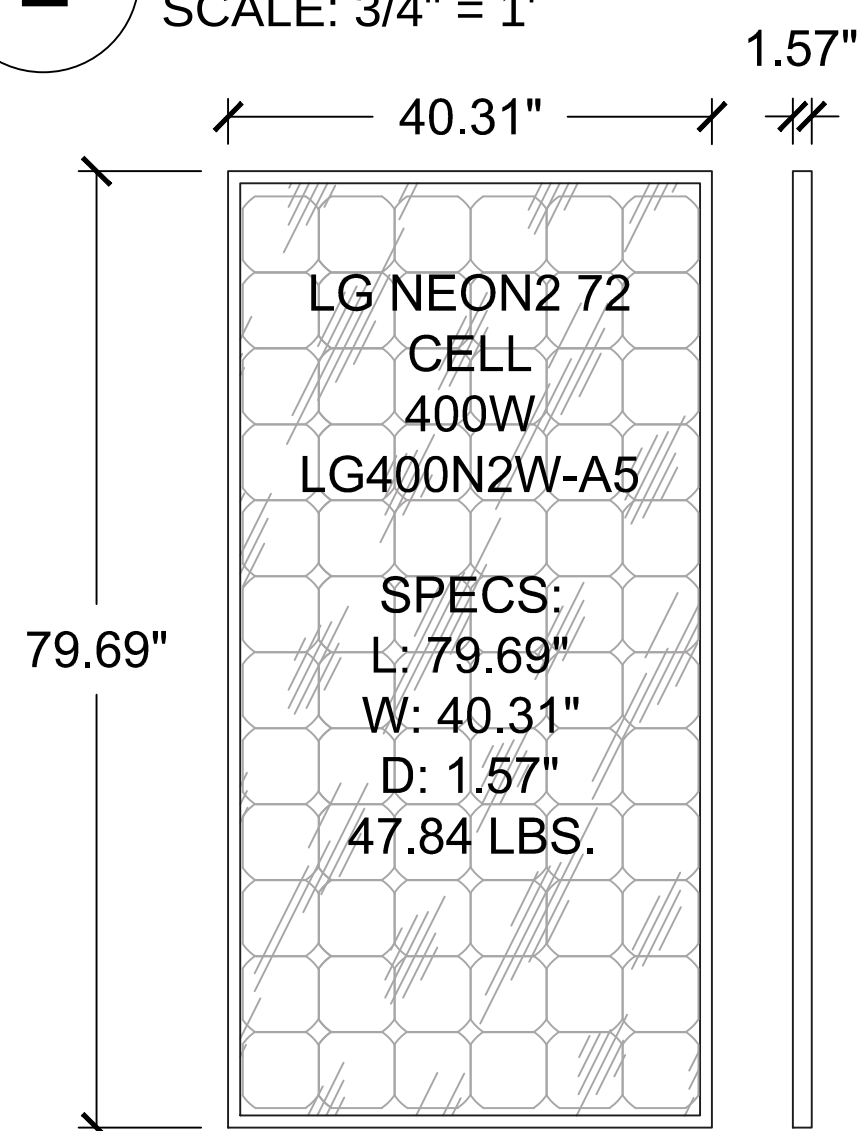
REVISIONS

NO.	DATE	ISSUE
0	12/07/18	90% DESIGN SET

PROJECT
PHOTOVOLTAIC
INSTALLATION

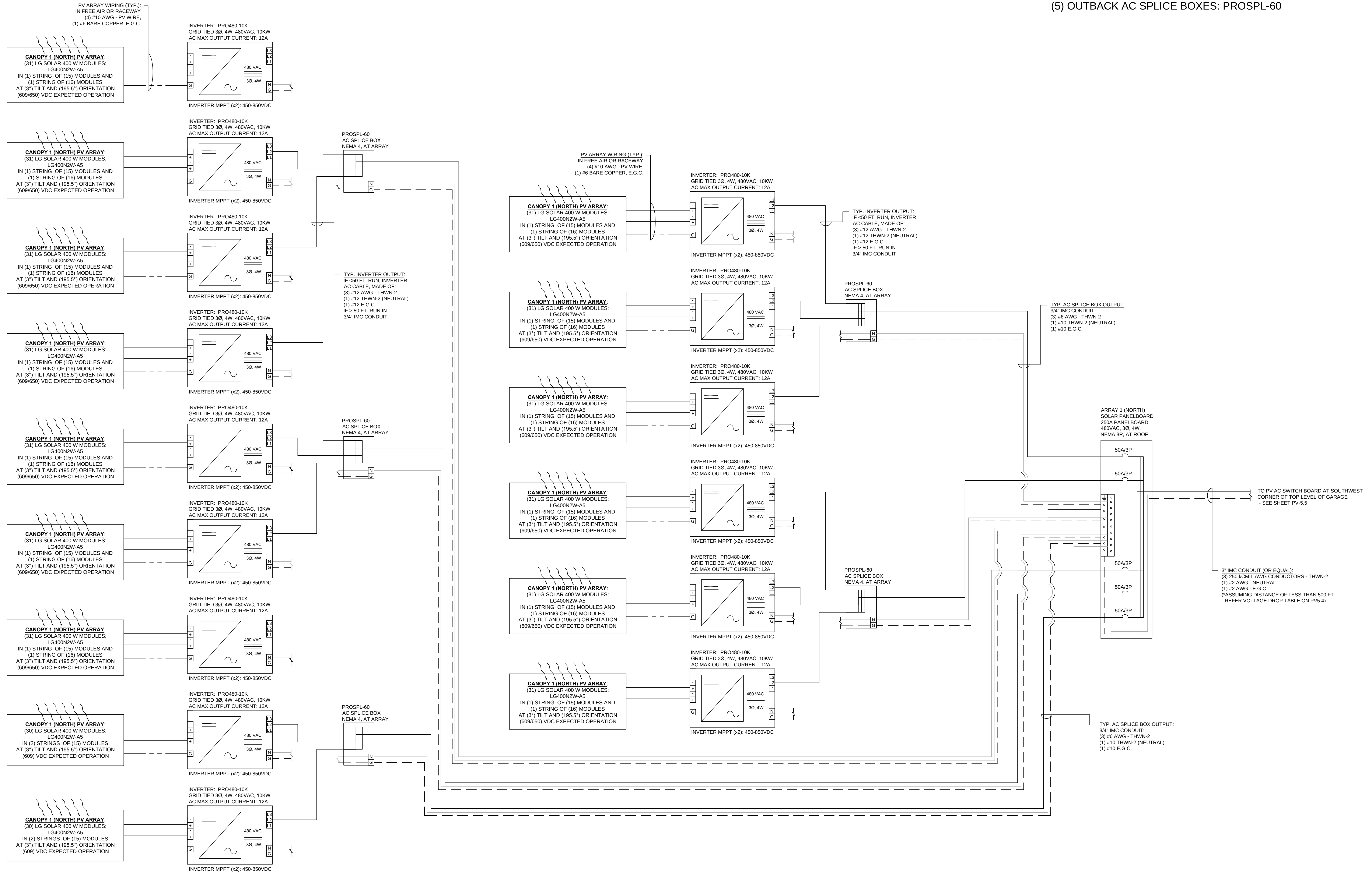
BJC CANOPY
4466 DUNCAN AVE.
ST. LOUIS, MO 63110

2 MODULE DETAIL
SCALE: 3/4" = 1'



DATE: 12/07/2018	SHEET SIZE: 30" x 42"
DRAWN: BL	
CHECKED: RD	SHEET NO.
VERSION: 1.0	
EQUIPMENT LAYOUT	PV 3.0

ARRAY 1 (NORTH) ELECTRICAL DIAGRAM



ARRAY 1: 185.2 kW (DC):
(463) LG SOLAR 400W MODULES: LG400N2W-A5,
(15) OUTBACK PRO HARVEST 10 KW INVERTERS: PRO480-10K
(5) OUTBACK AC SPLICE BOXES: PROSPL-60



DAY & NIGHT SOLAR

Contractors License #:

1605 EASTPORT PLAZA DRIVE
SUITE 135
COLLINSVILLE, IL 62234

PHONE: (618) 344-4001

PROJECT
PHOTOVOLTAIC INSTALLATION for

BJC CANOPY
4466 DUNCAN AVE.
ST. LOUIS, MO 63110

REVISIONS

NO.	DATE	ISSUE
0	12/07/18	90% DESIGN SET

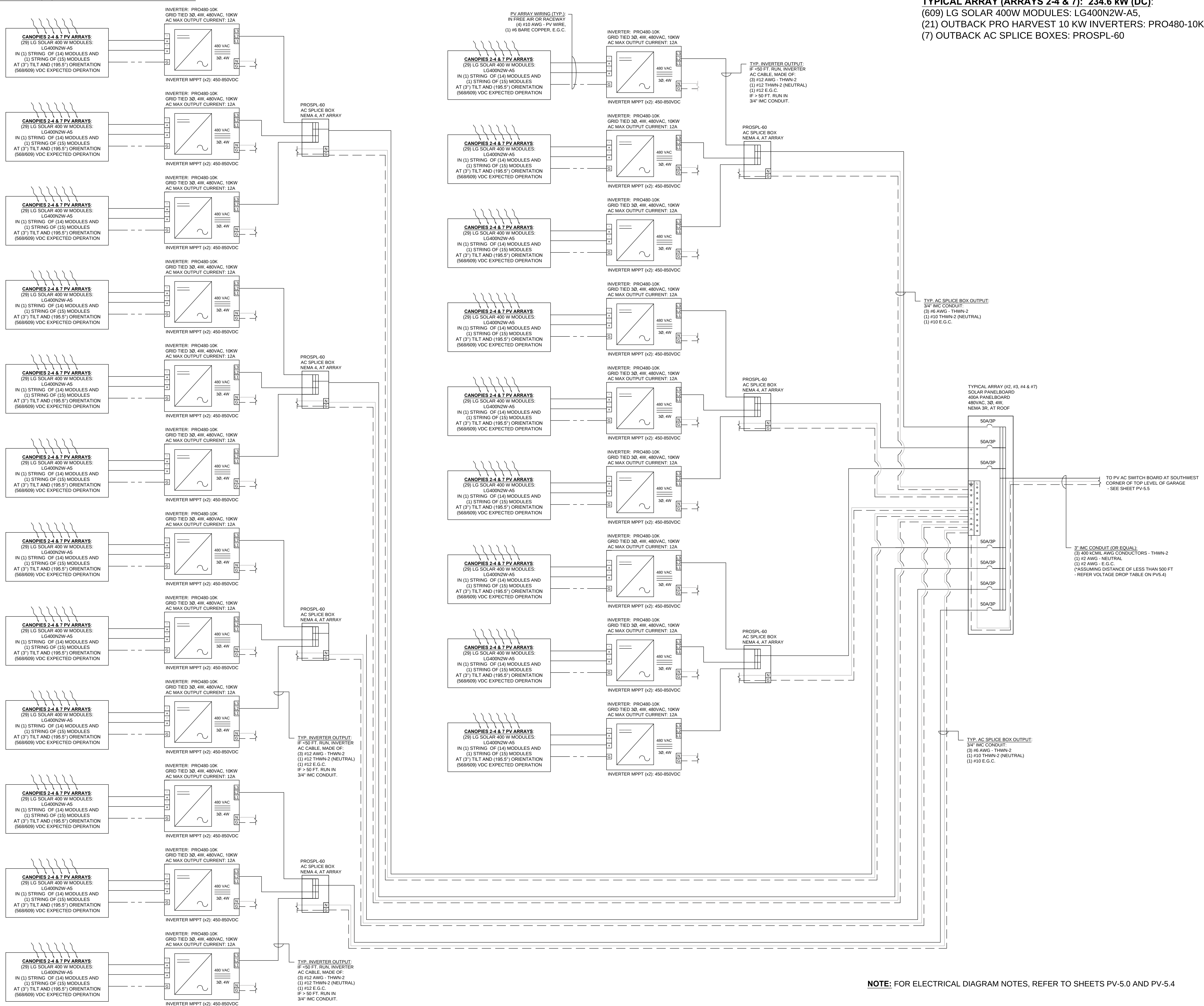
PROJECT
PHOTOVOLTAIC
INSTALLATION

BJC CANOPY
4466 DUNCAN AVE.
ST. LOUIS, MO 63110

ELECTRICAL DIAGRAM NOTES:

- FOR ALL DC RUNS, PV WIRE SHALL BE USED, AS PER NEC 690.35(D)(3) AND 690.31(B). ALL DC COMPONENTS (FUSES, LUGS, CRIMPS, SWITCHES, ETC.) SHALL BE RATED FOR 1000 VDC.
- ALL DC AND AC WIRING IN FREE AIR SHALL BE SUPPORTED OFF OF THE ROOF SURFACE AND PROTECTED FROM DAMAGE. ALL HARDWARE USED SHALL BE LISTED AND APPROVED FOR THE USE.
- PV MODULES SHALL BE GROUNDED WITH INTEGRATED GROUNDING MODULE CLAMPS OR SIMILAR SUCH ACCESSORY DEVICES WHICH SHALL BE LISTED AND APPROVED FOR THEIR USE. ARRAY FRAME STRUCTURE WILL BE GROUNDED WITH ILSCO GBL-4DBT (OR EQUIVALENT - SUITABLE FOR DIRECT BURIAL AND CONTACT WITH COPPER OR ALUMINUM) LAY-IN TYPE GROUNDING LUGS.
- CONDUIT TYPES SHALL MEET OR EXCEED LOCAL JURISDICTION REQUIREMENTS FOR CONDUIT PER THE LOCATIONS AND CONDITIONS OF USE. CONDUIT SIZED SPECIFIED IN THESE DRAWINGS ARE THE MINIMUM REQUIRED AND MAY BE UPSIZED FOR EASE OF INSTALLATION AT THE DISCRETION OF THE CONTRACTOR.
- ALL OUTBACK PRO HARVEST COMPONENTS, INCLUDING INVERTERS, AC SPLICE BOXES, AND CABLING ARE PART OF A UL LISTED ASSEMBLY, DESIGNED AND LISTED BY AN NRTL (TO UL 1741) FOR USE IN WET ENVIRONMENT, EXPOSED TO SUNLIGHT, AND AT 90° C FOR PV SYSTEM APPLICATIONS. REFER TO LISTING AND PRODUCT WHITE PAPERS FOR MORE INFORMATION.
- ALL METAL RACEWAYS AND EQUIPMENT SHALL BE BONDED.
- USE WATERPROOF FITTINGS FOR ALL EXTERIOR CONDUIT.
- PV SYSTEM (AC AND DC) SHALL BOND TO A GROUNDING ELECTRODE SYSTEM, AS PER 2017 NEC 690.47(D) AND NEC 250.64(C). USE #6 BARE COPPER GROUND (MIN.) WHERE SUBJECT TO DAMAGE.
- ONLY COPPER (CU) CONDUCTORS SHALL BE USED, UNLESS OTHERWISE NOTED. ALL AC CONDUCTORS SHALL BE 600V, 90° C COPPER. ALL AC CONDUCTORS IN CONDUIT SHALL BE THWN-2, WITH PROPERLY RATED CONNECTORS.
- ALL PV BREAKERS SHALL BE SUITABLE FOR BACK FEED USE.
- WIRE AC DISCONNECT SWITCH WITH UTILITY SIDE IN STATIONARY POSITION (TOP), AND SOLAR INVERTER ON MOVABLE BLADE SIDE (BOTTOM).
- 3 FT MIN. HORIZONTAL CLEARANCE REQUIRED BETWEEN ALL ELECTRICAL EQUIPMENT AND GAS EQUIPMENT.
- ALL WIRE RUNS SHALL NOT EXCEED 2% CALCULATED VOLTAGE DROP. REFER TO VOLTAGE DROP TABLE ON PV-5.5 FOR MAX DISTANCES ALLOWABLE PER WIRE SIZE.
- PV SYSTEM IS EQUIPPED WITH RAPID SHUTDOWN IN ACCORDANCE WITH NEC 690.12.

DATE: 12/07/2018	SHEET SIZE: 30" x 42"
DRAWN: BL	
CHECKED: RD	SHEET NO.
VERSION: 1.0	
ELECTRICAL DIAGRAM	PV 5.0



NOTE: FOR ELECTRICAL DIAGRAM NOTES, REFER TO SHEETS PV-5.0 AND PV-5.4



DAY & NIGHT SOLAR

Contractors License #:

1605 EASTPORT PLAZA DRIVE
SUITE 135
COLLINSVILLE, IL 62234

PHONE: (618) 344-4001

PROJECT

PHOTOVOLTAIC INSTALLATION for

BJC CANOPY
4466 DUNCAN AVE.
ST. LOUIS, MO 63110



REVISIONS

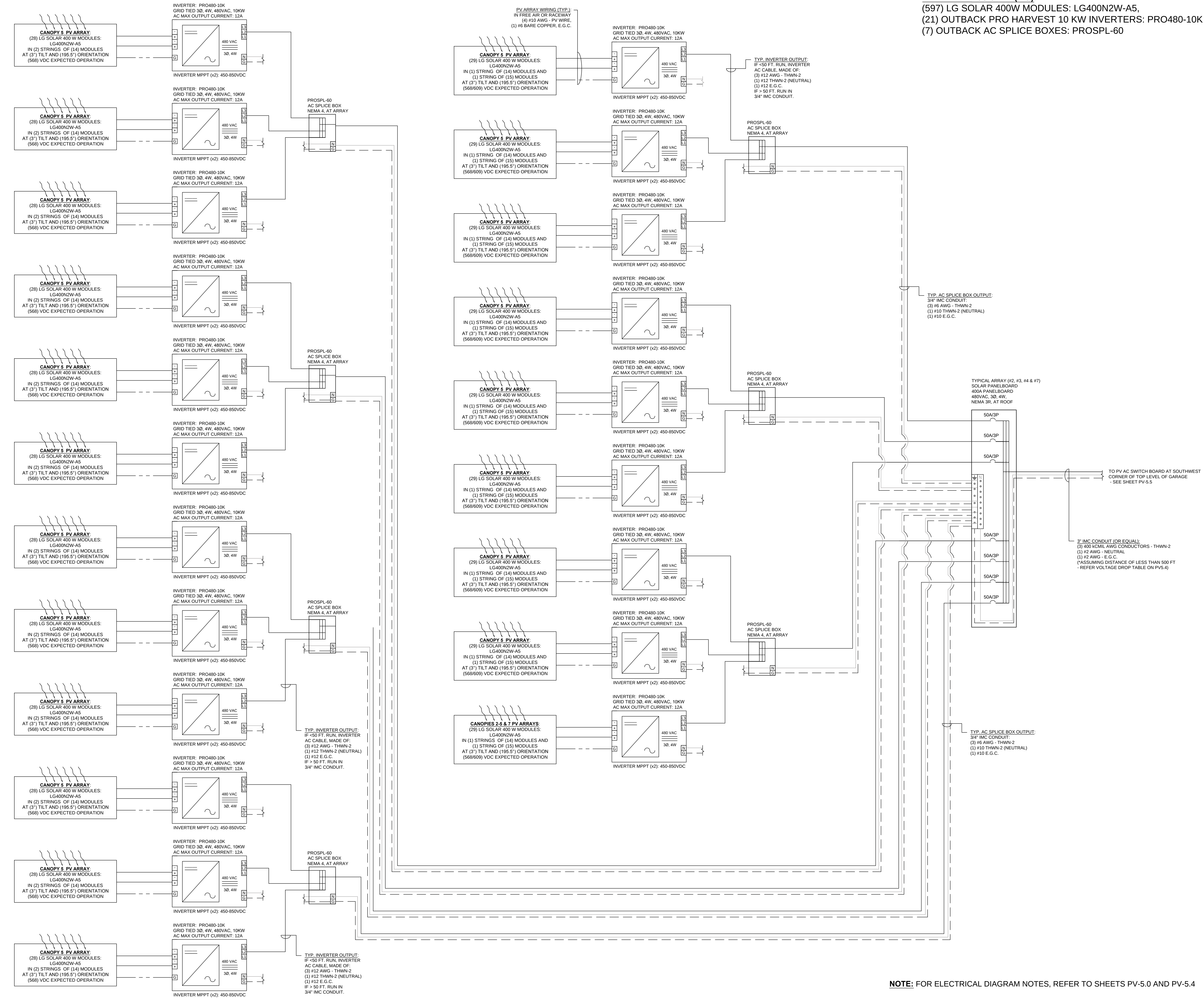
NO.	DATE	ISSUE
0	12/07/18	90% DESIGN SET

PROJECT PHOTOVOLTAIC INSTALLATION

BJC CANOPY
4466 DUNCAN AVE.
ST. LOUIS, MO 63110

DATE: 12/07/2018	SHEET SIZE: 30" x 42"
DRAWN: BL	
CHECKED: RD	<u>SHEET NO.</u> PV 5.1
VERSION: 1.0	
ELECTRICAL DIAGRAM	

ARRAY 5 ELECTRICAL DIAGRAM



DAY & NIGHT SOLAR

Contractors License #:

1605 EASTPORT PLAZA DRIVE
SUITE 135
COLLINSVILLE, IL 62234

PHONE: (618) 344-4001

PROJECT

PHOTOVOLTAIC INSTALLATION for

BJC CANOPY
4466 DUNCAN AVE.
ST. LOUIS, MO 63110

REVISIONS

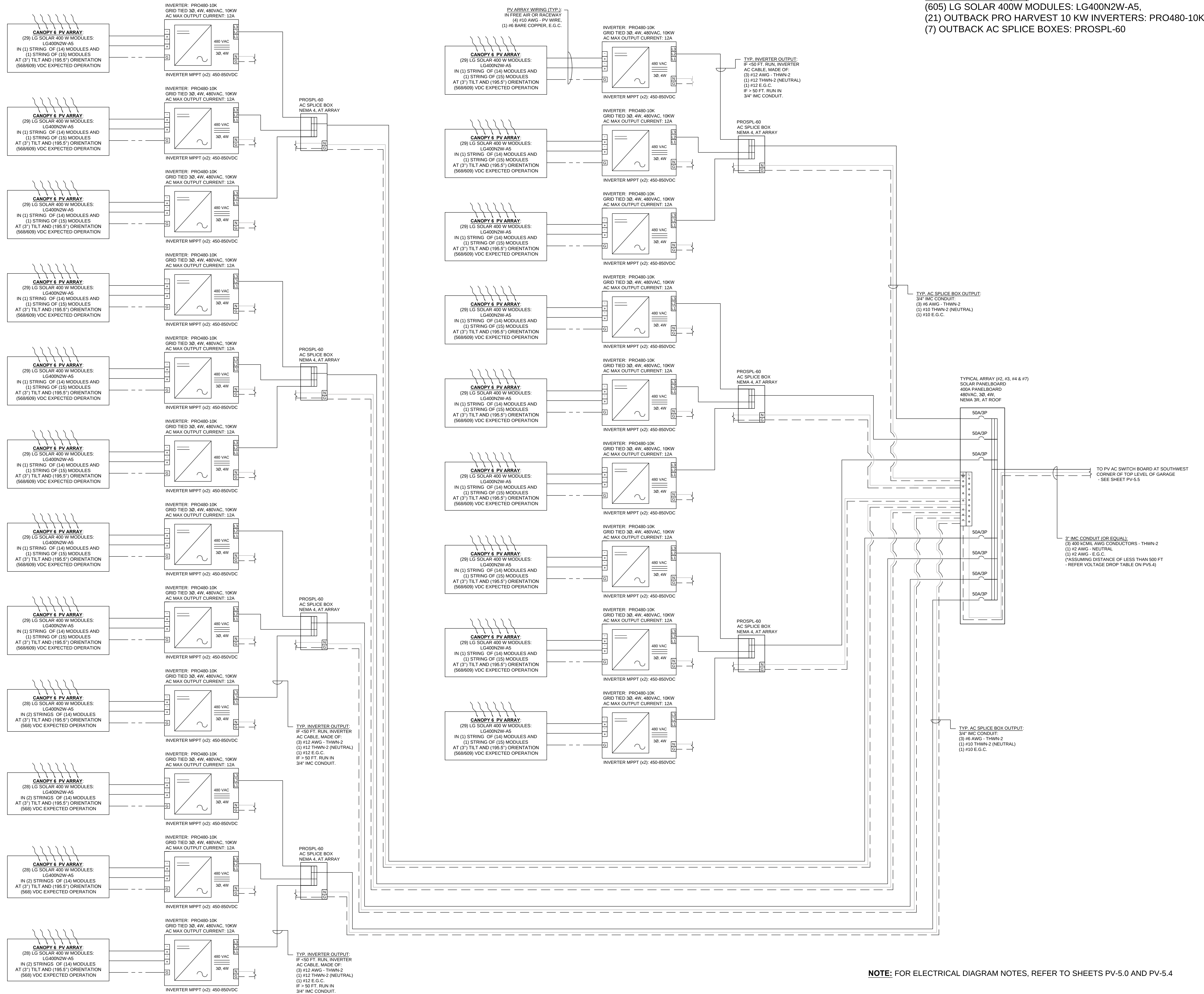
NO.	DATE	ISSUE
0	12/07/18	90% DESIGN SET

PROJECT
PHOTOVOLTAIC
INSTALLATION

BJC CANOPY
4466 DUNCAN AVE.
ST. LOUIS, MO 63110

DATE: 12/07/2018	SHEET SIZE: 30" x 42"
DRAWN: BL	
CHECKED: RD	SHEET NO.
VERSION: 1.0	
ELECTRICAL DIAGRAM	PV 5.2

ARRAY 6 ELECTRICAL DIAGRAM



NOTE: FOR ELECTRICAL DIAGRAM NOTES, REFER TO SHEETS PV-5.0 AND PV-5.4



DAY & NIGHT SOLAR

Contractors License #:

1605 EASTPORT PLAZA DRIVE
SUITE 135
COLLINSVILLE, IL 62234

PHONE: (618) 344-4001

PROJECT

PHOTOVOLTAIC INSTALLATION for

BJC CANOPY
4466 DUNCAN AVE.
ST. LOUIS, MO 63110



REVISIONS

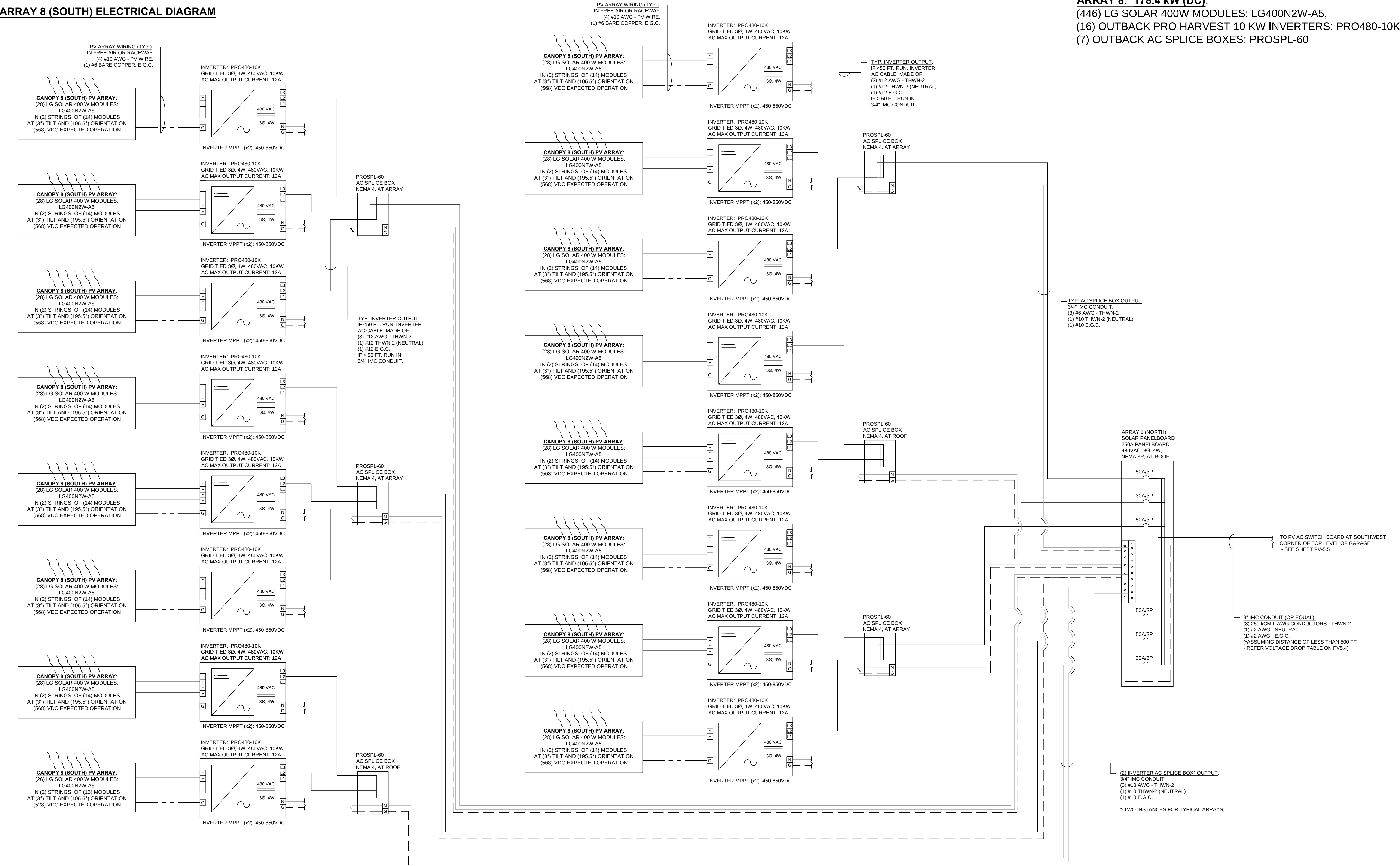
NO.	DATE	ISSUE
0	12/07/18	90% DESIGN SET

PROJECT PHOTOVOLTAIC INSTALLATION

BJC CANOPY
4466 DUNCAN AVE.
ST. LOUIS, MO 63110

DATE: 12/07/2018	SHEET SIZE: 30" x 42"
DRAWN: BL	
CHECKED: RD	<u>SHEET NO.</u>
VERSION: 1.0	PV 5.3
ELECTRICAL DIAGRAM	

ARRAY 8 (SOUTH) ELECTRICAL DIAGRAM



DAY & NIGHT SOLAR

Contractors License #:

1605 EASTPORT PLAZA DRIVE
SUITE 135
COLLINSVILLE, IL 62234

PHONE: (618) 344-4001

PROJECT
PHOTOVOLTAIC INSTALLATION for
BJC CANOPY
4466 DUNCAN AVE.
ST. LOUIS, MO 63110

REVISIONS		
NO.	DATE	ISSUE
0	12/07/18	90% DESIGN SET

PROJECT
PHOTOVOLTAIC
INSTALLATION

BJC CANOPY
4466 DUNCAN AVE.
ST. LOUIS, MO 63110

DATE: 12/07/2018	SHEET SIZE: 30" x 42"
DRAWN: BL	
CHECKED: RD	SHEET NO. PV 5.4
VERSION: 1.0	
ELECTRICAL DIAGRAM	

DAY & NIGHT SOLAR

Contractors License #:

1605 EASTPORT PLAZA DRIVE
SUITE 135
COLLINSVILLE, IL 62234

PHONE: (618) 344-4001

PROJECT
PHOTOVOLTAIC INSTALLATION for
BJC CANOPY
4466 DUNCAN AVE.
ST. LOUIS, MO 63110

REVISIONS

NO.	DATE	ISSUE
0	12/07/18	90% DESIGN SET

PROJECT
PHOTOVOLTAIC
INSTALLATION

BJC CANOPY
4466 DUNCAN AVE.
ST. LOUIS, MO 63110

DATE: 12/07/2018	SHEET SIZE: 30" x 42"
DRAWN: BL	
CHECKED: RD	SHEET NO.
VERSION: 1.0	
ELECTRICAL DIAGRAM	PV 5.5

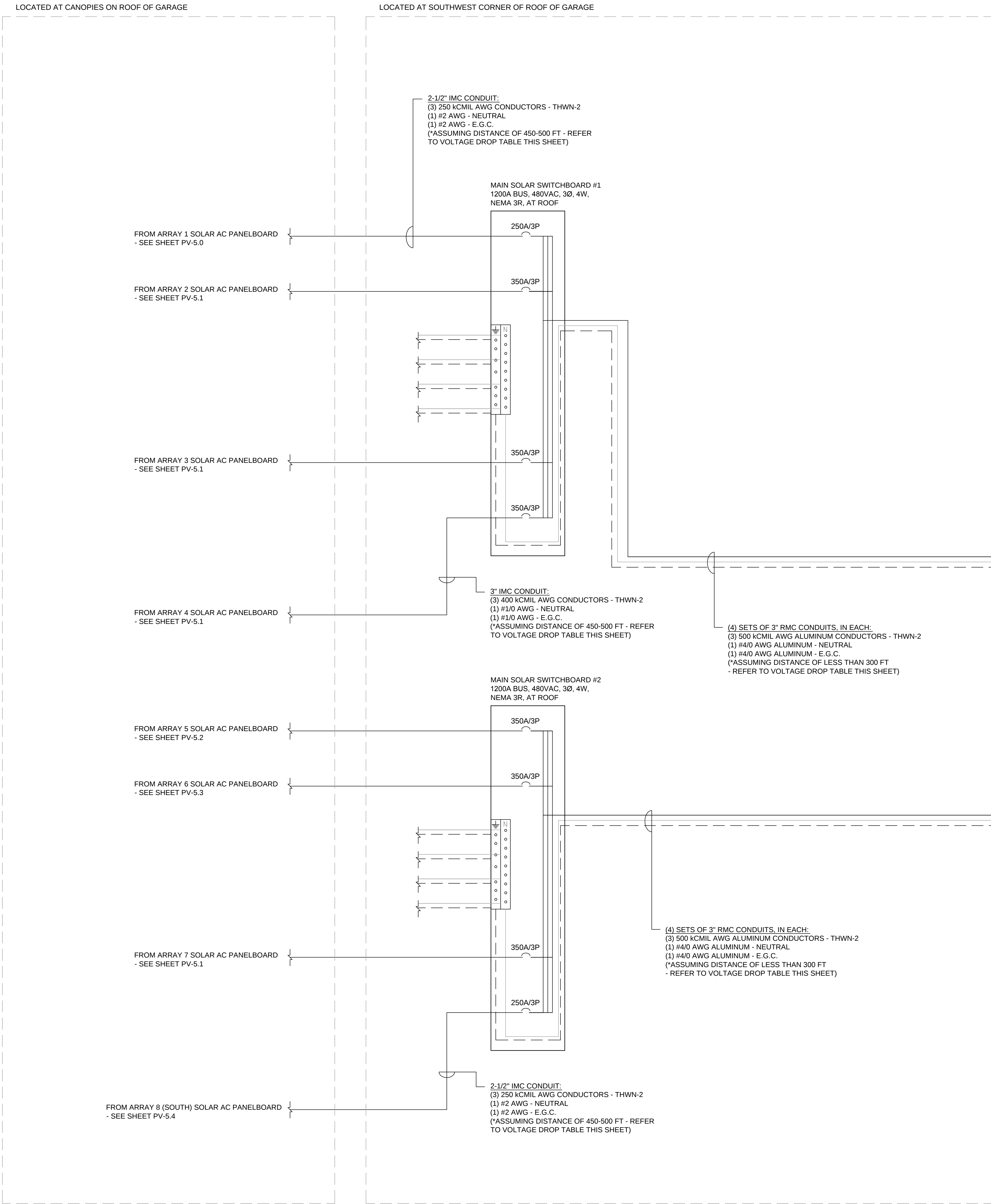
TOTAL SYSTEM SIZE, 8 CANOPIES: 1.82 MW (DC):
(4,547) LG SOLAR 400W MODULES: LG400N2W-A5,
(157) OUTBACK PRO HARVEST 10 KW INVERTERS: PRO480-10K
(53) OUTBACK AC SPLICE BOXES: PROSPL-60

VOLTAGE DROP TABLE FOR ALL AC WIRE RUNS:

*1200A SOLAR SWITCHBOARD TO AC DISCONNECT RUN ASSUMED TO BE ALUMINUM,
ALL OTHER WIRE RUNS ASSUMED TO BE COPPER

THREE PHASE (LINE TO LINE) ; 480V/277					(BALANCED SYSTEMS)				
FEEDER	LENGTH (FEET)	FLA (AMPS)	OCPP (AMPS)	VOLTS	AWG WIRE SIZE	OHMS /K ft.		V-DROP (@ FLA)	
Inverter to AC Splice Box Max. distance w/ #12	180	12	20	480	12	1.93		7.22	1.50%
Inverter to AC Splice Box Max. distance w/ #10	285	12	20	480	10	1.21		7.17	1.49%
AC Splice Box to Sub Pnl Max distance w/ #8	150	36	60	480	8	0.764		7.15	1.49%
AC Splice Box to Sub Pnl Max distance w/ #6	235	36	60	480	6	0.491		7.19	1.50%
250A Sub to 1200A Main Pnl Max dist. w/ 300MCM	500	192	250	480	300	0.0429		7.13	1.49%
250A Sub to 1200A Main Pnl Max dist. w/ 350MCM	590	192	250	480	350	0.0367		7.20	1.50%
400A Sub to 1200A Main Pnl Max dist. w/ 400MCM	500	252	350	480	400	0.0321		7.01	1.46%
1200A Main Pnl to AC Disc w/ (3) 500MCM (AL)	300	948	1200	480	1500	0.0774		6.96	1.45%

DROPS SHOWN FOR MAX ALLOWABLE DISTANCES RELATIVE TO WIRE SIZE IS CALCULATED AT 1.5% MAX. PER RUN. CHOOSE WIRE SIZE FOR EACH RUN BASED ON EQUIPMENT LOCATIONS (i.e. WIRE RUN DISTANCES) T.B.D. IN THE FIELD. IF LARGER WIRE SIZE THAN SHOWN ON DIAGRAM IS CHOSEN, ENSURE NEUTRAL/GROUND WIRE AND CONDUITS ARE SIZED APPROPRIATELY, FOR 40% MAX FILL. ALL NEUTRALS IN THIS PV SYSTEM ARE FOR VOLTAGE REFERENCE ONLY, AND NOT CURRENT-CARRYING THUS CAN BE SIZED EQUAL TO E.G.C.



TOTAL SYSTEM SIZE, 8 CANOPIES: 1.82 MW (DC):
 (4,547) LG SOLAR 400W MODULES: LG400N2W-A5,
 (157) OUTBACK PRO HARVEST 10 KW INVERTERS: PRO480-10K
 (53) OUTBACK AC SPLICE BOXES: PROSPL-60

ELECTRICAL NOTES

- ALL PV MODULES, ARRAY FRAMING AND RACKING SHALL BE GROUNDED PER MFR'S SPECIFICATIONS.
- ALL WIRE TERMINATIONS, SPLICES AND CONNECTIONS SHALL BE MADE USING A LISTED DEVICE or ELECTRICAL BOX SUITED FOR THE PURPOSE. ALL WIRES NOT IN CONDUIT TO BE PROVIDED WITH STRAIN RELIEF AT ENTRY INTO JUNCTION BOXES.
- PROVIDE AND INSTALL CONDUIT EXPANSION FITTINGS, PER MANUFACTURER'S SPECIFICATIONS, IN CONDUIT RUNS WHERE THERMAL EXPANSION IS 0.25" OR MORE, BASED ON RECORD MAXIMUM AND MINIMUM TEMPERATURES FOR THE SITE (SEE NEC TABLE 310.15(B)(2)(C), AND USING EXPANSION COEFFICIENT OF STEEL.
- BOTH ENDS OF ALL METALLIC CONDUIT CONTAINING GROUNDING ELECTRODE CONDUCTORS SHALL BE BONDED PER NEC 250.64(E).
- PROVIDE AND INSTALL ALL GROUNDING AS REQUIRED BY NEC ARTICLES 250, 690 AND SYSTEM MANUFACTURER.
- FOR INSTALLATIONS WITH TRANSFORMER-LESS INVERTERS - PV WIRE TYPE IS REQUIRED FOR ALL DC WIRE RUNS IN FREE AIR, OR NOT IN CONDUIT. EACH CURRENT CARRYING CONDUCTOR IN ALL PV SOURCE CIRCUITS OR PV OUTPUT CIRCUITS SHALL BE DISCONNECTED/ FUSED, AS REQUIRED FOR UNGROUNDED SYSTEMS.
- CONTRACTOR SHALL VERIFY EXISTENCE OF UNDERGROUND UTILITIES PRIOR TO ANY EXCAVATIONS.
- ELECTRICAL TRENCH RUNS, WHERE USED, SHALL USE SCHEDULE 40 PVC CONDUIT AND PROVIDE 18" MIN CLEARANCE FROM TOP OF CONDUIT TO GRADE, AND MAGNETIC WARNING TAPE AT 12" BELOW GRADE. 24" CLEARANCE AND SCHEDULE 80 PVC IS REQUIRED IN AREAS WHERE SUBJECT TO VEHICLE TRAFFIC.
- CHECK WITH LOCAL JURISDICTION FOR ANY ADDITIONAL FILL AND COMPACTION REQUIREMENTS, SPOILS TREATMENT AND/OR EROSION CONTROL MEASURES PRIOR TO EXCAVATION.
- INSTALLATIONS IN LIGHTNING-PRONE LOCATIONS ARE RECOMMENDED TO UTILIZE DC LIGHTNING ARRESTORS IN ACCORDANCE WITH MANUFACTURER'S SPECIFICATIONS.
- THE INSTALLATION OF THE PV SYSTEM SHALL CONFORM TO THE REQUIREMENTS OF THE 2016 CBC, 2016 CEC, 2014 NEC, ARTICLE 690 AND ANY OTHER APPLICABLE STANDARDS.
- INSTALLATION SHALL BE PERFORMED BY A LICENSED CONTRACTOR.

