



Technical Memorandum

Solar Photovoltaic Program Volume 2 Design Guideline Technical Memo

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Synopsis

The present document and all attached sketches provided in appendices are provided as a means to clarify some requirements and preferences regarding the design of photovoltaic systems commissioned for installation within the properties falling under the responsibility of the *City of Edmonton*.

Intent of Use

This section was developed for establishing PV design guidelines for the *City of Edmonton* expectations in the design and construction of their facility assets. Care has been taken to confirm the accuracy of the information contained herein. The views expressed herein do not necessarily represent those of any individual contributor. As the design of the assets and systems described herein continually evolves, and practices change and improve over time, so it is necessary to regularly consult relevant technical standards, codes, and other publications rather than relying on this publication exclusively. *The City of Edmonton*, authors, and members of the review committee, want to convey that this document does not constitute a project specific design. As such, no part of this document alleviates the responsibility of the professionals retained to design and/or construct specific projects from taking full responsibility and authenticating their designs in accordance with APEGA, AALA, AAA, Alberta Building Code, and any other statutory or safety requirements.

Any Standard Drawings, Details, or specifications herein are provided to convey the *City's* typically ideal general arrangement and requirements. Representations may not be to scale, they may be substantially schematic in nature and/or require further elaboration and development. As such those documents are not suitable for integration into a specific implementation without review and modification and are only intended for use by a competent designer exercising professional judgment. The designer shall modify and supplement as necessary to provide a complete, properly functioning, design that conforms in all respects to the *City's* functional requirements. When actualized in a particular implementation it is the designer's responsibility to ensure the size, location, and spacing of all elements, and all components/specifications, are suitable and safe for the use and location intended, and any applicable code, legislative, and authority requirements are adhered to. In addition, any accessibility, operational and maintenance requirements must be met. Deviations from the represented nominal design parameters, questions of intent or accuracy, or any other apparent conflicts, shall be reconciled with an appropriate *City* representative. Finally, when employing any aspect of these documents, the ultimately responsible professional designer shall remove any authentication of the original author(s), note any provenance as appropriate, and apply their own authentication as required.



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1) Performance Specifications: Clarification

a) System Performances Monitoring (PV modules):

i) String inverter-based systems:

(1) PV Module level monitoring is preferred, especially if it can be coordinated with module level electronic systems combining rapid shutdown and optimizer functions. For details, see section 5b and 5c herein.

(2) Systems unable to provide PV module level monitoring are not preferred for large systems (250kVA) unless the inverter provides some form of string testing and/or monitoring.

ii) Micro inverter-based systems providing monitoring features of the PV models associated with them are also preferred.

iii) Designer / Supplier to confirm acceptability of monitoring functions with *City* representatives (Engineering Services and Project Manager).

b) Rapid Shutdown & Residual Voltage:

i) The selected solution shall be fully compliant with the latest edition of the CEC C22.1 section 64 and STANDATA 18-ECI-064 (November 2020) and provide the safe voltage levels of 30Vdc or less no more than 30 seconds following activation the of the Rapid Shutdown System (RSD) for any wiring located beyond 1 meter from the solar array.

ii) Where achievable, designers & installers may install inverters within 1 meter of the array to simplify the system installation.

iii) For additional details, see section 5b and 5c herein, and all attached appendices.

iv) Should additional STANDATA or CEC C22.1 publications (published after publication of the present document) apply, designers shall contact the *City* representative to discuss all applicable updated guidelines.

2) Facility's Power Demand & Quality:

- a) The PV array, and its inverters, once installed, shall not degrade the site's power factor and shall not increase the facility's harmonic distortion:
 - i) The facility's harmonic distortion shall remain within the limits set in the IEEE-519. During commissioning, the facility's performance shall be assessed at the point of common coupling (i.e. at or near the facility's utility connection).
 - ii) The site's power factor shall remain within the limits prescribed by the local power utility supplier.
 - iii) Refer to EPCOR's Customer Connection Guidelines for further details.
- b) Earliest steps of the detailed design: Designers shall assess a facility's power factor and harmonic distortion levels prior to installing a new PV array:
 - i) Existing Conditions: Where existing sites have an existing harmonic distortion level near or exceeding the limits prescribed by the IEEE-519, designers shall immediately warn the *City of Edmonton* and propose options to address the issue.
 - ii) Intent:
 - (1) Primary: The site's harmonic distortion shall be appraised to ensure it will not be detrimental to the PV inverters' operation and life expectancy.
 - (2) Secondary: The site's harmonic distortion shall be appraised to ensure it can be compared to the distortion levels measured once the PV system is operational (performance validation).
- c) Notes:
 - i) If present on site and appropriately located at the service entrance: It is acceptable to use the site's built-in Power Quality Meter (PQM)
 - ii) If no PQM is installed on site: The assessment (prior to installation, and during the commissioning) shall be measured using a portable Power Quality Meter (PQM).
 - iii) Note: The PQM shall be capable of measuring harmonic distortion spectrums up to the 50th order (both voltage and current). It shall be installed on site for 7 days and measure the facility's power demand (kW, kVA, kVAR), power factor, harmonic distortion (volt and amps) during that period. Measurements shall be at 15 minute intervals maximum.

