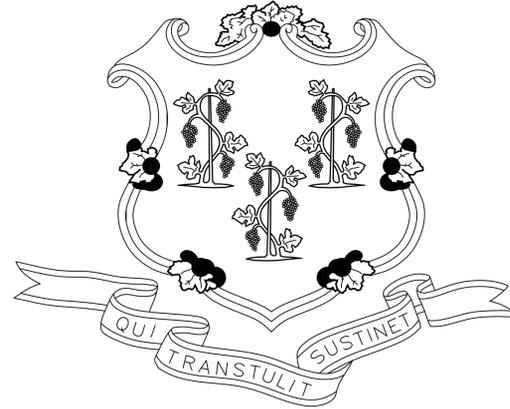


# STATE OF CONNECTICUT



**DANNEL P. MALLOY GOVERNOR**

DEPARTMENT OF CONSTRUCTION SERVICES  
**DONALD J. DeFRONZO**  
 ACTING COMMISSIONER

WESTERN CONNECTICUT STATE UNIV.  
**JAMES W. SCHMOTTER**  
 PRESIDENT

**SOLAR ELECTRIC INSTALLATION AT WESTERN CONNECTICUT STATE UNIVERSITY  
 MIDTOWN STUDENT CENTER  
 DANBURY, CONNECTICUT 06810**

**PROJECT NO. BI-RD-278A**

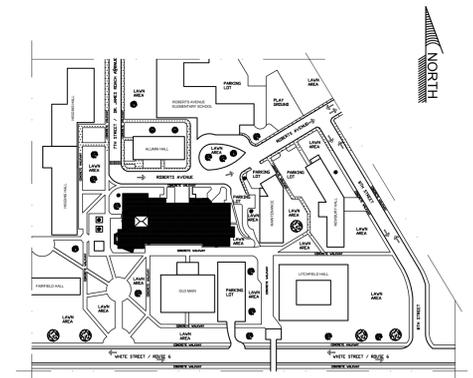
ARCHITECTS AND ENGINEERS  
 ARMM ARCHITECTURE ASSOCIATES, INC  
 725 KENILWORTH AVENUE  
 CHERRY HILL, NEW JERSEY  
 08002

CONTRACT DRAWINGS

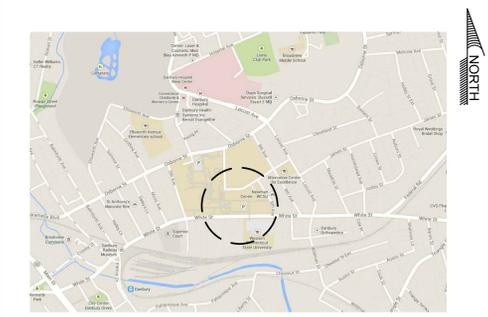
NO.	TITLE
	COVER SHEET
G.1	SITE STAGING PLAN
G.2	GENERAL NOTES
G.3	EXISTING CONDITIONS ROOF PLAN
PV.1	ROOF-TOP PV ARRAY PLAN
PV.2	SINGLE LINE DIAGRAM
PV.3	EQUIPMENT CALCULATIONS
PV.4	GENERAL PV DETAILS
PV.5	LABELS AND MARKINGS

**ABBREVIATIONS**

A/C	AIR CONDITIONER	LT	LIGHT
A.S.	ALONG SLOPE	MAX	MAXIMUM
ALUM	ALUMINUM	MIN	MINIMUM
BLKG	BLOCKING	M.R.V.	MOISTURE RELIEF VENT
CEM	CEMENT	MTL	METAL
C.I.	CAST IRON	O/C	ON CENTER
CO	CLEANOUT	OD	OUTSIDE
CONC	CONCRETE	O.H.	OVERHANG
CONT	CONTINUOUS	OZ.	OUNCE
COP	COPPER	PLYW.	PLYWOOD
D	DOWN	P.P.	PITCH POCKET
DM	DECK MOUNT	PREFAB.	PREFABRICATED
DR	DOOR	R	RIDGE
DS	DOWNSPOUT	RA	ROOF AREA
D.SL.	DRAIN SLEEVE	RD	ROOF DRAIN
E.J.	EXPANSION JOINT	SECT	SECTION
E.S.	EDGE SCUPPER	SL	SKYLIGHT
EXIST	EXISTING	SPEC	SPECIFICATION
FT	FOOT	S.S.	STAINLESS STEEL
GNV	GOOSE NECK VENTILATOR	T&B	TOP & BOTTOM
GV	GRAVITY VENT	TC	TERRA COTTA
GYP	GYPSUM	T&G	TONGUE & GROOVE
H	HEIGHT	TYP	TYPICAL
H.P.	HOT PIPE	TWS	THRU-WALL SCUPPER
INS	INSULATION	V	VALLEY
JT	JOINT	VENT	VENTILATOR
L	LEAD	VS	VENT STACK
LB.	POUND	W/	WITH
L.C.C.	LEAD COATED COPPER	WD	WOOD



SITE PLAN



LOCATION PLAN

APPROVALS

CONSTRUCTION SERVICES \_\_\_\_\_ DATE \_\_\_\_\_

AGENCY \_\_\_\_\_ DATE \_\_\_\_\_

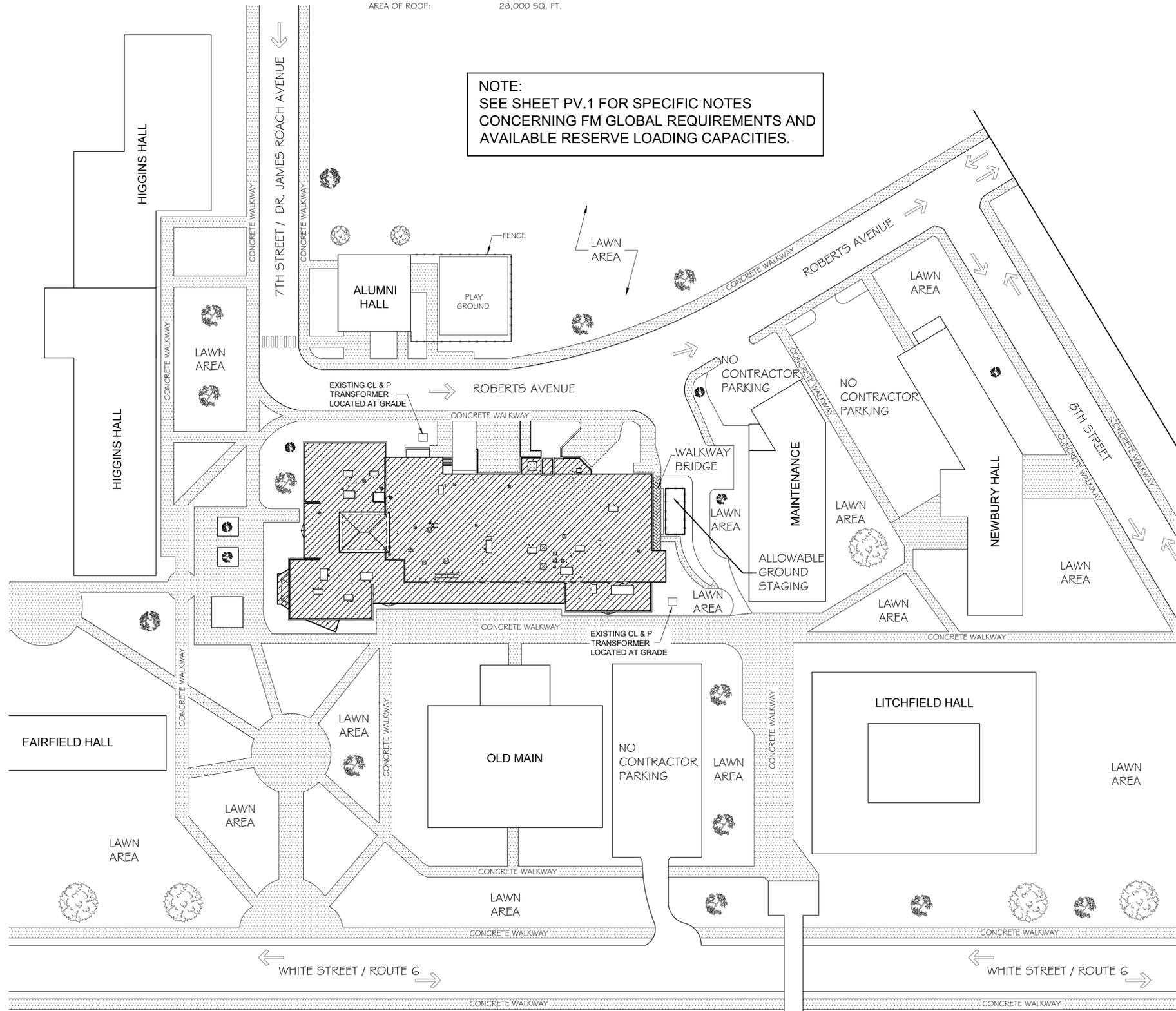
### BUILDING CRITERIA

USE GROUP: A-ASSEMBLY AND B - BUSINESS  
 CONSTRUCTION CLASS: IIB  
 BUILDING HEIGHT: 3 STORIES, ±29'-0"  
 AREA OF LARGEST FLOOR: 28,000 SQ. FT.  
 AREA OF ROOF: 28,000 SQ. FT.

### WIND LOAD DESIGN CRITERIA

1. BASIC WIND SPEED: 100 MPH  
 2. EXPOSURE CATEGORY: IIB  
 3. IMPORTANCE FACTOR: 1.05

**NOTE:**  
 SEE SHEET PV.1 FOR SPECIFIC NOTES  
 CONCERNING FM GLOBAL REQUIREMENTS AND  
 AVAILABLE RESERVE LOADING CAPACITIES.



### SITE PLAN

SCALE: 1/40" = 1'-0"

### GENERAL NOTES

THE GROUNDS, INCLUDING LAWNS, SHRUBS AND BUILDINGS WILL BE PROTECTED FROM ALL DAMAGE. ALL WHICH IS DAMAGED WILL BE REPAIRED TO THE SATISFACTION OF THE OWNER.

IT WILL BE THE CONTRACTOR'S RESPONSIBILITY TO COLLECT AND ACCOUNT FOR ALL IDENTIFICATION PASSES WHICH MAY BE ISSUED TO HIS PERSONNEL EITHER AT THE END OF THE CONTRACT OR WHEN NO LONGER REQUIRED. THE CONTRACTOR WILL COMPLY WITH ALL SECURITY REGULATIONS CURRENTLY ENFORCED BY THE OWNER AND/OR TOWNSHIP. CONTRACTOR'S PERSONNEL WILL NOT BE PERMITTED INSIDE THE BUILDING AT ANYTIME, EXCEPT WITH THE PERMISSION OF THE OWNER.

THE OWNER AND THE OWNER'S REPRESENTATIVES WILL HAVE FREE ACCESS TO ALL PORTIONS OF THE WORK SITE AT ALL TIMES FOR THE PURPOSE OF MONITORING THE WORK.

THE CONTRACTOR WILL MAINTAIN ONE SET OF THESE PLANS AND ASSOCIATED SPECIFICATIONS ON THE ROOF AT ALL TIMES FOR REFERENCE, WHILE HIS FORCES ARE WORKING ON THE ROOF.

STORE MATERIALS TO PREVENT DAMAGE. STACK ON SUPPORTS TO ALLOW AIR TO PASS UNDER.

### APPLICABLE CODES

CONNECTICUT STATE BUILDING CODE SEC. 29-252-1D - 2009 AMENDMENT TO THE 2005 CONNECTICUT SUPPLEMENT

- 2003 INTERNATIONAL BUILDING CODE \*
- 2003 INTERNATIONAL EXISTING BUILDING CODE \*
- 2003 INTERNATIONAL MECHANICAL CODE \*
- 2009 INTERNATIONAL ENERGY CONSERVATION CODE \*
- 2003 INTERNATIONAL PLUMBING CODE \*
- 2003 INTERNATIONAL RESIDENTIAL CODE OF THE INTERNATIONAL CODE COUNCIL, INC.\*
- 2011 NFPA 70 NATIONAL ELECTRICAL CODE OF THE NATIONAL FIRE PROTECTION ASSOC., INC.\*

\* EXCEPT AS AMENDED, ALTERED OR DELETED BY THE CONNECTICUT SUPPLEMENT, ARE HEREBY ADOPTED BY REFERENCE AS THE 2005 STATE BUILDING CODE. THE REQUIREMENTS OF THE 2009 AMENDMENT TO THE 2005 STATE BUILDING CODE SHALL APPLY TO ALL WORK FOR WHICH A PERMIT APPLICATION WAS MADE ON OR AFTER THE DATE OF ADOPTION.

### GENERAL SITE STAGING AND ALLOWABLE WORKING HOUR NOTES

- ALL GROUND STAGING AREA SHALL BE SURROUNDED BY 6' HIGH CHAINED LINK FENCE.
- STORAGE OF MATERIALS WILL BE ALLOWED ON THE ROOF SURFACES PROVIDED MATERIALS ARE EVENLY DISTRIBUTED WITH THE POTENTIAL OVERLOADING OF THE ROOF AT THE SOLE RESPONSIBILITY OF THE CONTRACTOR.
- CONTRACTOR'S WORKMEN SHALL BE EXPECTED TO EXERCISE CARE AND RESPECT FOR STUDENTS AND PERSONNEL WORKING AT THE FACILITY DURING RE-ROOFING INSTALLATIONS. FRATERNIZATION WITH STUDENTS OR OFFICE PERSONNEL WILL NOT BE TOLERATED AND ANY WORKMEN CAUGHT FRATERNIZING WITH STUDENTS AND OFFICE PERSONNEL OR PUBLIC ENTERING THE BUILDING WILL BE ASKED TO LEAVE THE PROJECT AND NOT RETURN.
- CONTRACTORS WILL BE EXPECTED TO COORDINATE WITH THE OWNER THE SHUTTING DOWN OF ALL AIR INTAKES WHEN ADHESIVES ARE BEING UTILIZED IN CLOSE PROXIMITY TO BOTH POWERED AIR INTAKES AND NON-POWERED GRAVITY VENTS. BOTH POWERED UNITS AND GRAVITY VENTS WILL BE SEALED WITH PLASTIC COVERS REMOVED IMMEDIATELY FOLLOWING THE FLASH-OFF OF ADHESIVE FUMES.
- ALL ACCESS BY THE CONTRACTOR TO THE ROOF DURING CONSTRUCTION WILL BE BY OUTSIDE LADDER PROVIDED BY CONTRACTOR.