ASSUMPTIONS:
HIGH TEMPERATURE = 34 °C
ROOFTOP TEMPERATURE = 51 °C (N/A FOR CANOPIES)
LOW TEMPERATURE = -17 °C
75 °C RATED AT BREAKER TERMINALS FOR AC CIRCUITS
90 °C RATED WIRE AND CONNECTORS FOR DC CIRCUITS
ADDED TEMP. FOR ROOF RUN = 17°C @ 3.5" ABOVE ROOF

PV MODULE SPECS

MAKE	LG SOLAR
MODEL	LG400N2W-A5
NOMINAL POWER	400 W
OPEN CIRCUIT VOLTAGE	49.3 VDC
SHORT CIRCUIT CURRENT	10.47 A
OPERATING VOLTAGE	40.6 VDC
OPERATING CURRENT	9.86 A
MAX SYSTEM VOLTAGE	1500 VDC (UL)
MAX SERIES FUSE RATING	20 A
NUMBER OF CELLS	72
TEMPERATURE COEFFICIENT (VOC)	-0.26%/°C

INVERTER SPECS

MAKE	PRO HARVEST
MODEL	PRO480-10K
RATED AC POWER	10,000 W
TRANSFORMERLESS, UNGROUNDED	YES
MAX INPUT VOLTAGE	1000 VDC
MPPT DC INPUT VOLTAGE RANGE	425-850 VDC
MAX INPUT CURRENT	12 A
MAX DC SHORT CIRCUIT INPUT CURRENT	30 A
NUMBER OF MPPT INPUT PAIRS	2
RATED AC VOLTAGE	480 VAC, 3Ø, 4W
AC VOLTAGE RANGE	442 - 528 VAC
MAX AC OUTPUT CURRENT PER PHASE	12 A
AC OVERCURRENT PROTECTION	60 A MAX, PER GROUP OF 3 INVERTERS
WATERPROOF RATING	NEMA 6

400A SOLAR PANELBOARD OUTPUT AMPACITY CALCULATION (ARRAYS 2-7)

10KW INVERTER OUTPUT CURRENT	12 A
NUMBER OF 10KW INVERTERS	21
CONTINUOUS DUTY FACTOR	1.25
MULTIPLE CONDUCTOR FACTOR	1
TEMP CORRECTION FACTOR	0.96
MINIMUM AMPACITY	
$12A \times 21 \times 1.25 = 315 A$	
ADJUSTED AMPACITY	
AMPACITY OF 400KCMIL CU WIRE (USE 75° TERMINALS)	335A > 315A, SO OK
DE-RATING OF 400 KCMIL CU WIRE (USE 90° WIRE): $380 \times 0.96 \times 1.0 = 364 A$	364A > 315A, SO OK
SUB PANEL OCPD RATING	350 A

250A SOLAR PANELBOARD OUTPUT AMPACITY CALCULATION (ARRAYS 1 / 8)

10KW INVERTER OUTPUT CURRENT	12 A
NUMBER OF 10KW INVERTERS	16
CONTINUOUS DUTY FACTOR	1.25
MULTIPLE CONDUCTOR FACTOR	1
TEMP CORRECTION FACTOR	0.96
MINIMUM AMPACITY	
12A X 16 X 1.25 = 240 A	
ADJUSTED AMPACITY	
AMPACITY OF 250KCMIL CU WIRE (USE 75° TERMINALS)	255A > 240A, SO OK
DE-RATING OF 250 KCMIL CU WIRE (USE 90° WIRE): 2290 X 0.96 X 1.0 = 278 A	278A > 240A, SO OK
SUB PANEL OCPD RATING	250 A

1200A SOLAR PANELBOARD OUTPUT AMPACITY CALCULATION

10KW INVERTER OUTPUT CURRENT	12 A
NUMBER OF 10KW INVERTERS	79
CONTINUOUS DUTY FACTOR	1.25
MULTIPLE CONDUCTOR FACTOR	1.0
TEMP CORRECTION FACTOR	0.96
MINIMUM AMPACITY	
12A X 79 X 1.25 = 1185 A	
ADJUSTED AMPACITY	
AMPACITY OF 4 SETS OF 500KCMIL AL WIRE (USE 75° TERMINALS)	1240A > 1200A, SO OK
TEMP DE-RATING OF 4 SETS OF 500 KCMIL ALWIRE (USE 90° WIRE): 1400A X 0.96 = 1344A	1344A > 1200A, SO OK
SUB PANEL OCPD RATING	1200 A

DC MAX VOLTAGE CALC. (COLD TEMP)

LG SOLAR 400W MODULE VOC	49.3 VDC
VOC TEMP COEFFICIENT	-0.26%/C
EXTREME LOW TEMP (ASHRAE MEAN DRY BULB)	-17° C
ΔT FROM STC	42
ADJUSTED MODULE VOC	54.7 VDC
ADJUSTED STRING VOLTAGE FOR LOW TEMP FOR MAX. STRING OF 16 MODULES IN SERIES	
875 VDC < 1000 VDC, SO OK	

AC JUNCTION BOX OUTPUT CAPACITY CALCULATION - (3) 10 KW INVERTERS

INVERTER OUTPUT CURRENT	12 A
NUMBER OF INVERTERS	3
CONTINUOUS DUTY FACTOR	1.25
MULTIPLE CONDUCTOR FACTOR	1
TEMP CORRECTION FACTOR	0.96
MINIMUM AMPACITY	
12 A X 1.25 X 3 = 45 A	
ADJUSTED AMPACITY	
12 A X 3 / 0.96 = 37.5 A	
GREATER OF 2	45 A
AMPACITY OF #8 WIRE (USE 75°)	50A > 45A SO OK
MAIN SOLAR OCPD RATING	50 A

AC JUNCTION BOX OUTPUT CAPACITY CALCULATION - (2) 10 KW INVERTERS

INVERTER OUTPUT CURRENT	12 A
NUMBER OF INVERTERS	2
CONTINUOUS DUTY FACTOR	1.25
MULTIPLE CONDUCTOR FACTOR	1
TEMP CORRECTION FACTOR	0.96
MINIMUM AMPACITY	
12 A X 1.25 X 2 = 30 A	
ADJUSTED AMPACITY	
12 A X 2 / 0.96 = 25	
GREATER OF 2	30 A
AMPACITY OF #10 WIRE (USE 75°)	35A > 30A SO OK
MAIN SOLAR OCPD RATING	30 A



DAY & NIGHT SOLAR

Contractors License #:

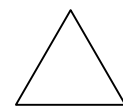
1605 EASTPORT PLAZA DRIVE
SUITE 135
COLLINSVILLE, IL 62234

PHONE: (618) 344-4001

PROJECT

PHOTOVOLTAIC INSTALLATION for

BJC CANOPY
4466 DUNCAN AVE.
ST. LOUIS, MO 63110



REVISIONS

NO.	DATE	ISSUE
0	12/07/18	90% DESIGN SET

PROJECT

PHOTOVOLTAIC INSTALLATION

BJC CANOPY
4466 DUNCAN AVE.
ST. LOUIS, MO 63110

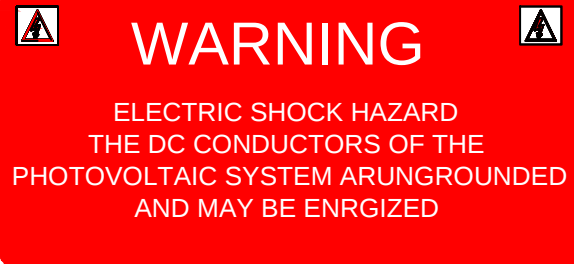
DATE: 12/07/2018	SHEET SIZE: 30" x 42"
DRAWN: BL	
CHECKED: RD	<u>SHEET NO.</u> PV 5.6
VERSION: 1.0	
ELECTRICAL NOTES	

JUNCTION BOX & CONDUIT RACEWAYS:

NEC 690.31(E)(3)
CONDUIT/ ALL JUNCTION BOXES,
EXPOSED RACEWAYS EVERY 10 FT.:

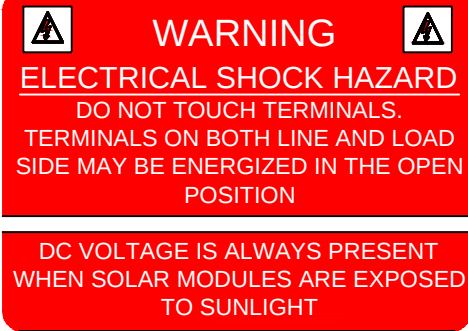


NEC 690.35(F)
PLACE THIS LABEL AT EACH JUNCTION BOX, COMBINER
BOX, DISCONNECT AND DEVICE WHERE ENERGIZED,
UNGROUND CIRCUIITS MAY BE EXPOSED DURING
SERVICE:

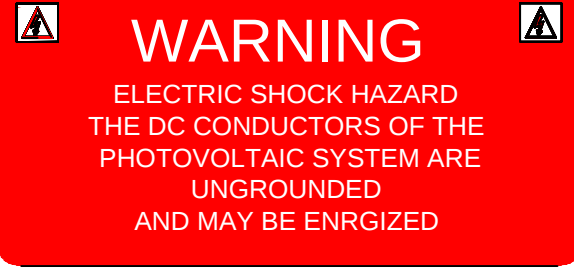


DC DISCONNECTS:

NEC 690.17(4)
PLACE THIS LABEL ON **ALL**
DISCONNECTING MEANS WHERE
ENERGIZED IN AN OPEN POSITION



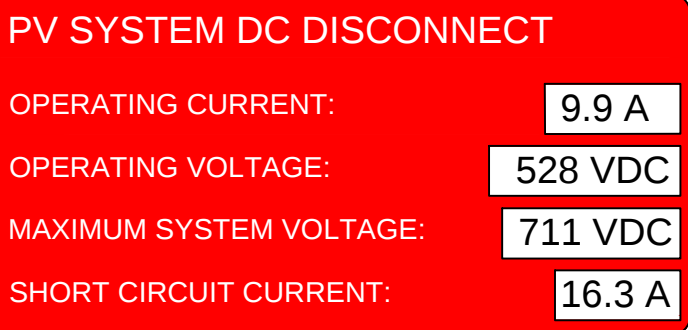
NEC 690.35(F)
PLACE THIS LABEL AT EACH JUNCTION BOX, COMBINER
BOX, DISCONNECT AND DEVICE WHERE ENERGIZED,
UNGROUND CIRCUIITS MAY BE EXPOSED DURING
SERVICE:



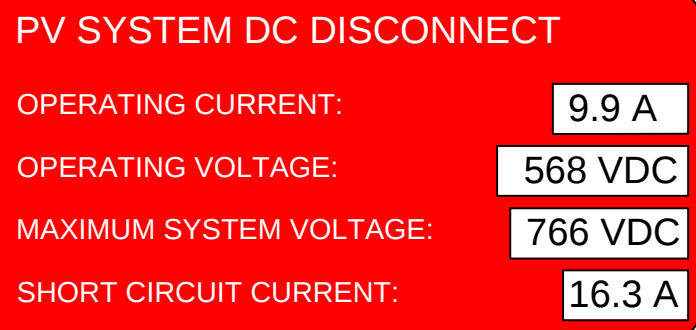
ON DC DISCONNECT SWITCHES (AT INVERTER):
NEC 690.14 (C)(2)