- iv) See also section 3 for further details

3) Harmonic Mitigation & Power Factor Compensation

a) Power Factor compensation:

- i) Most grid connected PV inverters are only set up to inject power at unity power factor, meaning they only produce active power. In effect this reduces the power factor, as the grid is then supplying less active power, but the same amount of reactive power. For this type of system, the designer shall assess the effect on the site's power factor (PF) and recommend solutions to ensure the PF will remain within the limits prescribed by the local utility supplier.
- ii) Designer shall assess if the inverter bank, when operating at its full rated current output, may result in a collapse of the site power factor, or in a swing from lagging to leading power factor in a "power export" scenario:

(1) Feasibility study: The Power Factor (PF) changes driven by the proposed PV array shall be evaluated based on the array's proposed AC active power output and the site's known min and max active, reactive and apparent power demand.

(2) Earliest steps of the detailed design: Said review shall be coordinated with the Utility interconnection study typically prepared by the local utility supplier for large systems (e.g @ or > 250kW for EPCOR).

iii) Acceptable solutions:

(1) Inverter equipped with an option to compensate the power factor can be used. Designers, manufacturers and installers using such inverters shall ensure the practice will not result in PV output curtailment which can negatively impact the site's return on investment.

(2) Inverter not equipped with an option to compensate the power factor shall be paired with a form of active power factor compensation unit such as a multi stage capacitor bank for example. The capacitor bank should be detuned as required to prevent any detrimental resonance effect with the harmonic distortion generated by both the site's non-linear loads and the inverter's bank.

b) Harmonic Mitigation:

i) Brief & Intent:

(1) The facility's non-linear loads can generate detrimental harmonic distortion as discussed in the above section.

- (2) The PV inverters can both generate harmonic distortion & be negatively impacted by the harmonic distortion generated by the facility's loads.
 - (3) As applicable: Where harmonic distortion levels exceed the limits permissible by both the IEEE 519 and the inverter's manufacturer, filters shall be installed. When installed in conjunction with a PV system, the filter(s) shall protect the inverter against the facility's harmonic distortion, and the facility against the cumulated distortion generated by the inverter banks.
 - (4) Designers / Installer / Manufacturer are NOT responsible to address pre-existing harmonic distortion issues present at the sites scheduled for the installation of a PV array. They are however responsible to ensure that:
 - (a) The PV inverters will not contribute / worsen the site's harmonic distortion
 - (b) The PV inverters will not be damaged by existing harmonic distortion generated by the site's non-linear loads (current).
 - (c) The PV inverters will not be damaged by existing harmonic distortion generated by the site's non-linear loads & the utility source (voltage).
- ii) Filters:
- (1) When filters are required, active and passive technologies are acceptable. When used, passive technologies shall be capable of filtering any harmonic distortion present for any operating conditions. Passive filters limited to narrow frequency bandwidth are not desirable and may be rejected at the City's sole discretion.
 - (2) Filters should prevent the circulation of harmonic current within the facility. Designer shall recommend the best approach to install harmonic mitigating filters. As applicable/practical, filters should be located:
 - (a) As close as possible to the harmonic distortion sources,
and/or
 - (b) Between the facility's non-linear load(s) and the planned inverter bank(s).
- iii) Special Considerations for Step Up Transformers:
- (1) When step-up transformers are required to adapt the PV inverter(s) AC output to the available utility voltage or service entrance voltage, they can

be used as means to actively filter the harmonic distortion originating from both the inverter banks and the facility's non linear loads.

- (2) The designer shall specify a delta (primary) to zig-zag (secondary) transformer. Systems rated above 50kW shall be connected via at least two of those transformers. Each transformer pair shall be specified with one unit providing a phase-angle shift of zero (0) degree, and one unit providing a phase-angle shift of thirty (30) degree.
- (3) Each transformer pair shall be connected to a central AC collector panel. Said panel shall be tied to the facility's power distribution system via a single breaker located at the service entrance.
- (4) For additional details, refer to the typical single lines diagrams provided in the appendix located at the end of the present document.

4) Typical PV system topology / Concept SLD for integration within facilities (new or existing):

- a) The facility's PV system shall be tied to the facility's service entrance board (SWGR, CDP, PNL) via a single circuit breaker. Systems equipped with multiple inverters shall include a central AC collector panel where all inverter's AC outputs are interconnected.
- b) Designers shall not connect multiple inverters at multiple points within a distribution system. Inverters shall NOT be connected downstream of any transfer switches or on busses supplied from emergency power sources or other types of distributed generators such as Combined Heat and Power (CHPs) generators.
- c) For details on the acceptable interconnection topology, refer to the attached typical SLDs

5) Fire Alarm Interlocks (FAI), Rapid Shutdown System (RSS), and related means of disconnection

a) Fire Alarms Interlock (FAI):

- i) Facilities not classified as Emergency Response Centers or Post Disaster Recovery Centers shall not be equipped with an interlock between the fire alarm and their PV rapid shutdown system,
- ii) Facilities classified as Emergency Response Centers or Post Disaster Recovery Centers shall be equipped with a fire alarm interlock with the PV rapid disconnection system. Upon activation, the system shall be latched and shall require both a clearance of the fire alarm condition and of the PV system rapid disconnection mechanism as follows:

- (1) Clearing the fire alarm condition alone shall NOT result in resuming the operation (i.e.: power production) of the PV array
- (2) Clearing the PV arrays' rapid shutdown system shall NOT result in resuming the operation (i.e.: power production) of the PV array
- (3) Upon clearance of the fire alarm conditions, an authorised operator shall manually resume the operation of the PV system

b) Rapid Shutdown System (RSS): Standardized Interface

- i) The Rapid Shutdown System shall include a wall mount "master panel" located within the site's electrical service entrance room and several "slave" stations located near the PV array per code requirement.
- ii) Master Panel:

(1) Where present: Automatic / Fire Alarm Interlock (FAI): Features

- (a) **Automatic Control Interface:** 1 input from the fire alarm panel. This input shall be used to trigger the rapid shutdown mechanism of the PV system
- (b) **Pilot Light:** 1 red cluster LED indicating an activation of the rapid shutdown via the fire alarm input. It shall have a label indicating "PV Rapid Shutdown Activated by Fire Alarm / Clear Fire Alarm First to Reset". This pilot light shall be illuminated as long as the alarm condition is not cleared

(2) Manual Rapid Shutdown (ESTOP): Features

- (a) **Control Interface:** 1 "mushroom cap" emergency stop button (ESTOP) with latching mechanism and "twist to release" feature allowing site operators to manually activate the rapid shutdown system.
- (b) **Pilot Light:** 1 amber cluster LED indicating an activation of the manual (ESTOP) rapid shutdown. It shall have a label indicating "PV Rapid Shutdown Activated by ESTOP / Twist ESTOP to Clear". This pilot light shall be illuminated as long as the ESTOP is not cleared

(3) Rapid Shutdown System: Reset

- (a) **Control Interface:** A green push button (unlatched) shall be provided to allow site operators to resume the PV array's power production

(b) Pilot Lights:

- (i) One (1) green cluster LED indicating the PV system is producing power . It shall have a label indicating "PV System in Operation". This pilot light shall be illuminated only when the PV system is authorised to produce power
 - (ii) One (1) blue cluster LED indicating the PV system is ready but is not producing power. It shall have a label indicating "Rapid Shutdown Cleared / Press Green Button to resume Operation". This pilot light shall be illuminated only if BOTH the fire alarm condition and the ETSOP are cleared
- iii) Rapid Shutdown System: Slave/Remote Stations:
- (1) Control Interface:
 - (a) All slave stations shall be equipped with an ESTOP as described above for the Master Panel
 - (b) Location to be determined according to applicable code rules and validated with Facility's owner
 - (2) Pilot Lights:
 - (a) One (1) amber cluster LED indicating an activation of the rapid shutdown (any condition). It shall have 2 labels indicating:
 - (i) "PV Rapid Shutdown Activated by ESTOP / Twist ESTOP to Clear". Voltage level is 30Vdc or less 1 meter from the PV array".
 - (ii) "Warning, PV array is active, shock hazard may still be present within PV array area. Stay clear from equipment".
 - (b) One (1) green cluster LED indicating the PV system is producing power. It shall have 2 labels indicating:
 - (i) "Warning PV System in Operation"
 - (ii) "Warning Shock Hazard, PV array is active, dc voltage exceeds 30Vdc"
 - (c) One (1) blue cluster LED indicating the PV system is ready but is not producing power. It shall have 2 labels indicating:

- (i) "Rapid Shutdown Cleared / Press Green Button IN MAIN ELECTRICAL ROOM to resume Operation"
 - (ii) "Warning Shock Hazard, PV array is active, dc voltage exceeds 30Vdc"
- iv) Rapid shutdown control voltage:
 - (1) Control voltage to be 120Vac. When a fire alarm input is present, the designer shall add an interposing relay as required for ensuring compatibility with the fire alarm voltage.
 - (2) 120Vac source to be provided from a dedicated branch circuit supplied from the utility. Branch circuits shall be on emergency power where available.
- v) Typical rapid disconnecting control circuit: Refer to attached typical concept drawing (concept to be refined by designer based on facility's specific conditions)

c) Rapid Shutdown System (RSS): Rapid Disconnection Means

- i) AC Side: the rapid disconnecting means shall act to immediately open the AC branch circuit tying the PV system to the facility. Typically, this shall be achieved by using a branch circuit breaker equipped with a shunt trip. This circuit breaker shall be installed at the facility's service entrance board and shall:
 - (1) Be equipped with a shunt trip circuit which will be rated 120Vac.
 - (2) Preferably be type "draw-out" to provide a visible means of isolation (i.e.: breaker drawn out).
 - (3) If the breaker is type "fixed frame" (i.e.: non draw-out such as a Moulded Case Circuit Breaker / MCCB), it shall be interfaced with the PV system via a wall mounted non fused load disconnect switch (NF-LDS). Said NF-LDS shall be equipped with a view glass providing operators with a direct view on the switch blades in both the open and closed position.
- ii) DC Side: Where required by the CEC C22.1 section 64, components shall be added to the Dc collector system to satisfy the conditions outlined in the November 2020 StanData 18-ECI-064 Electrical Code Interpretation:
 - (1) The means of maintaining the DC voltage at or below 30Vdc shall be achieved using module level electronic systems such as optimisers. Said system shall be certified as capable of acting as components of a DC rapid shut down system (within no more than 30 seconds).

