Creating Infrastructure
A PPP INITIATIVE OF GOVERNMENT OF KERALA

NOTICE INVITING QUOTATION

For

SELECTION OF CONTRACTOR FOR SUPPLY OF BOS ITEMS AND I&C OF 2 MWp GRID CONNECTED GROUND MOUNT SOLAR POWER PLANT

INKEL Limited invites offers from reputed contractors for supply of BOS items and I&C of 2 MWp Grid Connected Ground Mount Solar Power Plant.

Name of work	SELECTION OF CONTRACTOR FOR SUPPLY OF BOS ITEMS AND I&C OF 2MWp GRID CONNECTED GROUND MOUNT SOLAR POWER PLANT
Location of work	Vannamada, Palakkad, Kerala
Date of publication of bid	**23.10.2026**
Site visit	Bidder shall visit the site before the submission of bid
Last date & Time of submission of Bid documents	**31.10.2026 @ 10:30 AM**
Opening of Bids	**31.10.2026 @ 11:30 AM**
Nature of the contract	Supply of identified BOS items, Installation, Testing and Commissioning of 2 MWp Solar Power Plant

1. INTRODUCTION

1.1. Brief Description of the project

1.1.1. INKEL Limited has taken up the design (as per site conditions), supply, erection, testing & commissioning of 2 MWp Grid Tied Ground Mounted Solar PV Power plants at Vannamada, Kerala.

1.1.2. The Supply of major components such as PV Modules, Module Mounting Structure (MMS), Power Conditioning Units (PCU) and Transformer are in the scope of INKEL Limited. Base design and engineering activities of the solar power plant will be carried out by INKEL.

1.1.3. INKEL intends to appoint a bidder for supply of Balance of system and carrying out identified activities under installation and commissioning of this grid connected ground mount solar power plants.

1.1.4. The plant is envisaged to have several other infrastructural support systems such as module cleaning system for SPV modules, plant illumination system, fire alarm system, SCADA and all other which is required for the commissioning of Solar

1.2. Location Details:

Place	Vannamada
District	Palakkad
State	Kerala
Language	Malayalam, English
Time zone	IST (UTC+5:30)
Latitude	10°41'30.52"N
Longitude	76°49'25.39"E

1.3. ELIGIBILITY CRITERIA

- 'Bidder' should be a Company/Limited Liability Partnership (LLP) firm/Partnership Firm/ Proprietorship firm in any form submitting the Bid. Any reference to the Bidder includes its successors, executors and permitted assignee.

- Vendor should have executed contracts of similar ground mounted Solar Power Plants with aggregated capacity of 1 MWp with Grid Connectivity HT Level with a single plant capacity of 250 kWp within last 5 years from the date of notice inviting bids.

- The bidder shall have an average annual turnover equal to or more than Rupees One Crores for the last five financial years immediately preceding the bid opening date. The bidders shall submit audited financial statements in support of their financial capability.

1.4. Scope of this tender specification

1.4.1. Bidder scope includes supply of BOS Materials, installation, testing and commissioning of 2 MWp solar photovoltaic power plant.

1.4.2. This scope includes activities but not limited to obtaining approval from INKEL for the datasheets/drawings/manufacture/testing/ inspection at manufacturer's works, packing, supply, transportation, transit insurance, delivery to site, unloading, storage of all materials including the materials supplied by INKEL, installation and commissioning of power plant identified under this specification.

1.4.3. The Bidder shall arrange and maintain, at its own cost, comprehensive insurance coverage for all materials and equipment associated with the project, including materials supplied by INKEL, from the date of receipt at site until the successful commissioning of the Solar PV Power Plant. The insurance shall cover all risks, including loss, damage, theft, fire, natural

calamities, accidents, and other risks as applicable during transportation, storage, erection, installation, testing and commissioning.

Note: The above is only a broad outline of bidder scope for the sake of introduction. The detailed bidder scope is elaborated under various other sections of this document.

1.5. Enclosures to this tender specification (Tender purpose only)

1	Tentative Single line diagram
2	Tentative SPV plant layout with solar array, Control rooms and transformer
3	Tentative layout of control room
4	Datasheet of PV Module & PCU
5	Tentative GA Drawings of MMS
6	Tentative BOM.

2. SCOPE OF WORK

2.1. INKEL Scope of supplies and works

For clarity to the bidder, other items and activities within INKEL scope of solar PV plant end of the project are listed below:

a. Supply of Solar PV Modules.
b. Supply of String Inverters.
c. Supply of Power Transformer.
d. Supply of Module Mounting Structure (MMS) including fasteners.
e. Obtaining sanction order from Chief electrical inspectorate.

2.2. Bidder Scope of supply, installation and commissioning

All other items and work required for the commissioning of the Solar Power Plant which are not included in Sl. No. 2.1 above are in the scope of the bidder.

3. TECHNICAL SPECIFICATION FOR SUPPLY, INSTALLATION & COMMISSIONING

3.1. Civil Works

3.1.1. Civil Design, Engineering and Construction Responsibility

INKEL will provide tentative drawings for the module mounting structure and Control Room, based on the preliminary project requirements. The bidder shall review and verify the same and shall be responsible for carrying out the detailed engineering and final design of all foundations and civil works required for the installation and commissioning of 2 MWp Solar PV Plant.

The bidder shall consider the actual dimensions, loads, equipment requirements and interface requirements of all applicable equipment, including but not limited to HT/LT panels, cable trenches, SCADA, control panels, UPS area and other associated electrical and mechanical equipment, while preparing the final civil drawings.

INKEL shall provide the design for the Civil & Foundations works for the MMS. Tentative drawings for the control room shall be provided by the INKEL, however, the bidder shall submit the detailed/final drawings, calculations and design documents for the Control Room and all other associated civil works to INKEL for verification and approval after award of the work and before commencement of the respective works at site.

In case of any change in design due to site conditions, the details shall be submitted to INKEL for approval, before executing the works.

All civil works, including foundations, equipment plinths, Control Room works, cable trenches, equipment yards shall be within the scope and responsibility of the bidder.

3.1.2. Mounting of Inverters and Inverter Accommodation

The bidder shall provide required materials for mounting the inverters as per manufacturer recommendations. The bidder shall provide canopy to protect inverters against direct sunlight, rain and harsh weather.

Suitable weather proof enclosures as per standards applicable in outdoor installations to be provided for inverters placing in outside systems and this area to be constructed as a yard.

3.1.3. **Illumination System**

Supplying and providing of suitable illumination system for inverter accommodation, control room area, transformer yard and PV yard area is in bidder's scope. The bidder shall opt for lighting fixtures and accessories based on energy saving concept technology such as LED.

3.1.4. **Building**

3.1.4.1. A control room is to be constructed for housing the SCADA unit, HT& LT panel, Battery and UPS for protective relaying and storage for other materials, approximately 6m x 8m size, clearances pertaining to the statuary compliance. painted with interior and exterior Emulsion, flooring with industrial floor tiles, doors/windows as specified to have sufficient ventilation, cable trenches etc. as per approved specifications. A toilet area of 2m x 2m shall also be provided. Control Room shall be constructed with an RCC roof.

3.1.4.2. Bidder shall supply materials and manpower to construct the control room as per approved drawings and other documents.

3.1.4.3. Tentative layout is given for tender purpose only. Bidder can choose the design of the control room with suitable dimension accommodating all the features specified in this clause and approval shall be sought for accepting the same during detailed engineering. Layout of control room will be finalized during detailed engineering by INKEL.

3.1.4.4. Bidder shall prepare the detailed civil design of the control room structure based on the requirement mentioned above and the tentative layout provided. The design and drawings of the control room

shall be submitted to INKEL for approval and approval shall be obtained before construction.

3.1.5. **Electrification**

Electrification of building shall be carried out as per IS 732 and other relevant standards. Only energy efficient LED light fixtures shall be used. The design of lighting system in the buildings shall be carried out as per IS 3646. The building shall be provided with adequate quantity of light fittings, 5A/15A 1 phase sockets, fans etc., controlled by required ratings of MCBs and MCB DBs.

3.2. Electrical power and water for construction

The Bidder shall organize, on their own, necessary electrical power supply such as DG sets and water supply etc. required for construction activities.

3.3. Construction of temporary yards for safe storage of Materials

Bidder shall, at a suitable location at the site, as decided based on discussions with INKEL site engineer, construct temporary yards for safe storage of all Materials.

3.4. Civil works for transformer yard and foundation construction.

3.4.1. Bidder shall also construct the transformer foundations as well as transformer yard for accommodating 1.8 MVA transformer.

3.4.2. Bidder should submit the drawing for approval of INKEL before construction.

3.5. Unloading, safe storage and movement of supply items received at site:

3.5.1. **Items supplied by bidder**

3.5.1.1. Bidder shall organize all necessary resources such as labour, machinery and tools (cranes, hydra, forklifts, transportation trucks/trolleys, lifting accessories etc.) for unloading the items (supplied by the bidder) received at site and subsequent movement to storage yards.

3.5.1.2. Similar arrangements shall also be made by bidder for movement of the stored items from storage yards to the exact construction locations within the project site.

3.5.1.3. Bidder shall maintain proper documentation/compilation of all the records related to shipping (invoices, LRs, material receipt certificates etc.) and shall take approval from INKEL site engineer for every consignment. The documents shall be suitably preserved for further handing over to INKEL.

3.5.1.4. Registers shall be maintained for the storage yard to keep track of incoming/outgoing items.

3.5.1.5. Safety of items shall be in bidder's scope. Accordingly, suitable watch and ward shall be deployed on round-the-clock basis.

3.5.2. **All other items (supplies from INKEL and Bidder)**

3.5.2.1. Receipt and unloading of all materials supplied by INKEL except SPV Modules, Inverters, MMS and Transformers will be in the scope of the bidder.

3.5.2.2. Movement of all these items from their respective storage locations to the points of construction is in scope of bidder. Accordingly, bidder shall organize all necessary resources such as labour, machinery and tools (cranes, hydra, forklifts, transportation trucks/trolleys, lifting accessories etc.) for this purpose.

3.6. Installation of Module Mounting Structure (MMS) and mounting of PV modules

3.6.1. The installation of MMS and installation of PV modules shall be in the scope of the bidder and carried out as per approved drawings and instructions from INKEL.

3.6.2. The bidder shall remove plastic laminations on the module frame if any before installation.

3.7. Laying of DC cables for interconnection of SPV modules and inverters

3.7.1. Supply of SPV modules is in INKEL scope.

3.7.1.1. Type of module: N-Type Topcon

3.7.1.2. Capacity: 625Wp

3.7.1.3. Total Capacity as per power plant capacity.

3.7.2. The bidder shall supply the following items for DC cable laying

3.7.2.1. UV rated DC cables 4 or 6sqmm for interconnection of SPV modules and the inverters.

3.7.2.2. DC Distribution boards with fuses, SPDs and isolators of suitable ratings as per SLD

3.7.2.3. Suitable MC4 connectors, Y connectors, UV rated cable ties

3.7.2.4. Double Walled Corrugated pipes with suitable connectors and sizes as per requirement.

3.7.2.5. Cable ferrules and tools required for cutting and crimping of cables and connectors and laying the cables

3.7.3. 4 Sqmm cables shall be used for interconnecting the PV modules for route length up to 40meters. If route length is more than 40meters then 6sqmm cable is to be used for interconnecting the solar PV modules to the inverters.

3.7.4. Routing of cable should be as per relevant IS standards.

3.7.5. If cable is to be routed between the rows of solar array, then cables with HDPE pipes (and Couplers / Joints etc) shall be directly buried under ground as per IS1255.

3.7.6. Cable entry openings of conduits shall be sealed using appropriate sealants

3.7.7. Maximum of seven circuits shall be run through one conduit and fill ratio of 50% space is occupied by cables.

3.7.8. Cable ties, nylon polyamide 6.6 UV stabilized black, UL94 flammability rating V2, operating temperature up to 85 deg C, shall be used to arrest any possibility of movement or sagging. Cable ties shall be of make: 3M, Phoenix contact, Weidmuller, Hellermanntyton, Panduit or other reputed equivalent subject to approval of INKEL.

3.7.9. Solar cables, wherever exposed to direct sunlight (including gaps between tables) and buried underground, shall be laid through Double Wall Corrugated (DWC) HDPE conduits.

3.8. Underground cable trenches and laying of Power and communication cables

3.8.1. Depth from ground surface to the top of the cable shall not be less than 0.9

meters for 11 kV cables

3.8.2. Depth from ground surface shall not be less than 0.75 meters for LT power cables and control cables

3.8.3. Clearance between control and power cables shall not be less than 0.3 meters

3.8.4. Cables should be laid as per IS 1255 latest revision

3.9. Termination of cables at terminals of String Inverters (PCU).

3.9.1. Cables should be laid as per IS 1255 latest revision

3.9.2. The cables should be terminated at the string inverter terminals as per manufacturer recommendations.

3.9.3. Ferrules should be provided for identification of the cables.

3.10. Identification marking of cables using cable tags

3.10.1. Cable tags shall be provided on all power cables at both ends just before entering the equipment enclosure and every 20 m on cable tray or trench run.

3.10.2. Cable tags shall be of rectangular shape.

3.10.3. Cable tag shall be of 2mm thick Aluminium with number punched (embossed) on it and securely attached to the cable by not less than two turns of 20 SWG GI wire conforming to IS:280.

3.10.4. ID numbering scheme shall be provided to after Purchase order placement. Bidder shall submit the technical details of cable tags for INKEL approval during detailed engineering.

3.11. Installation of string inverters

3.11.1. The string inverter shall be installed as per the layout drawing and instruction manual.

3.11.2. Suitable angular/frame support with concrete foundation shall be provided as required along with canopy to protect the inverters from harsh rain and direct sunlight.

3.11.3. The ground below the inverter shall be provided with gravel to prevent water & mud spillage onto the inverter during rains.

3.12. Installation of electrical panels within main control room

3.12.1. Installation of LT distribution panels

3.12.2. 11kV HT breaker panel: 1 Set

3.12.3. Distribution boards (wall mounted): UPS DB, Auxiliary DB (room utilities), 1 No each + any extra boards as required

3.12.4. SCADA panel and sensors: 1 Set

3.12.5. HMI SCADA control desk with PCs and accessories: 1 set

3.12.6. UPS with battery bank, 5 kVA – 1 Nos

3.12.7. Panels shall be moved to the respective positions and placed over the cable trenches in control room, in the exact sequence and locations as per drawings. Drawing shall be provided after placement of purchase order.

3.12.8. HT breaker panel shall be placed on cable trench of main control room, with cable entry openings to match cable trench on bottom side.

3.12.9. Panels shall be suitably grouted using welding/ bolting methods as per relevant standards and recommendation of OEMs. INKEL approval shall be obtained for the grouting arrangement. All necessary hardware for the same shall be within bidder's scope of supply.

3.13. Cable Trench inside control room

3.13.1. Cable trenches shall be provided inside the control room for routing LT and HT cables.

3.13.2. Open trenches after installation of LT & HT panels shall be covered with removable chequered plate of sufficient thickness.

3.13.3. The cable trench shall be wide and deep enough to accommodate the cables running through the trench as per standards.

3.14. Supply and Installation of cable trays, cable laying/dressing etc. in main control room

3.14.1. Installation of cable trays

3.14.2. Bidder shall supply and install cable trays, fittings and accessories within control room for laying 11kV HT, DC/AC LT, control, communication cables etc. Cables trays shall be ladder type with horizontal corner bend pieces and shall have 750mm minimum width, 3mm minimum thickness and 100mm minimum height. Drawings/ make/ part number of these shall be submitted for INKEL

approval.

3.14.3. Cable trays shall be installed by Bidder on MS support angles provided in cable trench

3.14.3.1. Cable trays shall be in three vertical layer arrangements: bottom for 11 kV cables, middle for LT AC/DC cables and top for control/data/ communication cables.

3.14.3.2. Suitable cut outs, wherever applicable, shall be made in the cable trays to provide path for the cable to reach the panel.

3.14.3.3. Cable trays shall be double earthed to the earth mat grid of the room.

3.15. Cable routing, laying, dressing

3.15.1.1. All Cables entering into control room from outside (solar array/ transformer yards) shall be bunched appropriately LT/HT/control category wise. The multiple bunches shall be routed through PVC conduit pipes already provided in the building below the plinth beam of room.

3.15.1.2. Cables (HT, LT, communication, control etc.) shall be laid on cable trays in separate tiers with appropriate spacing as per IS: 1255.

3.15.1.3. Control/data/ instrumentation cables that run from inverter rooms to marshalling box of inverter transformers shall be routed through HDPE DWC conduit pipes of appropriate size.

3.15.1.4. Cables shall be dressed using appropriate cable ties at appropriate intervals to ensure firmness of their position over the trays.

3.15.1.5. Trefoil clamps shall be used wherever single core cables are used for three phase system. These clamps shall be at appropriate intervals to ensure firmness of bunching of cables.

3.15.1.6. All cable entry openings of conduit pipes, after laying/ termination of the cables, shall be sealed using appropriate sealant to ensure CLEA proof tightness.

3.15.1.7. All cable accessories such as cable conduits/pipes, ties, trefoil clamps, sealants etc for the above purpose shall be in bidder scope of supply.

3.15.1.8. All the supply and installation work as mentioned above shall be as per "Cable installation methodology" section of this specification and as per drawings. Drawings shall be provided after placement of purchase order.

3.16. Laying, termination of LT/HT/aux supply cables main control room and in associated transformer

3.16.1.1. For all electrical panels viz. PCUs/ LT Panels / HT VCB panels/ UPS/ battery bank /DB boards/ transformers, laying and termination of LT/HT/Aux power cables shall be in Bidder scope.

3.17. 11 kV HT cable Laying and termination from power transformer to 11 kV RMU

The 11 kV HT cable laying and termination work between power transformers to the HT VCB panel inside the control room and VCB Panel to 11 kV RMU shall be in the scope of the bidder.

3.18. Laying and installation of Control/data / instrumentation / Communication cables

3.18.1. All the cable installation accessories such as cable trays, cable conduits, cable glands, cable lugs, ferrules, cable ties, bolts, nuts, washers etc. shall be in bidder scope of supply. Cable laying and cable terminations shall be bidder scope. All necessary resources such as labour, tools and accessories required to carry out laying and termination works etc. shall be in Bidder scope.

