

## NOTICE INVITING TENDER

State Bank of India, Local Head office, Premises & Estate Deptt Bhopal invites two-bid online tenders through GeM portal for Supply, Installation, Testing & Commissioning of **4 Nos X 4 KWp each separate units of each DGM flats with separate 4 nos independent units of 4KWp On-Grid Roof Top Solar (PV) Power system (Total 16KWp) along with 5 year AMC at SBI, 4 NOS DGM FLATS (B3, B4, B5 & B6), location of flats near to each other B-3 (GF), B-4 (FF) in one Block & B-5(GF), B-6(FF) in another Block, Char Imli, Bhopal . UNDER BHOPAL CIRCLE** Madhya Pradesh & CG. The other details of the tender are as under:

**THE DELIVERY OF MATERIAL, INSTALLATION & CONSIGNEE DETAILS:- 4 Nos DGMs Flats (B3, B4, B5 & B6), SBI Colony, Char Imli, Bhopal.**

**Branch Manager/ Manager (Electrical):- Shri Deepak Vishwakarma- Contact:- 8889988331**

( Vendors who have already three or more non-completed ongrid solar works of our premises dept and completion time has expired as per GEM contract, Such firms are not eligible for participating in this work. If such firms apply for this tender, their price bid shall not be opened.

1.	Scope of Work & Eligibility criteria	<p>a) Supply, Installation, Testing and Commissioning of ON-GRID 4 Nos X 4 KWp each of separate units(Inverter/PV/Cable) separately (Total 16KWp) ( <b>Half cut Mono C-Si PERC 540 watt above</b> ) Solar Power plant on Rooftop of above Branch/office/Residence.</p> <p>b) Plant with net metering &amp; SIM based remote monitor feature with one year recharge by vendor.</p> <p>c) Solar plate Cleaning arrangement at rooftop with CPVC water pipe.</p> <p>d) Cleaning of Solar Panels once in a month.</p> <p>e) Graph of hourly solar power generation, E-day, E-total (Kwh) solar power generation details on inverter LED display simultaneously must be available.</p> <p>f) Connecting of armoured aluminum cable with 125/160 amp AMP MCCB from the existing branch supply.</p> <p>g) (site visit to be made by vendor before quoting)</p> <p>h) <b>The vendor should have office setup in Madhya Pradesh or Chhattisgarh for satisfactory/smoothly rendering maintenance services</b> supported by the necessary documents considering operational convenience. Copy of proof is required to be submitted in Hard copy alongwith with EMD and also upload in GeM portal. Non submission of which will be treated as invalid tender and liable to reject.</p> <p>i) <b>Elevated structure/superstructure</b> to be made at site with minimum height of 7 feet at one side and other is more than it according to site condition with all necessary technical specification and terms, condition of tender documents.</p> <p>j) <b>Inclusive of Five years AMC</b></p>
2	a) Tender invitation	<b>21.03.2024 to 01.04.2024 ( Time as per GeM portal)</b>
	b) Tender technical bid opening	01.04.2024 ( Time as per GeM)
	c) Technical bid clarification time	2 days hours
	d) Price bid opening	After 2 days from technical bid opening 03.04.2024

3	a) Earnest Money Deposit (EMD)	<b>Rs 12000/- (Rupees twelve thousand only)</b> to be submitted in the form DEMAND DRAFT in FAVOUR “ <b>AGM (Premises &amp; Estate), SBI, LHO, Bhopal</b> and payable at <b>Bhopal</b> . <b>Exempted for Micro and Small enterprises with uploading valid MSME/UDYAM registration certificate on GeM portal along with relevant documents.</b>
	b) Experience (Eligibility criteria)	<b>Minimum 3 years.as on 31.12.2023</b>
	c) Turnover (Eligibility criteria)	<b>4 lacs</b>
4	Initial Security Deposit (ISD)	<b>2% of contract value (without GST value)</b> to be submitted in the form DEMAND DRAFT in FAVOUR “ <b>AGM (Premises &amp; Estate), LHO, Bhopal</b> and payable at <b>Bhopal</b> . With-in 7 days from date of receipt of work order.
5	Security Deposit (SD)	<p><b>a) 5% of contract value</b> (without GST value) which ( contract value, shall be deducted from final bill). SD shall be released without interest after 60 months from date of COMMISSIONING subject submission to satisfactory performance and monthly cleaning report.</p> <p><b>b) Security deposit shall be forfeited in case</b></p> <p>i) Monthly cleaning work not done.</p> <p>ii) Quarterly preventive checking not completed.</p> <p>Cleaning and preventive checklist duly signed by User (respective branch) to be submitted at this office timely after each service as per scope of works under AMC.</p>
6	Time of completion of work	<b>45 days</b> from the date of generation of contract
7	Liquidate Damage(LD)	0.5% per week subject to maximum 5% of contract value.
8	Warranty period	60 months from the date of commissioning solar power plant
9	Place of opening of tender	Asst General Manager (P&E), State Bank of India, Local Head Office, Hoshangabad Road, Bhopal- 462011 0755-2575812, 2575811 agmprem.lhobho@sbi.co.in
10	Contact person (SBI)	Deepak Vishwakarma Manager (Electrical), State Bank of India, Local Head Office, Hoshangabad Road, Bhopal- 462011 0755-2575816

The Bank reserves the rights to accept any or to reject all the quotations/tenders/applications without assigning reasons thereof.

## **AGM (Premises & Estate)**

### **TECHNICAL SPECIFICATIONS**

#### **1.1 INTRODUCTION:**

In grid-connected Solar Photo-Voltaic (SPV) systems, **solar energy is fed into the building loads through bidirectional net meter** that are connected to the public electricity grid through a service connection with surplus energy being fed into the grid and shortfall being drawn from the grid. Application submission, liaisoning for obtaining feasibility approval and net meter installation shall be in scope of bidder. All works pertain to net metering are under to scope of contractor and contractor bear all the cost materials including liaison with DISCOM of state & Electrical Safety Department.

#### **1.2 QUALITY AND WORKMANSHIP:**

Solar PV modules are designed to last 25 years or more. It is therefore essential that all system components and parts, including the mounting structures, cables, junction boxes, distribution boxes and other parts also have a life cycle of at least 25 years. Therefore all works shall be undertaken with the highest levels of quality and workmanship. During inspection of Bank Engineer and its representatives will pay special attention to neatness of work execution and conformity with quality and safety norms. Non-compliance works will have to be redone at the cost of the Installer, Mono PERC half cut PV panel having 25 years of power output warranty.

#### **1.3 DEFINITION:**

A Grid Tied Solar Rooftop Photo Voltaic (SPV) power plant consists of SPV array, Module Mounting Structure, Power Conditioning Unit (PCU) consisting of Maximum Power Point Tracker (MPPT), Inverter, and Controls & Protections, interconnect cables and switches. PV Array is mounted on a suitable structure. Grid tied SPV system is without battery and should be designed with necessary features to supplement the grid power during day time. Components and parts used in the SPV power plants including the PV modules, metallic structures, cables, junction box, switches, PCUs etc., should conform to the BIS or IEC or international specifications, wherever such specifications are available and applicable.

