

	PURCHASE SPECIFICATION	BDC1617-16001	
Rudrapur	GROUP : BDC	Rev no	00

BDC1617-16001

SPECIFICATIONS FOR SUPPLY OF BOS, ERECTION & COMMISSIONING AND 05 YEARS OF COMPREHENSIVE MAINTENANCE FOR 160 Kwp ROOF TOP GRID CONNECTED SPV POWER PLANT AT BGGTS DUNDIGAL VILLAGE QUTHBULLAPUR MANDAL R.R DISTRICT TELANGANA,500 043 INDIA

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1.0 INTRODUCTION:

This specification defines the scope of the Bidder in **specifications for supply of balance of system (BoS), erection & commissioning and 05 years of comprehensive maintenance for 160 kw roof top grid connected spv power plant at BGGTS Dundigal village Quthbullapur Mandal R.R district Telangana.**

1.1 Site Details:

Site is located at BGGTS, Dundigal Village at a distance of 25 Km from Secundrabad railway Station. The 160KWp SPV plant is to be installed on south facing roof top of Repair facility shop of BGGTS having area of 24x100 Mtrs and height of approximately 15 Mtrs. The shop roof is tilted at ~ 5° and is made up of GI Power coated sheets. The BGGTS facility is supplied by one Transformer with a capacity of 1600 KVA and 1320Kva DG sets (500KVA X 02Nos and 320KVA X 01No).

The power evacuation of grid connected SPV system shall be made to main LT panel at a distance of about 240 Mtrs from repair facility shop.

Bidders are advised that they should visit the site before quoting to fully understand the site conditions. The site photographs and drawing are attached as **annexure C**.

2.0 BIDDER'S SCOPE:

The Scope of bidder is as follows:

- Erection and commissioning of **300 Wp, 540 Nos. SPV Modules supplied by BHEL** (Specifications as per SPV Module drawing- 3-679-02-00352 and SPV Module Data Sheet – CD- 4-4001-128).
- Supply, Erection and commissioning of Solar module mounting structure along with all accessories.
- Supply, Erection and commissioning of 03 String Inverters.
- Supply, Erection and commissioning of ACDB . Output from Solar String Inverters shall be fed to the Owner's LT Panel through ACDB installed near the Solar Plant. Unidirectional Multi function meter (MFM) of suitable current rating shall be provided at the outgoing feeder of ACDB to monitor Solar PV Generation along with suitable CT/PT.
- Supply, Erection and commissioning of DC Cu Cables for connection between Modules and Inverters.
- Supply, Erection and commissioning of AC Al Cables for connections between inverter, ACDB, LT Panel etc.
- Supply, Erection and commissioning of Web Enabled Data Logging system with 5 year service.
- Supply, Erection and commissioning of Earthing & lightning protection of SPV area as per relevant IS.

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- i. Supply, Erection and commissioning of Miscellaneous Equipment (Control cables, insulation tapes, , ferrules, Lugs, Cable Glands, cable trays, cable ties, pipe, Clamps, Safety Signs, project Schematic, Project information Signage, MC4 connectors etc.) and Civil Works.
- j. Synchronization of Grid, DG & Solar power.
- k. Obtaining all approvals and preparation of documents for obtaining those approvals for Construction and installation and commissioning of the Solar PV Plant from CEA / Local State Electricity Board. Necessary statutory fees shall be arranged by the bidder.
- l. Obtaining approval for Net (Import / Export) Metering from Local State Electricity Board / Local Statutory Authority and supply & installation of the same meter. Necessary statutory fees shall be arranged by the bidder.
- m. Freight & Transit insurance
- n. System Warranty of 05 years
- o. Comprehensive Maintenance contract of 5 years (Quarterly Visit).

Note: Such Items, not listed but required for completion of the Project shall deemed to have been included in the scope of this contract.

2.1 List of Items for Supply & E&C

Sl. No.	ITEM DESCRIPTION	Qty	SUPPLY	E & C	MAKE/ REMARKS
1.	Solar PV Module 300 Wp	540	x	☒	SPV Modules shall be provided by BHEL.
2.	Module Mounting Structures with Nuts, bolts, SS Hardware and accessories for 160KWp (540 Nos) SPV Modules	1 lot	✓	✓	Bidder Shall provide structure drawing and load analysis details.
3.	Grid Connected Solar String Inverter 50 kVA with mounting accessories, AC output 3Ø, 400V, 50 Hz	3 No.	✓	✓	Delta/ SMA/ KACO / Schneider/ ABB/ Reffusol/ Ingeteam.
4.	ACDB with MFM along with all accessories.	1 set	✓	✓	ACDB Panel Body: Should confirm to IP 55 and shall be made up of min.16 Gauge powder coated MS Sheet. MCCB make: ABB, L&T, C&S, SCHNIDER. MFM Make: Secure, Rishabh or reputed make.
5.	1.1kV grade heavy duty PVC insulated, Double sheathed, UV protected XLPO stranded copper cables as per IS: 7098	1300 Mtrs	✓	✓	Reputed makes viz., Polycab / Pagoda/ KEI / LAPP / Advance Cables / Equivalent.