3.18.2. Bidder shall lay and terminate the RS485 cables to SCADA from all plant equipment e.g. HT panels, ACDBs, transformers, UPS etc. These cables shall be laid between the panels of respective inverter/ main control rooms.

3.18.3. Bidder shall lay and terminate the Ethernet cables to SCADA from (a) PCUs, (b) numerical relays of VCB panels. These cables shall be laid between the panels of main control room.

3.18.4. Bidder shall lay and terminate control and instrumentation cables from inverters, transformers to SCADA and from HT breakers to SCADA.

3.18.5. Electrical Interconnections of HT breaker panels e.g. outgoing, incomers, Bus PT panels for inverter room and control room HT breakers.

3.18.6. Suitable size ferrules with details shall be provided on either side on either side of each control/ data/ instrumentation cable.

3.19. Transformer Erection

3.19.1. Bidder shall erect transformer on RCC foundation as per transformer GA details. Bidder scope of Installation and Commissioning of transformers shall include:

3.19.1.1. Construction of transformer RCC foundations, fencing and gates for transformer yard in control room Levelling, stone jelly, cable support structures fabrication & foundation works, all earthing related works-excavation etc.

3.19.1.2. Movement of transformer and its accessory parts such as radiators, cable boxes, hardware etc from storage yard and placement on foundation pedestal.

3.19.1.3. Assembly of transformer parts.

3.19.1.4. Cable laying and terminations at LV/HV/Marshalling boxes of transformer.

3.19.1.5. All activities applicable to oil filling and filtration including measurement of oil BDV and PPM. Particularly for inverter transformers, filtration of oil shall be carried out to such an extent as to obtain the desired BDV (>60 kV) and PPM (< 15ppm) values.

3.19.1.6. Testing of transformers as per pre-commissioning checks.

3.19.1.7. After installation of transformer, bidder shall level/ compact the ground with an appropriate magnitude and direction of slope to facilitate draining of rain water away from transformer yard. Accordingly, to prevent stagnation of water within transformer yard, bidder shall implement suitable civil works in and around the transformer yard. This shall include filling up the land (wherever necessary) with suitable soil and compact the filled-up portions either manually or with rollers, as applicable, as per site conditions, to achieve required compaction/slope.

3.19.2. **General Notes**

3.19.2.1. Bidder shall provide the 100 mm layer of stone gravels in transformer yards as per relevant IS standards / CBIP/ CEIG requirements etc.

3.19.2.2. Bidder shall provide applicable earthing connections to transformers, fencing /gates etc. in the yard as per relevant standards.

3.19.2.3. All other items (if any, other than the above) that are required to meet the technical requirements of transformer yard as per applicable standards/ CEA Regulations shall be incorporated by the bidder.

3.20. Supply and Installation of Weather monitoring system

3.20.1.1. As part of weather monitoring system (WMS), bidder shall supply, install and commission Irradiance Meters, Anemometer, Temperature Relative Humidity sensors and data logger with all necessary software and hardware such as power supply/ control/ data/ communication cables, support structures etc. required to integrate with SCADA.

3.20.1.2. Scope of bidder shall also include erection of all the mounting arrangements including all necessary civil works/ foundations, clamps arrangement etc. as recommended by manufacturer and required at site. Communication cables shall be laid and terminated at both SCADA station at main control room and data logger at weather monitoring station end. Similarly, power supply cables shall be laid between WMS and DB boards in main control room.

3.20.1.3. Exact location of the weather monitoring station shall be decided during detailed engineering.

3.20.2. The following sensors are to be supplied, installed and wired by the bidder:

3.20.2.1. Ambient air temperature near array field

3.20.2.2. Control room temperature

3.20.2.3. Module back surface temperature

3.20.2.4. Wind speed at the level of the array plane

3.20.2.5. Solar radiation incidental to array plane

3.20.2.6. Solar irradiation

3.21. Supply and Installation of SCADA system

3.21.1. SCADA system supplied shall comprise of data station panels and PC based control desks with software to collect, store, process and report the

data parameters of power plant and also to control the operations of the power plant by integrating the various equipment at the segments as follows:

3.21.1.1. Weather monitoring equipment

3.21.1.2. Power conditioning units: DC input/AC output parameters of inverters, grid data, fault status and events logged, etc.

3.21.1.3. Power transformer: Alarm/Trip signals, WTI/OTI temperature values.

3.21.1.4. 11kV HT breaker panels (as per SLD): ON/Trip status of VCB breakers, status of protection relays of transformer, oil / winding temperatures, AC parameters of the plant.

3.21.1.5. 11 kV switchyard equipment and associated panels

3.21.1.6. Bi-directional meter data for transmission to SLDC.

3.21.2. The SCADA system should have monitoring software and associated hardware that support MQTT protocol to transmit data to SLDC.

3.21.3. The SCADA system shall perform the following operations, which include the measurement and continuous recording of:

3.21.3.1. Ambient air temperature near array field

3.21.3.2. Control room temperature

3.21.3.3. Module back surface temperature

3.21.3.4. Wind speed at the level of array plane

3.21.3.5. Solar radiation incidental to array plane

3.21.3.6. Inverter output

3.21.3.7. DC output

3.21.3.8. AC and DC side Power of each inverter

3.21.3.9. Energy delivered to the Grid in kWh

3.21.3.10. System frequency

3.21.3.11. Solar irradiation

3.21.3.12. Voltage of the HT Side

3.21.3.13. Current and voltage of each sub-array/string

3.21.3.14. Power at HT terminal

3.21.3.15. PR ratio

3.21.3.16. Any other parameter considered necessary by supplier based on current prudent practice.

3.21.4. Bidder shall install the SCADA system in the main control room.

3.21.5. Cable laying/ terminations of all SCADA cables at respective rooms/panels/equipment including cable trench works shall be in bidder scope.

3.21.6. The details list of data points to be monitored will be finalized during detailed engineering.

3.21.7. Desktop PC and wireless modem with licensed OS (Win 8 or above) shall be supplied.

3.22. Supply, Installation and commissioning of Earthing system

3.22.1. INKEL shall provide the Earthing layout and the bidder has to install the earthing system in line with the design and as per IS 3043 latest amendments.

3.22.2. Earthing System shall connect all non –current carrying metal receptacles, electrical boxes, appliance frames, chassis and PV module mounting structures in one long run. The earth strips should not be bolted. Earthing Copper Wires/GI strips shall be interconnected by proper welding.

3.22.3. Each array structure and modules of the PV yard shall be grounded in accordance with the safety regulations on electricity. All the components of the PV plant like modules and inverters etc shall be earthed as per manufacturers recommendations. The materials used for earthing shall be copper or hot dip galvanized iron strips. If GI strips are used joints shall be properly protected against corrosion by applying bituminous compounds as directed by the Engineer-in Charge. Earth electrode shall be copper clad iron rods or stainless-steel rods with chemical treatment for decreasing earth resistance. Earthing shall be designed to dissipate fault current for a period of 3 seconds. The earth electrodes shall be interconnected with hot dip galvanized steel flat of size 25X6 mm thick laid underground. The zinc coating shall be of 70 microns.

3.22.4. The complete earthing system shall be electrically connected to provide return to earth from all equipment independent of mechanical connection

3.22.5. The equipment grounding wire shall be connected to earth strip by proper

fixing arrangement. Each strip shall be continued up to at least 500mm from the Equipments.

3.22.6. Earthing system design should be as per the standard practices and should confirm to the 1987 edition of IS 3043.

3.22.7. Masonry enclosure with the earth pit of size not less than 400mm X 400mm (depth) complete with cemented brick work (1:6) of minimum 150mm width duly plastered with cement mortar (inside) shall be provided. Hinged inspection covers of size not less than 300mm X 300mm with locking arrangement shall be provided. Suitable handle shall be provided on the cover by means of welding a rod on top of the cover for future maintenance.

3.22.8. Earthing system must be interconnected through GI strip to arrive equi-potential bonding. The size of the GI earth strip must be minimum 25mm X 6mm.

3.22.9. All metal casing / shielding of the plant shall be thoroughly grounded in accordance with Indian electricity act. The earthing for array and LT power system shall be as required as per provisions of IS.

3.22.10. The complete earthing system shall be mechanically and electrically connected to provide independent return to earth. All three-phase equipment shall have two distinct earth connections. An earth bus shall be provided inside the control facility. For each earth pit, necessary test point shall have to be provided.

3.22.11. All non-current carrying metal parts shall be earthed with two separate and distinct earth continuity conductors to an efficient earth electrode. The earthing shall be done in accordance with relevant sections of the Central Electricity Authority (Measures relating to safety and Electric Supply) regulations 2010.

3.22.12. Material for earthing like, Earth electrode with back fill compound, GI strips etc. will be part of bidder's scope of supply.

3.22.13. All three-phase equipment shall have two distinct earth connections. An earth bus shall be provided inside the control facility. For each earth pit, necessary test point shall have to be provided. In compliance to Rule 33 and 61 of Indian Electricity Rules, 1956 (as amended up to date), all non-current carrying metal parts shall be earthed with two separate and distinct earth

continuity conductors to an efficient earth electrode.

3.23. Supply, Installation and commissioning of Lightning protection system

3.23.1. The bidder shall supply, install Lightening protection system covering the entire plant area as per the IS/IEC 62305.

3.23.2. The lightning protection shall be provided for the entire plant as per IS 2309.The air terminations shall be designed by rolling sphere method with 40 mtrs dia. sphere. The inverter control room shall also be protected against lightning as per IS 2309(1989).

3.23.3. Earthing system shall be maintenance free and shall be as per IEC 62305 part 3 comprising of molecularly bonded copper of 99.9% purity on low carbon steel of 3 meters length (1mtr X 3nos) having diameter of 20mm with copper coating thickness of 250 microns with self-coupling peg and bore arrangements with fault current withstand capacity of 20kA RMS for 1 seconds, universal clamps made of SS304 for clamping. Earth enhancing mineral compound shall be inert to subsoil and shall not pollute the environment and non-corrosive to earth rod. It should be free from hazardous substances. Polypropylene and polyethylene earth rod inspection chamber with heavy duty covers shall be used to cover earth rod. The inspection chamber shall be of minimum size 170X170X 190 mm not protruding from the ground level with a weight bearing capacity of 50kN.The earth rod shall be interconnected with hot dip galvanized steel flat of size 30X3 mm thick laid directly in ground. The zinc coating shall be of 70 microns.

3.23.4. The entire space occupying SPV array shall be suitably protected against lightning by deploying required number of lightning arresters. Lightning protection should be provided as per IEC 62305.

3.24. Identification marking using painting

3.24.1. Following items shall be identified by way of artistic painting in black letters with yellow background. For danger symbol/text, white letters in red background. Identification number/ text to be painted shall be submitted for INKEL approval during detailed engineering for the following.

3.24.1.1. Solar array structures

3.24.1.2. String monitoring boxes

3.24.1.3. Size/ source/ destination of DC cable with arrow mark (power flow direction) to be painted on AJBs and PCUs

3.24.1.4. AC chamber/ DC chamber, Danger text/symbol.

3.24.1.5. PCUs DC chamber back side: DCDB ID numbers, cable size (with upward arrow mark, danger text/symbol

3.24.1.6. PCUs AC chamber back side: Transformer ID, cable size.

3.24.1.7. Same way as above, the corresponding panel ID with rating, cable destination with arrow mark in power flow direction, danger text/symbol shall be painted for all VCB panels, Inverter transformers (HV and LV sides).

3.24.1.8. Transformer cable boxes / marshaling boxes.

3.25. Cable markers and cables tags

3.25.1.1. Cable markers and joint markers for underground cables shall be provided along the route of the cables

3.25.1.2. Cable tags shall be provided at either of the cable (at the entry point to the panel / equipment to which it is connected / terminated) shall be provided

3.25.1.3. Cable tags details shall be provided by INKEL during detailed engineering.

3.26. Supply of Cables

3.26.1. Bidder shall supply all cables as per specifications approved by INKEL and single line diagram and cable schedule in this document.

3.26.2. All the supply and installation work as mentioned above shall be as per “Cable specification and installation methodology” section of this specification and as per drawings. Drawings shall be provided after placement of purchase order.

3.26.3. Bidder shall submit the documents for approval of INKEL and should be supplied as per approved documents from INKEL

3.27. Installation and commissioning of solar inverter, LT and HT panel

3.27.1. Bidder shall supply all cables as per specifications approved by INKEL and single line diagram and cable schedule in this document.

3.27.2. Bidder shall submit the documents for approval of INKEL, LT and HT Panels should be supplied as per approved documents from INKEL

3.27.3. The connection between solar inverter and transformer shall be appropriately rated Aluminium cable. It shall have provision to measure bus voltage, current and power feeding the transformer.

3.28. Compliance to fire and Safety Regulations

3.28.1.1. Adequate firefighting equipment and extinguishing agents of sufficient capacity and quantity must always be available at site and kept ready for immediate use. The firefighting system for the proposed power plant for fire protection shall be consisting of: Portable fire extinguishers in the control room for fire caused by electrical short circuits and Sand buckets in the control room.

3.28.1.2. The installation of Fire Extinguishers should confirm to TAC regulations and BIS standards.

3.28.2. The fire extinguishers shall be provided in the control room housing PCUs as well as on the site where the PV arrays have been installed.

3.28.3. The fire extinguishers shall be suitable for fighting fire of oils, solvents, gasses, paints, varnishes, electrical wiring, live machinery fires and all flammable liquid & gas

3.29. Supply and installation of Energy meters

3.29.1. **Special Energy Meter (SEM)/Interface Energy Meter**

- Supply and installation of CEA-compliant SEM/ABT at the designated injection/interconnection point.
- In addition to the above supply and installation of CEA-compliant Power Quality Meter at the injection/interconnection point.

- Meter shall be suitable for recording active energy and reactive energy in the applicable time blocks.
- Interface meters shall have an accuracy class as prescribed under the applicable CEA regulations; the CEA standards specify Class 0.2S for interface meters.
- Meter shall be suitable for bidirectional import/export measurement wherever applicable.

- Provision of main, check & standby metering arrangement as required by the concerned STU/KSEB/SLDC/distribution licensee and the approved metering scheme.
- The bidder shall provide all necessary CTs, PTs/CVTs, metering cores, test terminal blocks, meter panels and associated wiring required for the complete metering system.
- Metering CTs and PTs/CVTs shall be of suitable ratio, accuracy class and burden as approved by the concerned utility.
- Separate dedicated metering cores shall be provided wherever required.
- CT/PT ratios shall be selected based on the actual contracted capacity, maximum operating current and interconnection voltage.
- Communication and Remote Meter Reading
- The metering system shall be provided with suitable AMR/communication facility and RTU, wherever required by SLDC/STU/KSEB.
- The system shall facilitate remote acquisition of meter data for energy accounting, scheduling, settlement and monitoring.
- Communication shall be compatible with the protocol/network specified by the concerned authority. KSERC's Open Access framework specifically provides for RTU facilities for real-time SLDC monitoring where stipulated.

3.30. HT Panel Relay testing

All protective relays, Current transformers, Potential transformers and energy meters have to be tested by KSEBL/Electrical inspectorate. Bidder has to remit

the necessary testing charges to KSEBL/Inspectorate and compliance reports have to be submitted to INKEL. If any of the components is found defective or fails during testing, the same has to be replaced by the bidder.

3.31. Protection Devices of the HT Panel

The HT panels shall be tested & inspected by KSEB relay testing division before commissioning. Necessary fees for the same shall be paid by the bidder.

3.32. Pre-Commissioning Inspection / Checks / Tests

Bidder shall be responsible for carrying out pre-commissioning tests as per Inspection requirement table.

3.33. Infrastructure for Grid-Connectivity

The Bidder shall design, construct, supply, install, test and commission all infrastructure required for grid connectivity of the Solar PV Power Plant, as per the applicable statutory standards.

- A dedicated Yard shall be constructed at the boundary of the Solar PV Plant premises, at a suitable location mutually agreed with INKEL. The Yard shall include, but shall not be limited to, the following:

    1. Supply and installation of the required Distribution Pole (DP) structure including all structural members, insulators, hardware, stays, earthing and other accessories as required by the INKEL.

    2. Supply, installation, testing and commissioning of all required energy metering equipment, including CTs, PTs, energy meters, metering cubicles/panels and associated wiring, communication and accessories, as per the standards. All metering shall be as per the clause No.3.29.

    3. Supply and installation of a suitable RMU (Ring Main Unit) of the required voltage and fault withstand rating, complete with protection, metering interfaces, cable termination arrangements and all necessary accessories.

- The grid connectivity between the Solar PV Plant and the designated utility interconnection point shall be established through underground (UG) power cable. The Bidder shall be responsible for the complete UG cable works, including route survey, excavation, trenching, sand bedding, cable laying, protection, cable markers, warning tapes/tiles, backfilling, termination, jointing, testing and commissioning.

- The Bidder shall provide all necessary cable trenches/ducts, cable protection arrangements and other civil works required for safe and reliable installation of the UG cable.

- All necessary earthing and lightning protection arrangements for the Grid Connectivity Yard, DP, RMU, metering equipment and associated structures shall be provided in accordance with the applicable standards and utility requirements.

- The Bidder shall obtain all necessary approvals, clearances and inspection certificates from the concerned DISCOM/utility and other statutory authorities, wherever applicable, for Energisation and grid connectivity.

- The complete Grid Connectivity Yard and associated UG cable system shall be designed and executed based on the approved Single Line Diagram (SLD), utility interconnection requirements, sanctioned load/contract demand, voltage level and point of interconnection.

- The scope shall include all materials, equipment, civil works, erection, testing, commissioning, transportation, labour, tools and accessories necessary to make the grid connectivity system complete, safe, operational and ready for Energisation. No additional payment shall be made for any item required for completion of the grid connectivity works but not specifically mentioned above.

3.34. Trial run

Bidder shall provide support arrangements and required personnel on site for carrying out trial run along with Performance Ratio Test.