- (2) The components used to implement a DC rapid shutdown scheme shall form an integral part of the PV array and related electronics (inverter and optimiser as required). They shall be sourced from either:
- (a) The same manufacturer (system shall be factory tested by said manufacturer).
- OR
- (b) From different manufacturers provided that said manufacturers or a third party can provide certificates indicating a full compatibility between different product lines supplied from different manufacturers (E.g. SunSpecs or approved equivalent. Designer and Installer shall coordinate with the *City* to confirm if the proposed third party coordinating authority is acceptable to the *City*).
- (3) The *City* or its designated representatives (such as third party commissioning agents) will not accept the responsibility to act as a system integrator.

d) For details, refer to the attached typical SLD.

6) Voltage Presence Indicators (VPI)

- a) VPI shall be added to the system per the attached typical SLD (see appendix for details)

7) Surge Protection Devices (SPD)

a) AC:

- i) The new photovoltaic system shall be equipped with AC surge protection. AC collector panels must be equipped with dedicated SPDs. Large string inverter shall also include a dedicated SPD protection.
- ii) Inverter's built-in AC-SPDs are acceptable if available and as long as the SPD module can be replaced if it fails.
- iii) Micro inverters installed behind the photovoltaic cells shall only be paired with SPDs installed on their AC side.

b) DC:

- i) DC-SPDs may be required on the DC collectors paired with string inverters. For details, refer to applicable standards and codes including applicable lightning Protection code CSA/CN B72 and IEEE

- ii) Inverter's built-in DC-SPD are acceptable if available and as long as the SPD module can be replaced if it fails.
- c) Applicable practices and Codes / Designer shall review and consider the practices as outlined in the following reference documents:
 - i) As listed by the CSA - IEC 61643-12: Low-voltage surge protective devices - Part 12: Surge protective devices connected to low-voltage power systems - Selection and application principles
 - ii) IEEE C62.41.2 Recommended Practice on Characterization of Surges in Low-Voltage (1000 V and Less) Ac Power Circuits IEEE C62.72 IEEE Guide for the Application of Surge Protective Devices for Use on the Load Side of Service Equipment in Low-Voltage (1000 V or Less, 50 Hz or 60 Hz) Ac Power Circuits
 - iii) As/If applicable & for reference only and as applicable to SPD in PV systems only:
 - (1) IEC 62305-3 Protection Against Lightning – Part 3: Physical Damage to Structures and Life Hazard
 - (2) IEC 62305-4 Protection Against Lightning – Part 4: Electrical and Electronic Systems Within Structures
- d) For details, refer to the typical PV system SLD in the attached appendices at the end of the present document.

8) Islanding and Coordination with other types of distributed generators:

- a) Facilities shall NOT operate their PV system in an islanding mode of operation (i.e.: when the connection to the utility source is lost)
- b) Facilities equipped with backup generators and or other types of distributed generators (DG) such as Combined Heat and Power units (CHPs) engineered to operate in parallel with the local utility source:
 - i) Where achievable, the PV inverters shall be tied at the facility's electrical utility service entrance, upstream of all transfer switches.
 - ii) Where facility's emergency generator(s), and/or distributed generator(s) can run in parallel with the PV array's inverters:
 - (1) In case of a loss of utility source(s): The site's distribution system shall be equipped with control means preventing the operation solely on PV inverters and distributed generators (anti islanding protection systems).

(2) If the anti-islanding protective feature of the PV system (i.e.: its inverters) can be defeated by the presence of an onsite power source:

(a) A site-wide anti-islanding protection system shall be designed and reviewed with the *City's* Key stakeholders. If such a system is already present, it shall be modified as required to shut down the PV system as required.

(b) It is permissible to use the above described rapid shutdown control panel as part of an anti-islanding control means to ensure the PV array will not remain in operation while the utility source is not available.

9) Coordination with the facility's Lightning Protection System (LPS):

a) Existing site:

- i) Existing LPS shall not be compromised by the addition of a PV array. The designer of the PV array shall appraise the topology of the existing LPS and propose all required changes to ensure the facility and the new PV array are protected.
- ii) All LPS design changes shall be made in full compliance with the practices of the CAN/CSA B72 standard

b) New sites:

- i) The LPS and PV array design shall be fully coordinated. The designer of the PV array shall appraise the topology of the proposed LPS and coordinate with the LPS designer.
- ii) The LPS design shall be made in full compliance with the practices of the CAN/CSA B72 standard

c) LPS and PV array coordinated design notes (new and existing sites):

- i) The design documents for new or existing facilities shall be based on the rolling sphere method. Coordinated design drawings shall be prepared to demonstrate that the LPS air terminals provide an appropriate coverage for the PV array
- ii) The designers shall ensure that the PV array bonding conductor ARE NOT connected directly or indirectly (i.e.: via the PV array's supporting structure) to the LPS arresting conductors, air terminals and down conductors.
- iii) For details, refer to attached reference sketches:

- (1) The coordination between LPS and PV shall be based on the practices prescribed by the latest edition of the CAN/CSA B72 .
- (2) A PV Designers should retain the services of an LPS engineer to assess all required LPS modifications.
- (3) Risk related to galvanic corrosion shall be factored in to prevent the apparition of issues between the roof structure, the PV structure, and the LPS.