### ABBREVIATIONS

AC	ALTERNATING CURRENT	MISC	MISCELLANEOUS
AHJ	AUTHORITY HAVING JURISDICTION	(N)	NEW
APPROX	APPROXIMATE	OAE	OR APPROVED EQUAL
AWG	AMERICAN WIRE GAUGE	OC	ON CENTER
BFRCB	BACK-FEED RATED CIRCUIT BREAKER	OCPD	OVER CURRENT PROTECTION DEVICE
CL	CENTER LINE	OD	OUTSIDE DIAMETER
CB	COMBINER BOX	PC	PRECAST
CEC	CALIFORNIA ENERGY COMMISSION	PCOC	POINT OF COMMON COUPLING
CIP	CAST IN PLACE	PV	PHOTOVOLTAIC
DAS	DATA ACQUISITION SYSTEM	PVC	POLY-VINYL-CHLORIDE
DC	DIRECT CURRENT	PTC	PVUSA TEST CONDITIONS
DCD	DC DISCONNECT	RMC	RIGID METAL CONDUIT
DI	DROP INLET	SD	STORM DRAIN
DISC	DISCONNECT	SF	SQUARE FOOT/FEET
(E)	EXISTING	SIM	SIMILAR
EL	ELEVATION	STC	STANDARD TEST CONDITIONS
EMT	ELECTRICAL METALLIC TUBING	TBD	TO BE DETERMINED
EQ	EQUAL	TOF	TOP OF FOOTING
ID	INSIDE DIAMETER	TYP	TYPICAL
IMC	INTERMEDIATE METAL CONDUIT	UGPB	UNDER GROUND PULL BOX
JB	JUNCTION BOX	UON	UNLESS OTHERWISE NOTED
LFNC	LIQUID TIGHT FLEXIBLE NON-METALLIC CONDUIT	VIF	VERIFY IN FIELD
MCB	MAIN COMBINER BOX	XFMR	TRANSFORMER
MFR	MANUFACTURER	WP	WEATHER PROOF
MIN	MINIMUM	WS	WEATHER STATION

### GENERAL SAFETY NOTES

THE DESIGN OF THE ROOF-TOP ARRAY MUST FOLLOW DESIGN CONSIDERATIONS SET-FORTH BY THE CALIFORNIA DEPARTMENT OF FORESTRY AND FIRE PROTECTION. THESE GUIDELINES INCLUDE OFFSETS AND AISLE-WAYS TO ACCOMMODATE MOVEMENT ACROSS THE ROOF-TOP IN THE EVENT OF A FIRE. THERE ARE ALSO CONSIDERATIONS FOR MAXIMUM DIMENSIONS OF A CONTINUOUS ARRAY OR SUB-ARRAY. SINCE PHOTOVOLTAIC (PV) SOURCE AND OUTPUT CIRCUITS WILL BE ENERGIZED AS LONG AS THERE IS VISIBLE LIGHT, LABELING IS SPECIFIED IN THE PLANS TO DISTINGUISH PV CONDUITS FROM EXISTING SITE CONDUIT. BEYOND CAL-FIRE, THESE PLANS INCORPORATE OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) GUIDELINES. THIS MAINLY PERTAINS TO MINIMUM OFFSETS FROM PARAPETS OR THE ROOF EDGE.

ELECTRICALLY, THE DESIGN SHALL MEET ALL EQUIPMENT WORKING CLEARANCES AS DEFINED IN NEC ARTICLE 110.26 AS WELL AS CAREFUL CONSIDERATION OF EGRESS PATHS WHEN EQUIPMENT DOORS ARE OPENED. EQUIPMENT ELEVATION DRAWINGS INCORPORATE TRUE-SCALED DIMENSIONS OF TRADE-SIZE CONDUIT BODIES AND SWEEPS TO ENSURE PROPER CONDUIT BEND RADI. THIS MEASURE WILL ENSURE THAT THE CORRECT CONDUIT FITTING WILL FIT THE ALLOTTED SPACE. FURTHER, ALL EQUIPMENT SPECIFIED SHALL BE LISTED BY A NATIONALLY RECOGNIZED TEST LAB (UL, IEEE, ETC.).

THESE PLANS INCORPORATE DETAILS OUTLINING THE MINIMUM REQUIREMENTS FOR EQUIPMENT AND GROUNDING TO ENSURE PROPER INSTALLATION AS WELL AS SAMPLES OF THE REQUIRED LABELS AND MARKINGS. THE LABELS ADDRESS PERTINENT ARTICLES OF THE NEC AS WELL AS STANDARDS ADOPTED FROM PAST PROJECTS WITH VARIOUS UTILITY COMPANIES AND LOCAL AUTHORITIES HAVING JURISDICTION. IT IS IMPORTANT TO NOTE THAT ALL DETAILS AND SAMPLE LABELS DEPICT MINIMUM REQUIREMENTS AND IT IS UP TO THE INSTALLING CONTRACTOR TO PROVIDE MORE STRINGENT MEASURES AS MAY BE REQUIRED BY THE LOCAL AUTHORITIES HAVING JURISDICTION.

ANY WORK OR MATERIALS INCLUDED IN THE SPECIFICATION WITH A SIMILAR WORK ITEM OR MATERIAL OF A LESSER QUALITY INCLUDED ON THE DRAWINGS AND/OR VICE VERSA, THE MORE STRINGENT OR BETTER QUALITY WORK OR MATERIAL ITEM SHALL BE PERFORMED OR PROVIDED



drawing title <b>SITE PLAN</b>		STATE OF CONNECTICUT DEPARTMENT OF CONSTRUCTION SERVICES	
REVISIONS			
mark	date	description	
1	8.27.13	DESIGN DEVELOPMENT 60%	
2	12.10.13	CONSTRUCTION DOCUMENTS 100%	
3	01.20.14	BID PHASE	
4	03.26.14	DSB1 COMMENT RESPONSE	
5	07.15.14	BID DOCUMENTS	
6	12.04.14	RE-BID DOCUMENTS	
DRAWING PREPARED BY		date	
ARM ASSOCIATES, INC. 725 KENILWORTH AVENUE CHERRY HILL, NEW JERSEY 08002		10/04/13	
project		scale	
SOLAR ELECTRIC DESIGN WESTERN CONNECTICUT STATE UNIVERSITY MIDTOWN STUDENT CENTER		1/40"=1'-0"	
CAD no.		drawing no.	
axlvbvx		G.1	
project no.		drawing no.	
BI-RD-276A			

**GENERAL NOTES:**

**PROCEDURAL NOTES:**

- P1. PRIOR TO SUBMITTING A PROPOSAL, THE CONTRACTOR SHALL NOTIFY **ARMM ASSOCIATES, INC.** OF ANY DISCREPANCIES NOTED TO EXISTING CONDITIONS, STRUCTURE, ELECTRICAL SYSTEMS, ETC. AMONG SITE CONDITIONS, MANUFACTURER RECOMMENDATIONS OR CODES, REGULATIONS OR RULES OF JURISDICTIONS HAVING AUTHORITY.
- P2. ALL DIMENSIONS OF EXISTING CONDITIONS MUST BE VERIFIED PRIOR TO SUBMITTING A PROPOSAL.
- P3. THE SUCCESSFUL CONTRACTOR IS RESPONSIBLE FOR ALL BRACING AND SHORING OF EQUIPMENT DURING INSTALLATION.
- P4. THE SUCCESSFUL CONTRACTOR SHALL BE RESPONSIBLE FOR ALL SAFETY PRECAUTIONS, OSHA REQUIREMENTS AND SAFETY MEASURES ON SITE. THE A/E HAS NO OVERALL SUPERVISORY AUTHORITY AND NO DIRECT RESPONSIBILITY FOR THE SPECIFIC WORKING CONDITIONS OR FOR POSSIBLE EXISTING HAZARDS.

**GENERAL NOTES:**

- G1. THE SUCCESSFUL CONTRACTOR IS RESPONSIBLE FOR INSTALLING ALL EQUIPMENT AND FOLLOWING ALL MANUFACTURER'S OR ENGINEER'S DIRECTIONS AND INSTRUCTIONS.
- G2. THE SUCCESSFUL CONTRACTOR IS ADVISED THAT ALL DRAWINGS, COMPONENT MANUALS, ESPECIALLY THE INVERTER MANUALS, ARE TO BE READ AND UNDERSTOOD PRIOR TO INSTALLATION OR ENERGIZING OF ANY EQUIPMENT. THE SUCCESSFUL CONTRACTOR'S CONTRACTOR IS ALSO ADVISED TO HAVE ALL COMPONENT SWITCHES IN THE OFF (OPEN) POSITION AND FUSES REMOVED PRIOR TO INSTALLATION OF FUSE-BEARING COMPONENTS.
- G3. INSTALLATION CREW IS TO HAVE A MINIMUM OF ONE JOURNEYMAN LEVEL ELECTRICIAN ON SITE AT ALL TIMES WHEN ELECTRICAL WORK IS BEING PERFORMED.
- G4. FOR SAFETY IT IS RECOMMENDED THE INSTALLATION CREW ALWAYS HAVE A MINIMUM OF TWO PEOPLE WORKING TOGETHER.
- G5. THE SOLAR PHOTOVOLTAIC SYSTEM SHALL BE INSTALLED FOLLOWING THE CONVENTIONS OF THE NATIONAL ELECTRIC CODE. ANY LOCAL CODE WHICH MAY SUPERSEDE THE NEC SHALL GOVERN.
- G6. ALL COMPONENTS TO BE INSTALLED WITH THIS SYSTEM ARE TO BE LISTED BY A THIRD PARTY TESTING AGENCY (UL, ETL, ETC.). EQUIPMENT SHALL BE NEMA 4X OUTDOOR RATED OR BETTER, UNLESS LOCATED INDOORS.
- G7. THE SUCCESSFUL CONTRACTOR IS RESPONSIBLE FOR SELECTING AND PURCHASING EQUIPMENT THAT SHALL LAST THE LIFETIME OF THE PV SYSTEM. ALL ENCLOSURES, CONDUIT, STRAPS, PAINTED METAL SURFACES, CONCRETE, GROUNDING EQUIPMENT AND OTHER PRODUCTS SHALL BE SELECTED TO LAST THE LIFETIME OF THE PV SYSTEM. THE A/E SPECIFIES THE MINIMUM REQUIRED EQUIPMENT AND SPECIFICATIONS TO ACCOMPLISH THE PROJECT AND THE SUCCESSFUL CONTRACTOR IS RESPONSIBLE TO ENSURE THAT THESE SPECIFICATIONS ARE MET OR EXCEEDED WITH GOOD QUALITY EQUIPMENT, WORKMANSHIP AND SKILL.
- G8. DC VOLTAGE FROM THE ARRAY IS ALWAYS PRESENT AT THE DC DISCONNECT ENCLOSURE AND THE DC TERMINALS OF THE INVERTER DURING DAYLIGHT HOURS. ALL PERSONS WORKING ON OR INVOLVED WITH THIS PHOTOVOLTAIC SYSTEM MUST BE WARNED THAT SOLAR MODULES ARE ENERGIZED WHEN EXPOSED TO DAYLIGHT. THE LINE AND LOAD TERMINALS ON THE DC DISCONNECTS MAY BE ENERGIZED IN THE OPEN POSITION AND THE SWITCH IS TO BE LABELED TO COMPLY WITH ARTICLE 690.17 OF THE NEC REFLECTING THIS.
- G9. ALL PORTIONS OF THIS SOLAR ELECTRIC SYSTEM SHALL BE CLEARLY MARKED IN ACCORDANCE WITH THE NATIONAL ELECTRIC CODE ARTICLE 690.
- G10. THE SUCCESSFUL CONTRACTOR SHALL PERFORM INITIAL HARDWARE CHECKS AND PV WIRING CONDUCTIVITY CHECKS PRIOR TO TERMINATING ANY WIRES. ALL AC AND DC WIRE RUNS SHALL BE MEGGER TESTED AT 1,000VDC TO DEMONSTRATE A MINIMUM OF 100 MEGAOHMS RESISTANCE TO GROUND. THIS IS VERY IMPORTANT TO PREVENT EQUIPMENT DAMAGE!  
  
DO NOT MEGGER THE SOLAR MODULES, AS THIS WILL LIKELY DAMAGE THEIR INTERNAL DIODES. MEGGERING IS INTENDED FOR ALL CONDUCTORS INSTALLED BY THE SUCCESSFUL CONTRACTOR'S ELECTRICAL CONTRACTOR.
- G11. FOR PROPER MAINTENANCE AND ISOLATION OF INVERTERS, REFER TO ISOLATION PROCEDURE IN INVERTER OPERATION MANUAL. CONTRACTOR PERFORMING THE MAINTENANCE IS RESPONSIBLE TO FOLLOW ALL LOCKOUT/TAGOUT PROCEDURES.
- G12. THE PHOTOVOLTAIC SYSTEM'S UTILITY INTERCONNECTION POINT SHALL MEET THE SPECIFIC REQUIREMENTS OF ARTICLE 690.64, NATIONAL ELECTRIC CODE.
- G13. THE GROUNDING OF THE PHOTOVOLTAIC SYSTEM SHALL COMPLY WITH NEC 690.45 AND NEC 690.47. ANY CHANGES SHALL BE REVIEWED AND DEEMED ACCEPTABLE BY THE ENGINEER, MANUFACTURER AND LISTING AGENCY FOR PRODUCT SAFETY.
- G14. ELECTRICAL CONTRACTOR SHALL COORDINATE EQUIPMENT ACCEPTANCE TESTING AND COMMISSIONING WITH THE SUCCESSFUL CONTRACTOR.
- G15. THE SUCCESSFUL CONTRACTOR IS RESPONSIBLE FOR MOUNTING ALL EQUIPMENT PER THE PLANS AND SPECIFICATION OR MANUFACTURER'S SPECIFICATIONS. IF SPECIFICATIONS ARE NOT APPARENT, THE CONTRACTOR SHALL USE DILIGENT EFFORTS TO MOUNT EQUIPMENT SUCH THAT IT WILL BE CLEAN, LEVEL AND SOLID IN ORDER TO LAST THE LIFETIME OF THIS SOLAR ELECTRIC SYSTEM.
- G16. ANY METAL SHAVINGS RESULTING FROM SITE WORK SHALL BE CLEANED FROM ENCLOSURE INTERIORS, TOP SURFACES OF ENCLOSURES, THE GROUND SURFACE, ROOFS AND ANY ADDITIONAL AREAS WHERE OXIDIZED OR CONDUCTIVE METAL SHAVINGS MAY CAUSE RUST, ELECTRICAL SHORT CIRCUITS OR OTHER DAMAGE.
- G17. THE SUCCESSFUL CONTRACTOR SHALL CONSIDER THE WEATHERING OF EQUIPMENT OVER TIME AND ELIMINATE THE POSSIBILITY OF DEGRADATION OF EQUIPMENT DUE TO WATER ENTRY AND UV EXPOSURE. AS A RESULT, WE REQUIRE THE USE OF UNISTRUT OR SIMILAR MOUNTING SYSTEMS TO MOUNT ENCLOSURES, PULL BOXES, LOAD CENTERS, FUSE BOXES OR OTHER EQUIPMENT TO ROOFTOPS AND WALLS TO PREVENT WATER BUILD-UP. WEEP HOLES SHALL BE PROVIDED IN ENCLOSURES WHERE CONDENSATION OR WATER BUILD-UP MAY OCCUR. SEALING CONDUIT WITH A FIRE RETARDANT FOAM OR CAULK AT ENCLOSURE ENTRY POINTS IS RECOMMENDED TO MINIMIZE CONDENSATION AND PESTS IN ENCLOSURES. FOR CONDUIT LOCATIONS RUNNING THROUGH WALLS FIRE RETARDANT FOAM OR CAULK MUST BE USED TO MAINTAIN THE CURRENT FIRE RATING OF THE WALL AND MUST COMPLY WITH UL 1479 & UL 723 STANDARDS FOR THROUGH PENETRATIONS.
- G18. ALL METALLIC ENCLOSURES SHALL BE GROUNDED PER NEC ART. 250.
- G19. ALL WORK SHALL BE PERFORMED IN A SAFE, EFFICIENT, AND WORKMAN LIKE MANNER AND IN COMPLIANCE WITH EM-385-1-1 (USACE SAFETY MANUAL) AND PER SUBCONTRACTOR SPECIFIC SAFETY PLANS.
- G20. CONSTRUCTION STAGING OF CONCENTRATED LOADS ON ROOF SURFACE SHALL BE MINIMIZED. SPECIAL ATTENTION SHALL BE PAID TO ROOF LOADING DURING INSTALLATION SUCH THAT HEAVY ITEMS ARE NOT LOADED IN A MANNER THAT WOULD OVERLOAD THE ROOF.
- G21. CONTRACTOR SHALL COORDINATE SOLAR ARRAY INSTALLATION WORK WITH ROOFING PREPARATORY PROCEDURES AND REPAIR WORK.
- G22. CONTRACTOR SHALL RESTORE INTERIOR/EXTERIOR FINISHES TO ORIGINAL OR BETTER CONDITION.