Solar PV system shall consist of following equipments/components.

- Solar PV modules consisting of required number of **540 Watt Mono C-Si PERC PV modules** with Linear performance warranty.
- Grid interactive Power Conditioning Unit with 4G/5G SIM based Remote Monitoring System.
- Mounting structures.
- Junction Boxes.
- Earthing and lightening protections (both DC & AC sides).
- IR/UV protected PVC Cables, pipes and accessories.

- Water pipeline with necessary pump etc for cleaning of solar plates.
- Data acquisition system

#### 1.4 SOLAR PHOTOVOLTAIC MODULES:

1.4.1 The PV modules used must qualify to the latest edition of IEC PV module qualification test or equivalent BIS standards **Half cut Mono Perc C-Silicon** Solar Cell Modules IEC 61215/IS14286. In addition, the modules must conform to IEC 61730 Part-2-requirements for construction & Part 2 – requirements for testing, for safety qualification or equivalent IS.

- For the PV modules to be used in a highly corrosive atmosphere throughout their lifetime, they must qualify to IEC 61701/IS 61701.
- The total solar PV array capacity should not be less than allocated capacity (kWp) and should comprise of solar **Mono C-Si PERC** modules of minimum **540 watt or above** wattage. Module capacity less than minimum **540 watts** should not be accepted.
- Protective devices against surges at the PV module shall be provided. Low voltage drop bypass diodes shall be provided.
- PV modules must be mandatorily tested and approved by one of the IEC authorized test centers.
- The module frame shall be made of corrosion resistant materials, preferably having anodized aluminum.
- The bidder shall carefully design & accommodate requisite numbers of the modules to achieve the rated power in his bid. Bank shall allow only minor changes at the time of execution.

#### 1.4.2 Other general requirement for the PV modules and subsystems shall be the Following:

- The rated output power of any supplied module shall have tolerance of +/- 3%.
- The peak-power point voltage and the peak-power point current of any supplied module and/or any module string (series connected modules) shall not vary by more than 2 (two) per cent from the respective arithmetic means for all modules and/or for all module strings, as the case may be.
- The module shall be provided with a junction box with either provision of external screw terminal connection or sealed type and with arrangement for provision of by-pass diode. The box shall have hinged, weather proof lid with captive screws and cable gland entry points or may be of sealed type and IP-65 rated.
- IV curves at STC should be provided by bidder.

1.4.3 Modules deployed must use a RF identification tag. The following information must be mentioned in the RFID used on each modules (This can be inside or outside the laminate, but must be able to withstand harsh environmental conditions).

- Name of the manufacturer of the PV module.
- Name of the manufacturer of Solar Cells.
- Month & year of the manufacture (separate for solar cells and modules).
- Country of origin (separately for solar cells and module).

- e) I-V curve for the module Wattage,  $I_m$ ,  $V_m$  and FF for the module.
- f) Unique Serial No and Model No of the module.
- g) Date and year of obtaining IEC PV module qualification certificate.
- h) Name of the test lab issuing IEC certificate.
- i) Other relevant information on traceability of solar cells and module as per ISO 9001 and ISO 14001.

#### **1.5. ARRAY/MODULE MOUNTING STRUCTURE:**

- i. Hot dip galvanized MS/ Aluminium mounting structures shall be used for mounting the modules/ panels/arrays. Each structure will have angle of inclination as per the site conditions to take maximum insolation.
- ii. The Mounting structure must be Non-invasive Ballast Type and any sort of penetration of roof to be avoided. The design details are as follows:
  - a. The inclination of module should be within 10-15 degrees.
  - b. The upper edge of the module must be covered with wind shield so as to avoid bulk air ingress below the module. Slight clearance must be provided on both edges (upper & lower) to allow air for cooling.
- iii. The mounting structure should be as per latest IS 2062: 1992 and galvanization of the mounting structure shall be in compliance of latest IS 4759.
- iv. The fasteners should be made up of stainless steel. The structures shall be designed to allow easy replacement of any module. The array structure shall be so designed that it will occupy minimum space without sacrificing the output from the SPV panels.
- v. The total load of the structure (when installed with PV modules) on the terrace should be less than 60 kg/m<sup>2</sup>. The load shall be well distributed so that point loads are well within the limits.
- vi. The minimum clearance of the structure from the roof level should be in between 70-150 mm.
- vii. The structures should be laid on the rooftop on weather resistant FRP mountings which should be non-penetrating type and proper drainage of rain water over terrace through the installation area should be maintained.
- viii. The structures should be suitably loaded with reinforced concrete blocks of appropriate weight made out of M25 concrete mixture.
- ix. Special care should be taken while designing all structures for modules to cater to heavy rainfall.
- x. The array shall be located sufficiently inside the boundary wall of the terrace (parapet wall) and should not be projecting out. PV array shall be installed in the terrace space free from any obstruction and/or shadow. PV array shall be installed utilizing optimum terrace space to minimize effects of shadows due to adjacent PV panel rows.
- xi. Adequate spacing shall be provided between two panel frames and rows of panels to facilitate personnel protection, ease of installation, replacement, cleaning of panels and electrical maintenance.
- xii. Additional waterproofing shall be provided in the areas where RCC blocks are placed on the terrace.

- xiii. The minimum clearance between lower edge of PV panel and terrace ground level shall be 150 mm to allow ventilation for cooling, also ease of cleaning and maintenance of panels as well as cleaning of terrace.
- xiv. The PV array structure design shall be appropriate with a factor of safety of min. 1.5.
- xv. Each array may be provided with two bird repellents spikes at a level higher than the upper edge of the array. The location of the spike should be selected for minimum shadow effect.
- xvi. The support structure shall be free from corrosion when installed.
- xvii. PV modules shall be secured to support structure using screw fasteners and/or metal clamps. Screw fasteners shall use existing mounting holes provided by module manufacturer. No additional holes shall be drilled on module frames. Module fasteners/clamps shall be adequately treated to resist corrosion.
- xviii. Adequate spacing shall be provided between any two modules secured on PV array for improved wind resistance.
- xix. The structure shall be designed to withstand operating environmental conditions for a period of minimum 25 years.
- xx. The structure should be appropriately designed to withstand high wind velocities up to 200 km per hour. (The bidder is required to submit a certificate from an authorized chartered engineer with regards to the strength and durability of the structure)

#### 1.6 JUNCTION BOXES (JBs):

- a. The junction boxes are to be provided in the PV array for termination of connecting cables. The J. Boxes (JBs) shall be made of GRP/FRP/Powder Coated Aluminium /cast aluminium alloy/PC with full dust, water & vermin proof arrangement. All wires/cables must be terminated through cable lugs. The JB's shall be such that input & output termination can be made through suitable cable glands.
- b. Copper bus bars/terminal blocks housed in the junction box with suitable termination threads conforming to IP65 standard and IEC 62208 Hinged door with EPDM rubber gasket to prevent water entry. Single / double compression cable glands. Provision of earthing. It should be placed at 5 feet height or above for ease of accessibility.
- c. Each Junction Box shall have High quality Suitable capacity Metal Oxide Varistors (MOVs) /SPDs, suitable Reverse Blocking Diodes. Suitable earthing should be provided to SPD. The Junction Boxes shall have suitable arrangement monitoring and disconnection for each of the groups.
- d. Suitable markings shall be provided on the bus bar for easy identification and the cable ferrules must be fitted at the cable termination points for identification.