10) City of Edmonton's "Solar PV Guidelines Volume 3 - 6.6.2" ERRATUM:

- a) As posted in the *City of Edmonton* guidelines

6.6.2 Wiring Labeling

All colour coding of wires shall be in accordance with standard 3 phase or single-phase power systems. **Contractors may elect to label black phase conductors with Yellow tape/shrink wrap.** Where wire identification is completed with tape or shrink wrap – the coloring should be applied to at least three (3) locations along the exposed length within the device. It is recommended that labeling be applied before conductors are pulled, and then replaced if damaged during the wire pull.

- b) Reference & Correction:

- i) Reference: Canadian Electrical Code Part 1 CEC C22.1 Rule 4-032.
- ii) Correction: Yellow shall NOT be used. Designer & Contractor to follow applicable CEC C22.1 rules for permissible phase colour selection.

11) Additional reference standards to be factored into the design and construction of PV systems

- a) IEEE 1547 IEEE Standard for Interconnection and Interoperability of Distributed Energy Resources with Associated Electric Power Systems Interfaces,
- b) IEEE 2778 - IEEE Guide for Solar Power Plant Grounding for Personnel Protection

12) Rodent Protection: Clarifications

- a) While rodent infestation and nesting is a concern for roof mounted PV array, the intent of the design guideline is to also address problems related to bird nests, starting first and foremost with pigeons.

13) Architectural Integration / Notes:

- a) Intent: Clarification applicable to facade mounted PV arrays, solar canopies, or architecturally integrated PV array (e.g.: semi transparent green house glass roof with PV cells)

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- b) Operation & Maintenance Requirement: The active components of such systems (inverter or micro inverters) shall be installed within accessible space. E.g.: other words, access for maintenance shall not require the installation of specialty scaffolding, or the use of platforms suspended on davit arms for high riser towers. For those systems, the inverters shall be installed in accessible dedicated spaces.

ELECTRICAL ENGINEERING
AUTHENTICATED BYENGINEERING QA
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VER	Date	Author	Review	Check	Description/Scope
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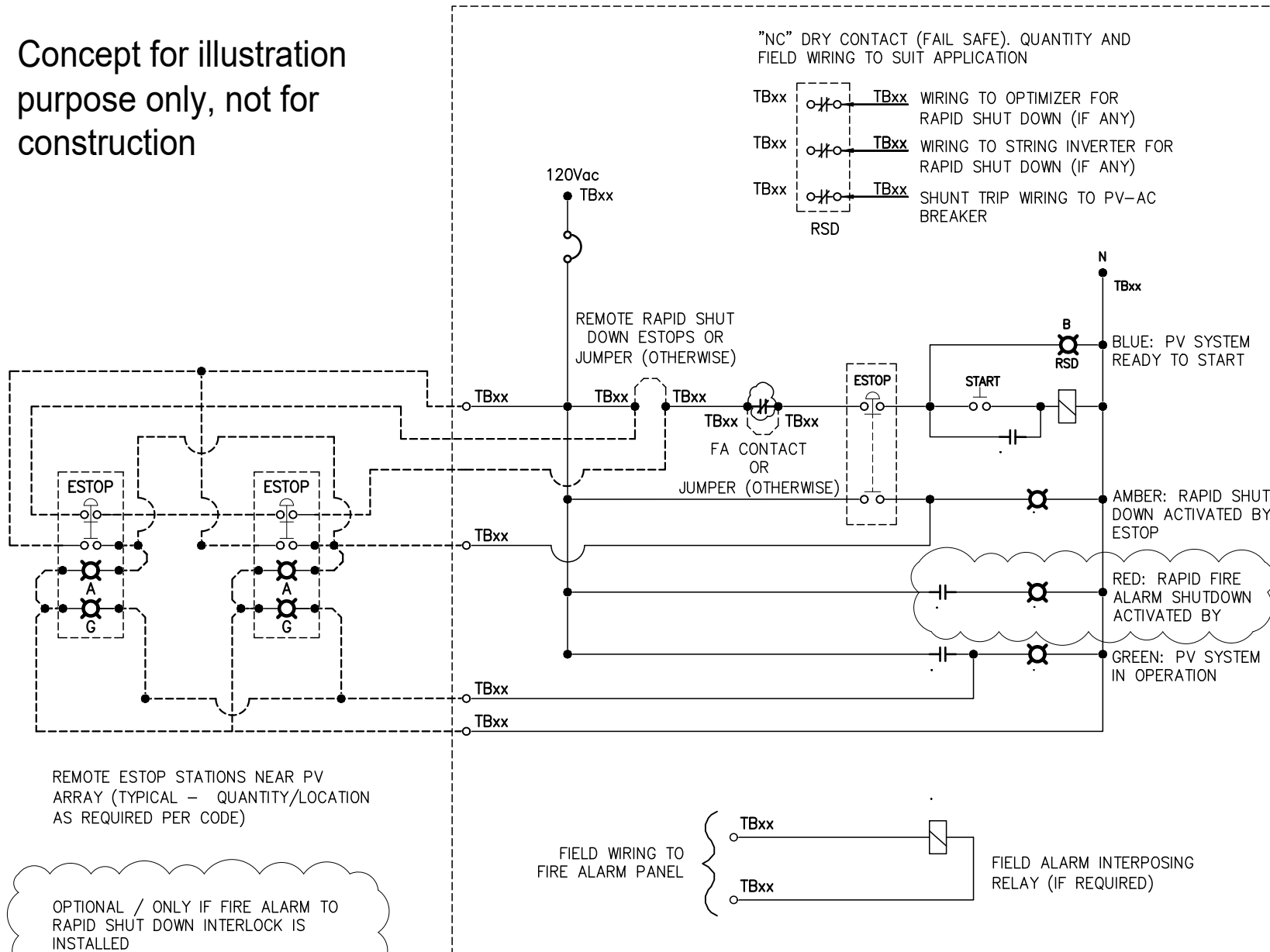
TECHNICAL MEMO