PHOTOVOLTAIC
DC DISCONNECT

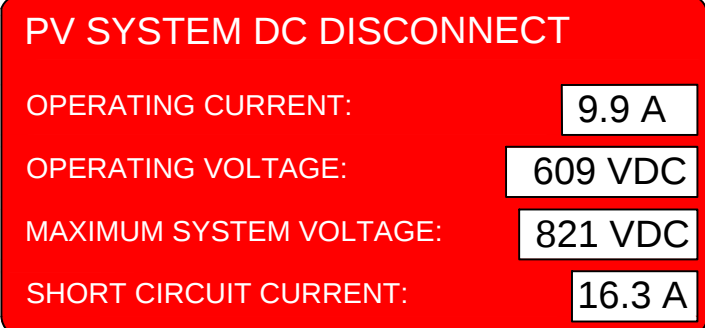
NEC 690.53 & NEC 690.14(C)(2)
PLACE THIS LABEL ON **ALL**
PHOTOVOLTAIC **DC** DISCONNECTING
MEANS (ON INVERTER IF INTEGRATED
DC DISCONNECTS **AND** AT SEPARATE DC
DISCONNECT IF APPLICABLE)
ON INVERTER



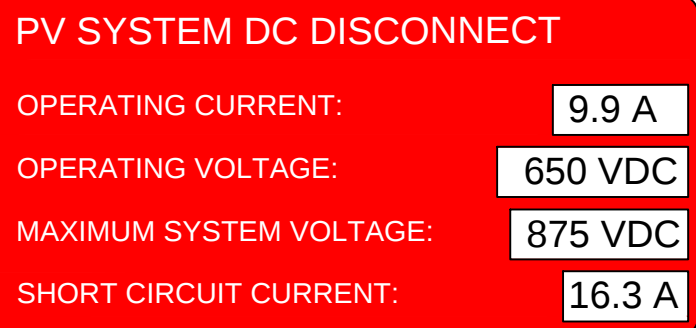
(13) MODULE STRINGS



(14) MODULE STRINGS



(15) MODULE STRINGS



(16) MODULE STRINGS

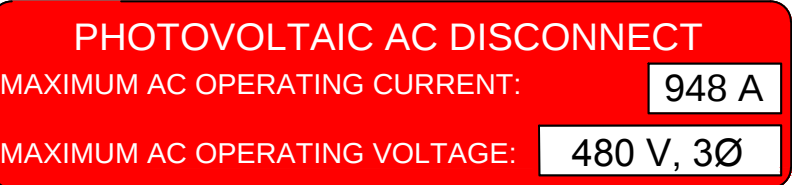
INVERTERS:

NEC 690.5(c)
PLACE THIS LABEL ON INVERTERS:



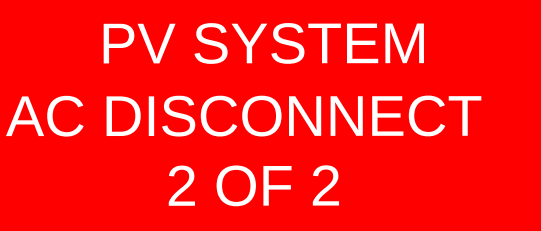
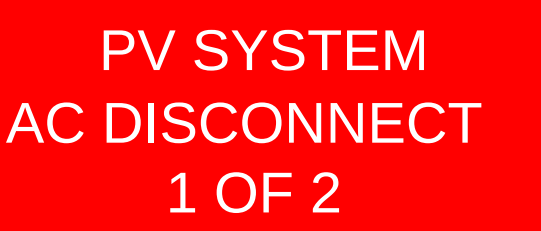
AC DISCONNECT(S):

NEC 690.54
PLACE THIS LABEL AT "INTERACTIVE POINT OF
INTERCONNECTION" (AT MAIN SERVICE PANEL
AND SUBPANEL IF APPLICABLE)



AT AC DISCONNECT
TYP. OF (2)

ON DESIGNATED AC DISCONNECT
SWITCH FOR UTILITY OPERATION (AT MSB IN BASEMENT):



AT AC DISCONNECT
SWITCHES

SOLAR POINT OF CONNECTION /
MAIN SWITCHBOARD:

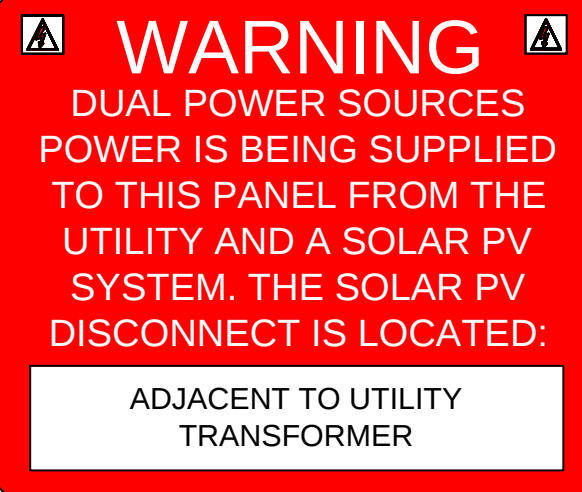
NEC 705.12(D)(7)
PLACE THIS LABEL AT PV BREAKER AND ALL
BREAKERS WITH BACKFED SOLAR CURRENT:



NEC 690.31(E)3 & 4
PLACE ON EXTERIOR/INTERIOR OF ELECTRICAL PANEL

CAUTION: SOLAR ELECTRICAL SYSTEM CONNECTED

NEC 705.12(D)4, 690.56(B)
AT MAIN SWITCHBOARD (NEAR METER)
AND ON SUB PANEL PANEL COVER:



NEC 690.12
PLACE ON EXTERIOR OF ELECTRICAL PANEL

SOLAR SYSTEM EQUIPPED WITH RAPID SHUTDOWN

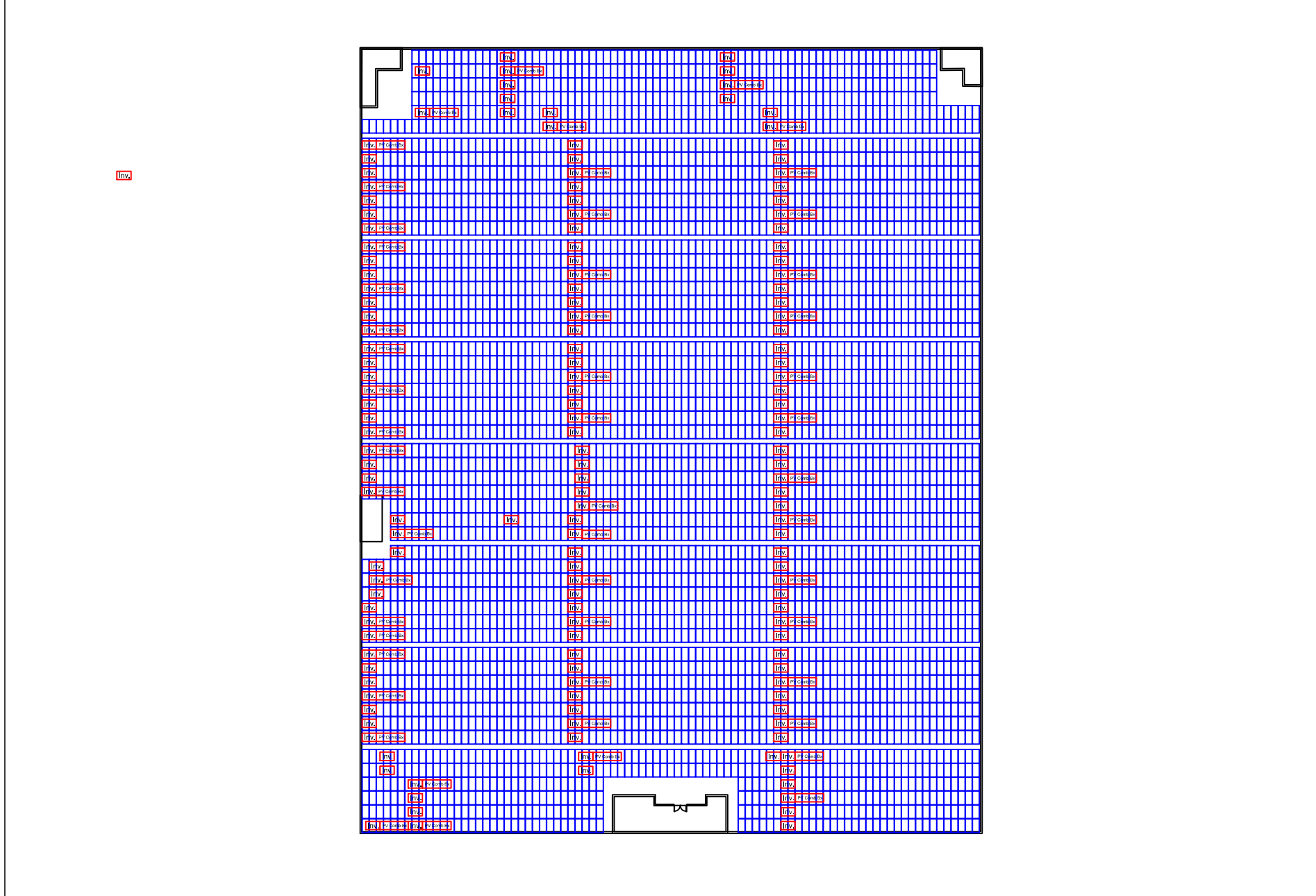
SITE DIRECTORY NOTE

- A SITE DIRECTORY SHALL BE INSTALLED AT THE MAIN SWITCHBOARD AND AT THE SOLAR POINT OF CONNECTING ALERTING EMERGENCY RESPONDERS THE LOCATION OF THE MAIN SOALR AC DISCONNECT AND ALL PV EQUIPMENT.
- DIRECTORY SHALL BE METAL OR PLASTIC WITH ENGRAVED OR MACHINE PRINTED LETTERS OR ELECTRO-PHOTO PLATING, WITH RED BACKGROUND WITH WHITE LETTERING.