#### 1.7 DISTRIBUTION BOARD:

- i. Distribution panel to receive the DC output from the array field.
  - ii. DC DPBs shall have sheet from enclosure of dust & vermin proof conform to IP 65 protection. The bus bars are made of copper of desired size and suitable capacity.
- a) Arrangement such as grouting and calming should be provided to secure the installation against the specific wind speed. The vendor should provide concrete foundation 500mmx500mmx500mm to increase the strength. Non-invasive structure are recommended to avoid leakage in roof. Grouting and Foundation both are compulsory to be made as stated above and advised by Bank's.**

- b) The mounting structure steel shall be as per latest IS 2062: 1992 and galvanization of the mounting structure shall be in compliance of latest IS 4759.
- c) Structural material shall be corrosion resistant and electrolytically compatible with the materials used in the module frame, its fasteners, nuts and bolts. Necessary protection towards rusting need to be provided either by coating or anodization.
- d) The fasteners used should be made up of stainless steel. The structures shall be designed to allow easy replacement of any module. The array structure shall be so designed that it will occupy minimum space without sacrificing the output from the SPV panels. Lay out should allow for easy access for panel cleaning.
- e) Regarding civil structures the bidder need to take care of the load bearing capacity of the roof and need arrange suitable structures based on the quality of roof.
- f) The total load of the structure (when installed with PV modules) on the terrace should be within permissible limit.
- g) The minimum clearance of the structure from the roof level should be 300 mm.
- h) CBs/MCCB shall be provided for controlling the DC power output to the PCU along with necessary surge arrestors.

**1.8 AC DISTRIBUTION PANEL BOARD:**

- a. Distribution Panel Board (DPB) shall control the AC power from PCU/ inverter, and should have necessary surge arrestors. Interconnection from ACDB to mains at LT Bus bar while in grid tied mode.
- b. All switches and the circuit breakers, connectors should conform to IEC 60947, part I, II and III/ IS60947 part I, II and III.
- c. The changeover switches, cabling work should be undertaken by the bidder as part of the project.
- d. All the Panel's shall be metal clad, totally enclosed, rigid, floor mounted, air - insulated, cubical type suitable for operation on three phase / single phase, 415 or 230 volts, 50 Hz
- e. The panels shall be designed for minimum expected ambient temperature of 45 degree Celsius, 80 percent humidity and dusty weather.
- f. All indoor panels will have protection of IP54 or better. All outdoor panels will have protection of IP65 or better.
- g. Should conform to Indian Electricity Act and rules (till last amendment).
- h. All the 415 AC or 230 volts devices / equipment like bus support insulators, circuit breakers, SPDs, VTs etc., mounted inside the switchgear shall be suitable for continuous operation and satisfactory performance under the following supply conditions

Variation in supply voltage	+/- 5 %
Variation in supply frequency	+/- 3 Hz

## 1.9. PCU/ ARRAY SIZE RATIO:

- a) **Total Inverter capacity should be greater than or equal to the Rooftop Power Plant Capacity.**
- b) **Maximum power point tracker shall be integrated in the PCU/inverter to maximize energy drawn from the array.**

## 1.10 PCU/ Inverter:

As SPV array produce direct current electricity, it is necessary to convert this direct current into alternating current and adjust the voltage levels to match the grid voltage. Conversion shall be achieved using an electronic Inverter and the associated control and protection devices. All these components of the system are termed the "Power Conditioning Unit (PCU)". In addition, the PCU shall also house MPPT (Maximum Power Point Tracker), an interface between Solar PV array & the Inverter, to the power conditioning unit/inverter The Inverter output should be compatible with the grid frequency. Typical technical features of the inverter shall be as follows:

- Switching devices: IGBT.
  - Control: Microprocessor /DSP.
  - Nominal AC output voltage and frequency: 415V, 3 Phase, 50 Hz (In case single phase inverters are offered, suitable arrangement for balancing the phases must be made.).
  - Output frequency: 50 Hz.
  - Grid Frequency Synchronization range: + 3 Hz or more.
  - Ambient temperature considered: -20o C to 80o C.
  - Humidity: 95 % Non-condensing.
  - Grid Frequency Tolerance range: + 3 or more.
  - Grid Voltage tolerance: - 20% & + 15 %.
  - No-load losses: Less than 1% of rated power.
  - Inverter efficiency (minimum): >93%.
  - THD: < 3%.
  - PF: > 0.95.
- a. Three phase PCU/ inverter shall be used with each power plant system (10kW and/or above) but In case of less than 10kW single phase inverter can be used.
  - b. PCU/inverter shall be capable of complete automatic operation including wake-up, synchronization & shutdown.
  - c. The output of power factor of PCU inverter is suitable for all voltage ranges or sink of reactive power, inverter should have internal protection arrangement against any sustainable fault in feeder line and against the lightning on feeder.
  - d. Built-in meter and data logger to monitor plant performance through external computer shall be provided.



- e. The power conditioning units / inverters should comply with applicable IEC/ equivalent BIS standard for efficiency measurements and environmental tests as per standard codes IEC 61683/IS 61683 and IEC 60068-2(1,2,14,30) /Equivalent BIS Std.
- f. The charge controller (if any) / MPPT units environmental testing should qualify IEC 60068-2(1, 2, 14, 30)/Equivalent BIS std. The junction boxes/ enclosures should be IP 65(for outdoor)/ IP 54 (indoor) and as per IEC 529 specifications.
- g. The PCU/ inverters should be tested from the MNRE approved test centers / NABL /BIS /IEC accredited testing calibration laboratories. In case of imported power conditioning units, these should be approved by international test houses.

#### **1.11 INTEGRATION OF PV POWER WITH GRID:**

The output power from SPV would be fed to the inverters which converts DC produced by SPV array to AC and feeds it into the main electricity grid after synchronization. In case of grid failure, or low or high voltage, solar PV system shall be out of synchronization and shall be disconnected from the grid. 4 pole isolation of inverter output with respect to the grid need to be provided.