**ELECTRICAL NOTES:**

- E1. IN EVERY PULL BOX, TERMINAL BOX, AND AT ALL PLACES WHERE WIRES MAY NOT BE READILY IDENTIFIED BY NAMEPLATE MARKINGS ON THE EQUIPMENT TO WHICH THEY CONNECT, IDENTIFY EACH CIRCUIT WITH A PLASTIC LABEL OR TAG FOR NUMBER, POLARITY OR PHASE.
- E2. THE SUCCESSFUL CONTRACTOR SHALL ROUTE AND LOCATE THE CONDUITS TO SUIT SITE CONDITIONS BUT SHALL NOT EXCEED THE MAXIMUM CONDUCTOR LENGTHS FOR EXCESSIVE VOLTAGE DROPS.
- E3. THE SUCCESSFUL CONTRACTOR SHALL DETERMINE EXACT ROUTING AND LENGTHS REQUIRED.
- E4. BENDS SHALL NOT DAMAGE THE RACEWAY OR SIGNIFICANTLY CHANGE THE INTERNAL DIAMETER OF RACEWAYS (NO KINKS).
- E5. SUPPORT CONDUCTORS IN VERTICAL CONDUITS IN ACCORDANCE WITH REQUIREMENTS IN NEC 300.19.
- E6. INSTALL ALL WIRING MATERIALS IN A NEAT WORKMANLIKE MANNER. USE GOOD TRADE PRACTICES AS REQUIRED BY CHAPTER 3 OF THE NEC.
- E7. INSTALL CONDUIT TO MAINTAIN PROPER CLEARANCES AND IN A NEAT INCONSPICUOUS MANNER. RUN PARALLEL AND AT RIGHT ANGLES TO STRUCTURAL MEMBERS OR OTHER CONDUITS. PROVIDE BOXES, FITTINGS AND BENDS FOR CHANGES IN DIRECTION. FASTEN CONDUIT SECURELY IN PLACE.
- E8. SUPPORT CONDUIT USING STEEL PIPE STRAPS OAE, LAY-IN ADJUSTABLE HANGERS, CLEVIS HANGERS OR SPLIT-HANGERS. HANGER SPACING SHALL BE INSTALLED PER NEC REQUIREMENTS FOR THE TYPE OF CONDUIT BEING INSTALLED. USE APPROVED BEAM CLAMPS FOR CONNECTION TO STRUCTURAL MEMBERS.
- E9. PROVIDE PULL, JUNCTION, OR CHRISTY BOXES WHERE REQUIRED TO FACILITATE THE INSTALLATION OF WIRING IN ADDITION TO THOSE SHOWN ON THE DRAWINGS. BENDS IN CONDUITS BETWEEN PULL BOXES SHALL NOT EXCEED THE EQUIVALENT OF FOUR 90 DEGREE BENDS.
- E10. RACEWAY EXPANSION FITTINGS SHALL BE INSTALLED TO ALLOW FOR THERMAL EXPANSION AND CONTRACTION WHERE NECESSARY, PER NEC 300.7(B). COMPONENT MANUFACTURER INSTRUCTIONS SHALL BE FOLLOWED AND ALL ACCESSORIES SHALL BE INSTALLED TO ENSURE PROPER FUNCTIONING OF FITTINGS.
- E11. WHEN FIELD CUTTING IS REQUIRED, THE CONDUIT SHALL BE CUT SQUARE AND DEBURRED.
- E12. CONDUIT SIZES SHOULD CONFORM TO NEC SPECIFICATIONS, TO INCLUDE FILL FACTOR AND DERATING FOR NUMBER OF CONDUCTORS WITH A MINIMUM CONDUIT SIZE BEING 3/4".
- E13. THE WIRING MINIMUM SIZE SHALL BE #12 AWG.
- E14. SAFETY REGULATIONS (LOCK OUT - TAG OUT, ETC.) IS THE FULL RESPONSIBILITY OF THE SUCCESSFUL PROPOSER'S SUBCONTRACTOR DURING CONSTRUCTION.
- E15. ALL WIRING IN CONDUIT SHALL BE THWN-2 FOR 90°C APPLICATIONS. USE BARE COPPER FOR GROUND FOR ALL EXTERNAL GROUNDING. USE 2 OR APPROVED EQUIVALENT SHALL BE USED FOR ALL EXPOSED OR HOMERUN WIRING.
- E16. FOR INTERCONNECTION VIA BUS TAP:
  - A. OVERCURRENT PROTECTION (SWITCHING DEVICE AND MEANS OF DISCONNECT) MUST BE LOCATED PER NEC 240.21.
  - B. THE CONDUCTORS SHALL BE CRIMPED WITH A CRIMP-ON TERMINAL LUG, MANUFACTURED BY ILSCO, BURNDY, OAE. THE TERMINAL LUG SHALL HAVE IDENTIFICATION OR COLOR CODING TO MATCH THE CONDUCTOR SIZE. TERMINAL LUGS SHALL HAVE LONG BARRELS TO PROVIDE 2 CRIMPS PER TERMINAL LUG PER CONDUCTOR.
  - C. CRIMPED TERMINAL LUGS SHALL BE CONSTRUCTED OF PURE COPPER AND TIN PLATED FOR HIGH CONDUCTIVITY AND RATED FOR 600V AT 90°C.
  - D. THE CRIMP MUST BE MADE WITH THE MANUFACTURER'S APPROVED TOOL DEVICE TO ACHIEVE THE PROPER CRIMP CONNECTION.
  - E. USE STAINLESS STEEL HARDWARE WITH THE FASTENER TORQUED TO MANUFACTURER'S RECOMMENDATIONS ON ALL THREE PHASES TO COMPLY WITH ARTICLE 110.14 OF THE 2008 NEC.
  - F. MINIMUM BEND RADIUS SHALL BE OBSERVED TO MAINTAIN GOOD CONDUCTOR QUALITY AND WIRE MANAGEMENT IN THE LOAD CENTER OR TRANSFORMER. IF THIS BEND RADIUS IS TOO CONSTRICTING, USE A 90° CRIMP-ON LUG MANUFACTURED BY ILSCO, BURNDY, OAE. 90° CRIMP-ON LUG MUST BE INSTALLED WITH RATED INSULATION THAT MEETS OR EXCEEDS THE CONDUCTORS' INSULATION IT IS BEING USED WITH. IT IS RECOMMENDED THAT ACCEPTABLE CLEARANCES ARE MAINTAINED WITH THIS BUS TAP FOR SAFE, CONTINUOUS OPERATION.
  - G. FOLLOW MANUFACTURER'S GUIDELINES, OR THE APPLICABLE AHJ, FOR MODIFICATION OF BUS BAR(S).
- E17. ALL CONDUITS SHALL BE FREE OF ANY OBSTRUCTIONS AND PROPERLY SECURED BEFORE WIRE IS PULLED.
- E18. THE SUCCESSFUL PROPOSER'S ELECTRICAL SUBCONTRACTOR SHALL PROVIDE SIGNAGE TO ALL ELECTRICAL BOXES, JUNCTION BOXES, PULL BOXES, DC DISCONNECTS, CONDUIT RUNS, AC DISCONNECTS, SUB PANELS AND MAIN SERVICES PER NEC ARTICLE 690.
- E19. MEGGER TESTING: MEGGER (INSULATION) TEST ALL CONDUCTORS AT 1,000V DC TO 100 MEGAOHMS BETWEEN THE CONDUCTOR UNDER TEST AND GROUND WIRE. CONDUCT TEST AFTER WIRE IS PULLED THROUGH THE CONDUIT BUT BEFORE TERMINATING TO THE MODULES, COMBINERS, DISCONNECTS OR INVERTER. DO NOT MEGGER TEST THE MODULES AS THEY MAY BE DESIGN LIMITED TO 600V DC AND MAY DAMAGE THE DEVICE. MEGGER TEST RESULTS TO BE DOCUMENTED AND KEPT WITH INSPECTION REPORTS. MEGGER TEST RESULTS SHALL BE MADE AVAILABLE FOR REVIEW WITH THE LOCAL BUILDING AUTHORITY PRIOR TO ANY INSPECTION.
- E20. ENSURE THAT ANY EXISTING LIGHTNING PROTECTION AIR TERMINALS EXTEND A MINIMUM OF 10" ABOVE THE TOP OF THE PV MODULES. THIS CAN BE ACCOMPLISHED BY EXTENDING THE EXISTING AIR TERMINAL OR BY INSTALLING A NEW, TALLER AIR TERMINAL WITH RATINGS EQUIVALENT TO THE EXISTING AIR TERMINAL. ALL LIGHTNING PROTECTION WORK SHALL BE PERFORMED IN ACCORDANCE WITH UFGS 24 41 00.00 20.

**STRUCTURAL NOTES**

- S1. THE CONTRACTOR IS ADVISED THAT ALL PLANS, DIMENSIONS, AND DETAILS DEPICT APPROXIMATE CONDITION AS SHOWN. MINOR VARIATIONS ARE TO BE EXPECTED AND ANY DEVIATIONS FROM THE CONTRACT DOCUMENTS SHALL BE APPROVED BY ARMM ASSOCIATES, INC. IN WRITING PRIOR TO PROCEEDING.
- S2. IT IS THE SUCCESSFUL CONTRACTOR'S RESPONSIBILITY TO DETERMINE THE LOCATION OF UTILITIES IN THE IMMEDIATE VICINITY OF CONSTRUCTION SO AS TO PREVENT DAMAGE TO THEM. SHOULD DAMAGE TO SUCH UTILITIES OCCUR THE SUCCESSFUL CONTRACTOR SHALL BE REQUIRED TO REPAIR SUCH DAMAGE AT THEIR OWN EXPENSE AND TO THE SATISFACTION OF THE OWNER.
- S3. SHOP DRAWINGS FOR ALL STRUCTURAL ELEMENTS MUST BE SUBMITTED BY THE SUCCESSFUL CONTRACTOR AND BE REVIEWED BY ARMM ASSOCIATES, INC. IF THE SUCCESSFUL CONTRACTOR FAILS TO OBTAIN A/E REVIEW OF THE SHOP DRAWINGS, THE OWNER RESERVES THE RIGHT TO REJECT IN PLACE WORK WITH THE SUCCESSFUL CONTRACTOR TO MAKE ALL CORRECTIONS AT NO COST TO THE OWNER.
- S4. LOADS GREATER THAN THE DESIGN LIVE LOADS SHALL NOT BE PLACED ON THE STRUCTURE.
- S5. THE ELECTRICAL DRAWINGS SHALL BE USED IN CONJUNCTION WITH THE STRUCTURAL DRAWINGS FOR DETAIL DIMENSIONS AND SECTION DETAILS AS REQUIRED.
- S6. THE SUCCESSFUL CONTRACTOR SHALL DETERMINE THE NUMBER, LOCATION, AND DIMENSION OF HOLES THROUGH FLOOR AND ROOF. CHASES, INSERTS, OPENINGS, SLEEVES, WASHERS, DRIPS, REVEALS, DEPRESSIONS AND OTHER PROJECT REQUIREMENTS.
- S7. SHOP DRAWINGS:
  - S7-1. ORIGINAL SHOP DRAWINGS SHALL BE SUBMITTED AS A COURTESY FOR ARMM ASSOCIATES, INC. REVIEW FOR THE FOLLOWING ITEMS:
    - a. STRUCTURAL STEEL
- S8. DESIGN LOADS:
  - S8-1. GOVERNING DESIGN CODE:
    - THE 2003 IBC INTERNATIONAL BUILDING CODE
    - ASCE 7-05 MINIMUM DESIGN LOADS FOR BUILDINGS AND OTHER STRUCTURES
  - S8-2. DESIGN LOADS SHALL BE IN ACCORDANCE WITH THE 2003 (IBC) INTERNATIONAL BUILDING CODE.
  - S8-3. THE CONTRACTOR IS CAUTIONED AS TO NOT STORE ANY CONSTRUCTION MATERIALS OR UNDERTAKE ANY CONSTRUCTION OPERATION THAT WILL EXCEED THE DESIGN LIVE LOAD CAPACITIES NOTED IN THE STRUCTURAL EVALUATION REPORTS ATTACHED TO THE REQUEST FOR PROPOSALS.
  - S8-4. THE STRUCTURE HAVE BEEN EVALUATED FOR THE DEAD AND LIVE LOADS INDICATED ON THE PLAN. ANY INCREASE OF LOADS DUE TO CHANGE IN USAGE OR CONSTRUCTION MATERIALS, ETC. SHALL BE FURTHER EVALUATED AND APPROVED IN WRITING BY THE SUCCESSFUL CONTRACTOR'S STRUCTURAL ENGINEER LICENSED IN THE STATE OF CONNECTICUT.
  - S8-5. THE STABILITY OF THE STRUCTURE IS DEPENDENT UPON THE DIAPHRAGM ACTION OF THE ROOFS. THE CONTRACTOR IS COMPLETELY RESPONSIBLE FOR THE METHODS OF CONSTRUCTION AND SHALL PROVIDE ALL GUYS, BRACING AND SHORING REQUIRED TO ACCOMMODATE ALL INTERIM LOADING CONDITIONS THROUGHOUT THE CONSTRUCTION PHASE.