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	(Part I & II) – 1976 or IS 1554 or IS9537 (a). 1 core 4 sq. mm unarmored red cable from series string to string inverter for +ve side (b). 1 core 4 sq. mm Unarmored black cable from series string to string inverter for –ve side	1300 Mtrs	✓	✓	Test reports confirming to IS should be submitted Length is indicative and can vary upto ±10%. Any variation beyond 10% shall be payable/recoverable @ Rs. 32/ meter.
6.	1.1kV grade heavy duty PVC insulated galvanized strip/wire armored XLPE stranded Cu conductor cables as per IS: 7098 (Part I & II) – 1976 or IS 1554 or IS9537. 3.5 C x 25 sq.mm cable (from String Inverter to ACDB)	75 Mtrs	✓	✓	Reputed makes viz., Polycab/KEI/LAPP/Advance Cables/equivalent. Length is indicative and can vary upto ±10%. Any variation beyond 10% shall be payable/recoverable @ Rs. 1100/ meter.
7.	1.1kV grade heavy duty PVC insulated galvanized strip/wire armored XLPE stranded Aluminum conductor cables as per IS: 7098 (Part I & II) – 1976 or IS 1554 or IS9537. 3.5 C x 300 sq.mm cable (from ACDB to LT Panel underground buried)	240 Mtrs	✓	✓	Reputed makes viz., Polycab/KEI/LAPP/Advance Cables/equivalent. Length is indicative and can vary upto ±10%. Any variation beyond 10% shall be payable/recoverable @ Rs. 1750/ meter. LT Panel Connection MCCB shall be provided by BGGTS.
8	Web enabled Data Logger	1 No.	✓	✓	Make: Reputed make.
9.	Lightning Arrestor (Globe type) with earthing for roof along with mounting arrangement as per relevant IS.	2 Set	✓	✓	As per the attached drawing No: 3-679-05-00037.
10.	Pipe earthing with earth Bus bar for Structures, String inverter and LA earthing as per IS3043.	06 Nos	✓	✓	This includes 02 earthing for LA
11.	Miscellaneous Equipment (Control cables, insulation tapes, , ferrules, Lugs, Cable Glands, cable trays, cable ties, pipe, for synchronization, Clamps, Safety Signs, project Schematic, Project information	1 set	✓	✓	Quantities as required for project completion, Bidder has to organize without any additional cost.

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	Signage, MC4 connectors, etc.) and Civil Works required for E&C.				
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Note: SPV Modules shall be supplied by BHEL; However I&C of SPV modules shall be in scope of Bidder.

1. The technical particulars, installation procedures and drawings of the bought out items Listed above clause 2.1 shall be submitted for approval to BHEL before procuring.
2. Bidder has to procure materials as per listed make. Whenever equivalent make has to be procured prior approval has to be taken from BHEL submitting the make and technical particulars of the component.
3. Test Certificates of BOS material and dimensional test reports of structures confirming to IS should be submitted to BHEL for PSI.

2.1.1 Solar PV Modules

540 Nos. SPV Modules shall be supplied by BHEL. Specifications of SPV modules is as per SPV Module drawing- 3-679-02-00352 and SPV Module Data Sheet – CD- 4-4001-128. Erection and commissioning of SPV Modules shall lie in Bidder's Scope.

2.1.2 MODULE MOUNTING STRUCTURE:

- I. The modules shall be mounted in slope & orientation of the inclined roof (5°). The structure design shall be appropriate and innovative. The structure shall be designed to allow easy replacement and approach to any module, its cleaning and maintenance. The panels shall not be installed on FRP transparent sheets.
- II. Design drawings with material selected and their standards shall be submitted for prior approval of Employer within 10 days of issuance of PO.
- III. The recommended safe load of roof is 15 kg/m² (frame & Purlin). The SPV Module weight is 12.5 kg/m². The mounting structure should be designed so that the total load of module + structure and accessories should not exceed 15 kg/m².
- IV. The mounting structure design & foundation shall be designed with reference to Base Wind speed of 160 kmph . For estimation of Design wind speed risk factors k1, k2, k3 shall each be taken as minimum 1.0. The structure must be designed with considering appropriate factor of safety. The bidder must provide the detail design and calculation for the structure design.
- V. The SPV modules should be fixed on the structure by using anodized aluminum or GI (70 Micron) channels. It shall support SPV modules at a given orientation

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& tilt, absorb and transfer the mechanical loads to the ground properly. Welding of structure at site shall not be allowed.

- VI. The structure shall be fixed to roof purlins using tek screw, suitable clamps and anodized extrusion. Nut & bolts, washers (packing and spring) supporting structures including Module Mounting Structures shall have to be adequately protected from rusting. Fasteners and washers to be used for erection of mounting structures could be of SS 304/UNS S 20430 or equivalent; however fasteners used for fixing modules over structures shall be of stainless steel of grade SS 316 or equivalent, and must sustain the adverse climatic conditions to ensure the life of structure for 25 years. Zinc rich spray paint shall be applied in scratches of the structures for preventing corrosion.
- VII. The array structure shall be grounded properly using maintenance free earthing kit.
- VIII. Cable should pass from Pipes/ cable Trays. Cable-ties shall be used to hold and guide the cables/wires from the modules/module mounting structure.
- IX. The installation of module mounting structure shall be waterproofed using waterproofing compound. No leakage/seepage of water should occur from the roof. Also during the course of installation of the structure on the roof, no damage to existing water proofing of the roof shall be made. Any damage to the waterproofing found during the above should be rectified to the existing roof condition by Bidder on his own cost.

2.1.3 STRING INVERTER:

String inverter should cater to the following requirements. Bidder should ensure compatibility of inverter with SPV modules and system. The technical particulars of the inverter have to be submitted to BHEL for approval before procurement.