#### **1.12 DATA ACQUISITION SYSTEM / PLANT MONITORING:**

- i. [Graphical representation of hourly solar power generation, with details of E-day, E-total \(Kwh\) solar power generation details simultaneously on inverter LED display.](#)
- ii. Data Logging Provision for plant control and monitoring, time and date stamped system data logs for analysis with the high quality, Metering and Instrumentation for display of systems parameters and status indication to be provided.
- iii. Data from the inverter shall be uploaded to internet via sim card based device. The monitoring details with logi ID and password should be shared by the Bank.
- iv. The following parameters are accessible via the operating interface display in real time separately for solar power plant.
  - 1. AC Voltage.
  - 2. AC Output current.
  - 3. Output Power.
  - 4. Power factor.
  - 5. DC Input Voltage.
  - 6. DC Input Current.
  - 7. Time Active.
  - 8. Time disabled.
  - 9. Time Idle.
  - 10. Power produced
  - 11. Protective function limits (Viz-AC Over voltage, AC Under voltage, Over frequency, Under frequency ground fault, PV starting voltage, PV stopping voltage).
- v. All major parameters available on the digital bus and logging facility for energy auditing through the internal microprocessor and read on the digital front panel at any time) and logging facility (the current values, previous values for up to a month and the average values) should be made available for energy auditing through the internal microprocessor and should be read on the digital front panel.
- vi. Remote Monitoring and data acquisition through Remote Monitoring System software at the Bank location with latest software/hardware configuration and service connectivity for online /real time data monitoring/control complete to be supplied and operation and maintenance/control to be ensured by the supplier. Provision for interfacing these data on [NAME OF THE ORGANISATION] server and portal in future shall be kept.

### **1.13 METERING: Net metering from MP Discom / CG Discom.**

Net Metering: Bi Directional Meter (As per M.P. Gazette notification 14 Nov. 2017 standard for net meter Net meter HT Consumer's premises AMR compatible generation meters & modems, as per provision of guidelines, the procedure and all technical specifications, standards of the solar rooftop system from M.P. Policy for decentralized renewable energy 2016) shall have the provision for measurement for Current, Voltage, frequency, Energy, Power/Load, power factor, maximum demand with RS232 with class 0.5 accuracy.

Net metering shall be provided by the contractor for the captioned sites of SBI. The scope of work for net metering is detailed as below:

- Preparation of necessary documentation and submission of application (Online /offline) to MP Discom (MPCZ/ MP Pachshim Kshetra/ MPoorv Kshetra)/ As per Chhatisgarh Discom for net metering.
- Obtaining site feasibility report from MP Discom.
- Obtaining net metering approval from MP Discom.
- Contractor shall work with MP Discom to enable SBI's signing of Power Purchase Agreement (PPA).
- Supply & Testing of net meter (Main & Check meter) and related accessories (Cubicle, CTs, PTs, earthing etc.) as per requirements of MP Discom.
- Replacement of existing meter and related accessories (Cubicle, CTs, PTs, earthing etc.) with new metering systems as per requirements of MP Discom.
- CEIG/CEA/ MP Discom inspectorate approval for supply, testing and replacement of new net metering system including preparation and submission of necessary documentation.
- CEIG/CEA/ MP Discom inspectorate approval of Solar Power Plant including preparation and submission of necessary documentation.
- Synchronization / Commissioning approval from CEIG/CEA/ MP Discom.
- Synchronization/Commissioning certificate for the Plant from CEIG/CEA/ MP Discom.

Note:

The contractor shall take up net metering for SBI turnkey basis including any statutory fees, fee towards testing of net meter, CTs, PTs, Cubicle etc. to be paid. Any other item / supply/ activity / approvals/NOCs/fees not specifically defined in the above clause but required for successful completion of net metering with MP Discom as per the latest Net Metering Policy for SBI shall be to the scope of the Contractor. In other case of non- applicability of Net metering, Contractor has to take care of approval of alternative mechanism as per state electricity regulatory norms & latest revisions of state grid code, all the required fees/NOC/other activity adhering to alternative mechanism shall be responsibility of contractor only

### **1.14 POWER CONSUMPTION:**

Regarding the generated power consumption, priority need to give for internal consumption first and thereafter any excess power can be exported to grid. . Decisions of appropriate authority like DISCOM, state regulator may be followed.

### **1.15 PROTECTIONS:**

The system should be provided with all necessary protections like earthing, Lightning, and grid islanding as follows:

#### **1.15.1 LIGHTNING PROTECTION:**

The SPV power plants shall be provided with lightning & overvoltage protection. The main aim in this protection shall be to reduce the over voltage to a tolerable value before it reaches the PV or other sub system components. The source of over voltage can be lightning, atmosphere disturbances etc,. The entire space occupying the SPV array shall be suitably protected against Lightning by deploying required number of Lightning Arrestors. Lightning protection should be provided as per IEC 62305 standard. Lightning conductor should be made of 25 mm dia 4000mm long GI spike as per Provision of IS 2309-1969. Necessary concrete foundation to be provided for holding Lightning conductor considering the wind speed. It should be earthed through 20x3 GI flat from pit with proper insulation. Height of Lightning conductor from array structure should be min 4 meter.

#### **1.15.2 SURGE PROTECTION:**

Internal surge protection shall consist of three MOV type surge-arrestors connected from +ve and –ve terminals to earth (via Y arrangement)/ SPD (type II). SPD should be provided in AC and DC side of solar PV system. It should have protection voltage of 2.5kv and nominal discharge current of 5kA (8/20) micro sec. SPD earthing terminals should be connected to earthing system.

#### **1.15.3 EARTHING PROTECTION:**

a. Each array structure of the PV yard should be grounded/ earthed properly as per IS: 3043-1987. In addition the lightning arrester/masts should also be earthed inside the array field. Earth Resistance shall be tested in presence of the representative of Bank engineer as and when required after earthing by calibrated earth tester. PCU, ACDB, SPD, LA, Structure and DCDB should also be earthed properly. Minimum 06 GI pipe earth pit to be provided as per relevant IS code.

b. Earth resistance shall not be more than 5 ohms. It shall be ensured that all the earthing points are bonded together to make them at the same potential.

#### **1.16. Grid Islanding:**

a. In the event of a power failure on the electric grid, it is required that any independent power-producing inverters attached to the grid turn off in a short period of time. This prevents the DC-to-AC inverters from continuing to feed power into small sections of the grid, known as “islands.” Powered islands present a risk to workers who may expect the area to be unpowered, and they may also damage grid-tied equipment. The Rooftop PV system shall be equipped with islanding protection. In addition to disconnection from the grid (due to islanding protection), disconnection due to under and over voltage conditions shall also be provided.

b. A manual disconnect 4pole isolation switch (MCB/ MCCB) as per max inverter output current beside automatic disconnection to grid would have to be provided at utility end to isolate the grid connection by the utility personnel to carry out any maintenance. This switch shall be locked by the utility personnel.

#### **1.17 CABLES:**

Cables of appropriate size to be used in the system shall have the following characteristics:

- i. Shall meet IEC 60227/IS 694, IEC 60502/IS1554 standards.

- ii. Temp. Range: –10oC to +80oC.
- iii. Voltage rating 660/1000V.
- iv. Excellent resistance to heat, cold, water, oil, abrasion, UV radiation Flexible.
- v. Sizes of cables between array interconnections, array to junction boxes, junction boxes to Inverter etc. shall be so selected to keep the voltage drop (power loss) of the entire solar system to the minimum. The cables (as per IS) should be insulated with a special grade PVC compound formulated for outdoor use.

Cable Routing/ Marking: All cable/wires are to be routed in a GI cable tray and suitably tagged and marked with proper manner by good quality ferule or by other means so that the cable easily identified.