3.34.1. Suitable pumps and water tanks along with plumbing works for cleaning shall be provided by the bidder.

3.35. Miscellaneous

3.35.1. Bidder shall supply all items such as tools, tackles and other materials which are necessary to complete the works mentioned in the scope of bidder and not mentioned in INKEL scope.

3.35.2. Bidder has to handover tools required for Operation and maintenance of the power plant.

4. CABLE SPECIFICATION AND INSTALLATION METHODOLOGY

4.1. Codes and Standards

All standards, specifications and codes of practice referred to herein shall be the latest editions including all applicable official amendments and revisions as on date of opening of bid. In case of conflict between this specification and those (IS codes, standards, etc.) referred to herein, the former shall prevail. All work shall be carried out as per the following standards/ codes as applicable.

4.1.1. IS:513 Cold rolled low carbon steel sheets and strips.

4.1.2. IS:802 Code of practice for the use of Structural Steel in Overhead Transmission Line Towers.

4.1.3. IS:1079 Hot Rolled carbon steel sheet & strips

4.1.4. IS:1239 Mild steel tubes, tubulars and other wrought steel fittings

4.1.5. IS:1255 Code of practice for installation and maintenance of power cables upto and including 33 KV rating

4.1.6. IS:1367 Part-13 Technical supply conditions for threaded Steel fasteners. (Hot dip galvanized coatings on threaded fasteners).

4.1.7. IS:2147 Degree of protection provided by enclosures for low voltage switchgear and control gear

4.1.8. IS:2309 Code of Practice for the protection of building and allied structures against lightning.

4.1.9. IS:2629 Recommended practice for hot dip galvanizing of iron & steel

4.1.10. IS:2633 Method for testing uniformity of coating on zinc coated articles.

4.1.11. IS:3043 Code of practice for Earthing

4.1.12. IS:3063 Fasteners single coil rectangular section spring washers.

4.1.13. IS:6745 Methods for determination of mass of zinc coating on zinc coated iron & steel articles.

4.1.14. IS:8308 Compression type tubular in- line connectors for aluminium conductors of insulated cables

4.1.15. IS:8309 Compression type tubular terminal ends for aluminium conductors of insulated cables.

4.1.16. IS:9537 Conduits for electrical installation.

4.1.17. IS:9595 Metal - arc welding of carbon and carbon manganese steels - recommendations.

4.1.18. IS:13573 Joints and terminations for polymeric cables for working voltages from 6.6kv up to and including 33kv performance requirements and type tests.

4.1.19. BS:476 Fire tests on building materials and structures

4.1.20. IEEE:80 IEEE guide for safety in AC substation grounding

4.1.21. IEEE:142 Grounding of Industrial & commercial power systems

4.1.22. DIN 46267 (Part-II) Non tension proof compression joints for Aluminium conductors.

4.1.23. DIN 46329 Cable lugs for compression connections, ring for Aluminium conductors

4.1.24. VDE 0278 Tests on cable terminations and straight through joints

4.1.25. BS:6121 Specification for mechanical Cable glands elastomers and plastic insulated cables.

4.1.26. Indian Electricity Act

4.1.27. Indian Electricity Rules.

4.1.28. Equipment complying with other internationally accepted standards such as IEC, BS, DIN, USA, VDE, NEMA etc. will also be considered if they ensure performance and constructional features equivalent or superior to standards listed above. In such a case, the Bidder shall clearly indicate the standard(s) adopted, furnish a copy in English of the latest revision of the standards along with copies of all official amendments and revisions in force as on date of opening of bid and shall clearly bring out the salient features for comparison.

4.2. Cable specifications

4.2.1. General

4.2.1.1. Irrespective of utilization voltage and current rating all type of power cables shall be minimum of 1100 V grade PVC/XLPE insulated conforming to IS: 1554 / IS 694. The control and power cable has to be laid separately. All LT XLPE cables shall conform to IS: 7098 Part I & II. All wires used on the LT side shall conform to IS and should be of appropriate voltage grade.

4.2.1.2. Cable inside the control facility/ switch yard shall be tagged and laid galvanized cable trays or mounted on mild steel supports duly painted. For Substation buildings, the Cables laid through the existing constructed trenches, shall be marked separately and the work shall be executed without damaging the existing infrastructure under authorization of operator on Duty. For laying/termination of cables latest BIS/IEC Codes/standards shall be followed.

4.2.1.3. The cables shall be adequately insulated and UV protected for the voltage required and shall be suitably color coded for the required services. Bending radii for cables shall be as per manufactures recommendations and IS: 1255. Cables shall also confirm to IEC 60189 for test and measuring methods.

4.2.1.4. Cables used on the DC side shall be of 1.8kV grade.

4.2.2. **Cables**

4.2.2.1. For the array level DC cabling, 1.8kV XLPE or XLPO insulated and sheathed, UV stabilized single core flexible copper cables shall be used; multi-core cables shall not be used.

4.2.2.2. For DC cabling from DCDB to PCU, XLPE Al. cables of 1.8kV grade or above shall be used.

4.2.2.3. For the AC cabling, PVC or XLPE insulated and PVC sheathed single or, multicore flexible copper/Aluminium cables shall be used, Outdoor AC cables shall have a UV - stabilized outer sheath

4.2.2.4. The total voltage drop on the cable segments from the solar PV modules to the solar grid inverter shall not exceed 2.0%

4.2.2.5. The total voltage drop on the cable segments from the solar grid inverter to the building distribution board shall not exceed 2.0%

4.2.2.6. The DC cables from the SPV module array shall run through a UV-stabilized PVC conduit pipe of adequate diameter with a minimum wall thickness of 1.5mm

4.2.2.7. Cables and wires used for the interconnection of solar PV modules shall be provided with solar PV connectors (MC4) and couplers

4.2.2.8. All cables and conduit pipes shall be clamped to the rooftop, walls and ceilings with thermo-plastic clamps at intervals not exceeding 50cm; The minimum DC cables size shall be 6.0 mm^2 copper; The minimum AC cable size shall be 4.0 mm^2 copper. In three phase systems, the size of the neutral wire size shall be equal to the size of the phase wire.

4.2.2.9. The following colour code shall be used for cable wires

DC positive: red (the outer PVC sheath can be black with a red line marking

- DC negative: black
- AC single phase: Phase: red; Neutral: black
- AC three phase: phases: red, yellow, blue; Neutral: black Earth wires: green

4.2.2.10. Cables and conduits that have to pass through walls or ceilings shall

be taken through PVC pipe sleeve.

4.2.2.11. Cable conductors shall be terminated with tinned copper end ferrules to prevent fraying and breaking of individual wire strands. The termination of the DC and AC cables at the Solar Grid Inverter shall be done as per instructions of the manufacturer, which in most cases will include the use of special connectors.

4.2.2.12. Bending radius for cables shall be as per manufactures recommendations and IS: 1255. Cables shall also conform to IEC 60189 for test and measuring methods.

4.2.2.13. For laying/termination of cables latest BIS/IEC Codes/ standards shall be followed.

4.2.3. **DC cables**

4.2.3.1. Should have Multi Strand Annealed high conductivity copper conductors.

4.2.3.2. The cables shall be adequately insulated and **UV protected** for the voltage required and shall be suitably color coded for the required services and confirm to IEC 69947.

4.3. Cable installation

4.3.1. Cable installation shall be carried out as per IS: 1255 and other applicable standards.

4.3.2. For Cable unloading, pulling etc. following guidelines shall be followed in general:

4.3.3. Cable drums shall be unloaded, handled and stored in an approved manner on hard and well drained surface so that they may not sink. In no case shall be drum be stored flat i.e., with flange horizontal. Rolling of drums shall be avoided as far as possible. For short distances, the drums may be rolled provided they are rolled slowly and in proper direction as marked on the drum. In absence of any indication, the drums may be rolled in the same direction as it was rolled during taking up the cables. For unreeling the cable, the drum shall be mounted on suitable jacks or on cable wheels and shall be rolled

slowly so that cable comes out over the drum and not from below. All possible care shall be taken during unreeling and laying to avoid damage due to twist, kink or sharp bends. Cable ends shall be provided with sealed plastic caps to prevent damage and ingress of moisture.

4.3.4. While laying cable, ground rollers shall be used at every 2-meter interval to avoid cable touching ground. The cables shall be pushed over the rollers by a gang of people positioned in between the rollers. Cables shall not be pulled from the end without having intermediate pushing arrangements. Pulling tension shall not exceed the values recommended by cable manufacturer. Selection of cable drums for each run shall be so planned so as to avoid using straight through joints. Care should be taken while laying the cables so as to avoid damage to cables. If any particular cable is damaged, the same shall be repaired or changed to the satisfaction of Engineer in Charge.

4.3.5. Cables shall be laid on cable trays strictly in line with cable schedule

4.3.6. Power and control cables shall be laid on separate tiers in line with approved guidelines /drawings. The laying of different voltage grade cables shall be on different tiers according to the voltage grade of the cables. In horizontal tray stacks, HT cables shall be laid on topmost tier and cables of subsequent lower voltage grades on lower tiers of trays. Single core cable in trefoil formation shall be laid with a distance of four times the diameter of cable between trefoil center lines and clamped at every two meters. All multi core cables shall be laid in touching formation. Power and control cables shall be secured fixed to trays/support with self-locking type nylon cable straps with de-interlocking facilities. For horizontal trays arrangements, multi core power cables and control cables shall be secured at every five-meter interval. For vertical tray arrangement, individual multi core power cables and control cables shall be secured at every one meter by nylon cable strap. After completion of cable laying work in the particular vertical tray, all the control cables shall be binded to trays/supports by Aluminium strips at every five-meter interval and at every

bend.

4.3.7. Bending radii for cables shall be as per manufacturer's recommendations and IS: 1255.

4.3.8. Where cables cross roads/rail tracks, the cables shall be laid in hume pipe/ HDPE pipe.

4.3.9. No joints shall be allowed in trip circuits, protection circuits and CT/PT circuits. Also joints in critical equipment in main plant area shall not be permitted. Bidder shall identify and accordingly procure the cable drum length.

4.3.10. In each cable run some extra length shall be kept at suitable point to enable one LT/two HT straight through joints to made, should the cable develop fault at a later stage. Control cable termination inside equipment enclosure shall have sufficient lengths so that shifting of termination in terminal blocks can be done without requiring any splicing.

4.3.11. Wherever few cables are branching out from main trunk route troughs shall be used.

4.3.12. Wind loading shall be considered for designing support as well Cable trays wherever required.

4.3.13. Where there is a considerable risk of steam, hot oil or mechanical damage cable routes shall be protected by barriers or enclosures.

4.3.14. The installation work shall be carried out in a neat workman like manner & areas of work shall be cleaned of all scraps, water, etc. after the completion of work in each area every day. Bidder shall replace RCC/Steel trench covers after the Installation work in that particular area is completed or when further work is not likely to be taken up for some time.

4.4. Separation

At least 300mm clearance shall be provided between:

- HT power & LT power cables,
- LT power & LT control/instrumentation cables,

4.5. Segregation

4.5.1. Segregation means physical isolation to prevent fire jumping.

4.5.2. All cables associated with the unit shall be segregated from cables of other units.

4.5.3. Interplant cables of station auxiliaries and unit critical drives shall be segregated in such a way that not more than half of the drives are lost in case of single incident of fire. Power and control cables for AC drives and corresponding emergency AC or DC drives shall be laid in segregated routes. Cable routes for one set of auxiliaries of same unit shall be segregated from the other set.

4.5.4. In switchyard, control cables of each bay shall be laid on separate racks/trays.

4.6. Cable tags

Cable tags shall be provided on all cables at each end (just before entering the equipment enclosure), on both sides of a wall or floor crossing, on each duct/conduit entry, and at every 20 meters in cable tray/trench runs. Cable tags shall also be provided inside the switchgear, motor control centers, control and relay panels etc. where a number of cables enter together through a gland plate. Cable tag shall be of rectangular shape for power cables and control cables. Cable tag shall be of 2 mm thick aluminum with number punched on it and securely attached to the cable by not less than two turns of 20 SWG GI wire conforming to IS:280. Alternatively, the Bidder may also provide cable tags made of nylon, cable marking ties with cable number heat stamped on the cable tags. Cable tags shall be provided on all cables at each end (just before entering the equipment enclosure), on both sides of a wall or floor crossing, on each duct/conduit entry, and at every 20 meters in cable tray/trench runs. Cable tags shall also be provided inside the switchgear, motor control centers, control and relay panels etc. where a number of cables enter together through a gland plate. Cable tag shall be of rectangular shape for power cables and control cables. Cable tag shall be of 2 mm thick aluminum with number punched on it and securely attached to the cable by

not less than two turns of 20 SWG GI wire conforming to IS:280. Alternatively, the Bidder may also provide cable tags made of nylon, cable marking ties with cable number heat stamped on the cable tags.

4.7. Protection of unarmored cables

While crossing the floors, unarmored cables shall be protected in conduits upto a height of 500 mm from floor level if not laid in tray.

4.8. Cable Terminations & Connections

4.8.1. The termination and connection of cables shall be done strictly in accordance with cable termination kit manufacturer'' instructions, drawings and/or as directed by Engineer in Charge. Cable jointer shall be qualified to carryout satisfactory cable jointing/termination. Bidder shall furnish for review documentary evidence/experience reports of the jointers to be deployed at site.

4.8.2. Work shall include all clamps, fittings etc. and clamping, fitting, fixing, WALKWAYS

4.8.3. , soldering, drilling, cutting, taping, preparation of cable end, crimping of lug, insulated sleeving over control cable lugs, heat shrinking (where applicable), connecting to cable terminal, shorting and grounding as required to complete the job to the satisfaction of the Engineer in Charge.

4.8.4. The equipment will be generally provided with undrilled gland plates for cables/conduit entry. The Bidder shall be responsible for punching of gland plates, painting and touching up. Holes shall not be made by gas cutting. The holes shall be true in shape. All cable entry points shall be sealed and made vermin and dust proof. Unused openings shall be effectively sealed by 2mm thick aluminium sheets.

4.8.5. Control cable cores entering control panel/switchgear/MCC/ miscellaneous panels shall be neatly bunched, clamped and tied with self-locking type nylon cable ties with de interlocking facility to keep them in position.

4.8.6. All the cores of the control cable to be terminated shall have

identification by providing ferrules at either end of the core, each ferrule shall be indelible, printed single tube ferrule and shall include the complete wire number and TB number as per the drawings. The ferrule shall fit tightly on the core. Spare cores shall have similar ferrules with suffix sp1, sp2, -etc along with cable numbers and coiled up after end sealing. Supply of ferrules is in Bidder's scope.

4.8.7. All cable terminations shall be appropriately tightened to ensure secure and reliable connections.

5. **Payment Terms:**

1. 20% of contract value shall be released against completion of installation of PV Modules.
2. 20% of contract value against completion of installation DC wiring, DCDB installation and DC cable termination at PCU
3. 20% of contract value after completion of control room roof.
4. 20% of contract value against delivery of LT & HT cables and Panels at site.
5. 10% of contract value after completion of installation in all respect.
6. 10% of contract value after pre-commissioning and 15 days trial run without any defects.
7. The material delivery and subsequent payments shall be made against approved procurement schedule to be finalized during contract agreement finalization.
8. The Engineer-in -charge is to be informed about the delivery of material one week in advance by the contractor. The Engineer in charge shall ensure the site acceptance / rejection of the received material at site within three days of delivery of material along with submitting the SAT procedure of the delivered material from the vendor by the contractor. The invoices shall be submitted by the contractor as per the accepted price schedule which is to be verified and made ready for release of payment within 30 days of receipt of the invoices subject to the satisfaction of the above conditions.

9. The Security Bank Guarantee (SBG) equivalent to 10% of the contract value shall be released upon successful commissioning of the project. The Performance Bank

Guarantee (PBG) equivalent to 5% of the contract value shall be released upon completion of the Defect Liability Period (DLP) of two (2) years from the date of commissioning, subject to satisfactory performance and fulfilment of all contractual obligations by the contractor.

10. Dues from the Contractor: All sums of money found due from the Contractor to INKEL under this contract, shall be recovered from the bills payable to him and from other assets movable or immovable as per Revenue Recovery Act for the time being in force or in any other manner as INKEL may deem fit.