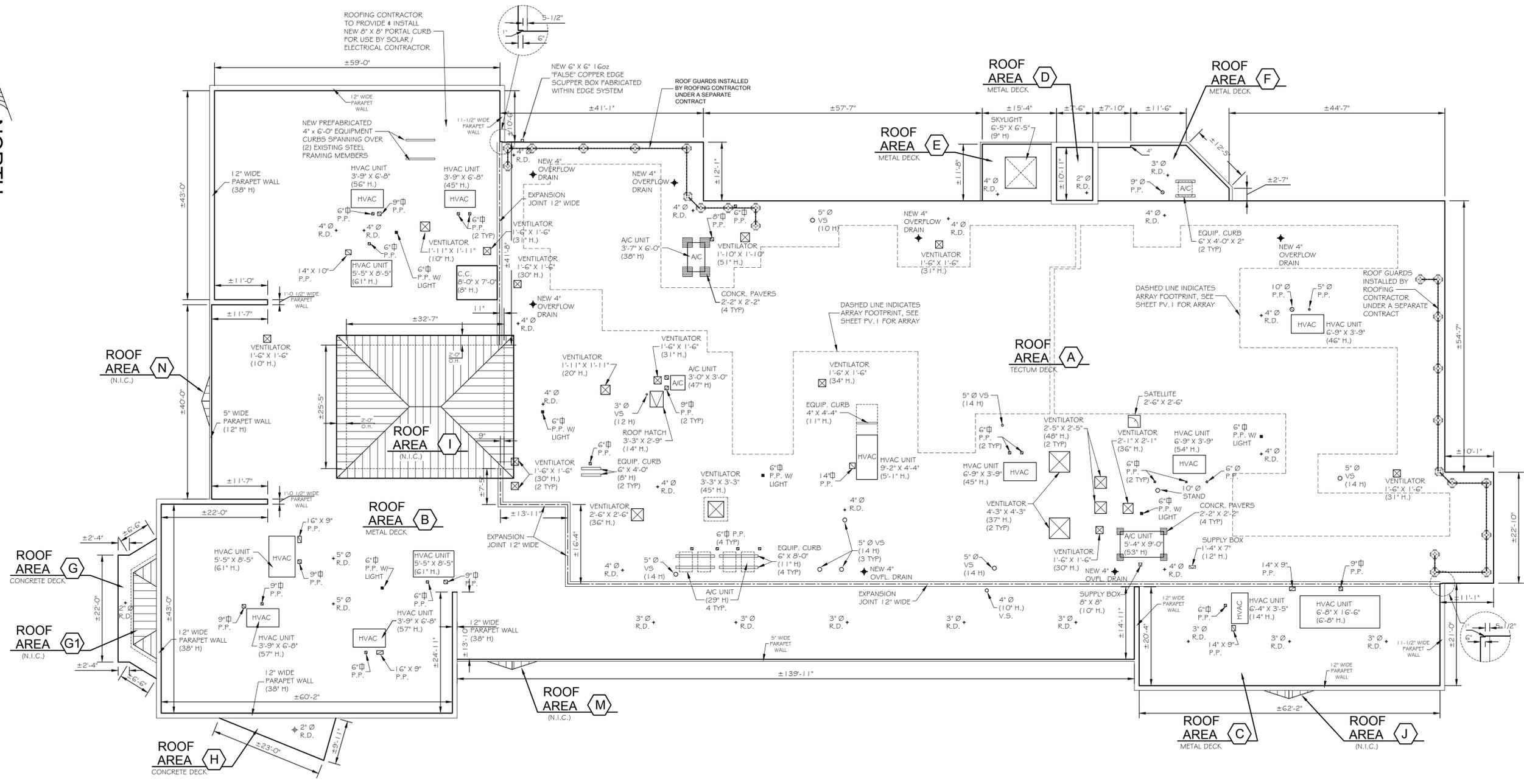
**MODULE INSTALLATION NOTES:**

- M1. REFER TO THE MODULE MANUAL FOR DETAILS ON RIGGING, UNPACKING, HANDLING, PLANNING, AND INSTALLATION.
- M2. THE MODULES MAY BE SHIPPED WITH SEVERAL MODULES PER BOX. TAKE CARE WHEN OPENING THE BOX TO ENSURE THAT ALL MODULES ARE SECURELY HANDLED.
- M3. NEVER LEAVE A MODULE UNSUPPORTED OR UNSECURED. THE SUCCESSFUL PROPOSER'S SUB-CONTRACTOR IS RESPONSIBLE FOR ALL MATERIAL HANDLING ON THE JOB SITE TO INCLUDE DAMAGES AND/OR THEFT.

**SOLAR ARRAY COMMISSION:**

- C1. THE ACCEPTANCE TESTING SHALL BE DONE IN ACCORDANCE WITH THE TESTING AND COMMISSIONING REPORT.

drawing title <b>GENERAL NOTES</b>			<b>STATE OF CONNECTICUT</b> DEPARTMENT OF CONSTRUCTION SERVICES		
R E V I S I O N S					
mark	date	description	DRAWING PREPARED BY <b>ARMM ASSOCIATES, INC.</b> 725 KENILWORTH AVENUE CHERRY HILL, NEW JERSEY 08002		date 10/07/13
1	10.04.13	DESIGN DEVELOPMENT 60%	project <b>SOLAR ELECTRIC DESIGN</b> WESTERN CONNECTICUT STATE UNIVERSITY MIDTOWN STUDENT CENTER		scale 3/32"=1'-0"
2	12.10.13	CONSTRUCTION DOCUMENTS 100% BID PHASE			drawn by CTD
3	12.10.13	BID PHASE	approved by FJM		drawing no. <b>G.2</b>
4	03.26.14	DSBI COMMENT RESPONSE			
5	07.15.14	BID DOCUMENTS			
6	12.04.14	RE-BID DOCUMENTS	CAD no. ax/so/box	project no. BI-RD-276A	



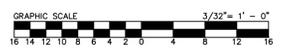
### DRAWING LEGEND

- ROOF DRAIN
- VENTILATOR CURB
- 1/2" PER FOOT SLOPE
- EXISTING DECK SLOPE
- EQUIPMENT CURB
- EXPANSION JOINT
- PARAPET WALL
- GAVEL STOP
- VENT STACK
- PITCH POCKET
- SKYLIGHT
- AIR CONDENSER UNIT
- HVAC UNIT

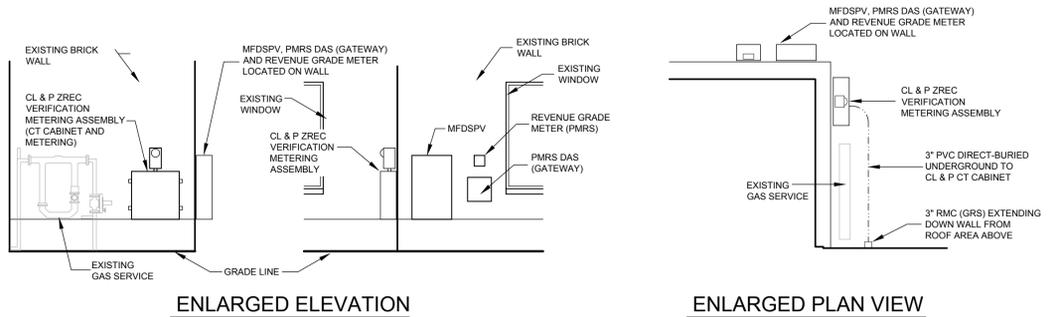
### EXISTING CONDITIONS ROOF PLAN

SCALE: 3/32" = 1'-0"

ANY WORK OR MATERIALS INCLUDED IN THE SPECIFICATION WITH A SIMILAR WORK ITEM OR MATERIAL OF A LESSER QUALITY INCLUDED ON THE DRAWINGS AND/OR VICE VERSA, THE MORE STRINGENT OR BETTER QUALITY WORK OR MATERIAL ITEM SHALL BE PERFORMED OR PROVIDED



drawing title EXISTING CONDITIONS ROOF PLAN			STATE OF CONNECTICUT DEPARTMENT OF CONSTRUCTION SERVICES	
REVISIONS			DRAWING PREPARED BY	
mark	date	description	ARM ASSOCIATES, INC. 725 KENILWORTH AVENUE CHERRY HILL, NEW JERSEY 08002	
1	10.04.13	DESIGN DEVELOPMENT 60%	project	
2	12.10.13	CONSTRUCTION DOCUMENTS 100%	SOLAR ELECTRIC DESIGN WESTERN CONNECTICUT STATE UNIVERSITY MIDTOWN STUDENT CENTER	
3	01.20.14	BID PHASE	approved by	
4	03.26.14	DSBI COMMENT RESPONSE	FJM	
5	07.15.14	BID DOCUMENTS	drawing no.	
6	12.04.14	RE-BID DOCUMENTS	G.3	
CAD no. axb/box			project no. BI-RD-276A	
			date 10/07/13	
			scale 3/32"=1'-0"	



ENLARGED ELEVATION

ENLARGED PLAN VIEW

**ENLARGED EQUIPMENT LOCATION ELEVATION AND PLAN VIEW**

DRAWING NOT TO SCALE

**FM GLOBAL REQUIREMENTS FOR THE ROOF-TOP PV ARRAY SYSTEM**

THE MIDTOWN STUDENT CENTER BUILDING IS INSURED BY FACTORY MUTUAL (FM) GLOBAL. THEREFORE THE INSTALLED SYSTEM SHALL MEET ALL REQUIREMENTS SET FORTH BY FM GLOBAL, INCLUDING BUT NOT LIMITED TO THE FOLLOWING:

- BAKER, INGRAM & ASSOCIATES (STRUCTURAL ENGINEERING SUB-CONSULTANT TO ARMM ASSOCIATES, INC.) HAS PERFORMED A ROOF LOADING SURVEY AND EVALUATION. AVAILABLE RESERVE DEAD LOAD CAPACITIES IS **9 LBS PER SQUARE FOOT** FOR EACH INDIVIDUAL ROOF AREA. THE ADDITIONAL LOAD REPRESENTED BY THE SYSTEM MUST BE ADEQUATELY SUPPORTED BY THE EXISTING STRUCTURE.
- THE CONTRACTOR AND/OR THE NON-PENETRATING BALLASTED PV RACKING SYSTEM MANUFACTURER SHALL PROVIDE STRUCTURAL DESIGN CALCULATIONS SEALED AND SIGNED BY A STATE OF CONNECTICUT LICENSED PROFESSIONAL ENGINEER. SAID DESIGN CALCULATIONS SHALL INCLUDE LOAD ANALYSES OF ALL SYSTEM COMPONENTS (MODULES, RACKING/FRAME, SUPPORTS, POSTS, ETC.). A SAFETY FACTOR OF 2.0 SHALL BE REQUIRED.
- UPLIFT CALCULATIONS FOR THE SYSTEM SHALL BE BASED UPON THE LATEST APPROVED EDITION OF SEACO PV2 "WIND LOADS ON LOW PROFILE SOLAR PHOTOVOLTAIC SYSTEMS ON FLAT ROOFS". THE USE OF BOUNDARY LAYER WIND TUNNEL TESTING TO DETERMINE UPLIFT RESISTANCE REQUIREMENTS SHALL ONLY BE ACCEPTABLE PROVIDED THE RESULTANT UPLIFT PRESSURES ARE NOT LESS THAN 65% OF THE CALCULATED PRESSURES FROM SEACO PV2. MINIMUM SYSTEM SETBACKS FROM ROOF EDGES SHALL BE DETERMINED IN ACCORDANCE WITH SEACO PV2.
- DESIGN WIND SPEED AND SURFACE ROUGHNESS EXPOSURE SHALL BE BASED UPON THE LATEST APPROVED EDITION OF FM GLOBAL PROPERTY LOSS PREVENTION DATA SHEET 1-28 "WIND DESIGN".
- SNOW LOAD VALUES SHALL BE EQUAL TO OR GREATER THAN THOSE OUTLINED IN THE LATEST APPROVED EDITION OF FM GLOBAL PROPERTY LOSS PREVENTION DATA SHEET 1-54 "ROOF LOADS".
- THE SYSTEM SHALL PASS HAIL TESTING PER THE LATEST APPROVED EDITION OF ANSI FM 4473 "TEST STANDARD FOR IMPACT RESISTANCE TESTING OF RIGID ROOFING MATERIALS BY IMPACTING WITH FREEZER ICE BALLS"; CLASS 2, 3, OR 4. SIMILAR TESTS SUCH AS UL 1703, UL 2218, ASTM E 1038, AND ASTM E 822 SHOULD BE CONSIDERED ACCEPTABLE DEPENDING UPON THE RESULTS THEREOF. A MINIMUM 1-1/2" DIAMETER SIMULATED HAILSTONE IS REQUIRED. TEST RESULTS SHALL BE SUBMITTED FOR REVIEW AND COMMENT BY FM GLOBAL.
- SYSTEM COMPONENTS SHALL NOT INCORPORATE SIGNIFICANT PLASTICS IN THEIR MANUFACTURE.
- ELECTRICAL WIRING SHALL NOT BE INSTALLED WITHIN RIB OPENINGS OF STEEL DECKING, OR WITHIN THE PLANE OF ABOVE-DECK COMPONENTS.
- GROUND FAULT PROTECTIVE DEVICES SPECIFICALLY DESIGNED FOR A ROOF-MOUNTED PV ARRAY SYSTEM SHALL BE PROVIDED IN ACCORDANCE WITH THE 2005 NATIONAL ELECTRICAL CODE (NEC / NFPA 70), ARTICLE 690 - SOLAR PHOTOVOLTAIC SYSTEMS; **PARAGRAPH 690.5 GROUND-FAULT PROTECTION; SUB-PARAGRAPHS (A) GROUND-FAULT DETECTION AND INTERRUPTION, (B) ISOLATING FAULTED CIRCUITS, AND (C) LABELS AND MARKINGS AND 2009 CONNECTICUT SUPPLEMENT.**
- PV ARRAY SOURCE CIRCUIT (STRING) WIRING SHALL BE CUSTOM LENGTHS OF RHW-2 / USE-2 CABLE FOR WIRING SOLAR PANELS (MODULES) WITH JUNCTION BOX CONNECTORS; # 10 AWG COPPER WITH 7-STRANDS; BLACK, 600V (UL LISTED) SUNLIGHT RESISTANT INSULATION.
- DC OUTPUT CIRCUIT WIRING AND AC FEEDERS SHALL COMPRISE STRANDED COPPER CONDUCTORS WITH UL DUAL-LISTED THWN-2/THHN INSULATION, INSTALLED IN RACEWAYS. ALL WIRING SHALL BE HEAT, MOISTURE, GASOLINE AND OIL RESISTANT. BLACK INSULATION FOR SIZES AWG # 2 AND LARGER SHALL ADDITIONALLY BE SUNLIGHT RESISTANT.
- RACEWAY EXPANSION FITTINGS SHALL BE PROVIDED TO ALLOW FOR THERMAL EXPANSION AND CONTRACTION (DUE TO EXTREME TEMPERATURE FLUCTUATIONS) IN ACCORDANCE WITH THE 2008 OR 2011 (LATEST ADOPTED EDITION) OF THE NATIONAL ELECTRICAL CODE (NEC / NFPA 70); ARTICLE 300 - WIRING METHODS; **PARAGRAPH 300.7 RACEWAYS EXPOSED TO DIFFERENT TEMPERATURES; SUB-PARAGRAPH (B) EXPANSION FITTINGS.** ALSO ARTICLE 352 - RIGID POLYVINYL CHLORIDE CONDUIT; TYPE PVC; **PARAGRAPH 352.44 EXPANSION FITTINGS.**