Sl. No	Technical parameter	Specification
1.	Type	Grid Connected String Inverter (transformer less).
2.	Make	Delta/ SMA/ KACO / Schneider/ ABB/ Reffusol/ Ingeteam.
3.0	Standards	
3.1	Efficiency Measurement	IEC 61683/ Equivalent BIS Std.
3.2	Environmental testing	IEC 60068-2 (1,2,14,30) / Equivalent BIS Std.
3.3	Interfacing with utility grid	IEC 61727
3.4	Islanding Prevention Measurement	IEC 62116
3.5	Type Test certificate issuing authority (for Sl. No. 3.1 , 3.2,3.3 and 3.4)	NABL/ IEC Accredited Testing Laboratories or MNRE approved test centers.

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4.0	Input DC	
4.1	PV array connectivity capacity	10% more than rated AC KVA(min)
4.2	Voltage range	Min 250-1000
4.3	MPP voltage range	Min 550-800
4.4	No of independent MPPT	Min 02
4.5	DC disconnect switch	Integrated Disconnect switch shall be provided on DC side
5.0	Output AC	
5.1	Nominal AC power output	50KVA
5.2	Output voltage and phase	Sine wave 3 Phase 400 V $\pm 20\%$ 50Hz AC, minimum 4 wire output RYBN or RYBN+PE
5.3	Reactive power	0.8 lagging to 0.8 leading
5.4	Total Harmonic Distortion (THD)	< 3% at rated power
5.5	Standby power consumption	Standby power consumption of Inverter shall be furnished by the Bidder.
6.0	Efficiency	Min 97.5%
7.0	Protection	
7.1	DC Side	1. Disconnection device 2. Reverse polarity protection 3. Reverse current to PV array protection over voltage, under voltage over current protection. 4. Short circuit protection: PV fuse 5. Surge protection: SPD type II
7.2	AC Side	1. Short circuit protection 2. Over voltage, under voltage over current protection over and under Grid frequency protection. 3. Anti Islanding protection 4. AC surge protection
7.3	Ground fault monitoring/ Grid Monitoring	Yes
8.0	Display	
8.1	Display type	LCD/LED
8.2	Display parameter	Voltage, current, power, line status, grid voltage grid frequency, export power and export energy.
9.0	Communication	
9.1	Communication port	RS485, port for web based remote monitoring system and should match with data logger.

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10.0	General	
10.1	Operating Temperature	-20 Deg. C to + 55 De. C
10.2	Dimensions	Shall be provided by the Bidder.
10.3	Weight	Shall be provided by the Bidder.
10.4	Cooling	Cooling arrangement (if any) details shall be furnished by the Bidder.
10.5	Ingress protection (IP)	IP 65 or better (outdoor installation)
10.6	Maximum altitude	Bidder to mention up to what altitude above sea level inverters will work without de-rating.

Note: if short circuit and surge protection of AC/DC side is not inbuilt in the string inverter same can be provided in ACDB and junction box.

Bidder shall provide for installation & commissioning of the string inverters. Bidder shall depute their service engineer to site during E&C of the string inverters. If Bidder engineers are not competent, Bidder has to arrange engineers from Inverter supplier during commissioning of the plant.

2.1.4 AC Distribution Board (ACDB)

AC power output of inverters shall be fed to distribution board panel (Consisting of 03 Nos of 100A MCCB & 01 No. 250A MCCB, Digital MFM- 1 No complete with CTs and accessories).

ACDB shall be floor mounted type and shall have Digital MFM to measure voltage, current, frequency, energy. Panel should confirm IP55 and shall be made of min.16 Gauge powder coated MS Sheet metal, totally enclosed, rigid, floor mounted, and cubical type suitable for operation on three phase 415 V, 50 Hz.

All power cables shall be taken through top or bottom of panel as per site requirement. Distribution Board shall be fitted with suitable rating and size Al/Cu bus, lugs, cable glands, MCBs, ferrules, HRC fuses, Accessories etc.

Connection & termination of Cables of main supply line & solar PV Power to DB Panel shall be in scope of bidder. Bidders are encouraged to Visit site before quoting.

2.1.4 Cables

- a. The Specification of wiring material of PV Power plant shall include but not limited to the following:

Sl. No	Item	Description
1.0	DC Cable	From PV module to inverter
1.1	Type	1.1kV grade heavy duty PVC insulated, Double sheathed, UV protected XLPO stranded copper cables as per IS: 7098 (Part I & II)

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		– 1976 or IS 1554 or IS9537
1.2	Size	1 core 4 sq. mm Unarmored
1.3	Laying	The cable must be laid through PVC conduit /GI pipe/ cable tray on roof and indoor. In case of using metallic pipe as conduit proper grounding of the conduit must be done.
2.0	AC Cable	From inverter to ACDB
2.1	Type	1.1kV grade heavy duty PVC insulated galvanized strip/wire armored XLPE stranded Cu conductor cables as per IS: 7098 (Part I & II) – 1976 or IS 1554 or IS9537.
2.2	Size	3.5 C x 25 sq.mm cable (from String Inverter to ACDB)
2.3	Laying	The cable must be laid through PVC conduit /GI pipe/ cable tray on roof and indoor. In case of using metallic pipe as conduit proper grounding of the conduit must be done.
3.0	AC Cable	From inverter to ACDB
3.1	Type	1.1kV grade heavy duty PVC insulated galvanized strip/wire armored XLPE stranded Aluminum conductor cables as per IS: 7098 (Part I & II) – 1976 or IS 1554 or IS9537.
3.2	Size	3.5 C x 300 sq.mm cable (from ACDB to LT panel)
3.3	Laying	Buried direct in ground including excavation, sand cushioning, Protective covering and refilling the trench etc. as required. Cable shall be buried at min 500mm deep.

b. Procedure of cable laying:

1. Cable terminations shall be made with suitable cable lugs & sockets etc, crimped properly and cables shall be provided with dry type compression glands wherever they enter junction boxes/ panels/ enclosures at the entry & exit point of the cubicles. The panels bottoms should be properly sealed to prevent entry of snakes/lizard etc. inside the panel. All cables shall be adequately supported. Outside of the terminals / panels / enclosures, shall be protected by conduits. Cables and wire connections shall be soldered, crimp-on type or thimble or bottle type.
2. Only terminal cable joints shall be accepted. Cable joint to join two cable ends shall not be accepted
3. All cable/wires/control cable shall be marked with good quality letter and number ferrules of proper sizes so that the cables can be identified easily.
4. All fasteners will be made of Stainless steel or Aluminum or UV Protected PVC.
5. Minimum two number loop must be provided at the start and end each span of cable laying and before termination for 300SQMM cable.

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2.1.5 Web enable data logger

Web enable data logging system should be a separate unit and shall be compatible with inverters. The data Logger shall keep record of associated electrical parameters at different stages to study performance of system as well as to study status of the system at a particular instant. The data logger should have required transducer to monitor and record the required relevant parameters of Inverters using remote monitoring over internet using GPRS based monitoring solution. The list of parameters should include:

- PV Voltage,
- PV Current,
- PV power
- Daily Generation
- Total Generation.

All above parameters to be included for all MPPT channels individually)

- Inverter Voltage, Current, Frequency
- Main Voltage, Current, Frequency
- Active Faults

The data logger shall have reliable data storage capacity (of minimum four months) to record all sorts of data simultaneously round the clock.

Web based Remote Monitoring system must be compatible with data logger. The system shall be provided with required accessories and required SIM card for wireless communication. The other required accessories, hardware and compatible software shall have to be provided as an integrated part of the system to monitor the real time data (maximum 20 minutes delay) through web server. The Data logger shall continuously send data to the server. The system can be monitored from anywhere through internet. The server shall be arranged by the bidder. The rental and other costs of the SIM cards, IP address, Server charge (storage, access charge and other charges if any), and Rental charge of data communication for remote monitoring system for a period of five (05) years shall be in bidders scope.

SPD (surge protection device) Type II suitable for communication network, as much number at suitable locations are required must be provided with the system.

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2.1.6 LA and EARTHING

LA Shall be provided as per the attached drawing No: 3-679-05-00037.

The earthing for lightning arrestor, plant equipment and LT power system shall be required as per provisions of IS: 3043.

Earth stations and Earthing System:

- I. Earthing Pit with Pipe Electrode: Earthing with 50 mm dia. GI pipe 3.64 mm thick x 3Mts. long to be filled with bitumen partly under the ground level and partly above ground level driven to an average depth of 3.65 Mts. below the ground level & restoring surface duly rammed.
- II. Masonry enclosure with the earth pit of size not less than 600 mm X 600 mm X 500 mm (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 300 mm X 300 mm 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.
- III. Earthing system must be interconnected through GI Strip 25mmx5mm to arrive equipotential bonding..
- IV. Equipment grounding (Earthing) will connect all non-current carrying metal receptacles, electrical boxes, appliance frames, chassis and PV panel mounting structures in one long run. The grounding wire should not be switched, fused or interrupted.
- V. Connecting the equipments to earth busbar including S & F GI (Hot Dip) wire of size as below on wall/floor with staples buried inside wall/floor as required and making connection to equipments with bolts, nuts, washers, cable lugs etc. as required and mending good damages Solid GI wire of 8 SWG.
- VI. Each Array Structure row must be connected to the earth minimum two separate point with S&F 25 mm x 5 mm galvanized (Hot Dip) MS flat on wall/floor with GI saddles as required and connection to equipments incl. drilling holes, with bolts, nuts, washers etc.
- VII. The complete earthing system will be electrically connected to provide return to earth from all equipment independent of mechanical connection.
- VIII. Test point will be provided for earth pits.

Earth resistance of the earth pits shall be tested in presence of the representative of BHEL as per applicable IS before commissioning and value to be less than 3Ω for structures and to be less than 1Ω for equipment body earthing for acceptance.

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2.1.7 Miscellaneous Equipment

Miscellaneous items like Control cables, insulation tapes, , ferrules, Lugs, Cable Glands, cable trays, cable ties, pipe, Clamps, Safety Signs, project Schematic, Project information Signage, MC4 connectors etc.) and Civil Works required for E&C shall be provided by the bidder. Such Items, not listed but required for completion of the Project shall deemed to have been included in the scope of the Bidder.

2.1.8 Synchronization of Grid, DG & Solar power.

The solar power shall be synchronized with DG and Main Grid Supply.
In general, the priority of usage of input energy sources should be in the following order.
First Priority: Solar
Second priority: Main
Third Priority: DG set

2.1.9 Approvals and liaisoning

Bidder has to obtain all approvals and preparation of documents for obtaining approvals for Construction, installation and commissioning of the Solar PV Plant from CEA / Local State Electricity Board and Net (Import / Export) Metering. All the necessary statutory fees, equipment charges shall be arranged by the bidder.

2.1.10 Freight & Transit insurance

Price quoted by the bidder is inclusive of the freight.

The Bidder shall take Insurance for transit of materials to the site and for the installation period.

Insurance of work at site

The Goods supplied under the Contract shall be insured fully against loss or damage incidental to manufacture or acquisition, transportation, storage, and delivery.