PRICE BID FORMAT (BOQ)
(Password Protected PDF)

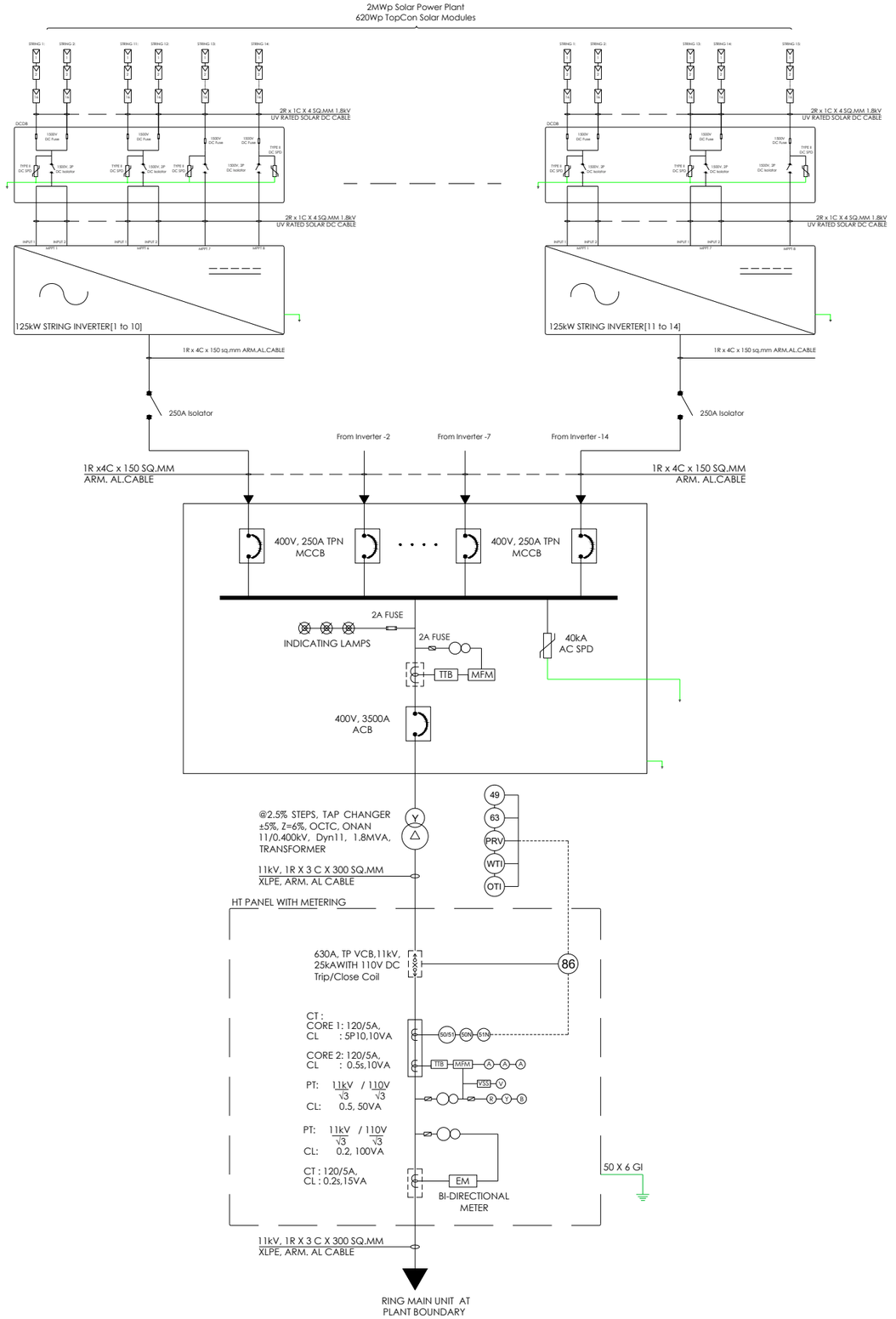
Name and Full Address of the Bidder:				
Sl No	**Description**	**Basic Price**	**GST**	**Total**
1	Supply of BOS items as per Scope of work and technical specification for commissioning of 2MWp grid connected solar power plant.			
2	Installation and commissioning work as per Scope of work and technical specification for 2MWp grid connected solar power plant.			
	Total (In Figures)			
	Total (In Words)			

Sign and Seal of the Bidder

NOTE:

1. Price shall be for carrying out the entire works as per the Scope of Work and Technical Specifications and all related works for executing everything necessary to complete the project satisfactorily in all respects as detailed in the Tender document.

2. The password for the price bid shall be shared at the time of bid opening.



ELECTRICAL DETAILS

DC SYSTEM RATING @ STC	2000kWp
AC SYSTEM RATING @ STC	1750kW
MODULES USED	[3200] 625Wp TopCon Solar Modules

Client Name:

inkel
Creating Infrastructure
A PPP INITIATIVE OF GOVERNMENT OF KERALA

INKEL Limited
Door No.7/473 ZA-5&6, Ajiyal Complex, Post Office Road, Kakkanad, Cochin - 682030

Project Name:	2MWP Solar Power Plant at Shri Mahasakhti Mills

Notes: The cable sizing shown in the SLD is tendative and will be finalised based on the actual cable length.

This drawing & any information or description matter set out hereon are the confidential property of INKEL LIMITED and is to be used only for the purpose for which it was lent and must not be used in any way detrimental to the interest of the company and is subjected to return on demand.

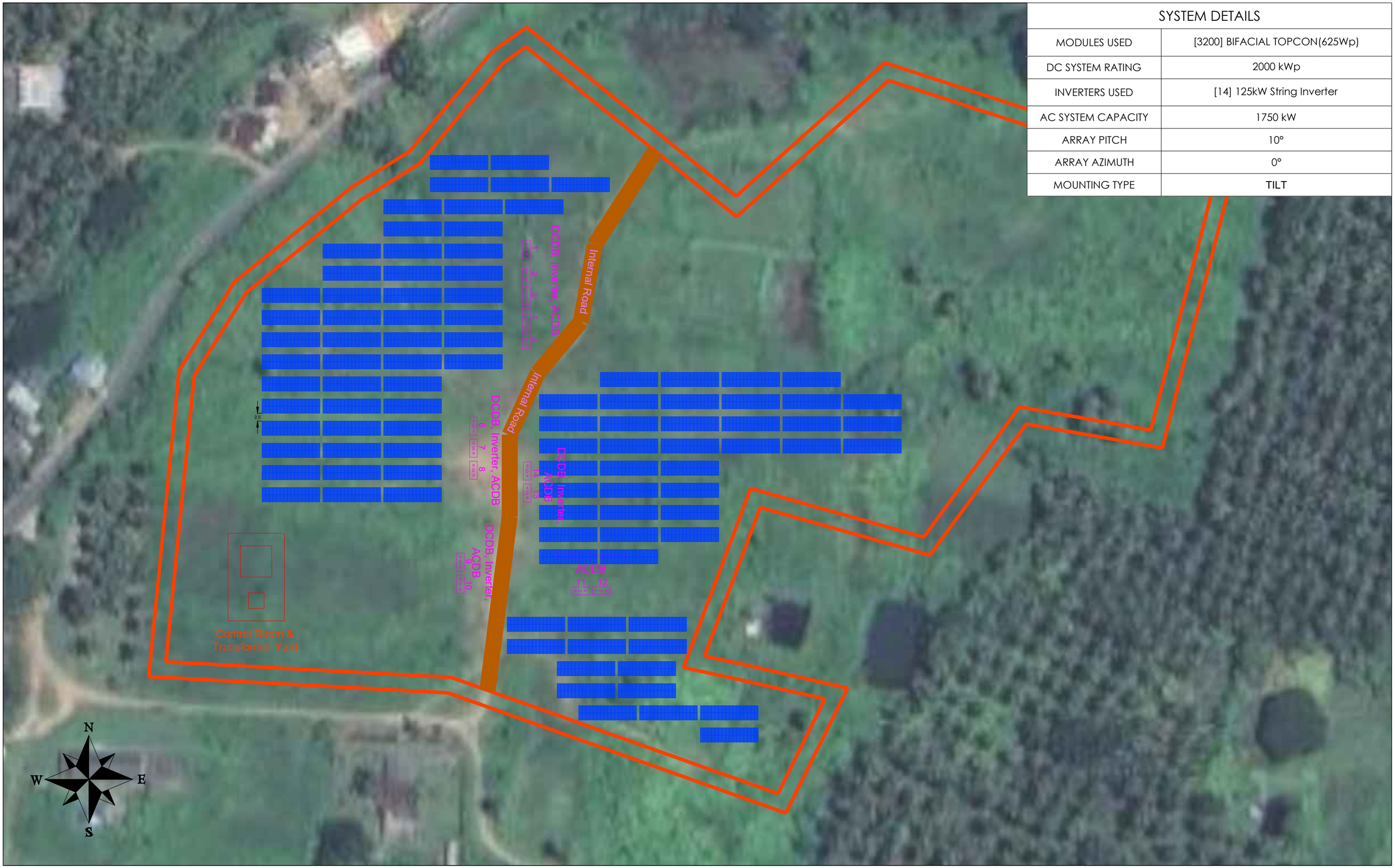
Title: PRELIMINARY SLD (E1)

Issued For: Approval

Drawing No.	Scale	Date
INKEL-SMSM-001	NTS	14/10/2026

Design By	Checked By	Approved By
AM	DM	GM

Rev.	Description	Date
1.0	For Approval	14/10/2026



SYSTEM DETAILS	
MODULES USED	[3200] BIFACIAL TOPCON(625Wp)
DC SYSTEM RATING	2000 kWp
INVERTERS USED	[14] 125kW String Inverter
AC SYSTEM CAPACITY	1750 kW
ARRAY PITCH	10°
ARRAY AZIMUTH	0°
MOUNTING TYPE	**TILT**

Project By:

inkel
Creating Infrastructure
A PPP INITIATIVE OF GOVERNMENT OF KERALA

INKEL Limited
Door No.7/473 ZA-5&6, Ajiyal Complex, Post Office Road, Kakkanad, Cochin - 682030

Project Name:	2MWp Solar Power Plant

Notes:
1. All dimensions are in meters unless specified otherwise.

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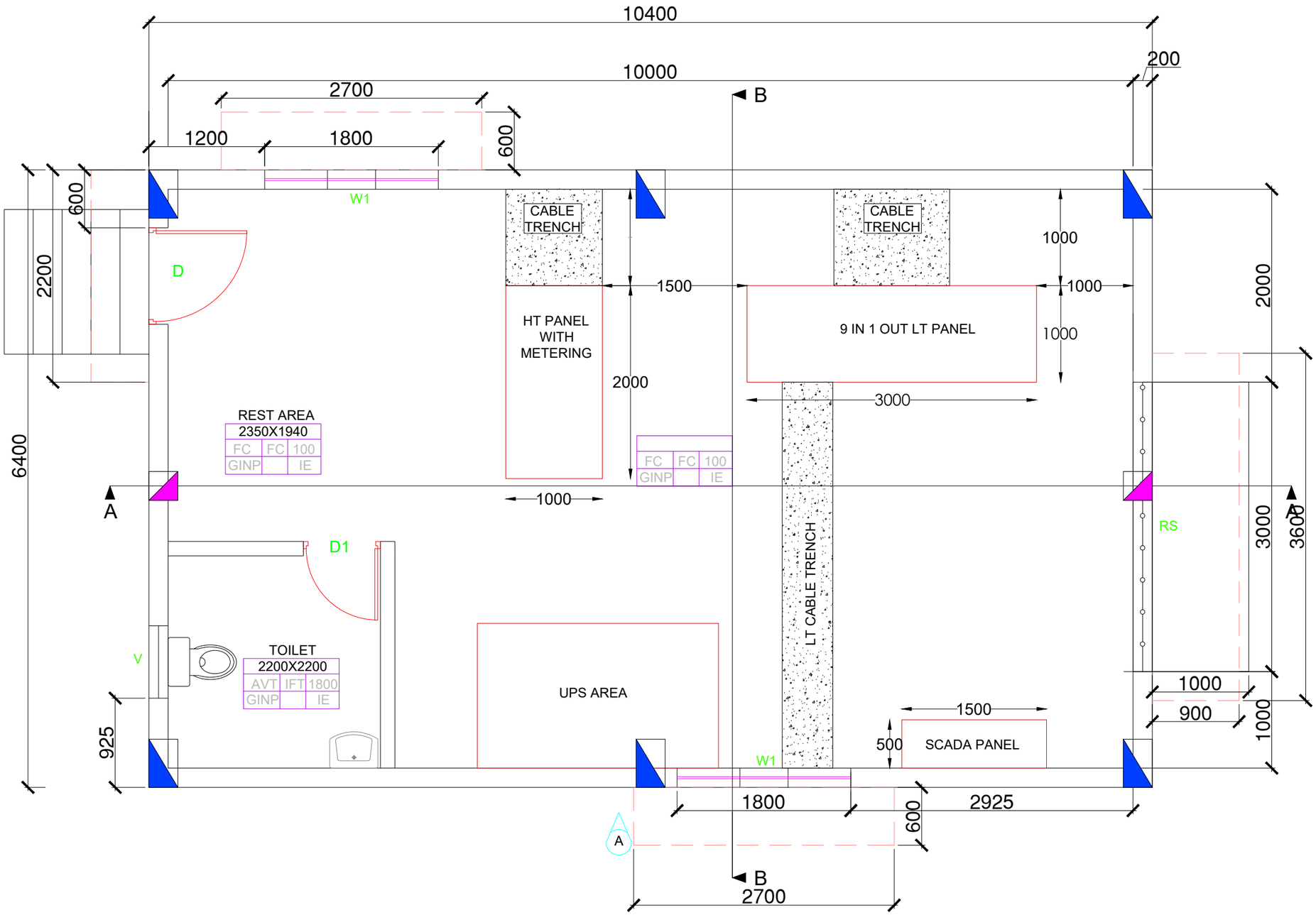
Title: Module Layout (PV1 of 1)

Issued For: Approval

Project ID	Scale	Date
IL/SMSM/001	NTS	14/10/2026
Design Engineer		Approved By
NJ		MPK

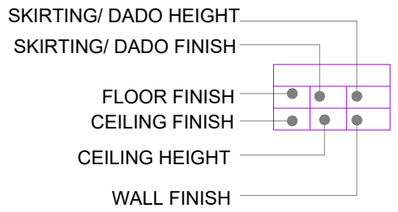
Rev.	Description	Date
1.0	For Approval	14/10/2026



JOINERY DETAILS
(Door, Rollingshutter, window, Loading Platform & ventilator)

Sl.No.	Item	Size	Type
1	D	1000X2100	Aluminium-SS
2	D1	800X2100	FRP-SS
3	RS	3000X3000	MS with Grill
4	W1	1800x900	Aluminium-Sliding
5	LPF	3000X1000	Concrete
6	V	750X600	Aluminium-Fixed

FINISHES	
SYMBOL	Description
FC	FLOOR COAT
IFT	INDUSTRIAL FLOOR TILE
GIP	GI PERFORATED CEILING
GINP	GI NON PERFORATED CEILING
AL	ALUMINUM GRID
IE	INTERIOR EMULSION
LPF	LOADING PLATFORM
CT	CERAMIC TILES



NOTE:

ALL FINISHES FOR THE FOLLOWING ROOMS ARE AS FOLLOWS UNLESS OR OTHERWISE SPECIFIED IN THE DRAWING.

Project By:
INKEL
Creating Infrastructure
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INKEL Limited
Door No.7/473 ZA-5&6, Ajiyal Complex, Post Office Road, Kakkanad, Cochin - 682030

Project Name:	2MWp Solar Power Plant
Notes:	

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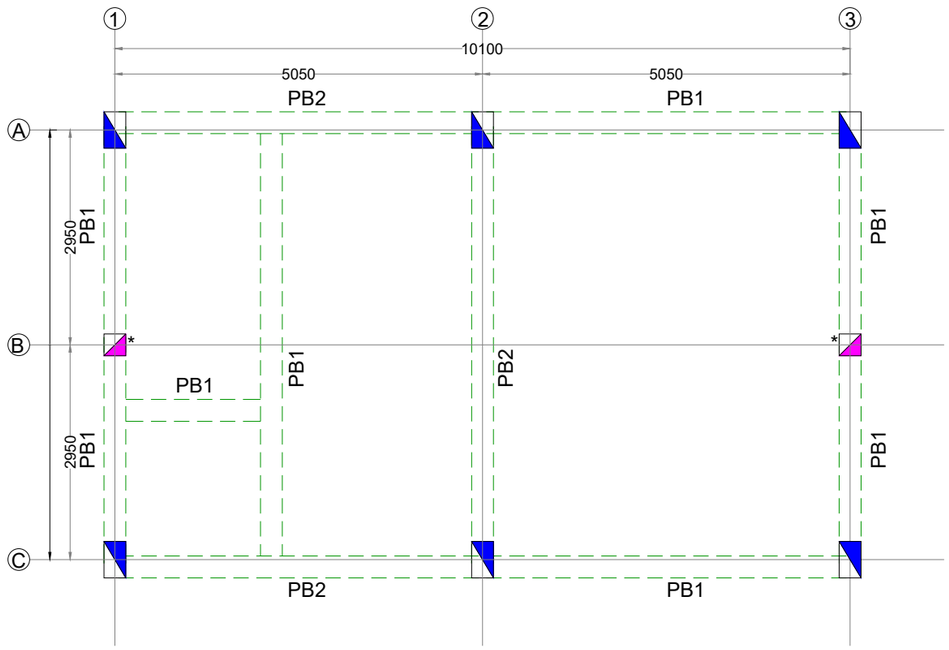
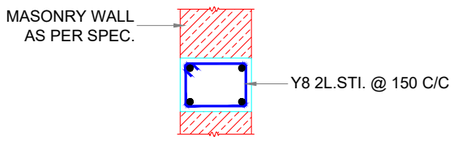
Title: Plan (CR1 of 10)		
Issued For: Approval		
Drawing No.	Scale	Date
IL-2MWp-001	NTS	30/09/2026
Design By	Checked By	Approved By
AM	DM	AGM

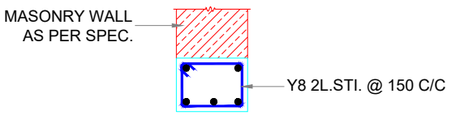
Rev.	Description	Date
1.0	For Approval	30/09/2026



*C2,F1 terminate at Plinth beam level

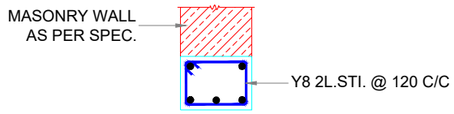


TYP.REFT.DETAILS OF RUNNING LINTEL AND FOR OPENING UP TO 1.0m (200 x 150)



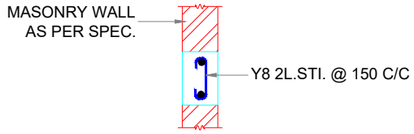
TYP.REFT.DETAILS OF LINTEL FOR OPENING 1.00mTO 1.50m (200 x 150)

(PROVIDE A BEARING OF 200mm ON BOTH SIDES OF OPENING.)

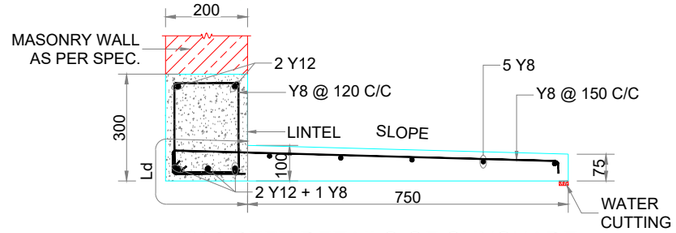


TYP.REFT.DETAILS OF LINTEL FOR OPENING 1.50m TO 2.0m (200 x 150)

(PROVIDE A BEARING OF 200mm ON BOTH SIDES OF OPENING.)