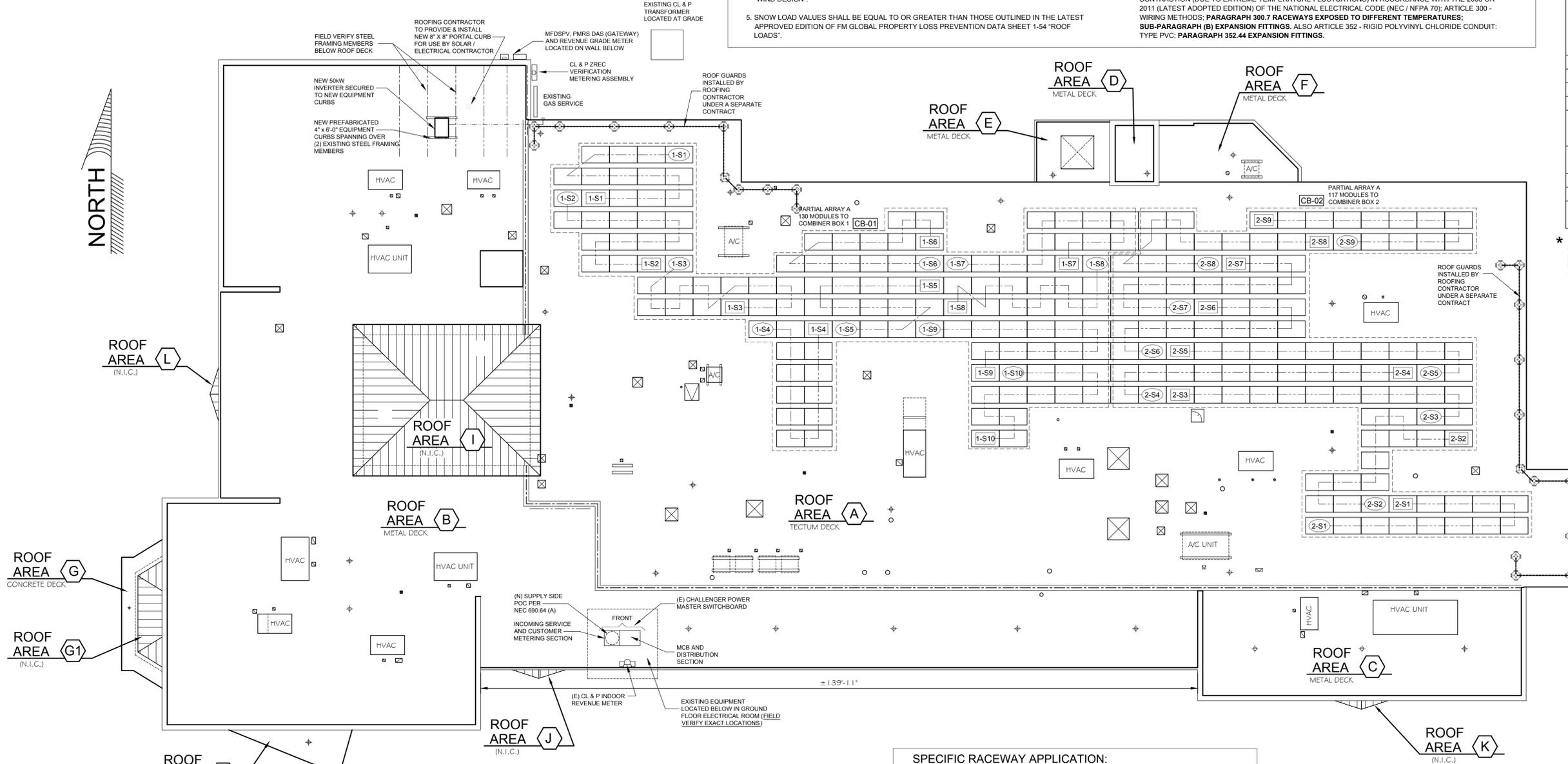
**SYSTEM SUMMARY**

MODULE MODELS	- BASIS OF DESIGN: SOLARWORLD SUNMODULE SW 250 MONO
MODULE DC STC RATING	250W
MODULES PER STRING (SOURCE CIRCUIT)	13
MODULE V <sub>oc</sub>	37.8V
MODULE V <sub>mp</sub>	31.1V
MODULE I <sub>sc</sub>	8.28A
MODULE I <sub>mp</sub>	8.05A
RACKING SYSTEM	BASIS OF DESIGN: GENMOUNT GENESIS SERIES 5 DEGREE
TOTAL MODULE COUNT	247 TOTAL MODULES
TOTAL DC STC SYSTEM RATING	61,750 W
INVERTERS	BASIS OF DESIGN: (1) ADVANCED ENERGY AE 50TX
INVERTER COUNT	1
SITE LATITUDE (NORTH)	41° 24' 01"
ARRAY AZIMUTH	180° SOUTH
MODULE TILT	5°
ASHRAE EXTREME ANNUAL * MEAN MINIMUM DRY BULB DESIGN TEMPERATURE	-17.0° C
ASHRAE 0.4% DRY BULB COOLING DESIGN TEMPERATURE *	33° C
INTERCONNECTION VOLTAGE	208V, 3Ph
INTERCONNECTION OCPD RATING	175A
INTERCONNECTION TYPE	POC ON SUPPLY SIDE OF EXISTING SERVICE DISCONNECTING MEANS PER NEC 690.64 (A)

\* TEMPERATURES VALUES FOR DANBURY, CONNECTICUT ARE INTERPOLATED BETWEEN PUBLISHED VALUES FOR BRIDGEPORT AND HARTFORD, CONNECTICUT.

**THE PROJECT DESCRIPTION:**

- THE CONTRACTOR SHALL PROVIDE AN APPROXIMATELY 60KW DC STC RATED ROOF-TOP PHOTOVOLTAIC ARRAY SYSTEM ON THE WESTERN CONNECTICUT STATE UNIVERSITY'S MIDTOWN STUDENT CENTER BUILDING. SAID ARRAY SHALL BE CONFIGURED FOR (SOLAR ELECTRIC) GRID-INTERACTIVE TIE-IN WITH NORTHEAST UTILITIES, CONNECTICUT LIGHT AND POWER (CL&P) AT 208 VOLT, 3 PHASE, 60 HERTZ.
- THE BASIS OF DESIGN IS A 61.75KW DC STC RATED SYSTEM COMPRISED OF (247) SOLARWORLD SUNMODULE SW 250 MONO MODULES; GENMOUNTS GENESIS NON-PENETRATING BALLASTED PV RACKING SYSTEM FOR FLAT ROOFS; SOLARBOS COMBINER BOXES WITH INTEGRATED DC DISCONNECT SWITCHES; AND AN ADVANCED ENERGY AE 50TX CENTRAL INVERTER.
- THE POINT OF CONNECTION (POC) OR POINT OF COMMON COUPLING (POCC) WITH CL&P SHALL BE AT THE SUPPLY SIDE OF AN EXISTING 2500 AMPERE MAIN CIRCUIT BREAKER (SERVICE MAIN DISCONNECTING MEANS) IN COMPLIANCE WITH NEC 690.64 (A). THE CONTRACTOR SHALL PROVIDE AN EXTERNALLY LOCATED AC MAIN FUSIBLE DISCONNECT SWITCH FOR THE PV ARRAY / SOLAR ELECTRIC SYSTEM; 200 AMPERE, 3 POLE, NEMA 3R ENCLOSURE; FOR READY ACCESS BY CL&P AND EMERGENCY RESPONSE PERSONNEL.
- ALTERNATE MANUFACTURERS SHALL BE ACCEPTABLE SUBJECT TO COMPLIANCE.
- THE INSTALLED SYSTEM SHALL MEET ALL REGULATIONS AND REQUIREMENTS SET FORTH BY CL&P, ESPECIALLY WITH REGARD TO THE FAST TRACK INTERCONNECTION APPLICATION, AND AVALING THE SMALL ZREC PROJECT TARIFF.
- THE MIDTOWN STUDENT CENTER BUILDING IS INSURED BY FACTORY MUTUAL (FM) GLOBAL. THEREFORE THE INSTALLED PV ARRAY SYSTEM SHALL MEET ALL REQUIREMENTS SET FORTH BY FM GLOBAL, ESPECIALLY WITH REGARD TO THE NON-PENETRATING BALLASTED PV RACKING COMPONENT.



**ROOF-TOP PV ARRAY PLAN**

SCALE: 3/32" = 1'-0"

**247 MODULES @ 250 WATTS PER PANEL**  
**61,750 WATT DC STC RATED SYSTEM**

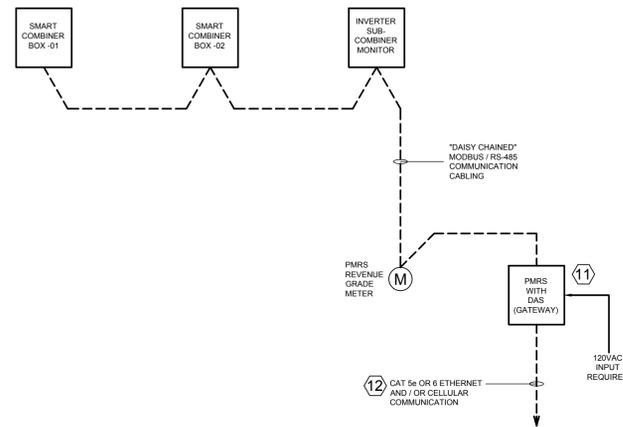
**SPECIFIC RACEWAY APPLICATION:**

- PV SOURCE CIRCUITS SHALL BE GROUPED AND ROUTED IN 1-1/2" PVC SCHEDULE 40 SLEEVES FROM MODULES TO COMBINER BOXES
- DC OUTPUT CIRCUITS AT THE ROOF (FROM COMBINER BOXES TOWARDS THE INVERTER) SHALL BE ROUTED IN PVC SCHEDULE 40 RACEWAYS. SAID RACEWAYS SHALL BE SUPPORTED ON COOPER B-LINE (BY EATON) DURA-BLOK COMPLETE ROOFTOP SUPPORT SOLUTION.
- RACEWAYS ROUTED DOWN FROM THE ROOF AND / OR ALONG BUILDING EXTERIOR WALLS SHALL BE RIGID METAL CONDUIT (GALVANIZED RIGID STEEL). UNDERGROUND RACEWAYS SHALL BE CONCRETE ENCASED PVC SCHEDULE 40, OR DIRECT BURIED PVC SCHEDULE 40, AS NECESSITATED BY APPLICATION; UNDERGROUND SWEEPS AND STUB-UPS SHALL BE RMC (GRS). INPUT AND OUTPUT RACEWAYS CONNECTING TO THE INVERTER SHALL BE LIQUID-TIGHT FLEXIBLE METAL CONDUIT, IF EXPOSED AND NOT STUBBED-UP DIRECTLY UNDER THE INVERTER.
- BUILDING INTERIOR RACEWAYS (FROM MFDSPV TO THE POC) SHALL BE ELECTRICAL METALLIC TUBING.

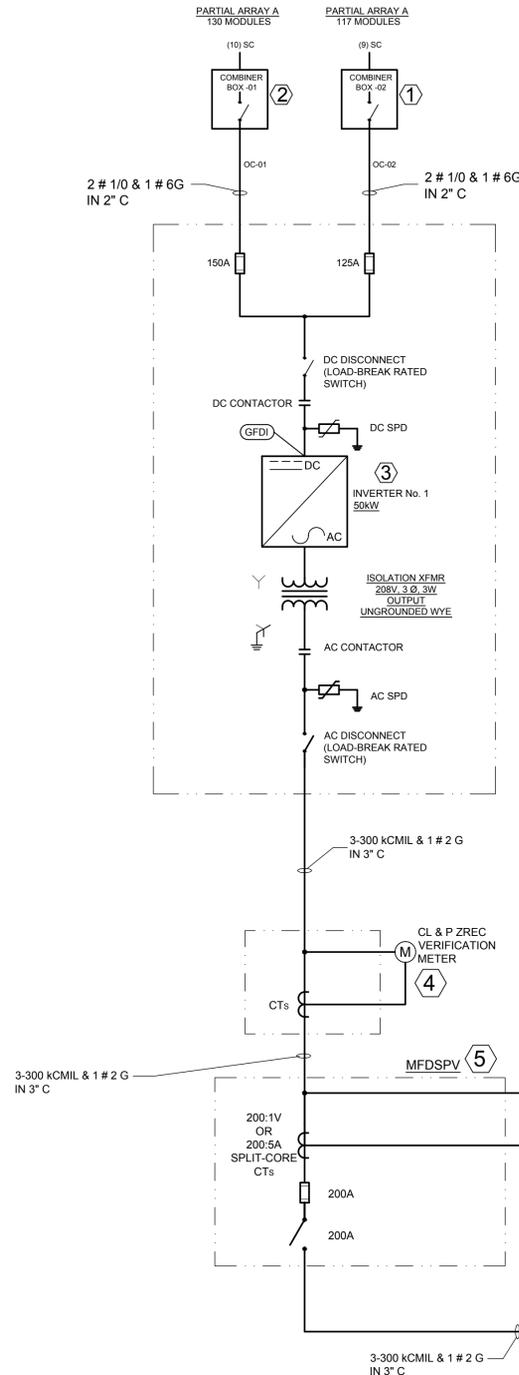
ANY WORK OR MATERIALS INCLUDED IN THE SPECIFICATION WITH A SIMILAR WORK ITEM OR MATERIAL OF A LESSER QUALITY INCLUDED ON THE DRAWINGS AND/OR VICE VERSA, THE MORE STRINGENT OR BETTER QUALITY WORK OR MATERIAL ITEM SHALL BE PERFORMED OR PROVIDED



drawing title <b>ROOF-TOP PV ARRAY PLAN</b>		STATE OF CONNECTICUT DEPARTMENT OF CONSTRUCTION SERVICES	
REVISIONS			
mark	date	description	
1	10.04.13	DESIGN DEVELOPMENT 60%	
2	12.10.13	CONSTRUCTION DOCUMENTS 100%	
3	01.20.14	BID PHASE	
4	03.26.14	DSBI COMMENT RESPONSE	
5	07.15.14	BID DOCUMENTS RE-BID DOCUMENTS	
6	12.04.14		
DRAWING PREPARED BY <b>ARMM ASSOCIATES, INC.</b> 725 KENILWORTH AVENUE CHERRY HILL, NEW JERSEY 08002		date 10/07/13	scale 3/32"=1'-0"
project <b>SOLAR ELECTRIC DESIGN</b> WESTERN CONNECTICUT STATE UNIVERSITY MIDTOWN STUDENT CENTER		drawn by CTD	approved by FJM
CAD no. ax/vo/xx	project no. BI-RD-276A	drawing no. <b>PV.1</b>	