Solar Photovoltaic Program Volume 2 Design Guideline - Technical Memo

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APPENDIX A (typical details / concept sketches)

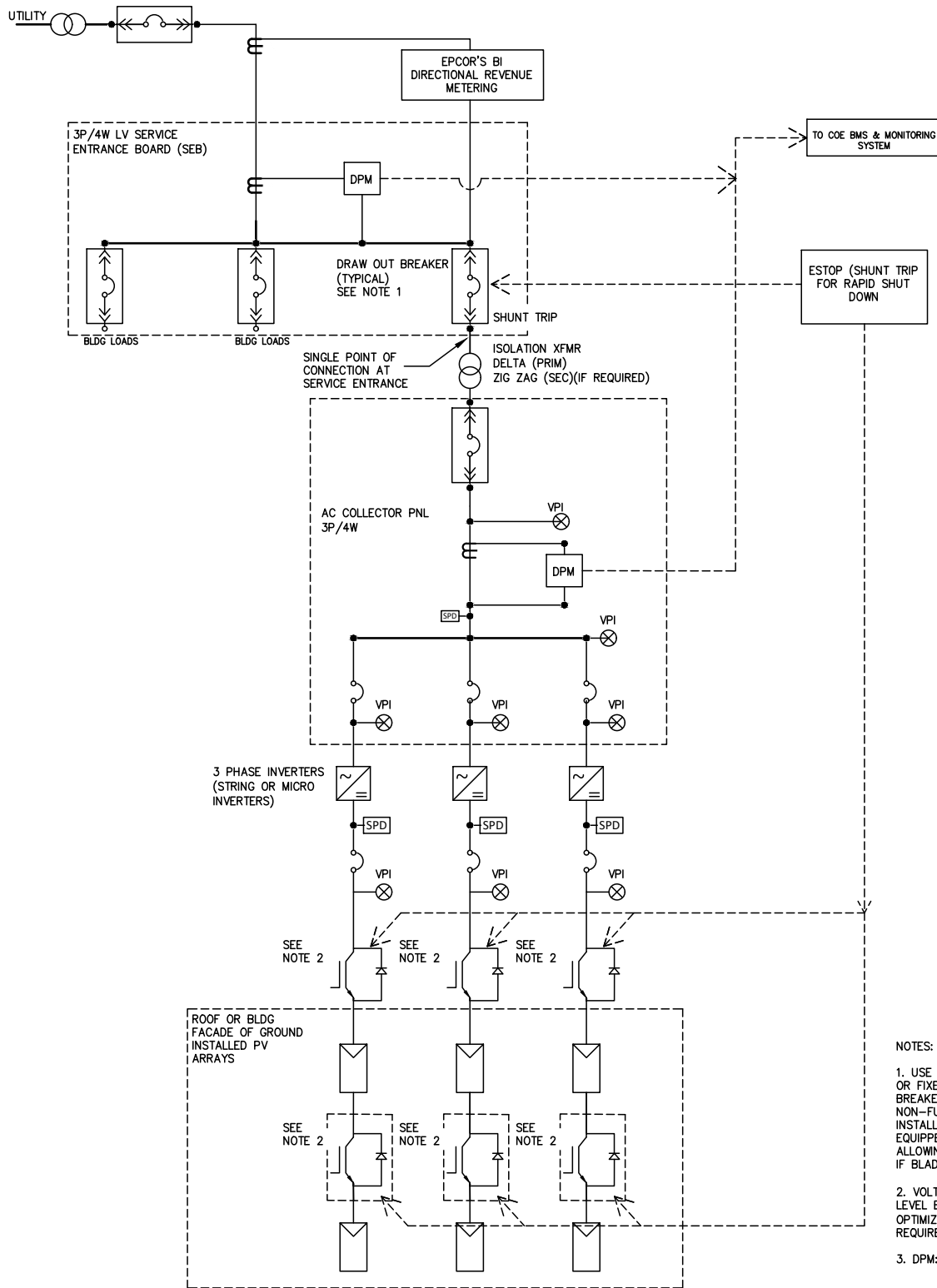
Concept for illustration
purpose only, not for
construction