TYP. REFT. DETAILS OF RUNNING LINTEL & FOR OPENING UP TO 1.0m (100 x 150)

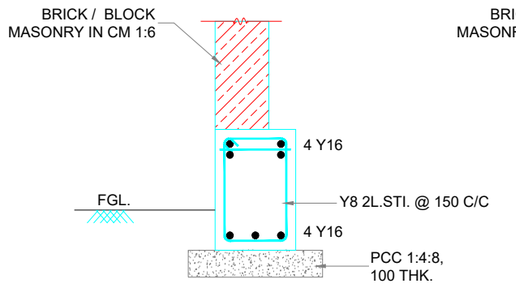


TYP.REFT.DETAILS OF SUNSHADE AND LINTEL FOR 3.5m C/C (MAXIMUM)

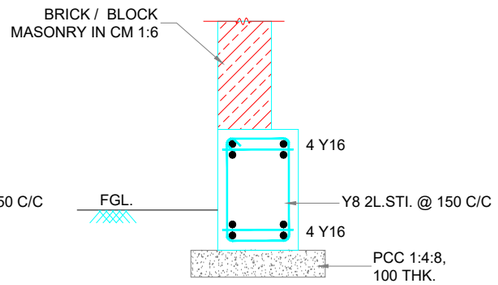
(DESHUTTERING OF SUNSHADE TO BE DONE ONLY AFTER CONSTRUCTING MASONRY ABOVE LINTEL AND PROPS SHALL BE REMOVED ONLY AFTER DESHUTTERING OF SLAB AND BEAMS)

NOTES

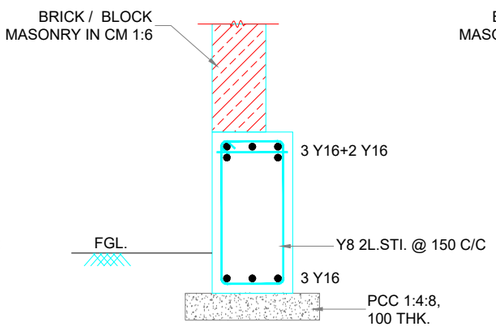
1. This drawing should be read along with Notes in this drawing, Architectural Drawings & Specifications.
2. All dimensions should be checked by the architect and any discrepancy found should be brought to our notice before execution.
3. All dimensions are in mm unless otherwise specified.
4. Dimensions shall not be measured directly from this drawing, follow only written dimensions.
5. Do not duplicate any part of this drawing without our written permission.
6. The grade of concrete and Steel should be M25 and Fe 500D respectively .
7. Clear cover to reinforcement , a)Column - 40mm , b)Footing -50mm.
8. Safe Bearing Capacity of soil is taken as 25 t/m² as per soil report which shall be verified at site before execution.
9. Building is designed for Ground Floor only. Lap length is 55 d, Where 'd' is the Diameter of bar



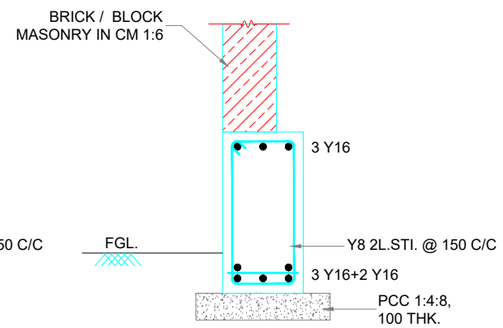
TYPICAL REFT. DETAILS OF PLINTH BEAM - PB1 300 x 450 SUPPORTING SPAN



TYPICAL REFT. DETAILS OF PLINTH BEAM - PB1 300 x 450 MID SPAN



TYPICAL REFT. DETAILS OF PLINTH BEAM - PB2 300 x 600 SUPPORTING SPAN



TYPICAL REFT. DETAILS OF PLINTH BEAM - PB2 300 x 600 MID SPAN

Project By:

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INKEL Limited
Door No.7/473 ZA-5&6, Ajiyal Complex, Post Office Road, Kakkanad, Cochin - 682030

Project Name:	2MWp Solar Power Plant
Notes:	

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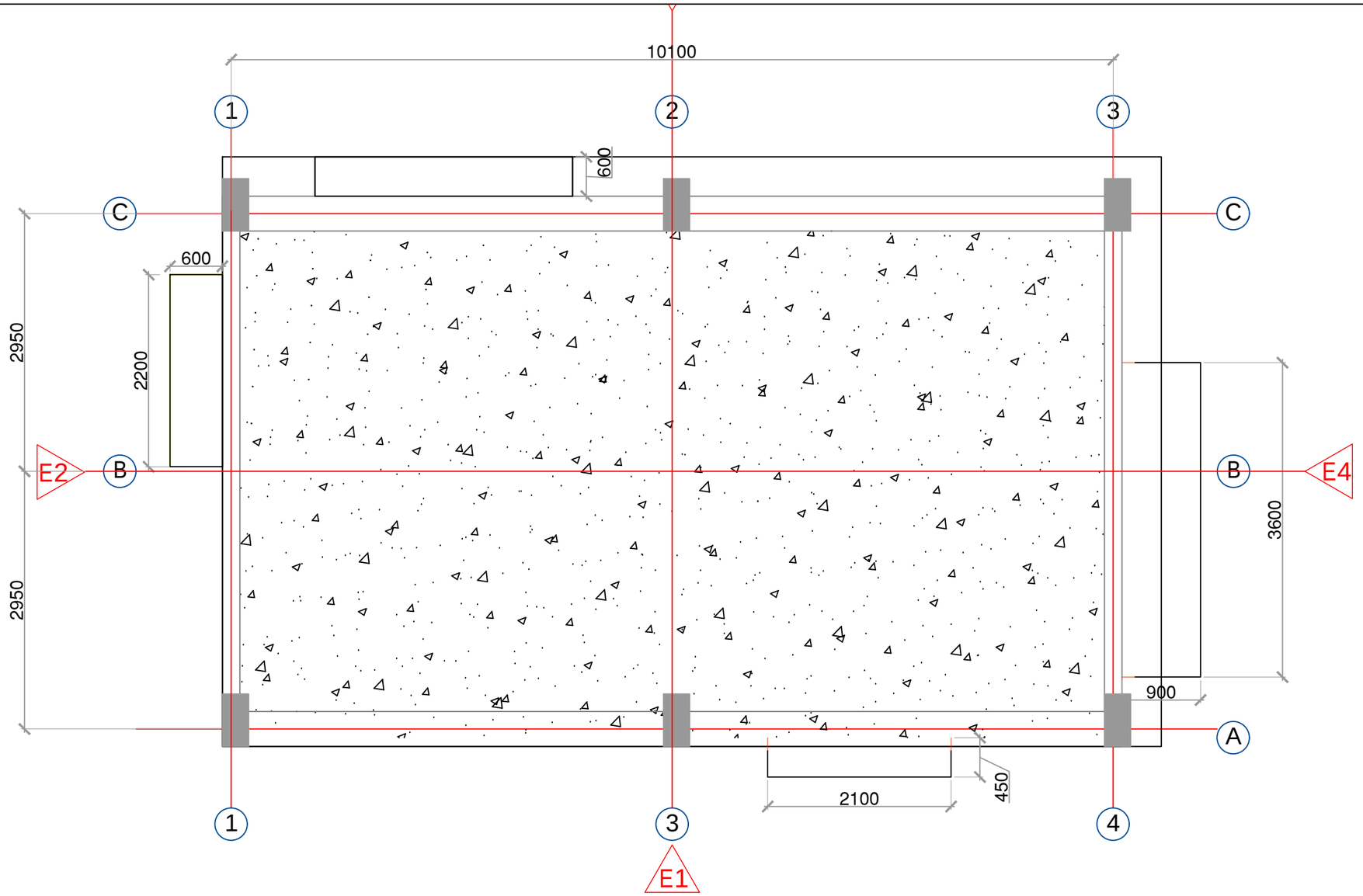
Title: Plinth Beam and Lintel Details (CR2 of 10)

Issued For: Approval

Drawing No.	Scale	Date
IL-2MWp-002	NTS	30/09/2026

Design By	Checked By	Approved By
AM	DM	AGM

Rev.	Description	Date
1.0	For Approval	30/09/2026



ROOF PLAN

DOOR WINDOW OPENING SCHEDULE

CODE	SIZE (IN MM)	SILL (IN MM)	LINTEL (IN MM)	NOs.	SPECIFICATION
D	1000X2100	--	+3100	01	
D1	800X2100	--	+3100	01	
RS	3000X3000	--	+4000	01	ROLLING SHUTTER
W	1800X600	+2200	+3100	02	

NOTES

1. This drawing should be read along with Notes in this drawing, Architectural Drawings & Specifications.
2. All dimensions should be checked by the architect and any discrepancy found should be brought to our notice before execution.
3. All dimensions are in mm unless otherwise specified.
4. Dimensions shall not be measured directly from this drawing, follow only written dimensions.
5. Do not duplicate any part of this drawing without our written permission.
6. The grade of concrete and Steel should be M25 and Fe 500D respectively .
7. All dimensions are in mm unless otherwise specified.
8. This is not a shop / fabrication drawing.

Project By:
inkel
Creating Infrastructure
A PPP INITIATIVE OF GOVERNMENT OF KERALA
INKEL Limited
Door No.7/473 ZA-5&6, Ajiyal Complex, Post Office Road, Kakkanad, Cochin - 682030

Project Name: 2MWp Solar Power Plant

Notes:

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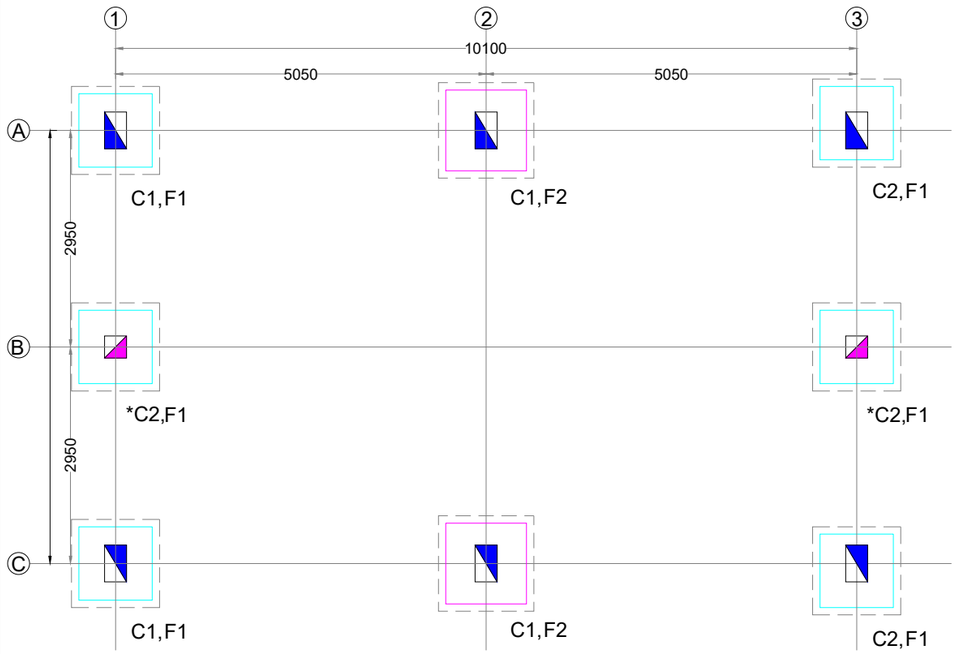
Title: Roof Plan (CR3 of 10)

Issued For: Approval

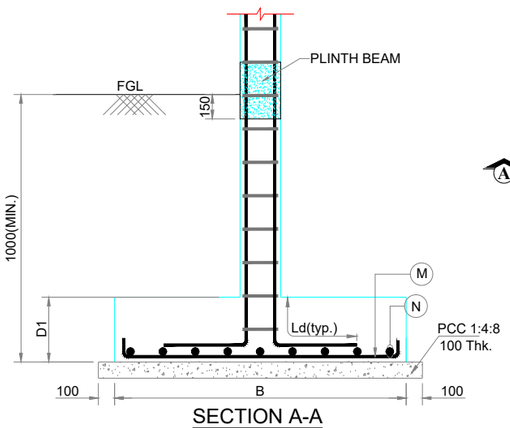
Drawing No.	Scale	Date
IL-2MWp-003	NTS	30/09/2026

Design By	Checked By	Approved By
AM	DM	AGM

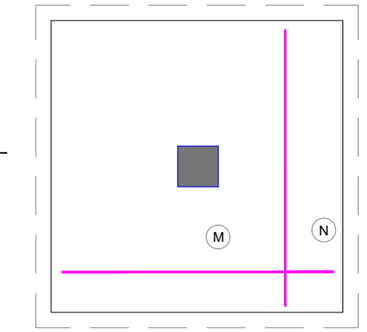
Rev.	Description	Date
1.0	For Approval	30/09/2026



*C2,F1 terminate at Plinth beam level



SECTION A-A



PLAN

TYP. DETAILS OF COLUMN FOOTING

SCHEDULE OF COLUMN FOOTING

TYPE	L	B	D1	M	N
F1	1000	1000	600	Y12 @ 170 C/C	Y12 @ 170 C/C
F2	1100	1100	600	Y12 @ 170 C/C	Y12 @ 170 C/C

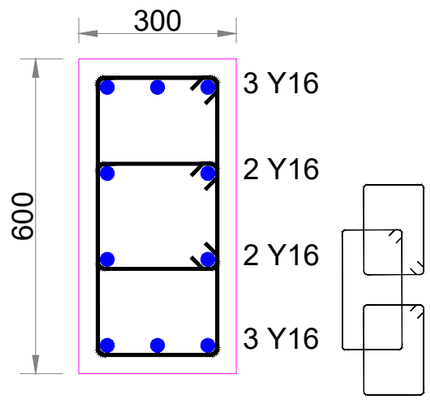
SAFE BEARING CAPCITY OF SOIL IS CONSIDERED AS 200kN/m² AS PER THE SOIL REPORT.

NOTES

1. This drawing should be read along with Notes in this drawing, Architectural Drawings & Specifications.
2. All dimensions should be checked by the architect and any discrepancy found should be brought to our notice before execution.
3. All dimensions are in mm unless otherwise specified.
4. Dimensions shall not be measured directly from this
drawing, follow only written dimensions.
5. Do not duplicate any part of this drawing without our written permission.
6. The grade of concrete and Steel should be M25 and Fe 500D respectively .
7. Clear cover to reinforcement , a)Column - 40mm , b)Footing -50mm.
8. Safe Bearing Capacity of soil is taken as 25 t/m² as per soil report which shall be verified at site before execution.
9. Building is designed for Ground Floor only. Lap length is 55 d, Where 'd' is the Diameter of bar.
11. The brick / block work shall be Concrete Hollow bricks.

TYPICAL SECTION OF COLUMN FOOTING

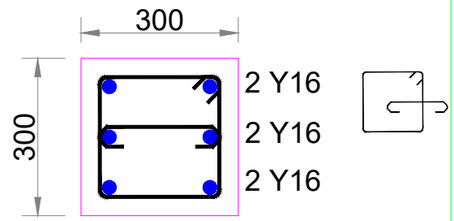
COLUMN SCHEDULE



Y8 TIES @ 150C/C

COLUMN - C1

(300 X 600)



Y8 TIES @ 150C/C

COLUMN - C2

(300 X 300)

Project By:

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A PPP INITIATIVE OF GOVERNMENT OF KERALA

INKEL Limited
Door No.7/473 ZA-5&6, Ajiyal Complex, Post Office Road, Kakkanad, Cochin - 682030

Project Name:	2MWp Solar Power Plant
Notes:	

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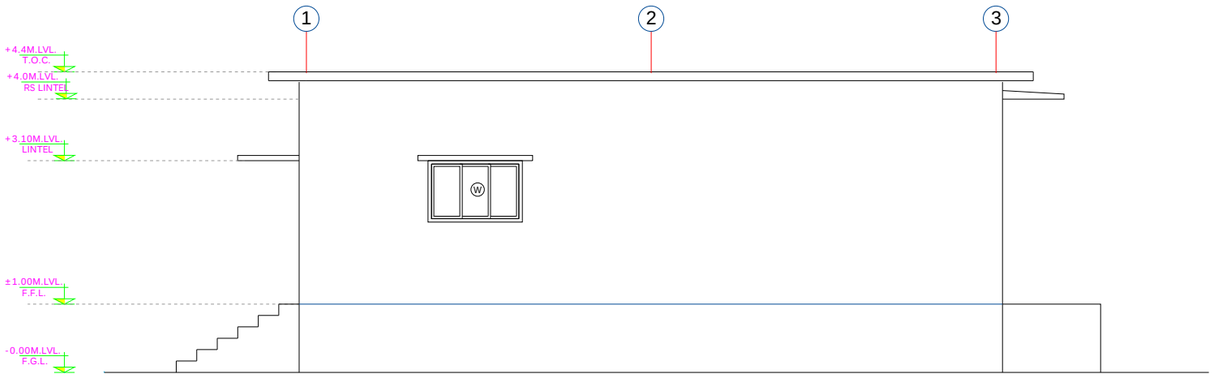
Title: Beam Layout and Column Details (CR4 of 10)