**PERFORMANCE MONITORING AND REPORTING SYSTEM (PMRS) DIAGRAM**  
DECK MONITORING OR APPROVED EQUAL



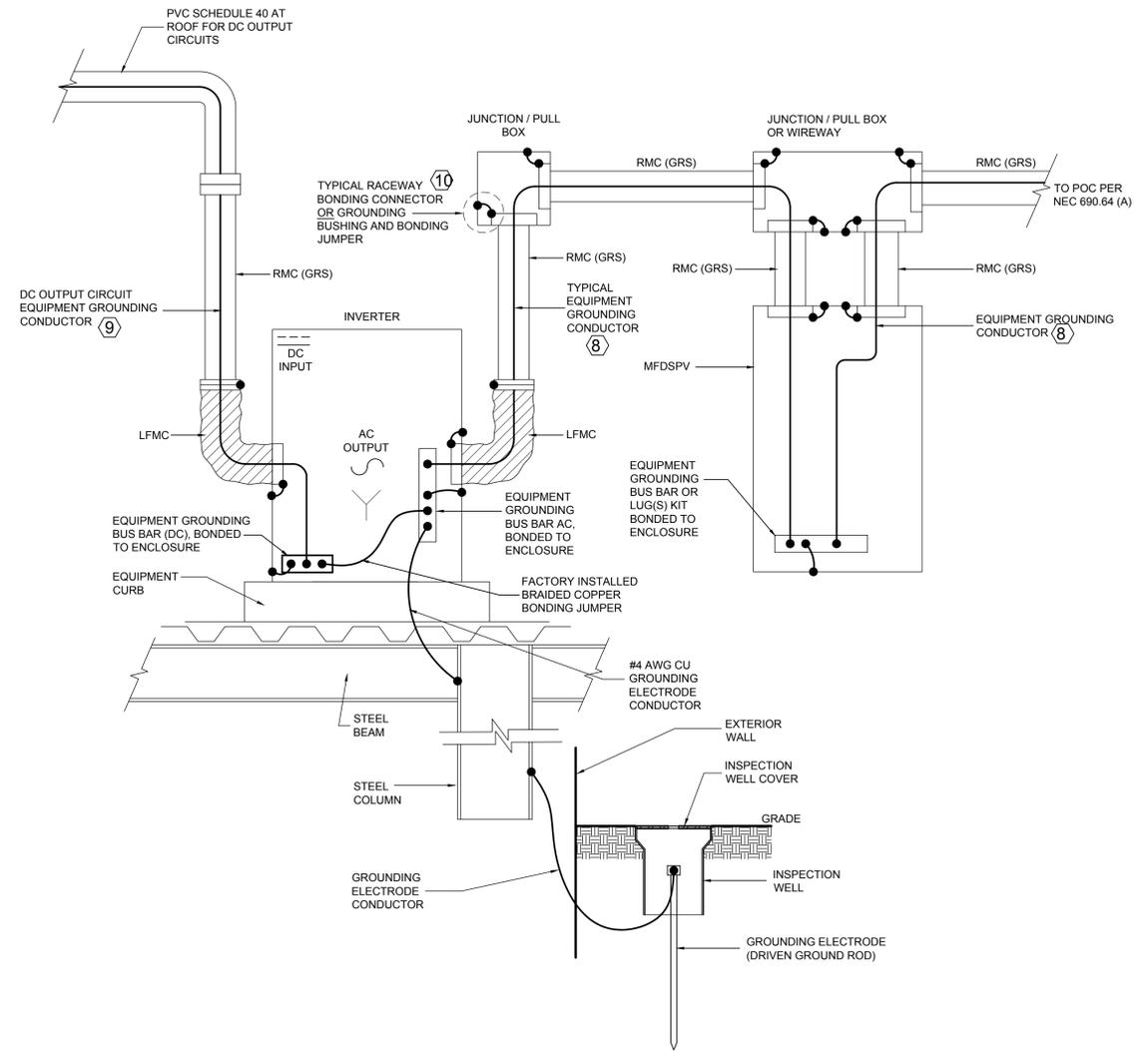
**DC OUTPUT CIRCUITS MCC AND OCP CALCULATIONS**

NEC 690.8 (A) (1) AND (2); 240.4 (B)

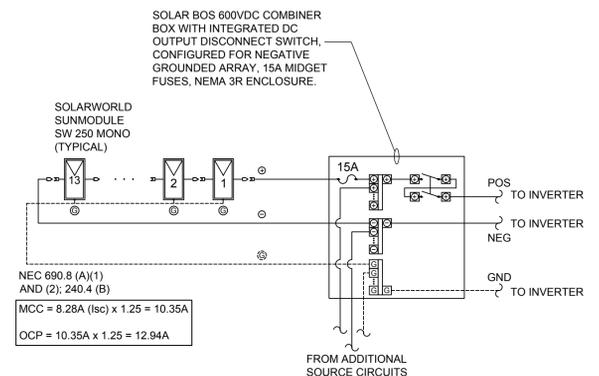
QC-01  
MAXIMUM CIRCUIT CURRENT =  $10 \times 8.28 \text{ (Isc)} \times 1.25 = 103.5\text{A}$   
OVERCURRENT PROTECTION =  $103.5\text{A} \times 1.25 = 129.38\text{A}$  (150A)

QC-02  
MAXIMUM CIRCUIT CURRENT =  $9 \times 8.28 \text{ (Isc)} \times 1.25 = 93.15\text{A}$   
OVERCURRENT PROTECTION =  $93.15\text{A} \times 1.25 = 116.44\text{A}$  (125A)

**PHOTOVOLTAIC (SOLAR ELECTRIC) SYSTEM SINGLE LINE DIAGRAM**



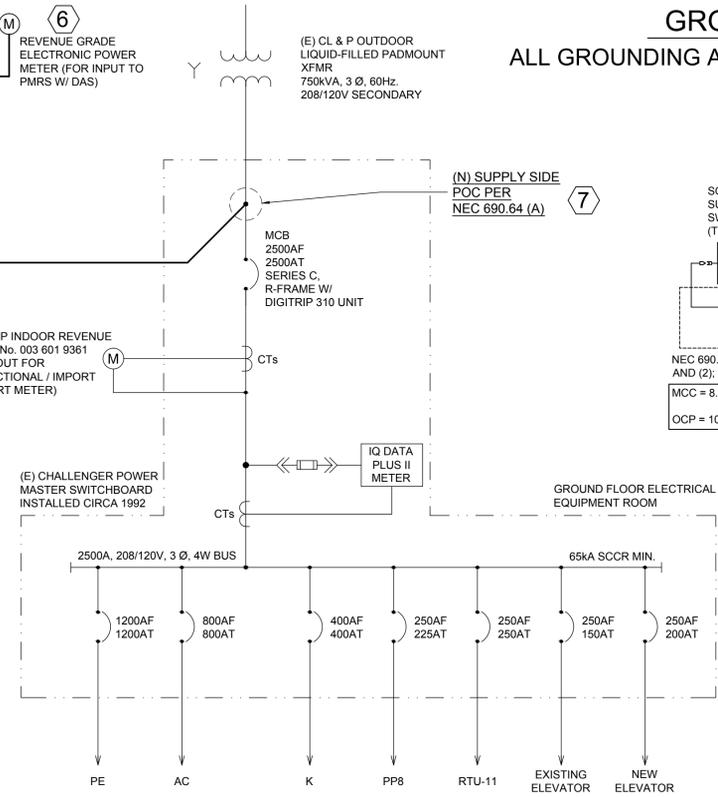
**TYPICAL PV SYSTEM GROUNDING AND BONDING DIAGRAM**  
ALL GROUNDING AND BONDING SHALL COMPLY WITH NEC ARTICLE 250 (14)



**SOURCE CIRCUIT WIRING DIAGRAM**

**GENERAL NOTES**

- THE BASIS OF DESIGN IS SOLARWORLD SUNMODULE SW 250 MONO, OR APPROVED EQUAL.
- EACH SOURCE CIRCUIT (PV ARRAY STRING) SHALL COMPRISE A MAXIMUM OF THIRTEEN (13) MODULES WIRED IN SERIES. SOURCE CIRCUIT WIRING SHALL BE CUSTOM LENGTHS OF RHW-2 / USE-2 CABLE FOR WIRING SOLAR PANELS (MODULES) WITH JUNCTION BOX CONNECTORS; # 10 AWG COPPER WITH 7-STRANDS, BLACK, 600V (UL LISTED) SUNLIGHT RESISTANT INSULATION.
- KEYED NOTES:**
- SMART COMBINER BOX WITH INTEGRATED LOAD-BREAK 600 VDC OUTPUT DISCONNECT SWITCH; CONFIGURED FOR NEGATIVE GROUNDED ARRAY; 15A, 600VDC MIDGET FUSE PER EACH INCOMING SOURCE CIRCUIT; SOLARBOS No.CST200-9M-15-N3 - OR APPROVED EQUAL.
- SMART COMBINER BOX WITH INTEGRATED LOAD-BREAK 600 VDC OUTPUT DISCONNECT SWITCH; CONFIGURED FOR NEGATIVE GROUNDED ARRAY; 15A, 600VDC MIDGET FUSE PER EACH INCOMING SOURCE CIRCUIT; SOLARBOS No.CST200-10M-15-N3 - OR APPROVED EQUAL.
- AE 50TX 208V INVERTER FOR OUTDOOR APPLICATION (NEMA 4), AS MANUFACTURED BY ADVANCED ENERGY - OR APPROVED EQUAL; DC INPUT SUB-COMBINER COMPARTMENT SHALL INCLUDE FUSES AS INDICATED.
- THE CONTRACTOR SHALL COORDINATE WITH CL & P AND PROVIDE SOW IF AND AS REQUIRED TO ACCOMMODATE THE ZREC VERIFICATION METER (CT CABINET, CTS, ETC.)
- PER CL & P REQUIREMENTS, PROVIDE AN EXTERNALLY LOCATED, LOCKABLE, TAGGABLE, PV SYSTEM AC OUTPUT FUSIBLE MAIN DISCONNECT SWITCH CAPABLE OF SHOWING A VISIBLE BREAK IN THE CIRCUIT. SQUARE D CATALOG No. H364AWK, OR APPROVED EQUAL. HEAVY-DUTY, FUSIBLE DISCONNECT SWITCH IN AN OUTDOOR NEMA 3R ENCLOSURE; MUST BE REVERSE-FEED RATED (BI-DIRECTIONAL POWER). INCLUDE EQUIPMENT GROUNDING BUS BAR OR LUG(S) KIT. PROVIDE OVERSIZED ENCLOSURE IF REQUIRED TO ACCOMMODATE THE SPLIT-CORE CURRENT TRANSFORMERS.
- THE METER SHALL BE AS MANUFACTURED BY ELKOR, VERIS, OR APPROVED EQUAL. COORDINATE WITH PMRS VENDOR / INSTALLER (DECK MONITORING OR APPROVED EQUAL).
- THE CONTRACTOR SHALL COORDINATE WITH CONNECTICUT LIGHT AND POWER (CL & P) AND THE LOCAL AUTHORITY HAVING JURISDICTION (AHJ) TO PROVIDE SUPPLY SIDE POINT OF CONNECTION IN COMPLIANCE WITH NEC 690.64 (A), FOR THE GRID-INTERACTIVE PHOTOVOLTAIC ARRAY SYSTEM. THE CONTRACTOR SHALL ALSO COORDINATE WITH CL & P. TO IMPLEMENT A NET METERING SYSTEM AS APPLICABLE AND / OR REQUIRED; REFER TO AND COMPLY WITH TERMS AND CONDITIONS FOR FAST TRACK INTERCONNECTION APPLICATION / AGREEMENT (GREATER THAN 10KW, LESS THAN 2000KW).
- UNLESS OTHERWISE NOTED ALL AC EQUIPMENT GROUNDING CONDUCTORS SHALL BE SIZED IN ACCORDANCE WITH NEC TABLE 250.66 (GROUNDING ELECTRIC CONDUCTORS). SEE KEYED NOTE (9) FOR DC OUTPUT CIRCUITS.
- WHERE UNGROUNDED CONDUCTORS ARE INCREASED FOR VOLTAGE DROP, EQUIPMENT GROUNDING CONDUCTORS SHALL BE INCREASED PROPORTIONATELY PER NEC 250.122 (B).
- ALTERNATE MEANS AND METHODS OF BONDING NORMALLY NON CURRENT-CARRYING RACEWAYS AND ENCLOSURES SHALL BE PERMITTED IF AND AS APPROVED BY THE LOCAL AUTHORITY HAVING JURISDICTION. SAID BONDED RACEWAYS AND ENCLOSURES CONNECTED TOGETHER AND TO THE SUPPLY SYSTEM GROUNDING EQUIPMENT REPRESENT A SECONDARY (AND THEREFORE REDUNDANT) LOW-IMPEDANCE PATH FOR GROUND-FAULT CURRENT. THE PRIMARY PATH COMPRISES INSULATED EQUIPMENT GROUNDING CONDUCTORS ROUTED WITH EACH AND EVERY DC CIRCUIT AND AC FEEDER.
- ENCLOSURE EQUIPPED WITH INTEGRAL 24 VDC POWER SUPPLY; PROVIDE 20A, 120V INPUT POWER BRANCH CIRCUIT FROM NEAREST AVAILABLE SOURCE (2 # 12 & 1 # 12G IN 3/4" C)
- CAT 5e OR 6 ETHERNET CONNECTIVITY TO BUILDING LAN IS REQUIRED FOR WEB BROWSER INTERFACE
- ALSO REFER TO DETAIL #3/PV.4 FOR PV ARRAY RACKING SYSTEM GROUNDING. DESIGN-INTENT IS COMPLIANCE WITH NEC 690.47 (C) (1) THROUGH (8) AS APPLICABLE.