Description	Project #	Author DN	Review PB	Check JM
	Localtion ID	ELECTRICAL		
Volume	1 of 4			
Sheet	E-1			
File	Solar PV Standard SK-2022-01-11.dwg			

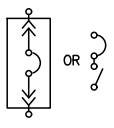
SOLAR PV STANDARD

PV RAPID SHUT DOWN MAIN INTERFACE PANEL

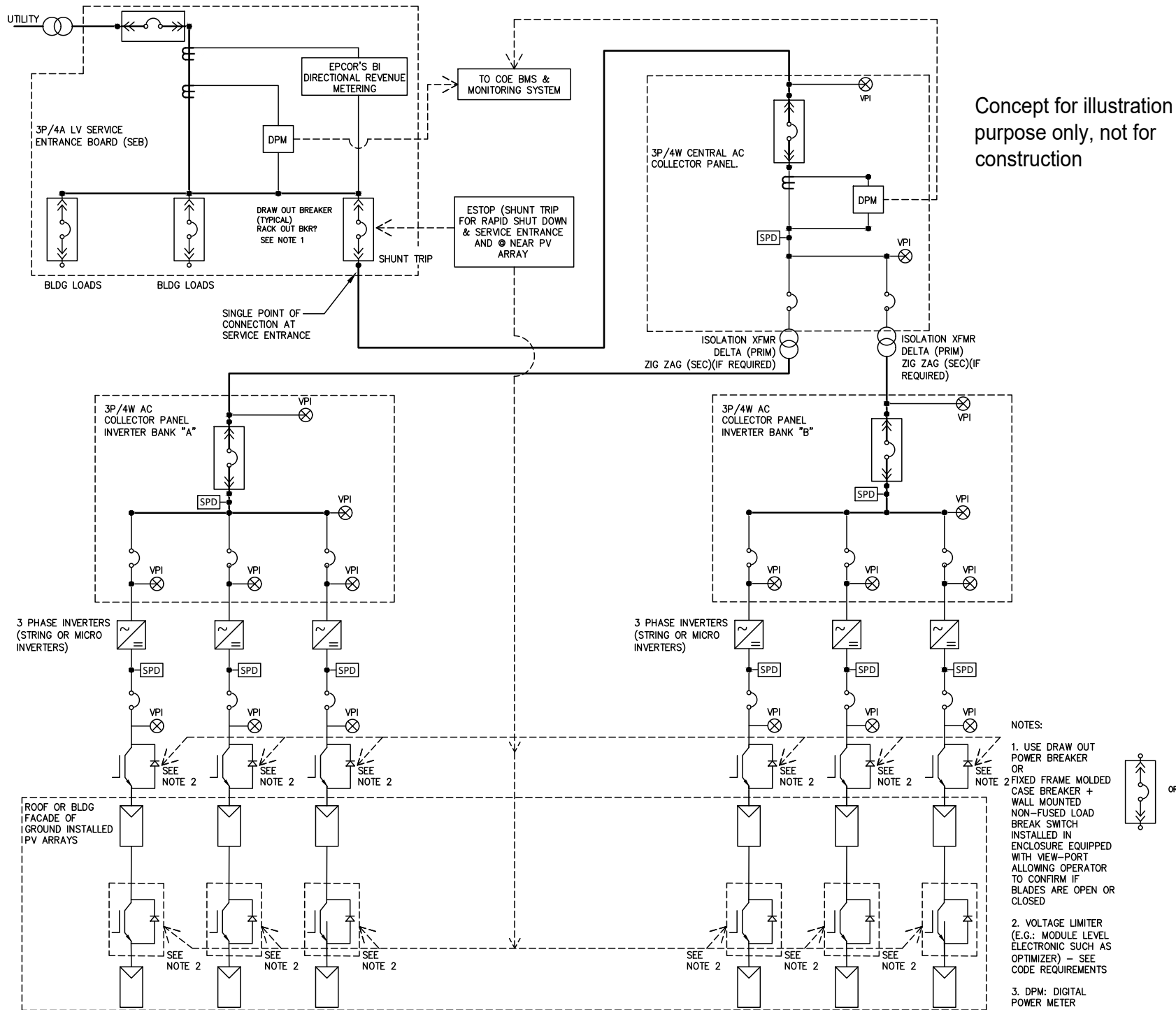


Concept for illustration
purpose only, not for
construction

- NOTES:
1. USE DRAW OUT POWER BREAKER OR FIXED FRAME MOLDED CASE BREAKER + WALL MOUNTED NON-FUSED LOAD BREAK SWITCH INSTALLED IN ENCLOSURE EQUIPPED WITH VIEW-PORT ALLOWING OPERATOR TO CONFIRM IF BLADES ARE OPEN OR CLOSED
 2. VOLTAGE LIMITER (E.G.: MODULE LEVEL ELECTRONIC SUCH AS OPTIMIZER) - SEE CODE REQUIREMENTS
 3. DPM: DIGITAL POWER METER