Issued For: Approval

Drawing No.	Scale	Date
IL-2MWp-004	NTS	30/09/2026

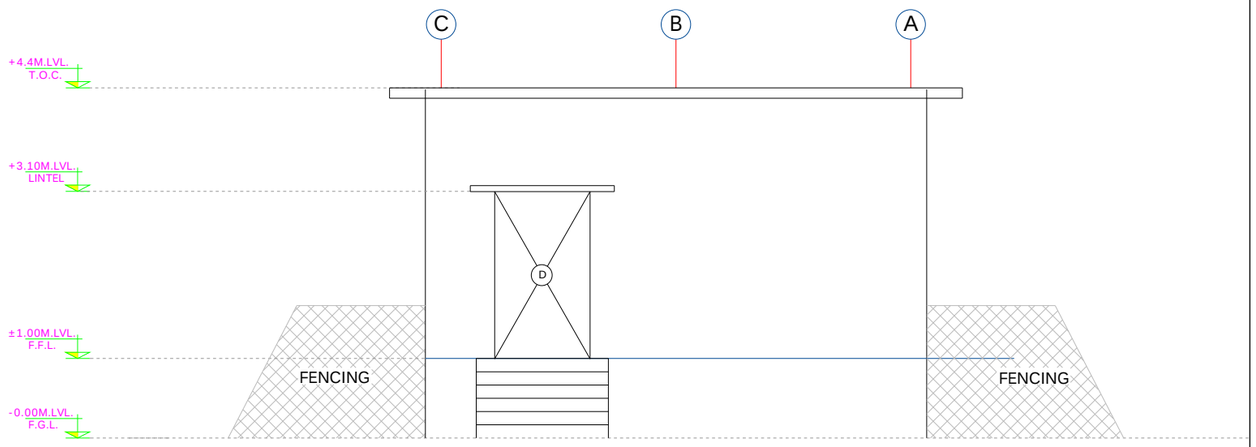
Design By	Checked By	Approved By
AM	DM	AGM

Rev.	Description	Date
1.0	For Approval	30/09/2026

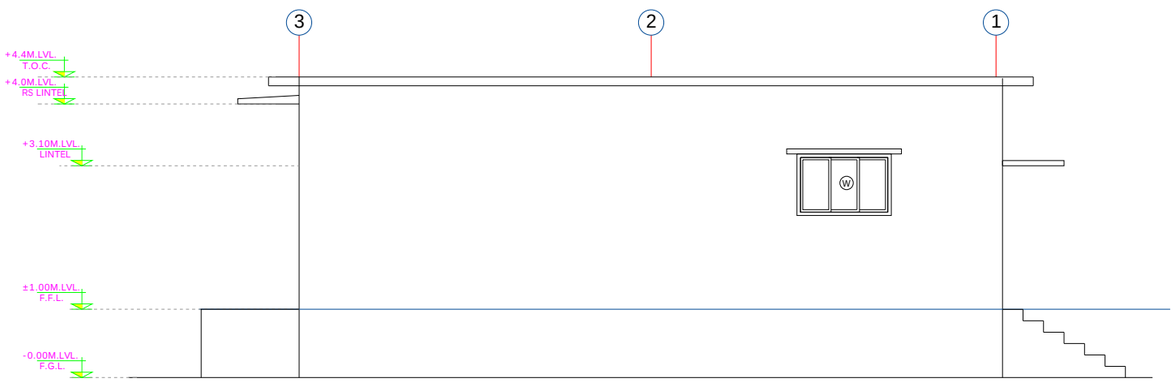


ELEVATION E1

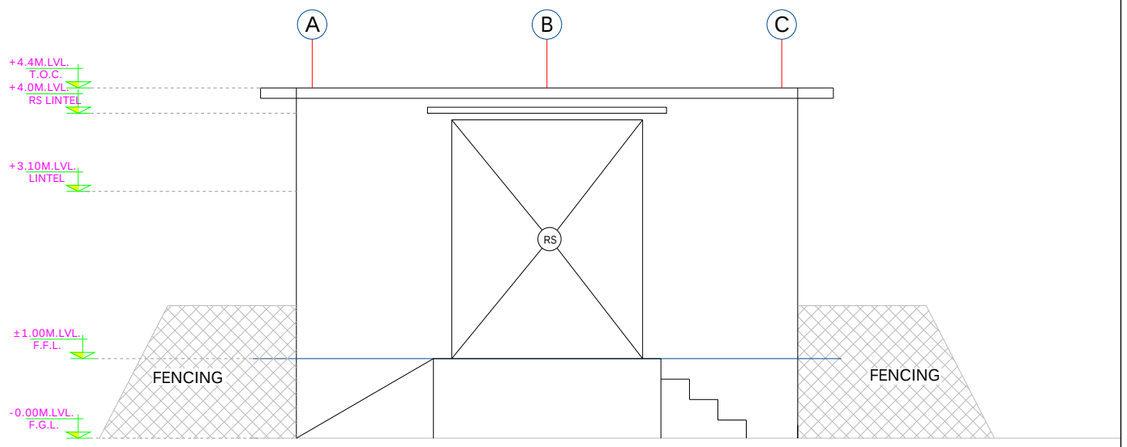
DOOR WINDOW OPENING SCHEDULE					
CODE	SIZE (IN MM)	SILL (IN MM)	LINTEL (IN MM)	NOs.	SPECIFICATION
D	1000X2100	--	+3100	01	
D1	800X2100	--	+3100	01	
RS	3000X3000	--	+4000	01	ROLLING SHUTTER
W	1800X900	+2200	+3100	02	



ELEVATION E2



ELEVATION E3



ELEVATION E4

Project By:

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A PPP INITIATIVE OF GOVERNMENT OF KERALA

INKEL Limited
Door No.7/473 ZA-5&6, Ajiyal Complex, Post Office Road, Kakkanad, Cochin - 682030

Project Name:	2MWp Solar Power Plant
Notes:	

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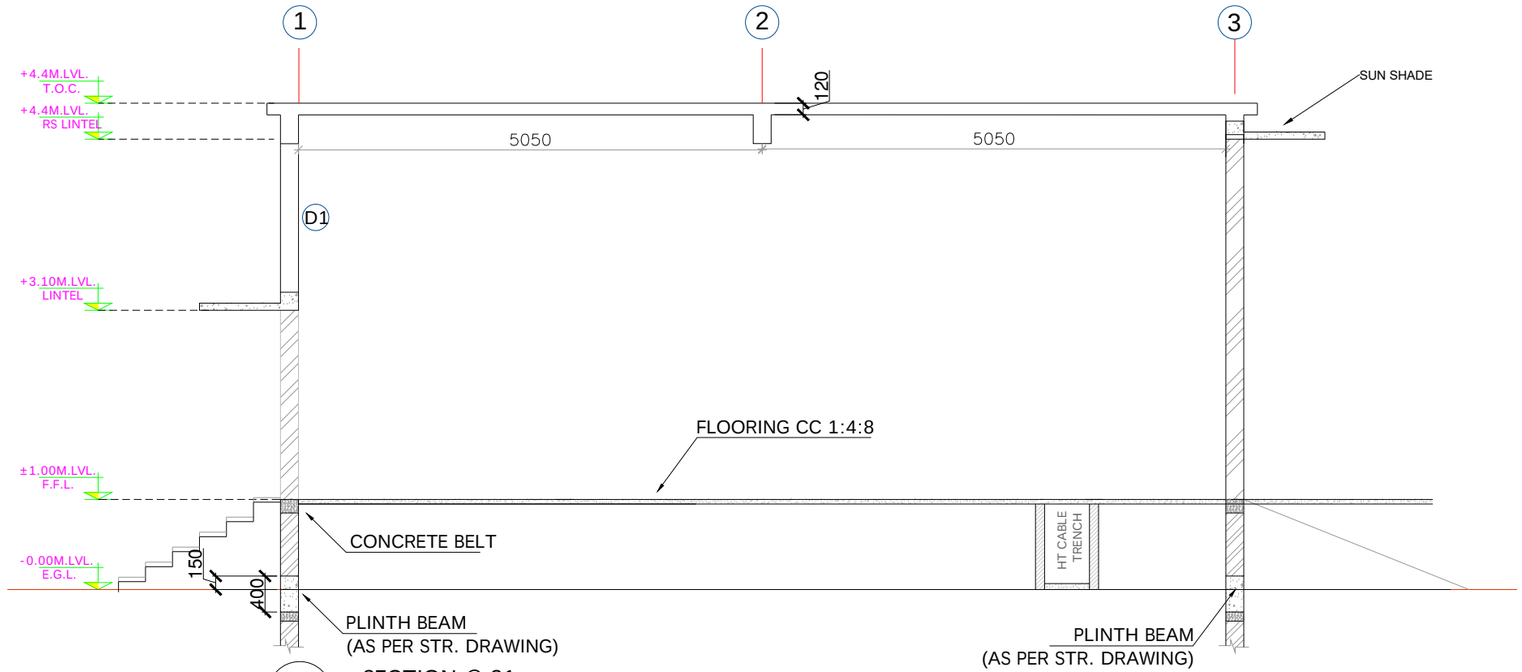
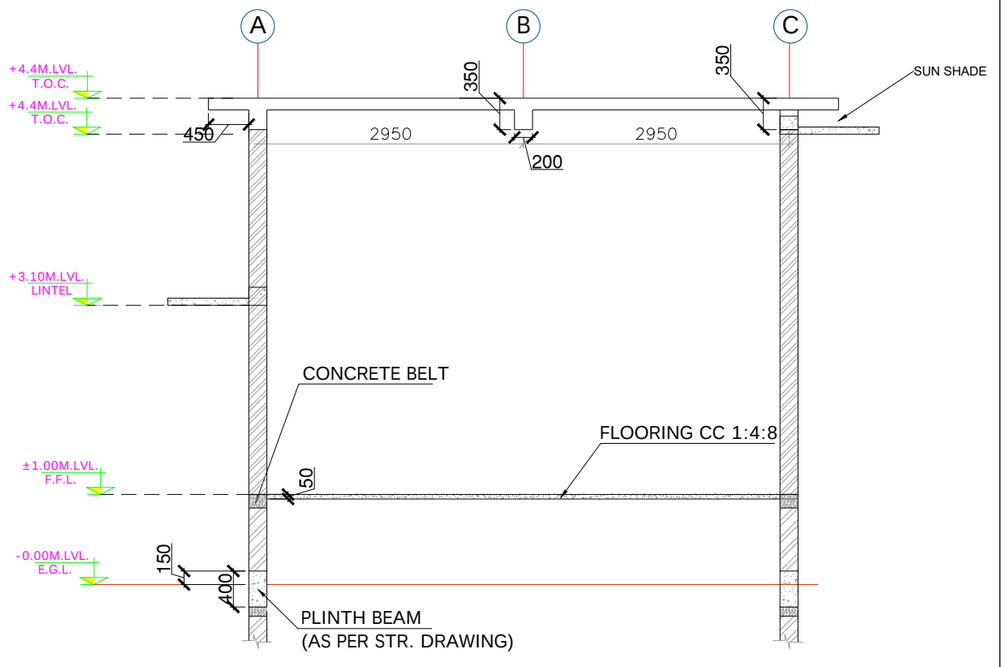
Title: Elevation (CR5 of 10)		
Issued For: Approval		
Drawing No.	Scale	Date
IL-2MWp-005	NTS	30/09/2026
Design By	Checked By	Approved By
AM	DM	AGM

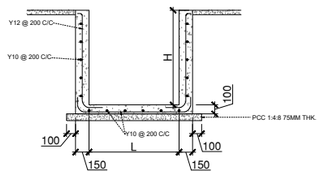
Rev.	Description	Date
1.0	For Approval	30/09/2026



SECTION @ S1



SECTION @ S2



SCHEDULE OF TRENCHES			
NO.	NAME OF TRENCH	W	H
1	LT CABLE TRENCH	2400	1000
2	HT CABLE TRENCH	500	1000

CABLE TRENCH DETAILS

Project By:

inkel
Creating Infrastructure
A PPP INITIATIVE OF GOVERNMENT OF KERALA

INKEL Limited
Door No.7/473 ZA-5&6, Ajyal Complex, Post Office Road, Kakkanad, Cochin - 682030

Project Name:	2MWp Solar Power Plant
Notes:	

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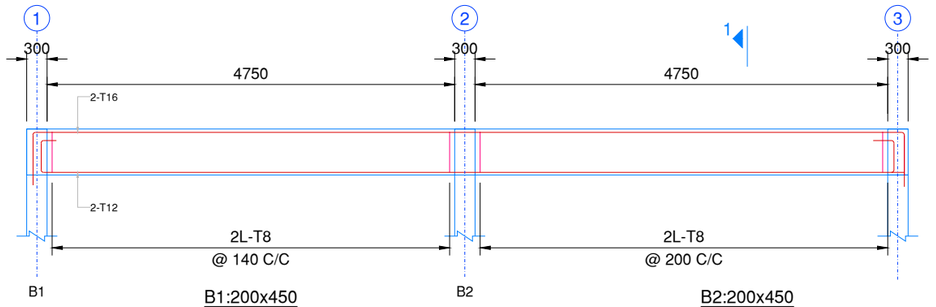
Title: Section Layout (CR6 of 10)

Issued For: Approval

Drawing No.	Scale	Date
IL-2MWp-006	NTS	30/09/2026

Design By	Checked By	Approved By
AM	DM	AGM

Rev.	Description	Date
1.0	For Approval	30/09/2026



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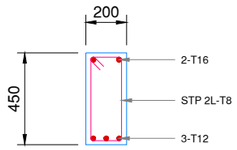
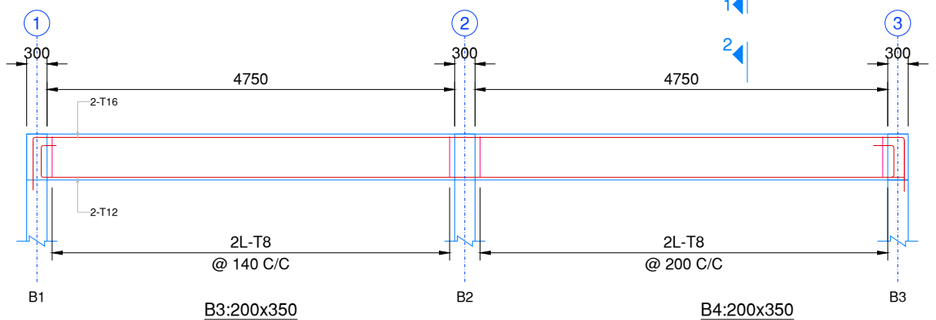
B2:200x450



SECTION 1-1



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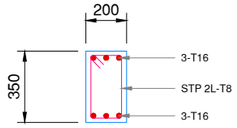

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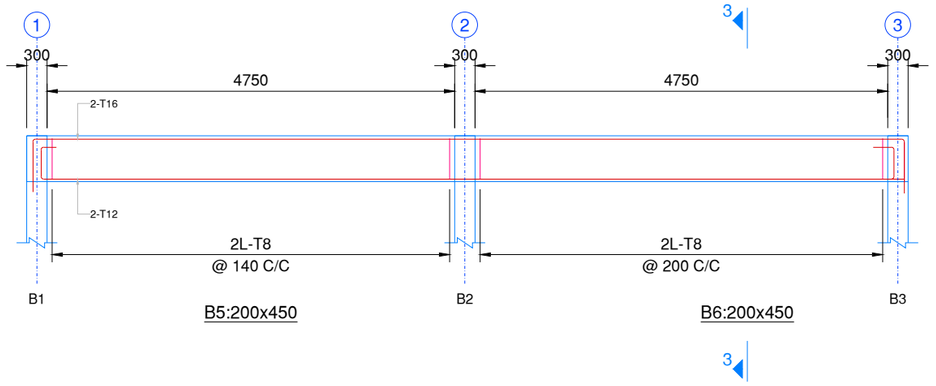

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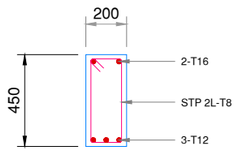
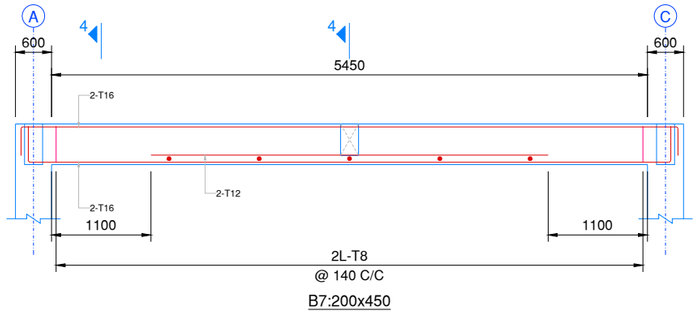


SECTION 3-3



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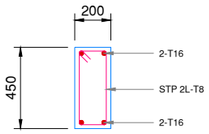

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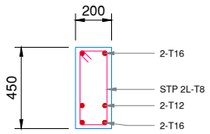
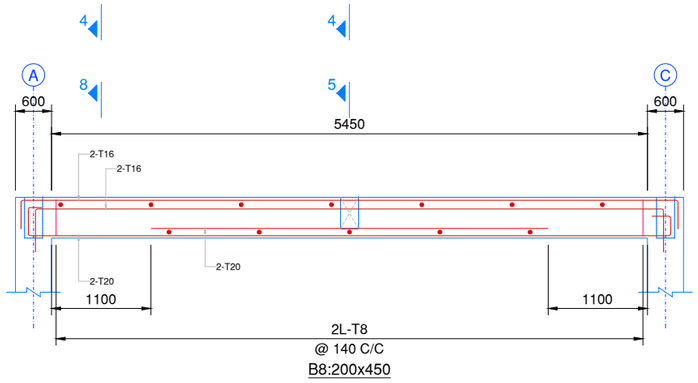


SECTION 5-5 (B7)



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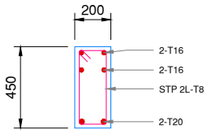

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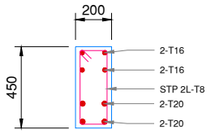

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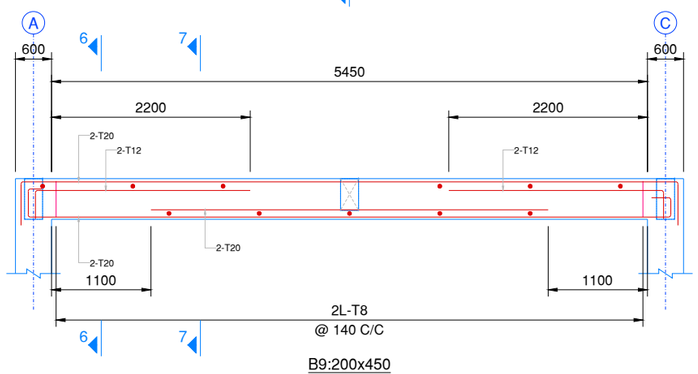