The Cable should be so selected that it should be compatible up to the life of the solar PV panels i.e. 25 years.

The ratings given are approximate. Bidder to indicate size and length as per system design requirement. All the cables required for the plant provided by the bidder. Any change in cabling sizes if desired by the bidder/approved after citing appropriate reasons. All cable schedules/layout drawings approved prior to installation.

Multi Strand, Annealed high conductivity copper conductor PVC type A pressure extruded insulation or XLPE insulation. Overall PVC/XLPE insulation for UV protection Armoured cable for underground laying. All cable trays including covers to be provided. All cables conform to latest edition of IEC/ equivalent BIS Standards as specified below: BoS item / component Standard Description Standard Number Cables General Test and Measuring Methods, PVC/XLPE insulated cables for working Voltage up to and including 1100 V ,UV resistant for outdoor installation IS /IEC 69947.

The size of each type of DC selected shall be based on minimum voltage drop however the maximum drop shall be limited to 1%.

The size of each type of AC cable selected shall be based on minimum voltage drop however the maximum drop shall be limited to 2%.

#### **1.18 TOOLS & TACKLES AND SPARES:**

Operation and maintenance guide and consumable spares like fuses should be provided by vendor.

#### **1.19 DANGER BOARDS AND SIGNAGES:**

Danger boards should be provided as and where necessary as per IE Act. /IE rules as amended up to date. Three signage shall be provided one each at battery –cum- control room, solar array area and main entry from administrative block. Text of the signage may be finalized in consultation with Bank.

#### **1.20 DRAWINGS & MANUALS:**

Two sets of Engineering, electrical drawings and Installation and O&M manuals are to be supplied. Bidders shall provide complete technical data sheets for each equipment giving details of the specifications along with make/makes in their bid along with basic design of the power plant and power evacuation, synchronization along with protection equipment.

I. Approved ISI and reputed makes for equipment be used.

II. For complete electro-mechanical works, bidders shall supply complete design, details and drawings for approval to Bank before progressing with the installation work.

### **1.21 PLANNING AND DESIGNING:**

i. The bidder should carry out the considering optimal usage of the space, material & labour. The bidder should submit the array layout, drawings along with shadow analysis report to Bank for approval. Bidders should submit detailed SLD for approval.

ii. Bank reserves right to change/modify sub-systems and components at any stage as per the local site conditions/ requirements.

iii. The bidder shall submit preliminary drawing for approval & based on any modification or recommendation, if any. The bidder shall submit three sets and soft copy in CD of final drawing for formal approval to proceed with installation work.

### **1.22 DRAWINGS TO BE FURNISHED BY BIDDER AFTER AWARD OF CONTRACT:**

i. The Contractor shall furnish the following drawings Award/Intent and obtain approval.

ii. General arrangement and dimensioned layout Schematic drawing showing the requirement of SV panel, Power conditioning Unit(s)/ inverter, Junction Boxes, AC and DC Distribution Boards, meters etc. Structural drawing along with foundation details for the structure.

iii. Itemized bill of material for complete SV plant covering all the components and associated accessories.

iv. Layout of solar Power Array.

**1.23 Safety - The bidder shall take entire responsibility for electrical safety of the installation(s) including connectivity with the grid and follow all the safety rules & regulations applicable as per Electricity Act, 2003 and CEA guidelines etc.**

## **TECHNICAL SPECIFICATIONS**

**The proposed projects shall be commissioned as per the technical specifications given below**

A Grid Tied Solar Rooftop Photo Voltaic (SPV) power plant consists of SPV array, Module Mounting Structure, Power Conditioning Unit (PCU) consisting of Maximum Power Point Tracker (MPPT), Inverter, and Controls & Protections, interconnect cables, Junction boxes, Distribution boxes and switches. PV Array is to be mounted on a suitable structure. Grid tied SPV system is without battery and should be designed with necessary features. Components and parts used in the SPV power plants including the PV modules, metallic structures, cables, junction box, switches, PCUs etc., should conform to the BIS or IEC or international specifications, wherever such specifications are available and applicable.

### **SPECIFICATIONS OF MAJOR COMPONENTS OF THE SYSTEM**

1. PV MODULES:

- a) The PV modules Mono-PERC half cut solar panel (Manufactured in India) to be employed shall be of minimum 144 cell configuration with rated power (Min 540 Wp +) at STC as certified for solar PV module power performance test as prescribed by latest edition of IEC 61215 / IS14286 and as tested by IEC / MNRE recognized test laboratory. The Solar Modules should be IEC Certified and BIS Approved.  
In addition, the modules must conform to IEC 61730 Part 1-requirements for construction & Part 2 - requirements for testing, for safety qualification.

The bidder shall carefully design & accommodate requisite numbers of the modules to achieve the rated power in the project proposal submitted to the Bank.

Technical Requirements:

**b) IDENTIFICATION AND TRACEABILITY**

Each PV module used in the solar power project must use a RF identification tag (RFID), which must contain the following information. The RFID can be inside or outside the module Laminate, but must be able to withstand harsh environmental conditions.

- i) Name of the manufacturer of PV Module
- ii) Name of the Manufacturer of Solar cells of PV Module
- iii) Month and year of the manufacture (separately for solar cells and module).
- iv) Country of origin (separately for solar cells and module)
- v) I-V curve for the module
- vi) Peak Wattage,  $I_m$ ,  $V_m$  and field factor (FF) for the module
- vii) Unique Serial No. and Model No. of the module
- viii) Date and year of obtaining IEC PV module qualification certificate
- ix) Name of the test lab issuing IEC certificate
- x) Other relevant information on traceability of solar cells and module as per ISO 9000 series.

It may be noted that from 1st April 2013 onwards; RFID shall be mandatorily placed inside the module laminate.

- c) Each module shall have low iron tempered glass front for strength & superior light transmission. It shall also have tough multi-layered polymer back sheet for environmental protection against moisture & provide high voltage electrical insulation.
- d) Solar module shall be laminated using lamination technology using established polymer (EVA) and Tedlar /Polyester laminate.
- e) The module frame shall be made of aluminium or corrosion resistant material, which shall be electrically compatible with the structural material used for mounting the modules.
- f) The peak-power point voltage and the peak-power point current of any supplied module and/or any module string (series connected modules) shall not vary more than 3 (three) per cent from the respective arithmetic mean for all modules and/or for all module strings, as the case may be.
- g) The module frame shall be made of anodized Aluminium, which shall be electrically & chemically compatible with the structural material used for mounting the modules. It is required to have provision for earthing to connect it to the earthing grid. The anodisation thickness shall not be less than 15 micron.
- h) Minimum three number of bypass diodes (Schottky type) and two number of MC4 connectors with appropriate length of TUV 2 Pfg 1169/08.2007 certified 4 sq.mm, Cu. armoured cable should be used only.
- i) Photon conversion efficiency of SPV Module should be greater than 17%. Module shall be made of high transmittance glass front surface giving high encapsulation gain.