SITE DIRECTORY

WARNING

POWER TO THIS BUILDING IS ALSO SUPPLIED BY ALTERNATIVE
POWER SOURCES WITH DISCONNECTS LOCATED AS SHOWN:



NOTE: PV ARRAYS AND INVERTERS
LOCATED AT ARRAY STRUCTURES



DAY & NIGHT SOLAR
Contractors License #:

1605 EASTPORT PLAZA DRIVE
SUITE 135
COLLINSVILLE, IL 62234

PHONE: (618) 344-4001

PROJECT
PHOTOVOLTAIC INSTALLATION for
BJC CANOPY
4466 DUNCAN AVE.
ST. LOUIS, MO 63110

REVISIONS

NO.	DATE	ISSUE
0	12/07/18	90% DESIGN SET

PROJECT
PHOTOVOLTAIC
INSTALLATION

BJC CANOPY
4466 DUNCAN AVE.
ST. LOUIS, MO 63110

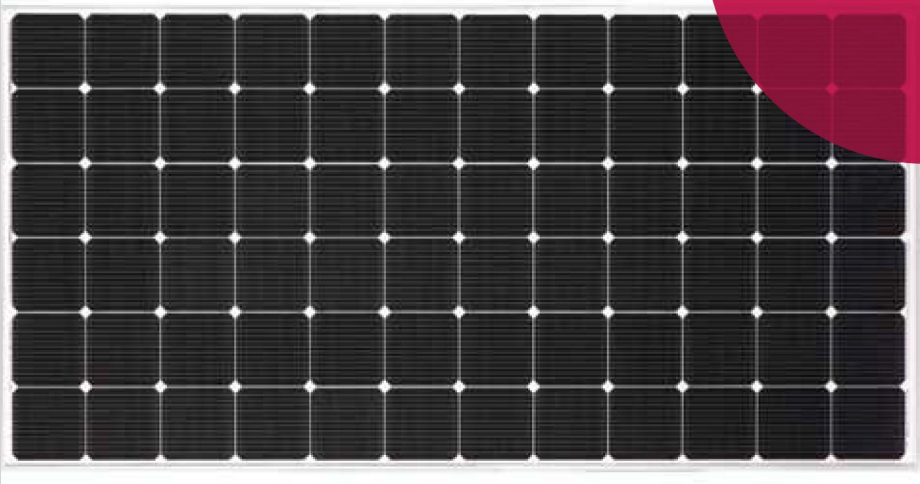
DATE: 12/07/2018	SHEET SIZE: 30" x 42"
DRAWN: BL	
CHECKED: RD	SHEET NO.
VERSION: 1.0	
PLACARDS AND SITE MAP	PV 6.0

SIGNAGE NOTES

- MINIMUM FONT SIZE SHALL BE 3/8" HEIGHT, ON FADE-RESISTANT MATERIAL, SUITABLE FOR ITS ENVIRONMENT.
- UL 969 SHALL BE USED AS A STANDARD FOR WEATHER RATING.
- ALL SIGNAGE SHALL HAVE RED BACKGROUND WITH WHITE LETTERING.
- CONDUIT STICKERS SHALL BE SHALL BE REFLECTIVE.
- PLAQUES SHALL BE METAL OR PLASTIC WITH ENGRAVED OR MACHINE PRINTED LETTERS OR ELECTRO-PHOTO PLATING.
- MAIN SERVICE DISCONNECT MARKING SHALL BE PLACED ADJACENT TO MAIN SERVICE DISCONNECT IN A LOCATION CLEARLY VISIBLE FROM THE LOCATION WHERE THE LEVER IS OPERATED.
- MARKING IS REQUIRED ON ALL INTERIOR AND EXTERIOR DC CONDUIT, RACEWAYS, ENCLOSURES, CABLE ASSEMBLIES, AND JUNCTION BOXES TO ALERT THE FIRE SERVICE TO AVOID CUTTING THEM. MARKING SHALL BE PLACED EVERY 10', AT TURNS AND ABOVE AND/OR BELOW PENETRATIONS, AND AT ALL DC COMBINER AND JUNCTION BOXES.
- SIGNAGE SHALL BE PERMANENTLY AFFIXED TO EQUIPMENT WITH POP-RIVETS OR APPROVED ADHESIVE.



Innovation for
a Better Life



LG NeON² 72cell

LG400N2W-A5

72 cell

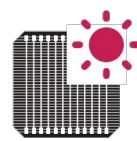
LG's new module, LG NeON², adopts Cello technology. Cello technology replaces 3 busbars with 12 thin wires to enhance power output and reliability. LG NeON² demonstrates LG's efforts to increase customer's value beyond efficiency. It features enhanced warranty, durability, performance under real environment, and aesthetic design suitable for roofs.



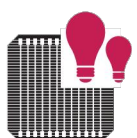
Enhanced Performance Warranty
LG NeON² has an enhanced performance warranty. The annual degradation has fallen from -0.6%/yr to -0.55%/yr. Even after 25 years, the cell guarantees 1.25% more output than the previous LG NeON² modules.



Aesthetic Roof
LG NeON² has been designed with aesthetic as in mind, thinner wires that appear all black as a distance. The product may help increase the value of a property with its modern design.



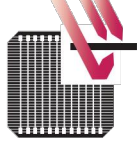
Better Performance on a Sunny Day
LG NeON² now performs better on sunny days thanks to its improved temperature coefficient.



High Power Output
Compared with previous models, the LG NeON² has been designed to significantly enhance its output efficiency, thereby making it efficient even in limited space.



Outstanding Durability
With its newly reinforced frame design, LG has extended the warranty of the LG NeON² for an additional 2 years. Additionally, LG NeON² can endure a front load up to 5400 Pa, and a rear load up to 4300 Pa.



Double-Sided Cell Structure
The rear of the cell used in LG NeON² will contribute to generation, just like the front, the light beam reflected from the rear of the module is redistributed to generate a great amount of additional power.

About LG Electronics

LG Electronics is a global player who has been committed to expanding its operations with the solar market. The company first embarked on a solar energy source research program in 1985, supported by LG Group's vast experience in the semiconductor, LCD, and mobile industries. In 2011, LG Solar successfully released its first Mono-Si solar module to the market, which is now available in 32 countries. The LG NeON² (previously known as Mono-Si NeON) and the LG NeON² won the "Inverter Power" in 2013 and 2015, which demonstrates LG Solar's real, innovative and commitment to the industry.

LG NeON² 72cell

LG400N2W-A5

Mechanical Properties

Cells	6 x 12
Cell Vendor	LG
Cell Type	Monocrystalline / N-type
Cell Dimensions	161.7 x 161.7 mm / 6 inches
# of Busbar	12 (Multi-Wire Busbar)
Dimensions (L x W x H)	2034 x 1054 x 40 mm
Front Load	5400Pa
Rear Load	4300Pa
Weight	21.7 kg
Connector Type	M4
Junction Box	IP68 with 3 Bypass Diodes
Cables	1200 mm x 2 ea
Glass	High Transmission Tempered Glass
Frame	Anodized Aluminum

Electrical Properties (STC*)

Module	400W
Maximum Power (Pmax)	400
MPP Voltage (Vmpp)	40.6
MPP Current (Impp)	9.86
Open Circuit Voltage (Voc)	49.3
Short Circuit Current (Isc)	10.47
Module Efficiency	19.3
Operating Temperature	-40 ~ +90
Maximum System Voltage	1500 (UL)
Maximum Series Fuse Rating	20
Power Tolerance (%)	0 ~ +3

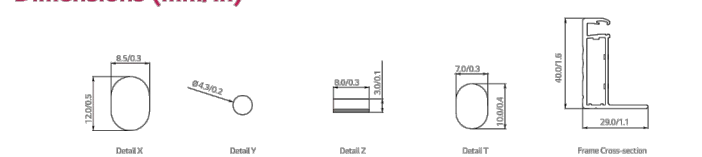
* STC: Standard Test Condition: Irradiance 1000 W/m², Ambient Temperature 25 °C, Air Mass 1.5
* The temperature power output is measured and determined by LG Electronics at its module and module dimensions.
* The typical change in module efficiency at 25°C/Watt is related to 1000W/m² ± 10%.

Electrical Properties (NOCT*)

Module	400W
Maximum Power (Pmax)	296
MPP Voltage (Vmpp)	37.6
MPP Current (Impp)	7.88
Open Circuit Voltage (Voc)	46.1
Short Circuit Current (Isc)	8.41

* NOCT: Nominal Operating Cell Temperature: Irradiance 800W/m², ambient temperature 25 °C, wind speed 1m/s.

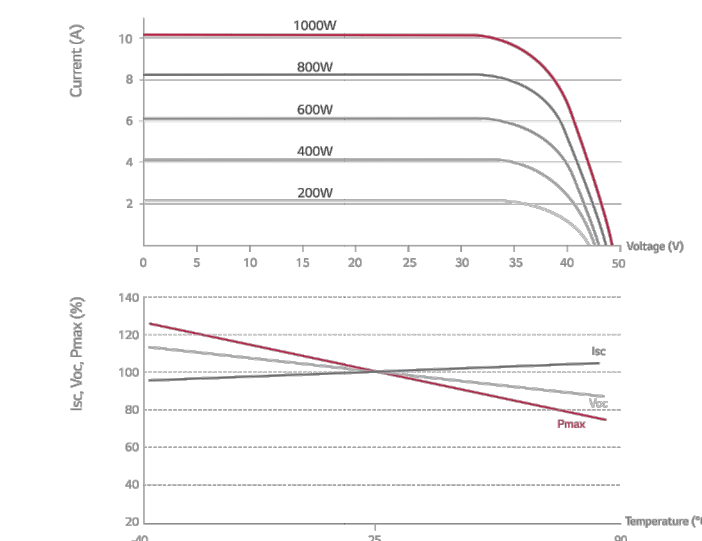
Dimensions (mm/in)



Temperature Characteristics

NOCT	45 ± 3 °C
Temp	-0.36%/°C
Voc	-0.26%/°C
Isc	0.02 %/°C

Characteristic Curves



North America Solar Business Team
LG Electronics USA, Inc.
1000 Sylmar Ave., Englewood Cliffs, NJ 07632
Contact: lg.usa@lge.com
www.lgusa.com

Product specifications are subject to change without notice.
Copyright © 2017 LG Electronics. All rights reserved.
01/01/2017

Innovation for a Better Life



Gen XL Inverter Series
10KW 480V MODEL



Features

- Rugged 3-phase 480V plug & play system
- Small and light (hand holdable, 30.6 lb.)
- Non-isolated inverter for use with ungrounded DC systems
- Peak 98.2% efficiency, CEC efficiency of 97.5%
- 200-850V DC MPP voltage range for 600V and 1,000V systems
- 10 kW AC full power MPP voltage range 450-850V
- Two DC string inputs with independent monitoring and MPPT management.
- Waterproof NEMA6, silent convection cooling
- Designed for high reliability, uses no electrolytic capacitors
- Wide temperature range, -40 to +65 °C
- Utility-Interactive; Listed to UL1741SA
- Compliant with UL1699B arc detection

Applications

- **Rooftop commercial;** usable where other solutions just won't work for example coastal, desert, high altitude locations.
- **Car ports, parking and shade structures;** units may be mounted in any orientation, under modules, on racking without extra strengthening, clear of risk of liability from vandalism.



Outback reserves the right to make changes to the products and information contained in this document without notice.
Copyright © 2018 OutBack Power. All Rights Reserved. Outback is a registered trademark of The Alpha Group.

www.outbackpower.com



AC Splice Box
PROSPL-60



What Is It?

Compatible junction box suitable for combining up to three ProHarvest inverters into one home run to an AC load center.