REVISIONS			DRAWING PREPARED BY	
mark	date	description	ARM ASSOCIATES, INC.	
1	10.04.13	DESIGN DEVELOPMENT 60%	725 KENILWORTH AVENUE CHERRY HILL, NEW JERSEY 08002	
2	12.10.13	CONSTRUCTION DOCUMENTS 100%	project	
3	01.20.14	BID PHASE	SOLAR ELECTRIC DESIGN WESTERN CONNECTICUT STATE UNIVERSITY	
4	03.26.14	DS#1 COMMENT RESPONSE	MIDTOWN STUDENT CENTER	
5	07.15.14	BID DOCUMENTS	approved by FJM	
6	12.04.14	RE-BID DOCUMENTS	drawing no. PV.2	

CAD no. x3/04/08 project no. BI-RD-276A

PROJECT INFORMATION	
Name	Midtown Student Center
Customer	Western Connecticut State University
Location	Danbury, United States 06810
Description	61.75kW DC STC Rated Roof-Top Photovoltaic Array for Grid-Interactive Tie-In with Northeast Utilities (Connecticut Light and Power) at 208V, 3Ph.

MODULE DATA		LOCAL TEMPERATURES	
Manufacturer	Solarworld AG	Ambient temperature (max)	33 °C
Type	Sunmodule Plus SW 250 mono	Ambient Temperature (min)	-17 °C
Rated power (P <sub>n</sub> )	250.0 Wp	ΔT Increase	30.0 °C
Open circuit voltage (V <sub>oc</sub> )	37.8 V		
MPP voltage (V <sub>mpp</sub> )	31.1 V		
Short circuit current (I <sub>sc</sub> )	8.3 A		
MPP current (I <sub>mp</sub> )	8.0 A		
Coefficient of V <sub>oc</sub>	-0.30 %/K		

SYSTEM CONFIGURATION						
No. inverters	Inverter type and configuration	No. modules	Rated DC power	AC power at V <sub>minmp</sub>	Rated AC power	DC/AC ratio
1	AE 50TX - 208Vac (19sx13m=247 modules)	247	61.8 kWp	50.0 kW	50.0 kW	123.5 %

Advanced Energy Industries, Inc. does not accept any liability for the accuracy, completeness, up-to-date nature, quality or usability for the purposes intended by you as a user of the data presented in the AEdesign service.

### Voltage Drop Calculations

#### Data Entry Window

1. Select voltage: 208

2. Select the max desired voltage drop (0%-5%): 2%

3. Select phase type: Three Phase

4. Select the type of wire: Stranded Copper Coated

5. Select the size of wire if known: 300 kcmil

6. Enter the length of wire (0-5000) if known: 300

7. Enter Amps (0-5000) if known: 139

8. Select the number of parallel wires (1 is non-parallel) or 2-25 pairs: 1

#### Results Window

9. Maximum voltage drop allowed: 4.16

10. Minimum voltage drop allowed at load: 203.84

11. Multiplier: 1.732050808

12. Resistance/1000' of wire: 0.0446

13. Wire Size: 300 kcmil

14. Distance: 300.00

15. Maximum Amps: 139

16. Minimum number of parallel wires: 1

17. Actual voltage drop: 3.22 volts (ok)

18. Actual voltage with load: 204.78 volts (ok)

19. Voltage difference: 0.94 volts (ok)

20. Total resistance per foot: 0.0000446 ohms

21. Minimum wire size for voltage drop: 250 kcmil recommended

22. Maximum distance with this load: 387 feet

23. Max ampacity @ 75°F: 285 amperes

24. Ampacity above or below load: 145.00 amperes (ok)

Directions: Fill in blank cells 1-8. If you leave only one entry blank in cells 5, 6 or 7, then a recommended maximum will appear to the left of the cell. The Ampacity of the wire in cell 13 is given in cell 23. If this cell turns red, the wire size in cell 13 is not large enough to carry even the minimum load. This ampacity is calculated in Table 310.16 as per 110.14(c). This number does not consider any other factors such as insulation type, continuous load, correction factors or adjustment factors.

- Formulas used:
- Maximum voltage drop allowed = Circuit Voltage(Cell 1) X Maximum voltage drop % allowed(Cell 2).
  - Minimum Voltage drop allowed at load = Voltage(Cell 1) - Max vd allowed (Cell 9)
  - Multiplier = 1 (if cell 3 is single phase)  
Multiplier = square root of 3 or 1.732050808 (if cell 3 is three phase)
  - Resistance/1000' of wire = resistance of the type wire in cell 14 and sized per cell 13 from Table 8
  - Size wire = Cell 5 (if known and entered in cell 5)  
Size wire = Cell 21 (if unknown and cell 5 is left blank)
  - Distance = Cell 6 (if known and entered in cell 5)  
Distance = Cell 22 (if unknown and cell 6 is left blank)
  - Maximum Amps = Cell 7 (if known and entered in cell 7)  
Maximum Amps = see below (if cell 7 is left blank)  
Max voltage drop(Cell 9) x Number of parallel wires(Cell 8)  
Resistance/foot(Cell 20) x Distance(Cell 14) x Multiplier(Cell 11)
  - Number of sets of parallel wires = Cell 8 (if known and entered in cell 8)  
Number of sets of parallel wires = 1 (if unknown and cell 8 is left blank)
  - Actual voltage drop = Resistance(Cell 20) x Amps(Cell 15) x Distance(Cell 14) x Multiplier(Cell 11)
  - Actual Voltage with load = Voltage(Cell 1) - Actual Voltage drop(Cell 17)
  - Voltage Difference = Actual Voltage(Cell 18) - Min. voltage(Cell 10)  
If ok then this cell turns green, if not then it turns red
  - Total Resistance per foot = Res. in table 8 of Cell 4 and Cell 13  
1000 x number of parallel wires (Cell 16)
  - Minimum wire size = the wire that has low enough resistance to carry the load without more than the max voltage drop.  
Resistance = Max voltage drop(Cell 9) x parallel wires(Cell 16)  
Amps(Cell 15) x Length(Cell 14) x Multiplier(Cell 11)
  - Distance = Max voltage drop(Cell 9) x parallel wires (Cell 16)  
Amps(Cell 15) x Resistance(Cell 20) x Multiplier(Cell 11)
  - Max Ampacity of the selected wire in Cell 13 =  
The ampacity of the conductor listed in Cell 4 and Cell 13 per Article 110.14(C) and Table 310.16. Note: This is the maximum ampacity allowed under ideal conditions.
  - Amps above or below load = Ampacity of Cell 23 - Ampacity of Cell 15

The calculations above were based on the following equations:

$$Vd = \frac{I \times R \times L \times M}{P}$$

Where: Vd= Maximum Voltage Drop in volts  
I= Current in Amps  
R= Resistance in ohms per foot  
L= Length of wire one way in feet  
M= Multiplier  
2 for single phase or  
1.732050808 for three phase  
P= Number of parallel runs

COMBINER	LONGEST RUN FROM STRING TO COMBINER (FT)	STRING CABLE SIZE (AWG)	R (OHMS/K FT)	IMP (A)	VOLTAGE DROP TO COMBINER BOX (V)	RUN FROM COMBINER TO INVERTER (FT)	NUMBER OF CABLES PER POLE	COMBINER CABLE SIZE (AWG OR KCMIL)	R (OHMS/K FT)	IMP (A)	VOLTAGE DROP TO INVERTER (V)	TOTAL VOLTAGE DROP	TOTAL PERCENT VOLTAGE DROP
		CU						CU					
CB-01	100	#10	1.29	8.05	2.08	125	1	#1/0	0.1270	80.50	2.56	4.63	1.15
CB-02	125	#10	1.29	8.05	2.60	200	1	#1/0	0.1270	72.45	3.68	6.28	1.55
												1.35	Average % VD

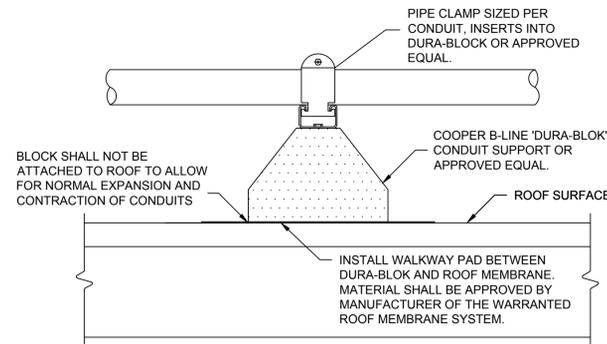
V <sub>MOC</sub> - Maximum Open Circuit Voltage - Temperature Adjusted	Project	WCSU Midtown Student Center Roof-Top PV Array
	Date	12/10/2013
	S	Number of SW 250 Mono Modules per String
	V <sub>oc</sub>	Module Open Circuit Voltage Rating
	STC	Standard Test Conditions
	T <sub>MIN</sub>	ASHRAE EAMMDDB Temp. for Danbury, CT
	T <sub>STC</sub>	Ambient Temperature at STC
	βV <sub>oc</sub>	Manufacturer's Temperature Coefficient
	V <sub>MAX</sub>	Maximum Module Open Circuit Voltage
V <sub>MOC</sub>	Maximum String Open Circuit Voltage	553.32 Volts

drawing title			STATE OF CONNECTICUT DEPARTMENT OF CONSTRUCTION SERVICES		
EQUIPMENT CALCULATIONS			R E V I S I O N S		
mark	date	description	DRAWING PREPARED BY		date
1	10.04.13	DESIGN DEVELOPMENT 60%	ARMM ASSOCIATES, INC.		10/07/13
2	12.10.13	CONSTRUCTION DOCUMENTS 100%	725 KENILWORTH AVENUE CHERRY HILL, NEW JERSEY 08002		scale 3/32"=1'-0"
3	01.20.14	BID PHASE	project		drawn by CTD
4	03.26.14	DSBI COMMENT RESPONSE	SOLAR ELECTRIC DESIGN WESTERN CONNECTICUT STATE UNIVERSITY MIDTOWN STUDENT CENTER		approved by FJM
5	07.15.14	BID DOCUMENTS			drawing no.
6	12.04.14	RE-BID DOCUMENTS			PV.3
CAD no.		xx\johxx	project no.		BI-RD-276A

**SPECIFIC INSTALLATION NOTES:**

- PV SOURCE CIRCUITS SHALL BE GROUPED AND ROUTED IN 1-1/2" PVC SCHEDULE 40 SLEEVES FROM MODULES TO COMBINER BOXES
- DC OUTPUT CIRCUITS AT THE ROOF (FROM COMBINER BOXES TOWARDS THE INVERTER) SHALL BE ROUTED IN PVC SCHEDULE 40 RACEWAYS. SAID RACEWAYS SHALL BE SUPPORTED ON 4" x 4" PRESSURE TREATED WOOD BLOCKS WITH ALUMINUM UNISTRUT (SLOTTED CHANNEL METAL FRAMING) AND STAINLESS STEEL CLAMPS.
- RACEWAYS ROUTED DOWN FROM THE ROOF AND / OR ALONG BUILDING EXTERIOR WALLS SHALL BE RIGID METAL CONDUIT (GALVANIZED RIGID STEEL). INPUT AND OUTPUT RACEWAYS CONNECTING TO THE INVERTER SHALL BE LIQUID-TIGHT FLEXIBLE METAL CONDUIT.
- BUILDING INTERIOR RACEWAYS (FROM THE MFDSPV TO THE POC) SHALL BE ELECTRICAL METALLIC TUBING.

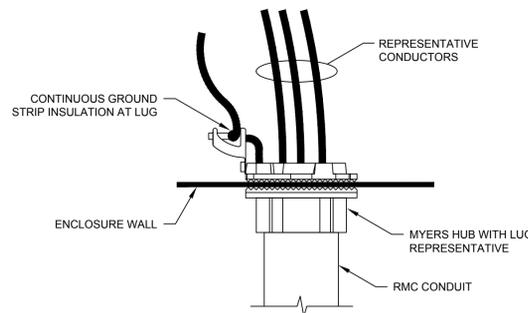
**NOTE: CONDUIT SUPPORTS SHALL BE COOPER B-LINE, DURA-BLOCK (800-851-7415). ALTERNATE CONDUIT SUPPORTS WILL BE CONSIDERED BY THE A/E DURING THE SUBMITTAL PROCESS.**



**DETAIL**

**1**  
**PV.4**

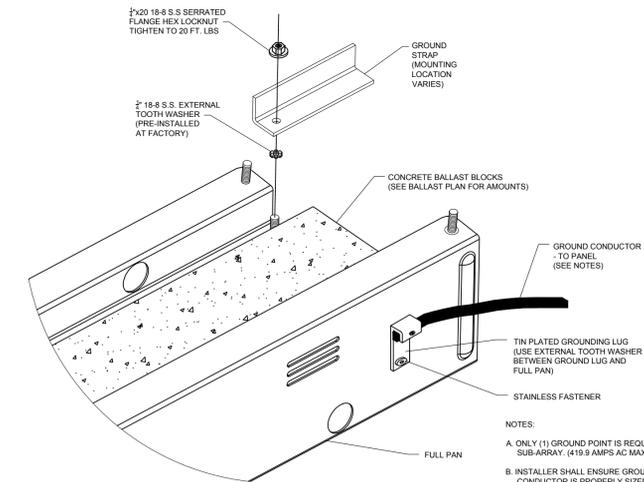
DRAWING NOT TO SCALE  
CONDUIT SUPPORT DETAIL  
ON ROOFING SURFACE



**DETAIL**

**2**  
**PV.4**

DRAWING NOT TO SCALE  
METALLIC CONDUIT GROUNDING DETAIL



**DETAIL**

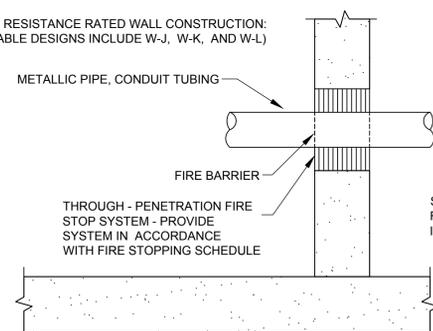
**3**  
**PV.4**

DRAWING NOT TO SCALE  
PV ARRAY GROUNDING DETAIL

**INSTALL WALL PENETRATION FIRE PROTECTION PER UFC\_3\_600\_01 (2-4.2) FOR EACH LOCATION WHERE A FIRE BARRIER (FIRE RESISTANCE RATED WALL CONSTRUCTION) IS PENETRATED, PROVIDE A UL-LISTED THROUGH-PENETRATION FIRE STOP ASSEMBLY IN ACCORDANCE WITH THIS SCHEDULE AND IN COMPLIANCE WITH ADDITIONAL REQUIREMENTS SPECIFIED BY THE NFPA OR BY ANY OVERRIDING JURISDICTION CONSTRUCTION STANDARDS APPLICABLE TO EACH PENETRATION CONDITION.**

ACCEPTABLE SYSTEMS FOR WALL PENETRATIONS		
CONCRETE OR MASONRY WALLS WITH A MINIMUM THICKNESS LESS THAN OR EQUAL TO 8 INCHES	CONCRETE OR MASONRY WALLS WITH A MINIMUM THICKNESS GREATER THAN TO 8 INCHES	FRAMED WALLS (VARYING THICKNESS)
W-J-1000 - 1999	W-K-1000 - 1999	W-L-1000 - 1999