**j) Technical Requirements:**

- i. The modules should be 100% PID (Potential Induced Degradation) tolerant and should comply with IEC 62804.
- ii. Modules shall perform satisfactorily in relative humidity up to 85% and temperature between 10° C and 85°C (module temperature).
- iii. Modules should have rugged design to withstand tough environmental conditions and high wind speeds (minimum up to 270 km/h). Fill Factor should be 0.72 minimum.
- iv. SPV module shall have module safety class-II and should be highly reliable, light weight and must have a service life of more than 25 years.
- v. Modules only with the same rating and of same manufacturer and model shall be supplied.

**k) Component Specifications:**

- i. The glass used to make the PV modules shall be toughened low iron glass with minimum thickness of 4.0 mm for 144 cell module. The glass used shall have transmittance of above 90%. Glass must have bending of less than 0.3%.
- ii. The back sheet used in the PV modules shall be of three layered or mono layered structure. The back sheet used in the crystalline silicon based modules shall be 3 layered structures. Outer layer of fluoro polymer, middle layer of Polyester (PET) based and Inner layer of fluoro polymer or UV resistant polymer. Back sheet with additional layer of Aluminium also will be considered.
- iii. The back sheet should be durable for humid – hot conditions with properties of moisture barrier, elongation retention and UV resistance.

**l) Authorised Testing Laboratories / Centers:**

- i. The PV modules must be tested and approved by one of the IEC authorized test centers. Test certificates can be issued by any of the NABL / BIS Accredited Testing / Calibration Laboratories.
- ii. Test certificates for the system/ components/ items from any of the NABL / BIS Accredited Testing Calibration Laboratories / MNRE approved test centers to be submitted to the Bank.
- iii. The Contractor shall provide the Bill of Materials (BOM) of the module that is submitted for approval along with the datasheets of each component. The component datasheet shall contain all the information to substantiate the compliance for component specifications mentioned above. The Contractor shall also provide complete test reports and certifications for the module proposed as per above. The BOM proposed shall be the subset of Constructional Data Form (CDF)'s of all the test reports.

**m) Warranties:**

**a). Material Warranty:**

- i. Material Warranty is defined as: The manufacturer should warrant the Solar Module(s) to be free from the defects and/or failures specified below for a period not less than twenty five (25) years from the date of sale to the original customer.
- ii. Defects and/or failures due to manufacturing
- iii. Defects and/or failures due to quality of materials.
- iv. Non conformity to specifications due to faulty manufacturing and/or inspection processes. If the solar Module(s) fails to conform to this warranty, the manufacturer will replace the solar module(s), at the Owners sole option.

**b). Performance Warranty:**

- i. The manufacturer should warrant the output of Solar Module(s) for at least 90% of its rated power after initial 10 years & 80% of its rated power after 25 years from the completion of trial run at site/date of final commissioning.
- ii. Modules with lower degradation rate less than 0.7% per year will be considered.
- iii. The contractor shall collect the Warranty Certificate for performance of the modules from the manufacturer and submit the same to SBI prior to delivery of the products to the respective sites.
- iv. If, Module(s) fail(s) to exhibit such power output in prescribed time span, the Contractor will bound to either deliver additional PV Module(s) to replace the missing power output with no change in area of site used or replace the PV Module(s) with no extra cost claimed at Owner's sole option.

2. **Solar PV Mounting Structure**

- a. The mounting structure shall have to be designed by the Contractor after spot verification.
- b. The module mounting structures should be made suitable for Sheet Roof & Flat RCC roof.
- c. Structures shall be supplied complete with all members to be compatible for allowing easy installation at the rooftop site.
- d. The structures shall be designed to allow easy replacement of any module.
- e. Each structure will have a provision to adjust its angle of inclination to the horizontal as per the site condition and will be capable of withstanding a wind load of 150 Km/hr after grouting and installation. The vendor has to submit the installation drawings approved by the registered structural engineer that designed structure and grouting method is capable of withstanding a wind pressure of 150 Km/hr.
- f. Few locations/site are of Flat RCC roof, where the suitable Elevated GI Structure to be fabricated to utilize the space beneath the Structure.
- g. The Modules on the elevated structures with GI Sheet roofs & existing GI Sheet roof will be mounted with Anodized Aluminium Channels/structures. The Anodized Aluminium Rails/channels should be fixed with suitable Adhesives to the GI Sheet roof withstanding wind speed of 150Km/hr
- h. Mounting Structure must be designed to withstand all weights of modules and to withstand wind speed of 150km/hr. Anti-theft Nut & Bolts must be used for modules.
- i. For Elevated Structure Hot dip galvanized MS angles & poles to be used adhering to IS standards. The thickness of galvanization should be minimum of 90 microns. All the nuts, bolts are made of good quality Stainless Steel (SS 304). Space must be provided in between rows for proper maintenance and cleaning.  
The minimum clearance of the lowest part of the module structure and the developed ground level shall not be less than 600 mm. The structure shall be fixed tilt type to give maximum output from the plant
- j. Material Specification for MS Items for Elevated Structure:

Column	MB200
Rafter	Rectangular Tube 100 x 50 x 4mm
Purlin	Rectangular Tube 80x50x4mm
Base Plate	HR Plate 300x300x10mm



- k. Bidders have to submit detailed designs and Drawings to SBI for acceptance and approval before execution of work.
- l. Vendor shall carry out all the tasks such as cleaning/ scratching/ roughening/ smoothing etc required to prepare the floor for effective bonding with the concrete pedestal of the module mounting structures (MMS). Foundation that is Concrete pedestal for the MMS structures shall be of 300X300X300mm @ ratio 1:2:4 concrete mix as per IS: 456. Two-part epoxy compound (NITO Bond Epoxy Resin Bonding agent) shall be applied between the floor and pedestal surfaces to facilitate effecting bonding.
- m. Contractor to confirm that no damage to existing water proofing of the roof shall be made during the course of installation of the structure on roof top. Any damage to the waterproofing found during the above should be rectified to the existing roof condition at Contractor's cost. All pedestals shall be finished to the existing roof condition to prevent any water seepage later. Contractor shall commence the work only after clearance of drawings by SBI authority
- n. Racks will be laid out in parallel matrices allowing individuals to access the area between the racks for cleaning and other maintenance needs. In between the row of solar panels sufficient gap need to be provided to avoid falling of shadow of one row on the next row. Seismic factors for the site will be considered while making the design of the foundation. Array support structure shall be fabricated using corrosion resistant GI sections electrically compatible with the structural material. Adequate spacing shall be provided between any two modules secured on PV panel for improved wind resistance
- o. Provision for installing the Array Junction Box shall be available on the same frame material and specification as defined for Module mounting structure.
- p. The total load of the structure (when installed with PV modules) on the terrace should be less than 60 kg/m<sup>2</sup>. The array structure shall be grounded properly using maintenance free earthing kit suitable for mounting over building terrace.
- q. Bidder has to design MMS as per the actual site conditions and loads of roof top. Elevated systems to be installed on any roof, if the obstacles found within the terrace area. Structural integrity and safety is afforded the topmost priority during the design process. The expected life of a solar power plant is 25 years and ensure that structures are designed in a manner to ensure achieving of said milestone

r) **Cable Trays:**

**Cable trays should be overhead .It should be avoided at ground installation** The perforated cable trays with Tray cover shall be manufactured from good commercial, high grade strength sheet steel having minimum thickness of 1.6mm for Tray and 1m m for Tray Cover. The perforated cable trays shall be hot dip galvanized according to IS-2629, BS729-1971

OR

Equivalent standard suitable for indoor/outdoor use having moderate humidity and air pollution. The zinc coating thickness shall work out by applying a 610 gm of zinc per square meter surface with an approximate thickness of 80 microns

Sr No	Size of Tray Size	Size of Tray Cover	Approx. Quantity
1	250mm X 100mm X 1.6mm	250mm X 15mm X 1mm	As required
2	100mm X 50mm X 1.6mm	100mm X 15mm X 1mm	As required
3	50mm X 25mm X 1.6mm	50mm X 15mm X 1mm	As required

### 3. **Junction Box:**

A DC Junction/Combiner Box shall be used to combine the DC cables of the solar module arrays with DC fuse protection for the outgoing DC cable(s) to the DC Distribution Box.