	SOLAR PV STANDARD		Description		
			Location ID	Project #	
			Discipline	ELECTRICAL	Author DN Review PB Check JM
	TYPICAL TOPOLOGY (SMALL SYSTEM @ OR <50KVA)		Volume		
			Sheet	2 of 4	Drawing Number
			File	Solar PV Standard SK-2022-01-11.dwg	



Concept for illustration purpose only, not for construction

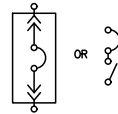
Description	Project #	Author DN	Review PB	Check JM
	Location ID	ELECTRICAL		
Volume	3 of 4			
Sheet	Solar PV Standard SK-2022-01-11.dwg			
File	E-3			

SOLAR PV STANDARD

TYPICAL TOPOLOGY (SMALL SYSTEM >50KVA)

NOTES:

1. USE DRAW OUT POWER BREAKER OR FIXED FRAME MOLDED CASE BREAKER + WALL MOUNTED NON-FUSED LOAD BREAK SWITCH INSTALLED IN ENCLOSURE EQUIPPED WITH VIEW-PORT ALLOWING OPERATOR TO CONFIRM IF BLADES ARE OPEN OR CLOSED
2. VOLTAGE LIMITER (E.G.: MODULE LEVEL ELECTRONIC SUCH AS OPTIMIZER) - SEE CODE REQUIREMENTS
3. DPM: DIGITAL POWER METER



NO INTERCONNECTION AT THE ROOF LEVEL BETWEEN THE PV'S BONDING SYSTEM AND THE LIGHTNING PROTECTION SYSTEM (LPS) GROUNDING/DOWN CONDUCTORS

SEPARATION DISTANCE KEPT

AIR TERMINAL AND DOWN CONDUCTORS

AC AND DC SPDS

GJB

PV FRAME'S BONDING

4/0 AWG Cu

SERVICE ENTRANCE BOARD

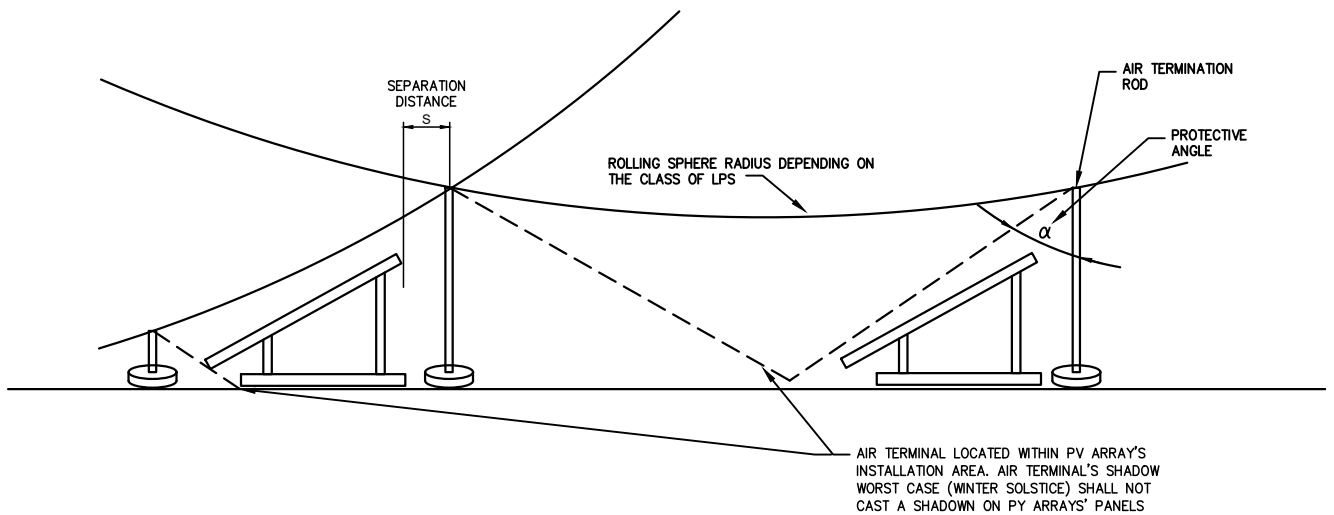
MAIN EQUIPMENT BOND

SECTION TO UTILITY TRANSFORMER

NEUTRAL BONDING TO GROUND AT SERVICE ENTRANCE ONLY (SOLID GROUND SYSTEM)

INTERCONNECTION BETWEEN LPS GROUND ELECTRODE AND BUILDING'S SERVICE ENTRANCE GROUND ELECTRODE BELOW GRADE IN ONE LOCATION ONLY. EACH SYSTEM TO BE PROVIDED WITH ITS OWN GROUND ELECTRODE

Concept for illustration purpose only, not for construction



SOLAR PV STANDARD

Description			
Location ID		Project #	
Discipline	ELECTRICAL	Author DN	Review PB Check JM
Volume		Drawing Number	
Sheet	4 of 4	E-4	
File	Solar PV Standard SK-2022-01-11.dwg		



Lightning Protection System and PV System Installation Coordination