FIRE RESISTANCE RATED WALL CONSTRUCTION: (APPLICABLE DESIGNS INCLUDE W-J, W-K, AND W-L)

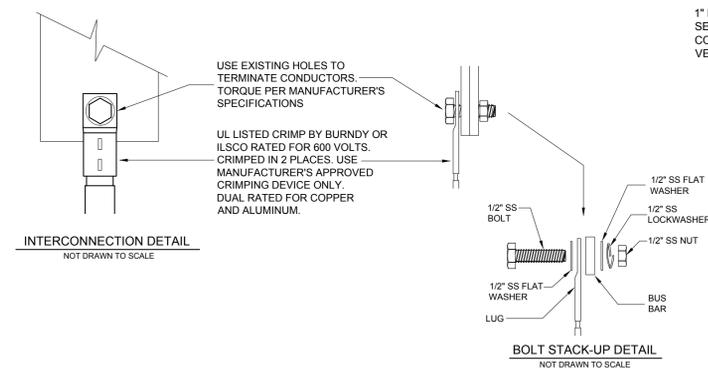
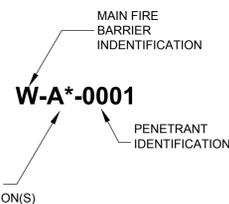


**DETAIL**

**4**  
**PV.4**

DRAWING NOT TO SCALE  
TYPICAL THROUGH - PENETRATION  
FIRESTOP SYSTEM DETAIL

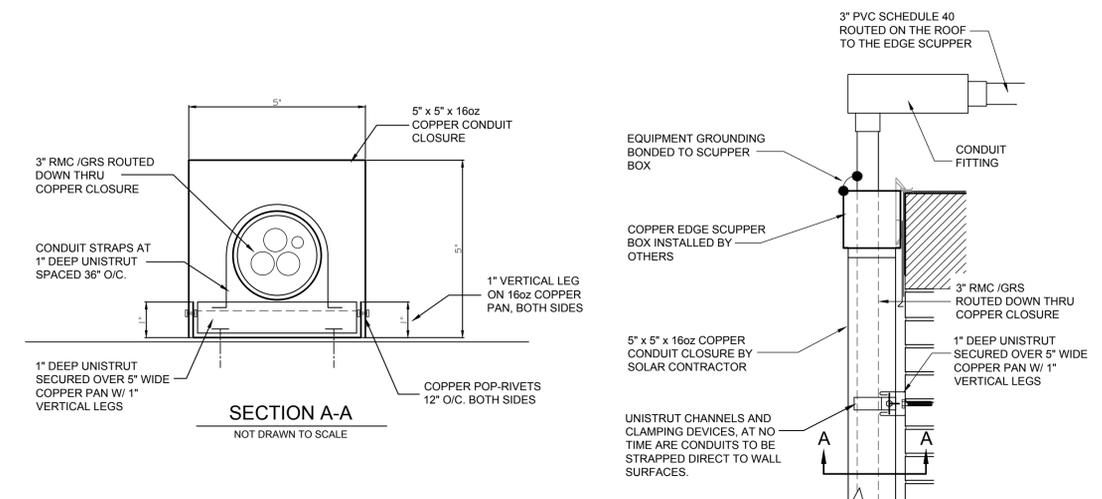
**NUMBERING SYSTEM:**



**DETAIL**

**5**  
**PV.4**

DRAWING NOT TO SCALE  
SUPPLY SIDE POC PER NEC 690.64 (A)

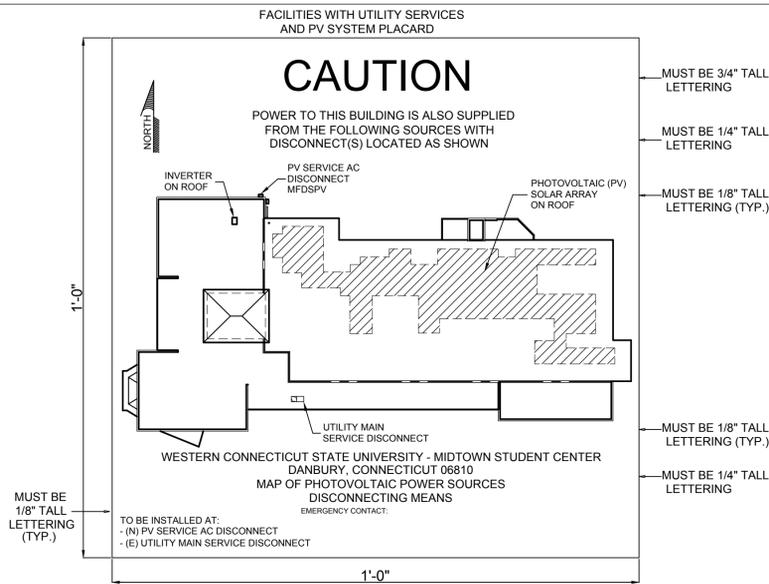


**DETAIL**

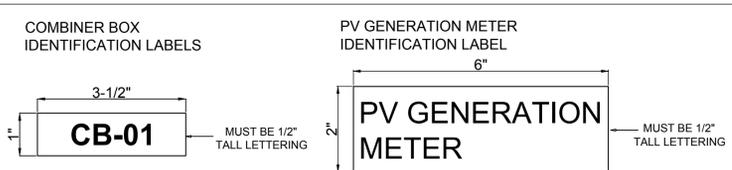
**6**  
**PV.4**

DRAWING NOT TO SCALE  
COPPER CONDUIT CLOSURE

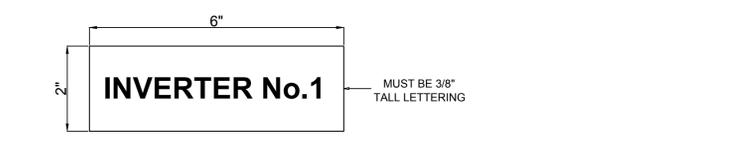
drawing title			STATE OF CONNECTICUT DEPARTMENT OF CONSTRUCTION SERVICES	
GENERAL PV DETAILS			DRAWING PREPARED BY	
REVISIONS			ARM ASSOCIATES, INC.	
mark	date	description	725 KENILWORTH AVENUE CHERRY HILL, NEW JERSEY 08002	
1	10.04.13	DESIGN DEVELOPMENT 60%	project	10/07/13
2	12.10.13	CONSTRUCTION DOCUMENTS 100%	SOLAR ELECTRIC DESIGN WESTERN CONNECTICUT STATE UNIVERSITY MIDTOWN STUDENT CENTER	scale 3/32"=1'-0"
3	01.20.14	BID PHASE		drawn by CTD
4	03.26.14	DSBI COMMENT RESPONSE	approved by FJM	
5	07.15.14	BID DOCUMENTS	drawing no.	
6	12.04.14	RE-BID DOCUMENTS	CAD no. axl/box	project no. BI-RD-276A



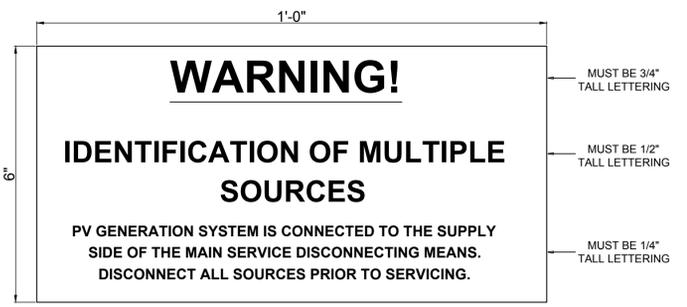
**A** FACILITIES WITH UTILITY SERVICES AND PV SYSTEMS DIRECTORY  
SCALE: NTS



**B** EQUIPMENT IDENTIFICATION LABELS  
SCALE: NTS

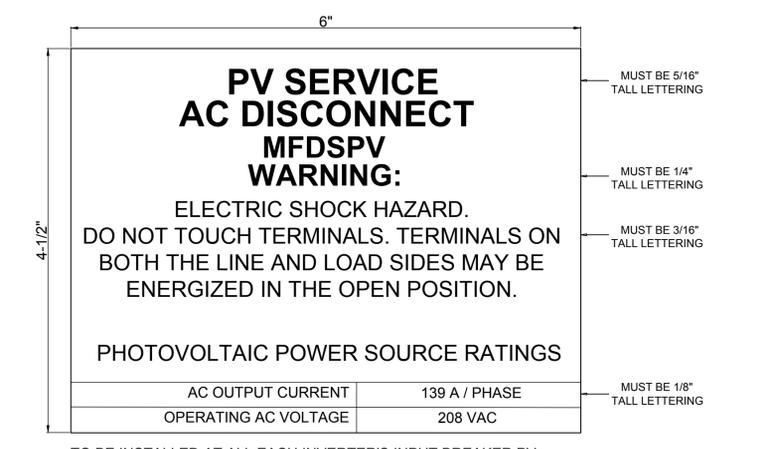


**C** INVERTER IDENTIFICATION LABEL  
SCALE: NTS

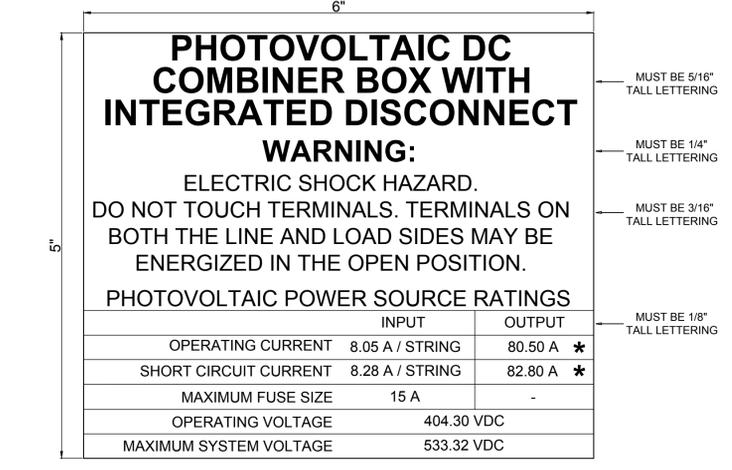


TO BE INSTALLED:  
- (E) UTILITY MAIN SERVICE DISCONNECT  
- (N) PV SERVICE AC DISCONNECT

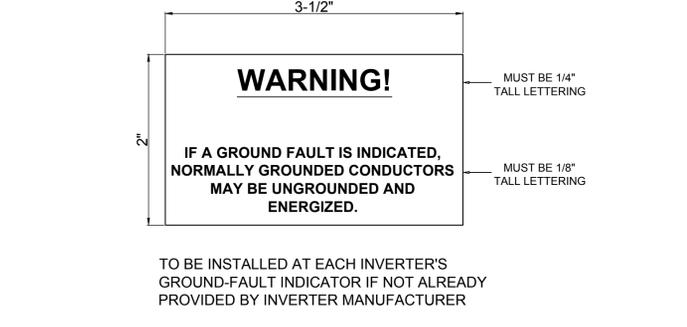
**D** IDENTIFICATION OF MULTIPLE SOURCE PLACARD  
SCALE: NTS



**E** PHOTOVOLTAIC SERVICE AC DISCONNECT LABEL  
SCALE: NTS



**F** DISCONNECTING COMBINER BOX LABEL  
SCALE: NTS



**G** INVERTER GROUND-FAULT PROTECTION IDENTIFICATION LABEL  
SCALE: NTS

- NOTES:**
- PLACARDS SHALL BE LOCATED ON THE MAIN SERVICE DISCONNECT AND SHALL CONFORM TO THE FOLLOWING:
    - MARKING CONTENT: CAUTION: SOLAR ELECTRIC
    - SYSTEM CONNECTED
    - RED BACKGROUND
    - WHITE LETTERING
    - MINIMUM 3/8" LETTER HEIGHT
    - ALL CAPITAL LETTERS
    - ARIAL OR SIMILAR FONT, NON-BOLD
    - REFLECTIVE, WEATHER RESISTANT MATERIAL
    - SUITABLE FOR ENVIRONMENT WITH UV PROTECTIVE LAMINATE
  - PLACARDS SHALL BE PLACED A MINIMUM OF EVERY 10' ALONG DC CONDUIT, RACEWAYS, ENCLOSURES, CABLES ASSEMBLIES, AND JUNCTION BOXES AND SHALL CONFORM TO THE FOLLOWING:
    - MARKING CONTENT: CAUTION: SOLAR ELECTRIC
    - SYSTEM CONNECTED
    - RED BACKGROUND
    - WHITE LETTERING
    - MINIMUM 3/8" LETTER HEIGHT
    - ALL CAPITAL LETTERS
    - ARIAL OR SIMILAR FONT, NON-BOLD
    - REFLECTIVE, WEATHER RESISTANT MATERIAL
    - SUITABLE FOR ENVIRONMENT WITH UV PROTECTIVE LAMINATE
  - ALL OTHER LABELS AND SIGNAGE NOT COVERED IN NOTES 1 AND 2 ABOVE SHALL CONFORM TO THE FOLLOWING SPECIFICATIONS, OAE:
    - MATERIAL: 0.010 HP12W
    - 467MP ADHESIVE
    - UV PROTECTIVE LAMINATE
    - BLACK & COLOR PRINT ON WHITE BACKGROUND

OR

    - METAL OR PHENOLIC WITH ENGRAVED OR MACHINE PRINTED LETTERS
  - ALL LABELS SHALL BE PRODUCED AT A UL APPROVED LABEL SHOP, SUCH AS PENMAR INDUSTRIES, INC., OR TECH TAG & LABEL, MOHAWK SAFETY, OAE.



**H** LABEL FOR EXISTING SERVICE DISCONNECT  
SCALE: NTS



**I** DC EQUIPMENT LABEL  
SCALE: NTS

DRAWING TITLE			STATE OF CONNECTICUT DEPARTMENT OF CONSTRUCTION SERVICES	
LABELS AND MARKINGS			REVISIONS	
mark	date	description	drawing prepared by	date
1	10.04.13	DESIGN DEVELOPMENT 60%	DRAWING PREPARED BY <b>ARM ASSOCIATES, INC.</b> 725 KENILWORTH AVENUE CHERRY HILL, NEW JERSEY 08002 project <b>SOLAR ELECTRIC DESIGN</b> <b>WESTERN CONNECTICUT</b> <b>STATE UNIVERSITY</b> <b>MIDTOWN STUDENT CENTER</b> CAD no. xxi/xxv project no. BI-RD-276A	10/07/13
2	12.10.13	CONSTRUCTION DOCUMENTS 100%		scale 1"=20'-0"
3	01.20.14	BID PHASE		drawn by CTD
4	03.26.14	DSBI COMMENT RESPONSE		approved by FJM
5	07.15.14	BID DOCUMENTS		drawing no.
6	12.04.14	RE-BID DOCUMENTS		<b>PV.5</b>