Insurance during installation at site:

The Bidder shall so far as reasonably practicable insure against the Bidder's liability in respect of any loss or damage occurring whilst the Bidder is at EMPLOYER'S site for the purpose of making good a defect or carrying out the tests on completion during the installation & commissioning of the equipment at employer's site or for the purpose of completing any outstanding work and against any loss or damage arising during the defects liability period from a cause occurring prior to the taking over of new solar PV plant by the employer. For all practical purpose such insurance, during Defect Liability Period, shall be from an Indian Insurance Company.

2.1.11 System Warranty of 05 years

The bidder must ensure that the goods supplied under the contract are new, unused and of most recent or current models and incorporate all recent improvements in design and materials unless provided otherwise in the contract.

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The warrantee period of the complete PV Systems will be **60 calendar** months from the date of successful commissioning. The equipments or components, or any part thereof of the Power Plant, if so found defective during warrantee period, the bidder will remain liable to repair or replace immediately under warrantee obligation to the satisfaction of the Purchaser in order to ensure trouble free operation of the Power Plant. Within the scope of warranty, the Bidder will repair or replace of any defective part of the Plant & Equipment supplied, Works done and services rendered under the Contract and render periodic maintenance as a preventive measure to up keep performance of the power plant and also to attend breakdown maintenance as and whenever needed.

2.1.12 Comprehensive Maintenance contract of 5 years (Quarterly Visit).

All the equipment's to be installed for commissioning of solar PV power plant and the power plant in whole (Except SPV Modules) shall be under Comprehensive Maintenance Contract for 5(five) years from the date of successful commissioning.

The equipments or components, or any part thereof, so found defective/damage during Comprehensive Maintenance Contract period will be forthwith repaired or replaced within the scope of warrantee obligation to the satisfaction of the BHEL.

The maintenance of solar PV power plant includes routine & periodic maintenance, overhauling, breakdown maintenance, and repairing or replacement of defective invertors, and other components, providing of consumables shall be under CMC.

The Down-Time of PV system should not be more than 72 hours (03 days).

The comprehensive CMC will include 4 quarterly visits per year along with emergency/breakdown visits. CMC charges shall be inclusive of all to & from travel, lodging, boarding, etc.

2.1.13 O&M Manual and TEST CERTIFICATES

- 03 copy of O&M Manual shall be submitted within 10 days of E&C.
- Routine test certificates/Test Reports for structures (along with galvanization), string inverters to be furnished by the BIDDER. BHEL, if required will inspect the materials at Bidder place.
- Equipment shall not be dispatched until BHEL issues a "Dispatch clearance" to Bidder.
- Warranty certificates shall be submitted for all bought-out items.

Note:

- It is advised that bidder should visit site and ascertain what type of equipment/machines needed at site for execution.
- Supply shall be made directly to the site.
- Space for Storage of supplied material shall be provided by BGGTS.
- Water and electricity during E&C shall be provided by BGGTS.
- The Unloading and shifting of all the materials viz., BHEL supplied material and Bidder supplied materials from stores/storage location to the site (building rooftop) lies in the

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scope of Bidder.

6. The roof is accessible through stepped staircase, but in case the materials has to be shifted avoiding staircase, pulley or other lift arrangements to shift it to rooftop has to be done by Bidder.
7. All tools and tackles, like power drilling machine, cutting machine, digging tools, complete set of crimping tools etc, required for installation, wiring, crimping, assembly, digging of cable trenches, if required, earth pits & Megger for checking insulation resistance of cable prior to commissioning etc., have to be organized by the bidder.
8. The storage, watch & ward responsibility of all the materials including BHEL supplies at site will be in Bidder's scope until the commissioning of the plant. Any deficit occurring due to misplacement/mishandling will be borne by the Bidder at no extra cost. The shifting of all the materials to the roof-top from storage location for erection will be in the scope of the Bidder and he has to make necessary arrangements for the same.
9. Before mounting the PV modules on to the structures, each PV module have to be tested during peak sunshine period. Short circuit current (Isc) & Open circuit voltage (Voc) of the module has to be checked & recorded using multimeter and Clamp meter. Ensure the modules are electrically OK. Special crimping tools required for crimping to be arranged by Bidder as per this specification, have to be used to crimp 4 sq.mm cables to quick connects for connecting output of series strings to inverter inputs. **This crimping tool has to be kept at site permanently even after completion of project.**
10. Each string Open circuit Voltage & Short Circuit Current (with a testing jig having appropriate load) to be checked and recorded as directed by the BHEL site engineer at site.
11. Mounting of string inverter at site is in the scope of Bidder. Bidder has to mount the inverter at an appropriate place and to provide necessary canopy to cover the string inverter.
12. All the terminations required for SPV plant viz., at the inverter and DB panel etc., will be in the scope of the Bidder. The necessary lugs and hardware required for the termination have to be arranged by the Bidder. Bidder has to ensure that terminations have been made without any tension.

Note: Bidder have to carefully measure twice the exact length of cables required for the connection before cutting the cable from cable drum. Any short fall in length of cable arising out of Bidder works should be borne by the Bidder. Bidder is required to assist BHEL and associate with the other Bidder's technical team during pre-commissioning checks and in commissioning of the power plant.

3.0 Delivery Schedule

For Supply of BOQ and E&C (Cl.2.1): The total time period for Supply and E&C is within 70 days from the date of PO.