- i. The junction boxes are to be provided in the PV array for termination of connecting cables. The Junction Boxes (JBs) shall be made of GRP/FRP/with full dust, water & vermin proof arrangement. All wires/cables must be terminated through cable lugs. The JB's shall be such that input & output termination can be made through suitable cable glands.
- ii. Suitable markings shall be provided on the busbar for easy identification and the cable ferrules must be fitted at the cable termination points for identification.
- iii. Copper bus bars/terminal blocks housed in the junction box with suitable termination threads conforming to IP 65 standard and IEC62208 Hinged door with EPDM rubber gasket to prevent water entry, Single/ double compression cable glands, Provision of earthings. It should be placed at a height suitable for ease of accessibility.
- iv. Each combiner box/ junction box will have suitable Reverse Blocking Diodes of maximum DC blocking voltage of 1000 V with suitable arrangement for its connecting.
- v. Junction boxes should be equipped with fuses on both positive & negative input to protect the PV module from short circuits.
- vi. The combiner box/ Array junction Box will also have suitable surge protection device to protect the PV modules as well as the other electrical / electronic systems from transients over voltages created due to lightning and to reduce insulation break downs due to lightning.

The SPD's should be tested and approved according to IEC 61643-11 and EN 50539-1:2013-03.

### 4. **Solar Array Fuse**

- i. The cables from the array strings to the solar grid inverters shall be provided with DC fuse protection. Fuses shall have a voltage rating and current rating as required. The fuse shall have DIN rail mountable fuse holders and shall be housed in thermoplastic IP 65 enclosures with transparent covers.

**Selection of fuses:** It is important to coordinate the power dissipation of fuse-links with the acceptable power dissipation of fuse holders. Rated voltage of fuse-link and fuse holder should be at least 20% higher than open circuit voltage of photovoltaic installation. Typical rated voltage of fuse-links and fuse holders is 1000 V DC. Rated current of fuse-links  $\geq 1.4$  ISC. (ISC = short circuit current of photovoltaic modules), Utilization category g PV (protection against overload and short-circuit), Minimum interrupt rating  $1.35I_n$ , Non fusing current  $1.13 I_n$ .

### 5. **DC Distribution Board:**

A DC distribution box shall be mounted close to the solar grid inverter. The DC distribution box shall be of the thermo-plastic IP65 DIN-rail mounting type and shall comprise the following components and cable terminations:

Incoming positive and negative DC cables from the DC Combiner Box- DC circuit breaker, 2 pole & DC surge protection device (SPD), class 2 as per IEC 60364-5-53; Outgoing positive and negative DC cables to the solar grid inverter.

### 6. **Power Conditioning Units:**

#### a) **General:**

- i. DCDB output will be fed to Inverter/ Power Conditioning Unit (PCU), grid interactive in nature, which mainly consists of Maximum Power Point Tracker (MPPT), Charge Controller, Inverter, Voltage Stabilizer, Frequency and voltage and distribution panel along with necessary Displays, Indicators and Alarms. It shall provide necessary protections

for Grid Synchronization and Data Logging/Monitoring. The Invertors should convert DC power produced by SPV modules in to AC power and must synchronize automatically its AC output to the exact AC Voltage and frequency of **Suitable Capacity**. The bidder have to choose the inverter as string as per the design. PCU should conform IEC 61683, IEC 60068 as per specifications.

- ii. The string inverter shall be installed near to the solar array and hence it shall be suitable for weather proof and shall have IP65 class of protection. Also, a separate hood type arrangement using GI metal sheet to cover top of the string inverter enclosure shall also be provided with necessary mounting arrangements.
- iii. The inverters shall have protection against any sustained fault, lightning discharge in feeder line and earth leakage faults.
- iv. PCU/inverter shall be capable of complete automatic operation including wake-up, synchronization & shutdown.
- v. The combined wattage of all inverters should not be less than rated capacity of power plant.
- vi. The PCU shall be mounted on a suitable reinforced concrete pad inside control room not susceptible to inundation by water. All cable entry to and from the PCU shall be fully sheathed to prevent access of rodents, termites or other insects into the PCU from bottom/top of the PCU in form of a detachable gland plate.
- vii. In case of GRID failure, the PCU shall be re-synchronized with grid after revival of power supply. Vendor to furnish the time taken by PCU to be re-synchronized after restorations of GRID supply same to be indicated in data sheet to be submitted during detail engineering stage.
- viii. Typical technical features of String inverter of following ratings is required as mentioned below: Bidder should ensure compatibility of inverter system with SPV modules **PV modules Mono-PERC half cut solar panel** and above.
- x. DC side of each inverter shall be earthed to distinct earth pit through adequate size conductor as per IS 3043 -1987. The size of conductor/ procedure for earthing for inverters shall be as per the maximum fault current of DC system.
- xi. To allow maintenance of the PV Inverter, means of isolating the PV Inverter from the DC side must be provided by a DC isolator mandated in each photovoltaic power system according to IEC 60364-7-712.
- xii. **Operating Modes:** Operating modes of PCU shall include, but not limited to, the following modes.

**I). Low Power Mode:** The control system shall continuously monitor the output of the solar arrays connected to the inverter until preset value is exceeded & begins to export power provided there is sufficient solar energy and grid voltage and frequency are in specified range.