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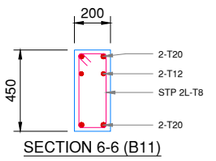
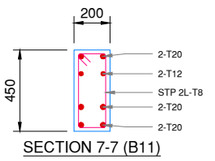


SECTION 6-6 (B11)



SECTION 7-7 (B11)

Project By:

inkel
Creating Infrastructure
A PPP INITIATIVE OF GOVERNMENT OF KERALA

INKEL Limited
Door No.7/473 ZA-5&6, Ajiyal Complex, Post Office Road, Kakkanad, Cochin - 682030

Project Name:	2MWp Solar Power Plant
Notes:	

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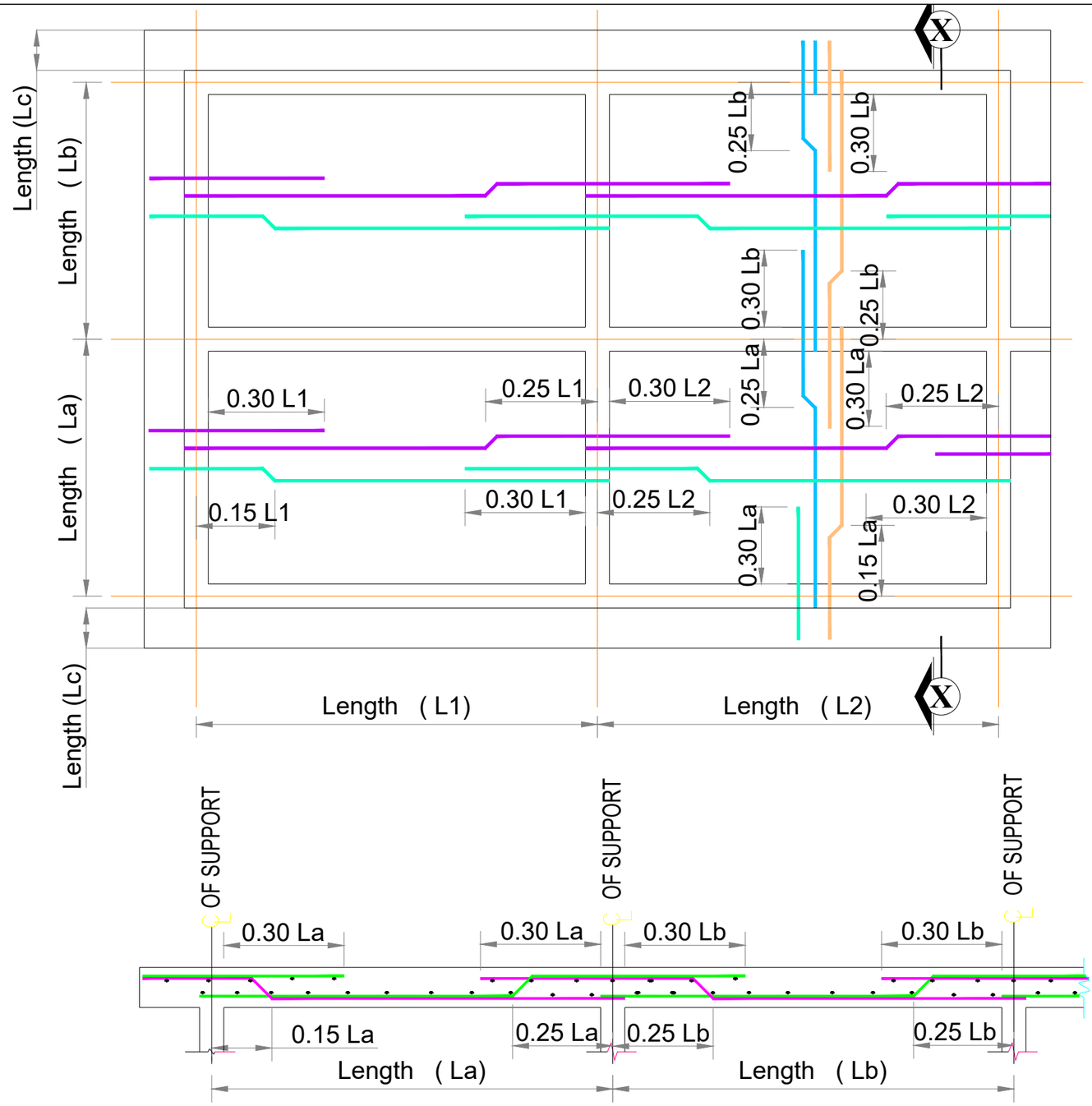
Title: Beam Layout and Column Details (CR7 of 10)

Issued For: Approval

Drawing No.	Scale	Date
IL-2MWp-007	NTS	30/09/2026

Design By	Checked By	Approved By
AM	DM	AGM

Rev.	Description	Date
1.0	For Approval	30/09/2026



SECTION X-X

DETAILS OF RCC SLAB				
TYPE	THICK	SHORT SPAN	LONG SPAN	REMARKS
S1	120	Y8 @ 180 C/C	Y8 @ 180 C/C	Two way

LENGTH DETAILS	
L1	5050mm
L2	5050mm
La	2950mm
Lb	2950mm
LC	450mm

Project By:

INKEL
Creating Infrastructure
A PPP INITIATIVE OF GOVERNMENT OF KERALA

INKEL Limited
Door No.7/473 ZA-5&6, Ajiyal Complex, Post Office Road, Kakkanad, Cochin - 682030

Project Name: 2MWp Solar Power Plant

Notes:

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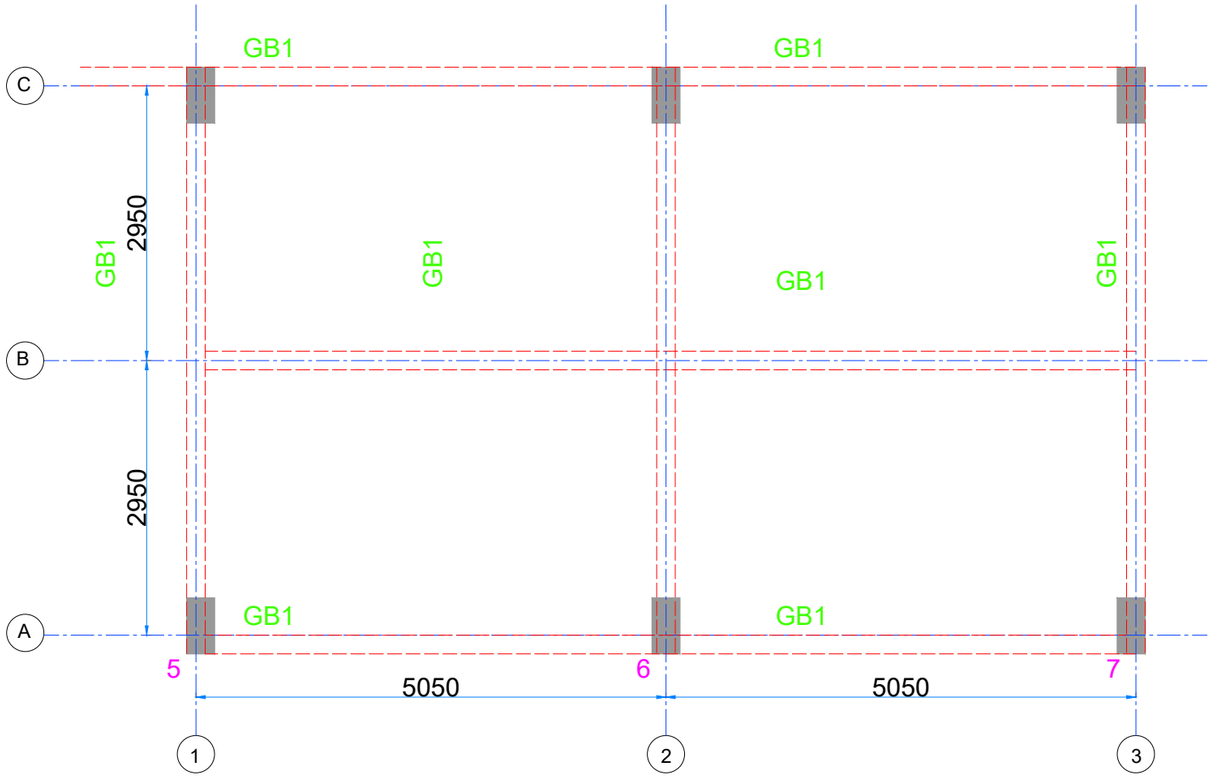
Title: Details of RCC Slab (CR8 of 10)

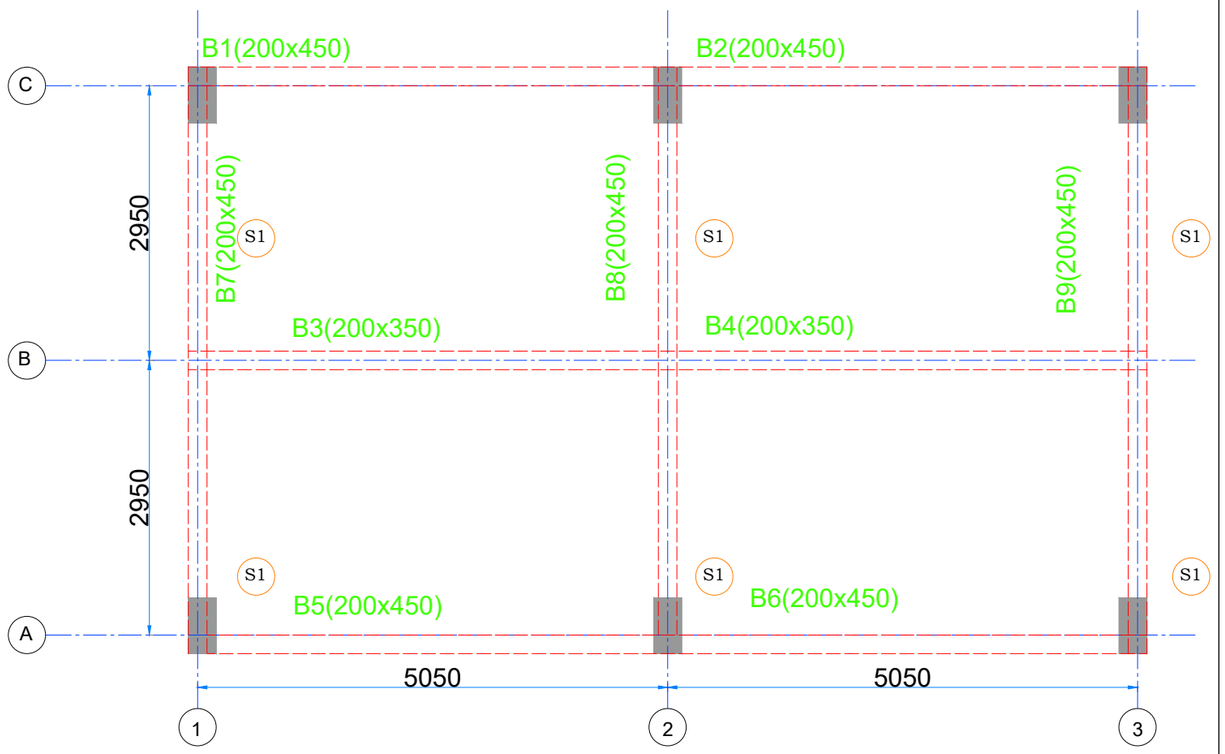
Issued For: Approval

Drawing No.	Scale	Date
IL-2MWp-008	NTS	30/09/2026

Design By	Checked By	Approved By
AM	DM	AGM

Rev.	Description	Date
1.0	For Approval	30/09/2026





*ALL PLINTH BEAMS (GB1) ARE 200 X 400

Project By:

INKEL Limited
Door No.7/473 ZA-5&6, Ajiyal Complex, Post Office Road, Kakkanad, Cochin - 682030

Project Name:	2MWp Solar Power Plant
Notes:	

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Title: Beam Layout (CR9 of 10)

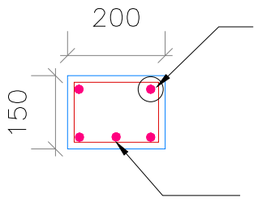
Issued For: Approval

Drawing No.	Scale	Date
IL-2MWp-009	NTS	30/09/2026

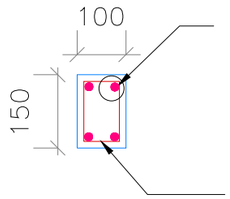
Design By	Checked By	Approved By
AM	DM	AGM

Rev.	Description	Date
1.0	For Approval	30/09/2026

LINTELS SHOULD BE ANCHORED INTO BRICK ON EITHER SIDE BY 300mm.



For 20cmThk wall



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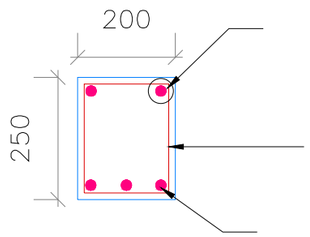

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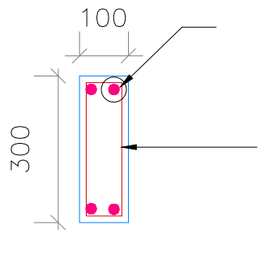

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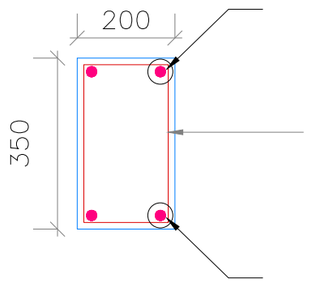

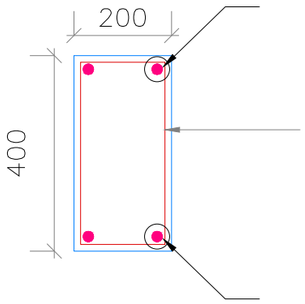

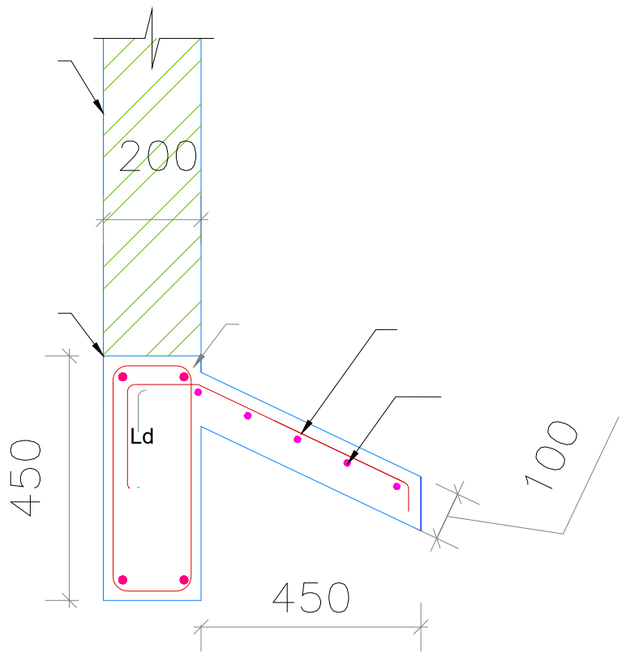

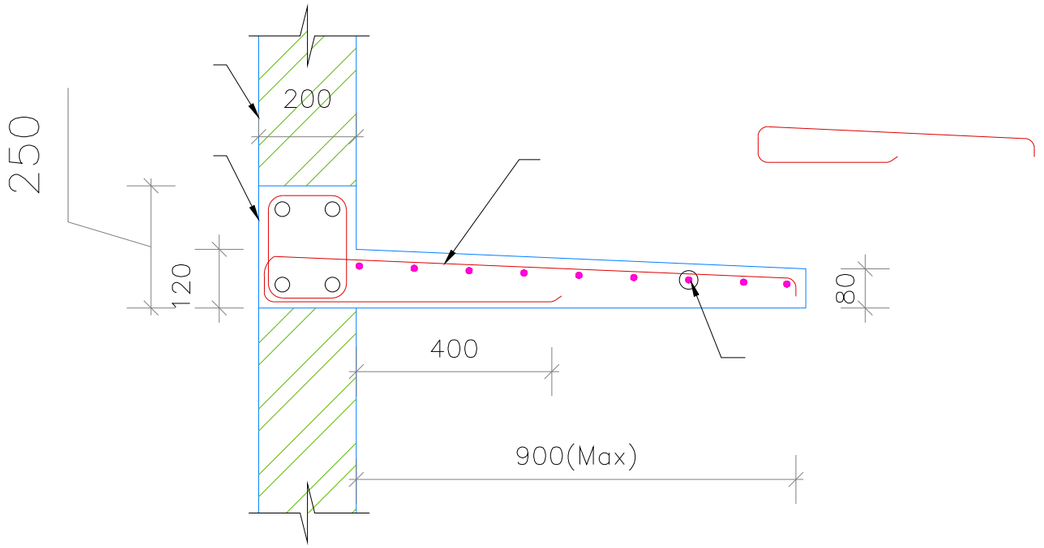

Project By:

inkel
Creating Infrastructure
A PPP INITIATIVE OF GOVERNMENT OF KERALA

INKEL Limited
Door No.7/473 ZA-5&6, Ajiyal Complex, Post Office Road, Kakkanad, Cochin - 682030

Project Name:	2MWp Solar Power Plant
Notes:	

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Title: Lintel and Shade Layout (CR10 of 10)