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GENERAL TERMS AND CONDITIONS:

- 1) Bidder's responsibility, right and liabilities under this project will commence from the date of acceptance of the purchase order.
- 2) The installation activity will have to be carried out in such a manner that will not cause any inconvenience to the other agencies working in the site. Any permits from the customer, if required, are to be arranged by the Bidder for his personnel.
- 3) After completion of the E&C, the entire site/area will be cleaned of debris etc. by the Bidder prior to handing over of the site to BHEL.
- 4) All the materials brought to site has to have proper paper work like DC, Invoice etc. duly verified & signed by BHEL/BHEL's customer to be submitted to BHEL for payment.
- 5) Any damage to the buildings/structures/area made by Bidder's work men or by Bidder's agent will be made good by Bidder at Bidder's cost.
- 6) Bidder shall take work permit before commencement of all types of non-routine works as per the statutory procedures followed at the work place.
- 7) Bidder shall explain the job, associated hazards and precautions to his workmen.
- 8) Bidder shall ensure deployment of at least one person who should have the skill, knowledge and experience of performing the allotted task and shall be able to guide his team.
- 9) Bidder shall ensure safe procedure is followed during execution of the job.
- 10) Bidder shall ensure that his workmen wear appropriate safety Personal Protective Equipment.
- 11) Bidder shall ensure adequate supervision of the activity by his supervisor.
- 12) Bidder has to adhere to necessary legal/safety requirements and BHEL shall be kept indemnified against any untoward events taking place during the course of work.
- 13) No child labour should be employed for executing the project.
- 14) In case project is not completed as per BHEL scope due to reasons arising out of materials from BHEL end/Bidder's end, bidder has to complete the job at later stage without any extra charges. No overrun charges shall be paid in case of extension of project schedules.
- 15) Any miscellaneous materials that have not been mentioned specifically in the specification/tender which are required for E&C of the plant shall be deemed to be included in the specification and shall be supplied by the Bidder without any extra charges. Any scope of activities which are not specifically mentioned in this specification but required for the completion of the E&C of the SPV plant for safe, trouble free, normal operation shall be provided at no extra cost by the Bidder, unless explicitly excluded in the specification.
- 16) **Bidder must meet statutory/HSE compliance as per Annexure D enclosed along with this tender document.**
- 17) The design and operational features of the equipment offered shall also comply with the provisions of latest issue of the Indian Electricity Rules and other statutory regulations.
- 18) **Statutory obligation:** Bidder is required to meet all the statutory obligations/ legal requirement with regard to workmen deployed by Bidder for the project such as ESI, PF,

Signature and seal of Bidder

	PURCHASE SPECIFICATION	BDC1617-16001	
Rudrapur	GROUP : BDC	Rev no	00

Minimum wage act, Work man compensation act/Accident/medical insurance, Income Tax act, Employees Insurance act etc.

- 19) The installation should strictly conform to this specification. All the works shall be executed strictly as per the direction of BHEL engineer at site.

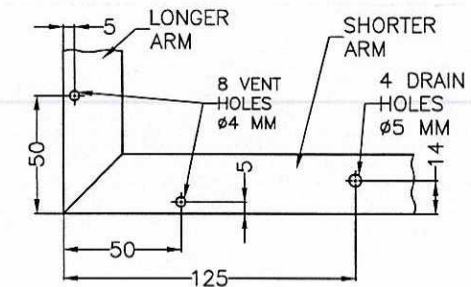
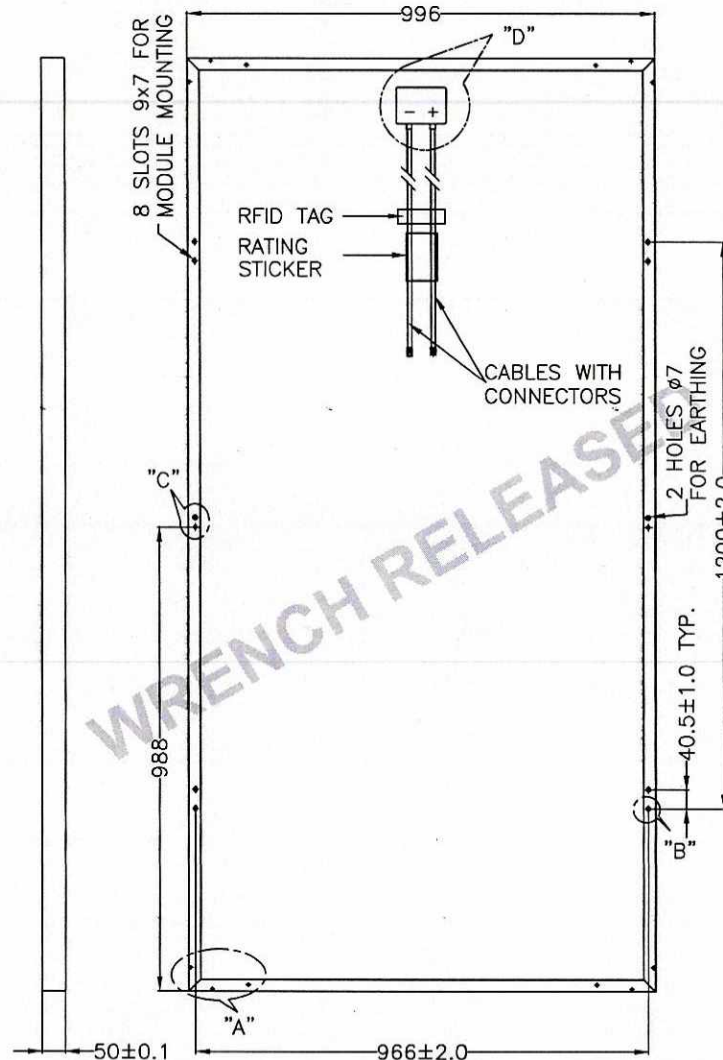
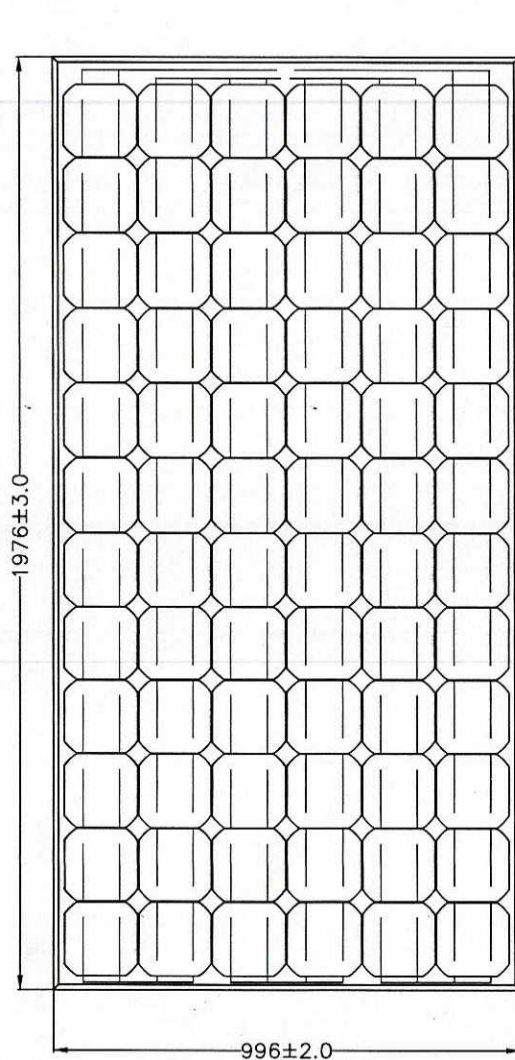
5.0 LIST OF ENCLOSURES:

Following enclosure makes the part of BDC1617-16001.

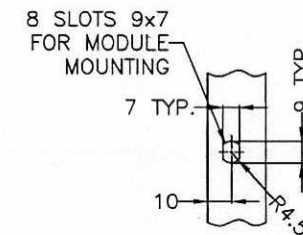
- 5.1 SPV Module drawing- 3-679-02-00352
- 5.2 SPV Module Data Sheet – CD- 4-4001-128
- 5.3 Schematic of Lightning Arrestor – 3-679-05-00037
- 5.4 Annexure – A includes Qualifying Criteria, Payment terms, bidder's information, and declaration by Bidder etc.
- 5.5 Annexure – B format for certificate by chartered accountant
- 5.1 Annexure – C site photographs
- 5.2 Annexure – D Statutory compliance by Bidder.

Signature and seal of Bidder

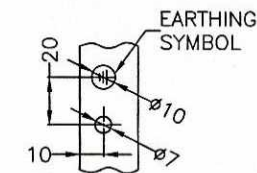
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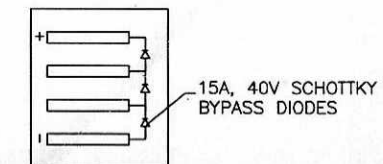
DETAIL - "A"



DETAIL - "B"



DETAIL - "C"



DETAIL - "D"

REV.	DATE	ALTERED	REV.	DATE	ALTERED	NAME	SIGN	DATE	DEPT.	CODE
		CHECKED	00		CHECKED					
		APPROVED			APPROVED					
				FIRST ISSUE		DRAWN	SAN	Sd/-	020911	
						CHECKED	NAR	Sd/-	020911	
						APPROVED	SR	Sd/-	020911	



BHARAT HEAVY ELECTRICALS LIMITED.
ELECTRONICS DIVISION, BANGALORE

TITLE: PHOTOVOLTAIC MODULE - L24270
156 mm MONO SOLAR CELLS (Corner Block Type)

M.O. No.

DRG. No.