Ideal For:

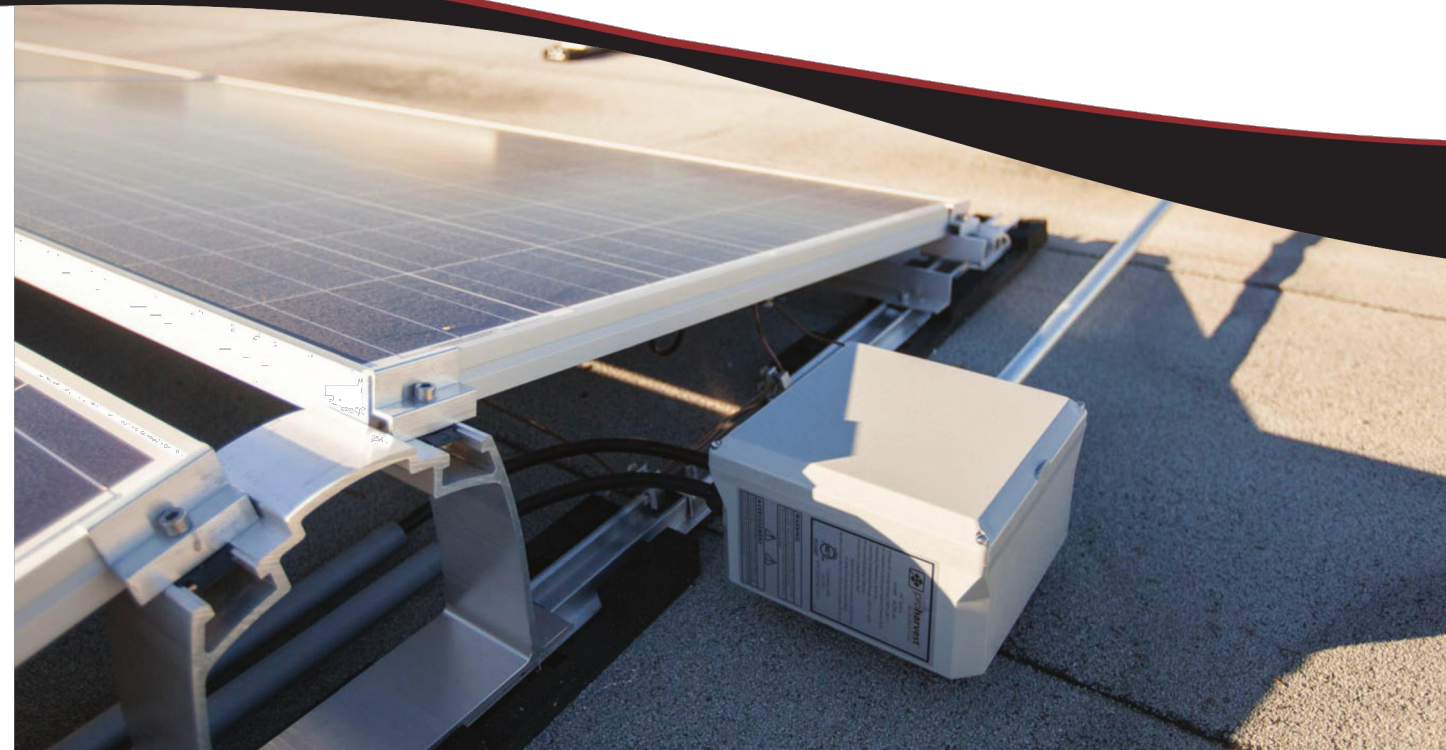
Rooftop solar, carports

Features

- **Combine AC outputs:** (3) PRO208-50/75, 208VAC inverters—60A OCPD, (3) PRO480-84, 480VAC inverters—60A OCPD
- Small, inexpensive

Enclosure Highlights

- Outdoor, weatherproof
- NEMA4, polycarbonate enclosure
- Corrosion resistant
- UV resistant
- Knockouts on bottom of enclosure
- Mountable flat or upright
- Three gland fittings supplied with splice-box



Outback reserves the right to make changes to the products and information contained in this document without notice.
Copyright © 2017 OutBack Power. All Rights Reserved. Outback is a registered trademark of The Alpha Group.

www.outbackpower.com

Inverter Series SPECIFICATIONS

09/2018

DC Input (2 MPPT Inputs)	PHXL480-10K
Max. Open Circuit Voltage (per string)	1,000VDC
Full Power MPPT Range (per string)	450-850VDC
DC Maximum Input	300VDC
DC Allowable Stacking Ratio (total, 2 inputs combined)	Not allowed <1 under any circumstances
DC Maximum Input	Current limit: 0°C to 130 °C Short circuit current: 30A Switch back from current to input source: 0A The DC connector has been evaluated and approved by UL for use as the load break disconnect required by the NEC.

* On the DC side of the inverter, each input limits at 600V and/or 13A, and the combined total AC outputs is limited to 9175 VA. Higher DC/AC string powers may be applied, the inverter will limit as described above. Total stacking for inverter must not exceed 4.0 under any circumstances.

AC Output	PHXL480-10K
AC Maximum	Continuous rated output power (to 40°C): 9175 VA Continuous output current (per phase): 13A Output over current protection: 10A
AC Derate (40-65°C)	13A
AC Three-Phase System Compatibility	480V three-phase, neutral and ground
AC Voltage Range	Phase to Phase Maximum: 480V Nominal: 480V Minimum: 208V
AC Output Frequency Range	Minimum: 50 Hz / 60 Hz Default: 60 Hz Adjustment: 5 to 70 Hz
AC Synchronization to Bus Current	Maximum Output Fault Current and Duration AC Minimum Wire Gauge (for grid connection) AC Disconnect Means

Other Specifications	PHXL480-10K
Efficiency	Peak: 98.2% / CEC: 97.5%
Dimensions (H x W x D) (mm/in)	315 x 279 x 182 / 12.25 x 10.9 x 7.14
Weight (kg/lb)	13.4 / 29.4
Operating Temperature Range (°C/°F)	-40 to +65 / -40 to 150
Power Consumption	Standby: <4.5W / Night: <3.0W
Cooling	Natural convection, no fan
Communication	PowerView or Modbus/RS485
Environmental Rating	Indoor/Outdoor: NEMA4
Certifications	UL 1741-S41, UL 1741-WEBS41, UL 1699B, CAN/CSA C22.2 NO. 107.1, FCC Part 15 Part A. Meets the requirements of NEC 690.11
Warranty	10 year

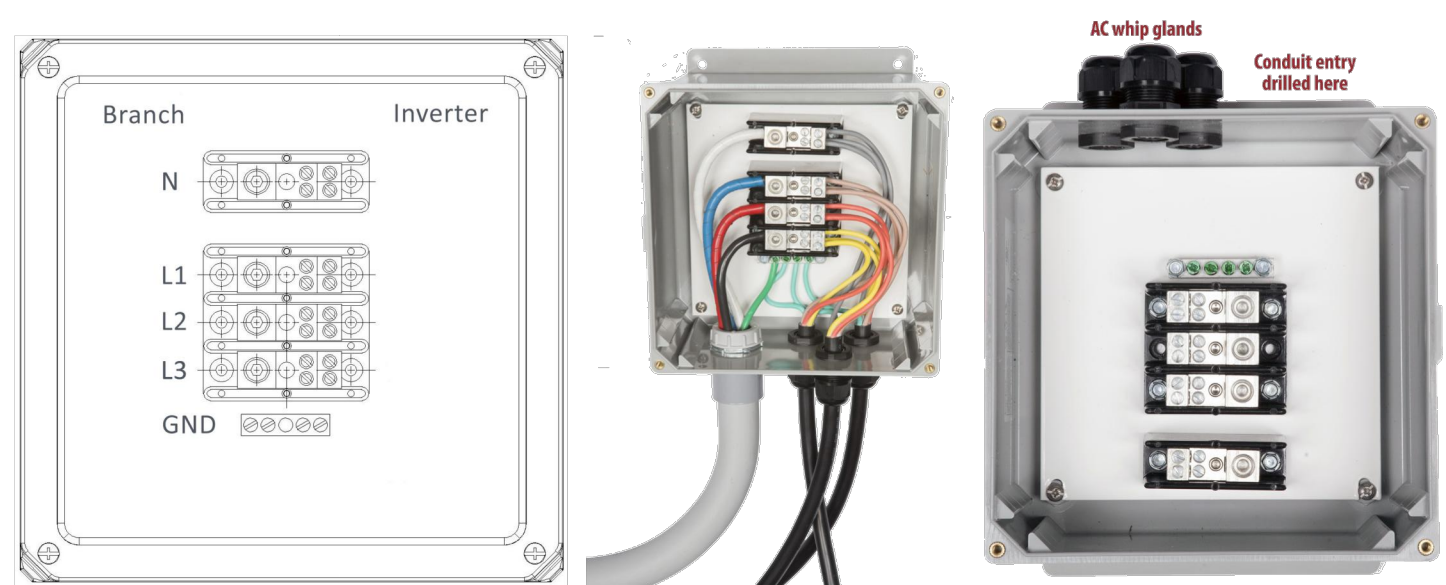
Outback reserves the right to make changes to the products and information contained in this document without notice.
Copyright © 2018 OutBack Power. All Rights Reserved. Outback is a registered trademark of The Alpha Group.

www.outbackpower.com

ProHarvest AC Splice Box SPECIFICATIONS

04/2017

Electrical		PROSPL-60
AC Voltage (Three-Phase)	208 to 480VAC	
AC Frequency	50/60Hz	
Maximum Current Rating (Three-Phase and Neutral)	60AAC continuous	
Terminal Configuration	Three-phase + neutral	
Conductors (Copper Only, 90°C)	Branch: 3-20 AWG Inverter: 12 AWG Equipment Ground Conductor (EGC) per NEC 250.122: 10 AWG	
Terminal Torque	Branch: 120in.-in. Inverter: 200in.-in.	
Physical		PROSPL-60
Dimensions H x W x D (in/mm)	8.5 x 8.5 x 7.5 / 215 x 215 x 190	
Maximum Allowable Size for Branch Circuit Conduit (in.)	2	
Environmental Rating	NEMA	
Operating Temperature Range	-40 to 65°C	
Ordering Guide		
Item	Part Number	Description
AC Splice Box	PROSPL-60	AC Splice—NEMA enclosure. Includes three gland fittings for up to three inverter AC cables. Inverter AC cables must be ordered separately.



Outback reserves the right to make changes to the products and information contained in this document without notice.
Copyright © 2017 OutBack Power. All Rights Reserved. Outback is a registered trademark of The Alpha Group.

www.outbackpower.com



DAY & NIGHT SOLAR
Contractors License #:

1605 EASTPORT PLAZA DRIVE
SUITE 135
COLLINSVILLE, IL 62234

PHONE: (618) 344-4001

PROJECT
PHOTOVOLTAIC INSTALLATION for
BJC CANOPY
4466 DUNCAN AVE.
ST. LOUIS, MO 63110

REVISIONS

NO.	DATE	ISSUE
0	12/07/18	90% DESIGN SET

PROJECT
PHOTOVOLTAIC
INSTALLATION

BJC CANOPY
4466 DUNCAN AVE.
ST. LOUIS, MO 63110

DATE: 12/07/2018	SHEET SIZE: 30" x 42"
DRAWN: BL	
CHECKED: RD	SHEET NO.
VERSION: 1.0	
EQUIPMENT SPECS	PV 7.0