Issued For: Approval

Drawing No.	Scale	Date
IL-2MWp-010	NTS	30/09/2026

Design By	Checked By	Approved By
AM	DM	AGM

Rev.	Description	Date
1.0	For Approval	30/09/2026

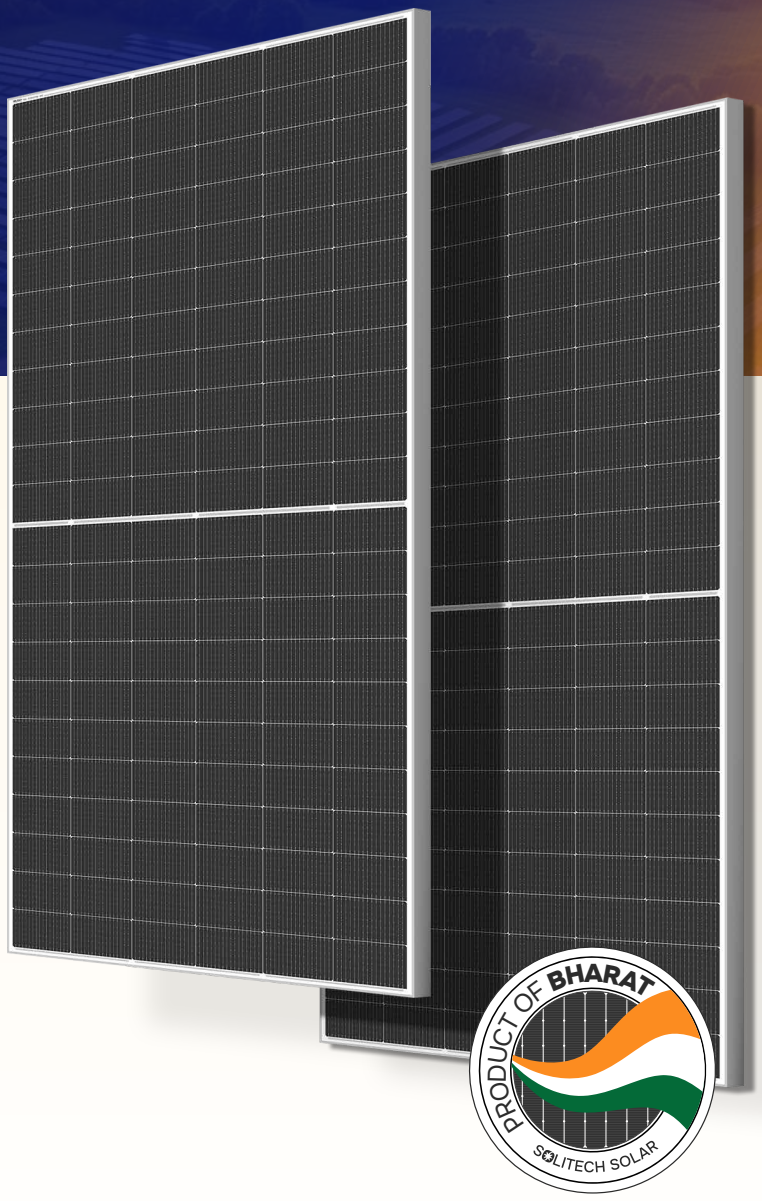
SOLITECH SOLAR

SOLI FUSION

610 Wp - 650 Wp

Bi-Facial Module with Dual Glass

N-Type TOPCon G12R



Wattage

610Wp - 650Wp

Junction Box

Split Junction Box
(3 nos. with individual Bypass Diods)

Cell

132 Half-cut
N-Type Solar cell

Dimensions (LxWxT in mm)

2382 × 1134 × 30 mm

Weight (kg)

32.4

Design

Silver Anodized Aluminum Alloy Frame and Semi Tempered Glass on Front and back, AR coating on Front Glass

Certifications

BIS Certified

ISO 9001:2015 14001:2015 45001:2018

IEC

IS 14286,
IS/IEC 61730-1 & 2,
IEC - 62804 - PID
IEC 62716 - Ammonia corrosion
IEC 61701 - Salt mist corrosion
IEC 61853 - Irradiance and temperature performance measurements and power rating

ALMM ENLISTED

2.0 GW GIGA FACTORY WITH ADVANCED AI

12 Years of Product Warranty

30 Years of Warranty on Linear Performance

Scan to know more

Model Type : SGE - G12R132T16G - AAA*

*AAA denotes Module Wattage

Electrical Characteristics (STC)

	650	645	640	635	630	625	620	615	610
Nominal Maximum Power (Pmax)	650	645	640	635	630	625	620	615	610
Optimum Operating Voltage (Vmp)	41.98	41.90	41.82	41.72	41.64	41.57	41.49	41.4	41.31
Optimum Operating Current (Imp)	15.49	15.4	15.31	15.225	15.136	15.04	14.95	14.86	14.77
Open Circuit Voltage (Voc)	49.66	49.56	49.48	49.39	49.3	49.21	49.12	49.03	48.94
Short Ciruit Current (Isc)	16.39	16.305	16.22	16.135	16.05	15.96	15.87	15.78	15.69
Module Efficiency (%)	24.04	23.86	23.67	23.49	23.30	23.12	22.93	22.75	22.56

STC: Irradiance 1000W/m², Cell Temperature 25°C, AM = 1.5

Electrical Characteristics (NOMT)

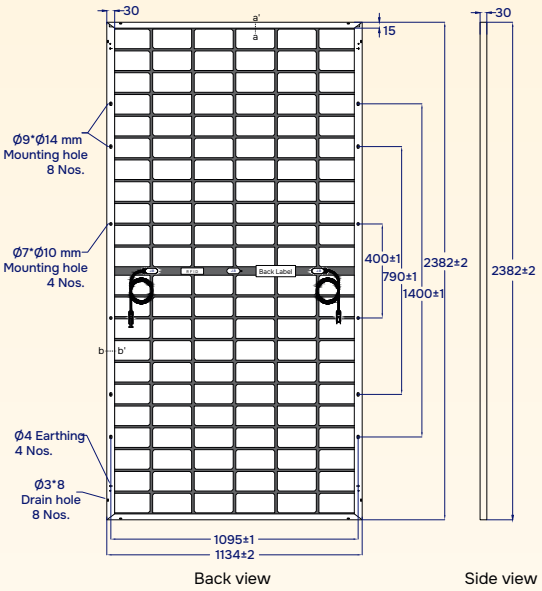
	495	491	487	483	479.5	475.6	471.9	467.9	464.2
Nominal Maximum Power (Pmax)	495	491	487	483	479.5	475.6	471.9	467.9	464.2
Optimum Operating Voltage (Vmp)	39.88	39.81	39.73	39.63	39.56	39.49	39.42	39.33	39.25
Optimum Operating Current (Imp)	12.40	12.33	12.26	12.19	12.12	12.04	11.97	11.90	11.83
Open Circuit Voltage (Voc)	47.18	47.10	47.01	46.92	46.84	46.75	46.66	46.58	46.49
Short Ciruit Current (Isc)	13.12	13.06	12.99	12.92	12.85	12.78	12.71	12.64	12.56

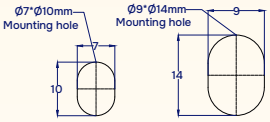
NOMT: Irradiance 800W/m², Ambient Temperature 20°C, AM = 1.5 Wind Speed 1m/s

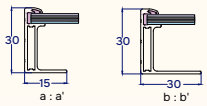
Bi-Facial Output – Backside Power Gain @ STC**

Nominal Maximum Power (Pmax)	5%	681	675	670	665	660	654	649	644	641
Module Efficiency (%)		25.17	24.98	24.78	24.59	24.39	24.20	24.01	23.81	23.69
Nominal Maximum Power (Pmax)	10%	711	706	700	695	689	684	678	673	671
Module Efficiency (%)		26.30	26.10	25.89	25.69	25.49	25.28	25.08	24.88	24.82
Nominal Maximum Power (Pmax)	15%	742	736	730	724	719	713	707	701	702
Module Efficiency (%)		27.43	27.22	27.00	26.79	26.58	26.36	26.15	25.94	25.95
Nominal Maximum Power (Pmax)	20%	772	766	760	754	748	742	736	730	732
Module Efficiency (%)		28.56	28.33	28.11	27.89	27.67	27.45	27.22	27.00	27.08

** Additional power gain from the rear side, relative to the front side's power at STC, is influenced by the mounting structure (such as height and tilt angle) and the ground's reflectivity. Bi-Faciality Factor: 70 ± 5%.







All dimensions are in mm.

Mechanical Specifications

Cell Type	G12R Half-Cut N-type TOPCon Bifacial Solar Cells
No. of cells	132 (66×2)
Dimensions	2382 × 1134 × 30 mm
Weight	32.4 kg
Front Cover	2 mm Low Iron Semi-Tempered AR Coated Glass
Back Cover	2 mm Low Iron Semi-Tempered Glass
Frame	Anodized Aluminium Alloy
Junction Box	30A Split Junction Box - IP68 Rated
Protection Class	Class II
IEC Fire Type	Class C
Connector Type	MC4 Compatible
Output Cables	4.0 mm² (+): 300 mm , (-): 300 mm or Customized Length

Maximum Operating Conditions

Operating Temperature	-40°C to +85°C
Maximum System Voltage	1500V
Maximum Series Fuse Rating	30 A / 35 A

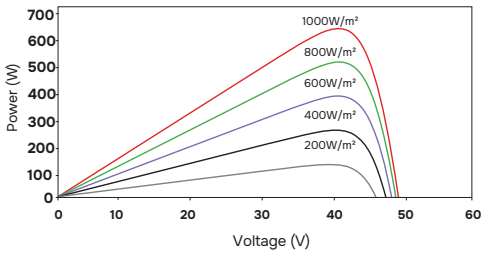
Temperature Coefficients

Current α (Isc)	0.045 %/°C
Voltage β (Voc)	-0.25 %/°C
Power γ (Pmax)	-0.29 %/°C

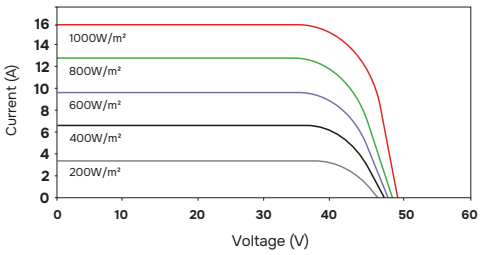
Packing Configuration#

	20FT	40FT
No. of Modules per Pallet	36 Nos	36 Nos
No. of Pallets per Container	10 Pallets	20 Pallets
No. of Modules per Container	360 Nos	720 Nos

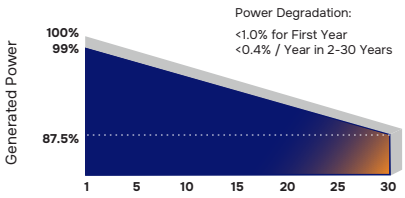
Power-Voltage Curves (SGE - G12R132T16G - 630)



Current-Voltage Curves (SGE - G12R132T16G - 630)



Linear Graph

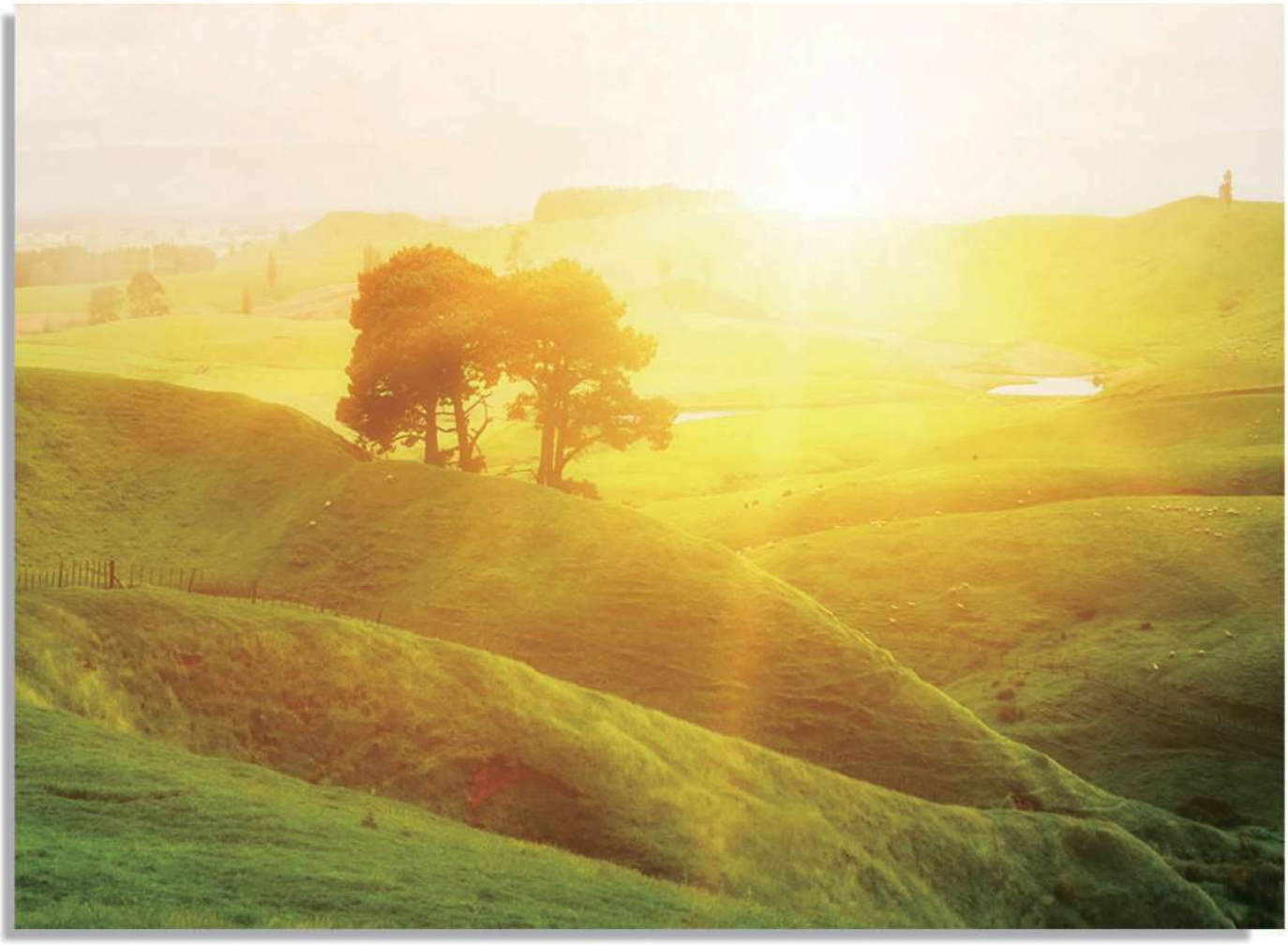


#Quantity of modules/container may get changed without prior notice.

- For handling & installation instructions, refer to Solitech Solar's installation manual available on the company website
- Before placing an order, confirm your requirements with our sales representative
- The electrical data provided is for reference purposes only
- PV modules need to be disposed of as per government regulations after their life cycle
- Refer to Solitech Solar's warranty document for terms and conditions
- Due to constant product modifications, Solitech Solar reserves the right to amend the above specifications without prior notice
- Images in the datasheet are for representation purposes only

Three Phase String Inverter

SUN-120 / 125 / 130 / 135 / 136K-G01P3-EU-AM8



- 8 MPP trackers, Max. efficiency up to 98.8%
- Zero export application, VSG application
- String intelligent monitoring
- Wide output voltage range
- Anti-PID function
- Type II DC/AC SPD

Deye

Technical Data

Model	SUN-120K-G01P3 -EU-AM8	SUN-125K-G01P3 -EU-AM8	SUN-130K-G01P3 -EU-AM8	SUN-135K-G01P3 -EU-AM8	SUN-136K-G01P3 -EU-AM8
Input Side					
Max. DC Input Power (kW)	180	187.5	195	202.5	204
Max. DC Input Voltage (V)	1100				
Start-up DC Input Voltage (V)	250				
MPPT Operating Range (V)	200-1000				
Max. DC Input Current (A)	40+40+40+40+40+40+40+40				
Max. Short Circuit Current (A)	60+60+60+60+60+60+60+60				
No.of MPP Trackers	8				
No.of Strings per MPP Tracker	4+4+4+4+4+4+4+4				
Output Side					
Rated Output Power (kW)	120	125	130	135	136
Max. Active Power (kW)	132	135	135	135	136
Rated Output Voltage/Range (V)	3L/N/PE 220/380V, 230/400V 0.85Un-1.1Un (this may vary with grid standards)				
Rated Grid Frequency (Hz)	50 / 60 (Optional)				
Operating Phase	Three Phase				
Rated AC Grid Output Current (A)	181.9/174	189.4/181.2	197/188.5	204.6/195.7	206.1/197.2
Max. AC Output Current (A)	200/191.4	204.6/195.7	204.6/195.7	204.6/195.7	206.1/197.2
Output Power Factor	>0.99				
Total Harmonics Current Distortion (THDi)	<3%				
DC Injection Current (mA)	<0.5%				
Grid Frequency Range	45-55 or 55-65 (Optional)				
Efficiency					
Max. Efficiency	98.8%				
Euro Efficiency	98.3%				
MPPT Efficiency	>99%				
Protection					
DC Reverse-Polarity Protection	Yes				
AC Short Circuit Protection	Yes				
AC Output Overcurrent Protection	Yes				
Output Overvoltage Protection	Yes				
Insulation Resistance Protection	Yes				
Ground Fault Monitoring	Yes				
Anti-islanding Protection	Yes				
Temperature Protection	Yes				
Integrated DC Switch	Yes				
Remote Software Upload	Yes				
Remote Change of Operating Parameters	Yes				
Surge Protection	DC Type II / AC Type II				
General Data					
Size (mm)	1006W×516H×325.5D (Excluding Connectors and Brackets)				
Weight (kg)	103				
Topology	Transformerless				
Internal Consumption	<1W (Night)				
Running Temperature	-25 to +60°C, >45°C Derating				
Ingress Protection	IP65				
Noise Emission (Typical)	≤65 dB				
Cooling Concept	Smart Cooling				
Permissible Altitude (m)	4000				
Designed Lifetime	8 Years				
Grid Connection Standard	IEC 61727,IEC 62116,CEI 0-21,CEI 0-16,EN 50549, NRS 097,RD 140,UNE 217002, OVE-Richtlinie R25,G99,VDE-AR-N 4105,VDE-AR-N 4110				
Operating Surroundings Humidity	0-100%				
Safety EMC / Standard	IEC/EN 61000-6-1/2/3/4, IEC/EN 62109-1, IEC/EN 62109-2				
Features					
Display	LCD 240 × 160				
Interface	RS485/RS232/Wifi/LAN				

Deye