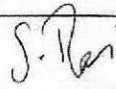
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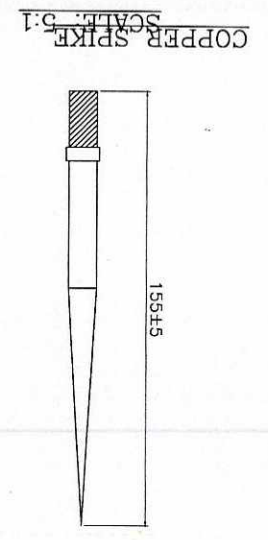
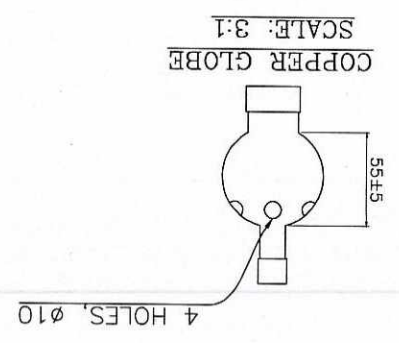
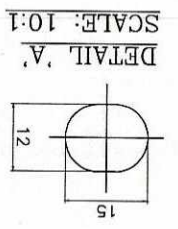
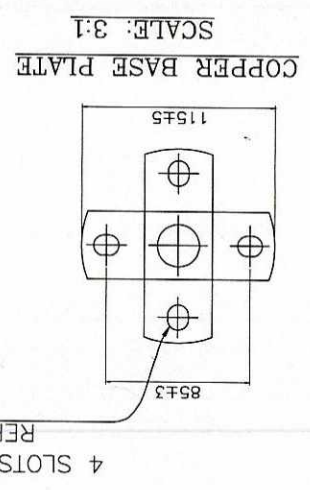
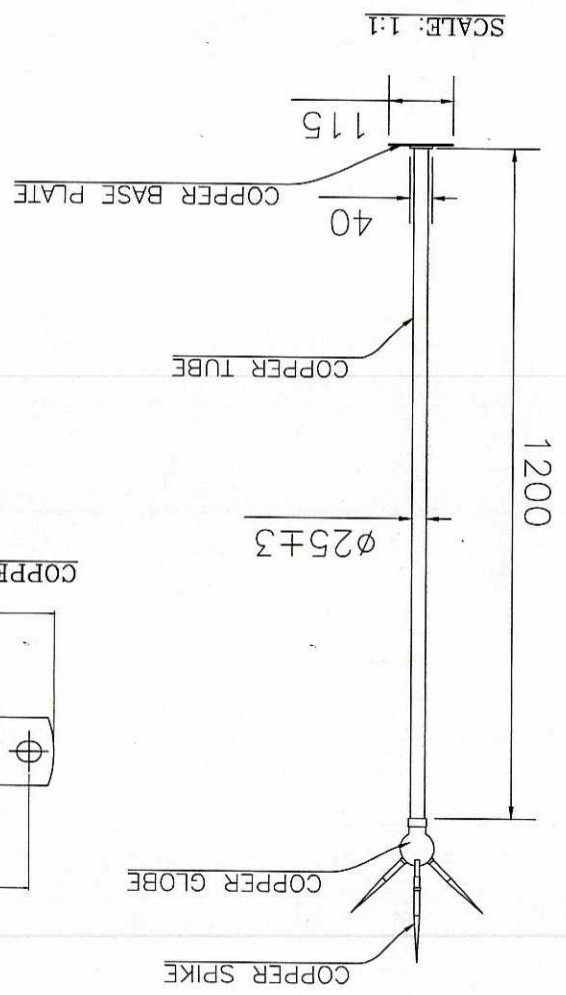
CARD CODE

No. OF SHTS 01

SHt No. 01

REV 00

		PRODUCT STANDARD		CD-4-4001- 128
		ELECTRONICS DIVISION		REV. 00
		A4-10		PAGE 01 OF 01
TECHNICAL SPECIFICATION FOR PV MODULE L24270 (24 V, 300 WATTS)				
COPY RIGHT AND CONFIDENTIAL The information on this document is the property of Bharat Heavy Electrical Limited. It must not be used directly or indirectly in anyway detrimental to the interest of the company.	1. PV MODULE TYPE NO.		: L24270	
	2. CONFIGURATION		: SINGLE GLASS LAMINATED TYPE WITH WITH 72 NOS. OF 156-mm MONO CRYSTALLINE SILICON SOLAR CELLS (12*6) IN SERIES CONFIGURATION.	
	3. OVERALL SIZE		: 1966 (±3) * 986 (±2) * 35 (±1) mm	
	4. WEIGHT		: 25 Kg. (Typ.)	
	5. PV MODULE FRAME MATERIAL		: ANODISED ALUMINIUM	
	6. JUNCTION BOX		: IP65 GRADE JUNCTION BOX WITH CABLES AND CONNECTORS	
	7. RFID Tag		: As per JNNSM Guidelines	
	8. TYPICAL ELECTRICAL CHARACTERISTICS :			
	8.1 OPEN CIRCUIT VOLTAGE (Voc)		: 45.0 V	
	8.2 SHORT CIRCUIT CURRENT (Isc)		: 8.8 A	
8.3 VOLTAGE AT PEAK POWER POINT (Vmp)		: 37 V		
8.4 CURRENT AT PEAK POWER POINT (Imp)		: 8.11 A		
8.5 PEAK POWER OUTPUT (Pmax.)		: 300 W		
8.6 CELL EFFICIENCY		: 17.4 %		
8.7 MODULE EFFICIENCY		: 15.5 %		
8.8 FILL FACTOR		: ≥ 0.70		
NOTE :				
1. Electrical specifications mentioned above are at Standard Test Conditions of 100 mW/sq. cm solar insolation (AM 1.5) and at 25 deg C temperature.				
2. Measurement repeatability of peak power output: ± 3 %				
REVISION : (00)		APPROVED BY : 		
		SR		
		PREPARED  SM	ISSUED Engg.	DATE 18.03.2015



NOTE:-
(1) LIGHTNING ARRESTOR: 25±3MM DIA
1.2 MTRS. (MIN.) LONG COPPER TUBE
WITH COPPER GLOBE ON THE TOP. SCREW
ON TYPE COPPER SPIKES- 5NOS. MOUNTED
ON THE COPPER GLOBE.
(2) FOUNDATION BOLT AM10x125 AS PER IS:5622
WITH M10 HEX. NUT, M10 SPRING
WASHER & M10 PLAIN WASHER-4
SETS-FINISH: ZINCPIATED TO 12 MICRONS.

REV.	DATE	ALTERED	CHECKED	REV.	DATE	ALTERED	CHECKED	REV.	DATE	ALTERED	CHECKED
PRODUCED BY AN AUTODESK EDUCATIONAL PRODUCT											
PROJECT/PRODUCT SPV POWER PLANT											
BDC											
DEPTT.											
UNTO. DIM. OR.											
C/M/F											
SCALE											
N.T.S.											
WEIGHT-KG											
REF. TO ASSY. DRG.											
IT. NO.											
NO. OF											
REV.											
DRAWING NO.											
3-679-05-00037											
SHEET NO.- 01											
NO. OF SHEETS- 01											
SIZE- A3											