**III) Sleep mode:** Automatic 'sleep' mode shall be provided so that unnecessary losses are minimized at night.

- xii. The PCU/ inverter generated harmonics, flicker, DC injection limits, Voltage Range, Frequency Range and Anti-Islanding measures at the point of connection to the utility services should follow the latest CEA (Technical Standards for Connectivity Distribution Generation Resources) Guidelines.
- xiii. **Integration of PV Power with Grid:** The output power from SPV would be fed to the inverters which converts DC produced by SPV array to AC and feeds it into the main electricity grid after synchronization. In case OF 90 KWP CAPACITY GRID failure, or low or high voltage, solar PV system shall be out of synchronization and shall be disconnected from the grid. Once the DG set comes into service, PV system shall again be synchronized with DG supply and load requirement would be met to the extent of availability of power. 4 pole isolation of inverter output with respect to the grid/DG Power connection need to be provided.
- xiv. **Grid Islanding:**  
Anti-islanding (Protection against Islanding of Suitable capacity Grid): The PCU shall have anti islanding protection in conformity to IEEE 1547/UL 1741/ IEC 62116 or equivalent BIS standard.  
i) The Rooftop PV system shall be equipped with islanding protection. In addition to disconnection from the grid (due to islanding protection) disconnection due to under and over voltage conditions shall also be provided.  
ii) A manual disconnect 4pole isolation switch beside automatic disconnection to grid would have to be provided at utility end to isolate the grid connection by the utility personnel to carry out any maintenance. This switch shall be locked by the utility personnel.  
iii) Inverter shall be tested for islanding protection performance. When the mains power is off, the PCU should also get automatically off so that back-feeding to the grid is not possible.
- xv. **Maximum Power Point Tracker (MPPT):**  
Maximum power point tracker shall be integrated into the PCU to maximize energy drawn from the Solar PV array. The MPPT should be microprocessor / micro-controller based to minimize power losses. The details of working mechanism of MPPT shall be mentioned.  
The efficiency of the Charge controller (MPPT based with data logger) shall not be less than 94% and shall be suitably designed to meet array capacity.  
MPPT must conform IEC 62093, IEC 60068 as per specifications.
- xvi. **Data Acquisition System / Plant Monitoring:**  
i Data logger system (Hard ware) and the software for study of effect of various environmental & grid parameters on energy generated by the solar system and various analyses would be required to be provided. The communication interface shall be suitable to be connected to local computer and also remotely via the Web using either a standard modem or a GSM / WIFI modem.  
ii Remote Monitoring system shall be provided to monitor the Solar Power Generation such that all (i.e. AC & DC) electrical parameters (cumulative & instant) in graphical presentation from string level, next inverter and so on as desired by Bank/ owner  
iii Monitoring complete systems including hardware and Modem/Router shall facilitate monitoring of the performance of the Inverter /inverters, energy yield, temperature, irradiance level etc through LAN based or GSM based network. PC based inverter monitoring is also required for local monitoring of each system. Some of the salient features of the monitoring system shall be:

a) The data acquisition system shall have a real-time clock and data storage capacity for recording data round the clock for min. one year.

b) The monitoring of the Solar system and logging / viewing of system data shall be through a PC with latest software/hardware configuration and service connectivity to be supplied, operation & maintenance/control to be ensured by the bidder.

c) The software package shall be preferably windows based MS Excel compatible. The data shall be represented in both tabular and graphical form.

**d) Plant with net metering & SIM based remote monitor feature with one year re-charge by vendor. All the cost should bear by the vendor.**

e) The following parameters are accessible via the operating interface display in real time separately for solar power plant:

- AC Voltage.
- AC Output current.
- Output Power
- Power factor.
- DC Input Voltage.
- DC Input Current.
- Time Active.
- Time disabled.
- Time Idle.
- Power produced
- Protective function limits (Viz-AC Over voltage, AC Under voltage, Over frequency, Under frequency ground fault, PV starting voltage, PV stopping voltage)

f) All major parameters available on the digital bus and logging facility for energy auditing through the internal microprocessor and read on the digital front panel at any time) and logging facility (the current values, previous values for up to a month and the average values) should be made available for energy auditing through the internal microprocessor and should be read on the digital front panel.

g) Metering and Instrumentation for display of systems parameters and status indication to be provided.

h) **PV array energy production:**

a) Digital Energy Meters to log the actual value of AC/ DC voltage, Current & Energy generated by the PV system provided. Energy meter along with CT/PT should be of 0.5 accuracy class shall be provided.

b) All major parameters available on the digital bus and logging facility for energy auditing shall be available on the display.

c) The following parameters should be accessible via the operating interface display.

- a) AC Voltage.
- b) AC Output current.
- c) Output Power
- d) DC Input Voltage.

- e) DC Input Current.
- f) Time Active
- g) Time disabled.
- h) Time Idle
- i) Temperatures
- j) Inverter Status

### **POWER CONSUMPTION:**

Regarding the generated power consumption, priority need to give for internal consumption first and thereafter any excess power can be exported to grid

### **7) AC Distribution Board (ACDB):**

- i. AC Distribution Panel Board (DPB) shall control the AC power from PCU/ inverter, and should have necessary surge arrestors. Interconnection from ACDB to mains at LT Bus bar while in grid tied mode. ACDB shall be installed on roof-top.
- ii. All switches and the circuit breakers, connectors should conform to IEC 60947, part I,II and III/ IS60947 part I, II and III.
- iii. The changeover switches, cabling work should be undertaken by the bidder as part of the project.
- iv. All the Panels shall be metal clad, totally enclosed, rigid, floor mounted, air - insulated, cubical type suitable for operation on three phase / single phase, 415 or 230 volts, 50 Hz and designed for minimum expected ambient temperature of 45degree Celsius, 80 per cent humidity and dusty weather.
- v. All indoor panels will have protection of IP54 or better. All outdoor panels will have protection of IP65 or better.
- vi. Should conform to Indian Electricity Act and rules (till last amendment).
- vii. ACDB shall be 3-phase, 50Hz, 415VAC, 1.1kV system voltage, outdoor, with canopy, IP55, neoprene gasket for doors/ frame joints, CRCA sheets 2mm (frame)/ 1.6mm (door)/ 3mm (removable gland plate bottom side), painting seven tank process, colour RAL 7032, base frame with section 75mm min/ black painted, panel lifting hooks, Al bus bars as per SLD, RYB colour coded heat-shrinkable sleeves for bus bars, SMC/DMC insulator supports, Al earth bus, accessible live parts shrouded with FRP/polycarbonate sheets, MCBs for i/c feeders, 25mm min phase to phase clearance, LED indicators for RYB at o/g, colour coded Cu-cable AC/DC wiring (1.5/2.5 mm<sup>2</sup> as applicable) etc. For the incoming and outgoing power cables, nickel plated brass double compression glands, Al cable lugs, SS304 plain/ spring washers shall be provided.
- viii. Modifications/ addition if any, in existing L T panel and D G set panel of SBI shall be done at site and covered in scope of Bidder. Also required size cable and other equipment between existing panel to solar AC distribution panel is covered in scope of Bidder.
- ix. An AC distribution box shall be mounted close to the solar grid inverter.
- x. The AC distribution box shall be of the thermo plastic IP65 DIN rail mounting type and shall comprise the following components and cable terminations:
  1. Incoming 3-core / 5-core (single-phase/three-phase) cable from the solar grid inverter
  2. AC circuit breaker, 2-pole / 4-pole
  3. AC surge protection device (SPD), class 2 as per IEC 60364-5-53
  4. Outgoing cable to the grid interconnection point
- xi. Extra feeders (including two spare feeders) shall be provided to meet the various auxiliary supply requirements at the roof-top such as module washing pumps, data loggers etc.

- xiii. MCCB, MCB shall be L&T/C&S/Siemens/ABB/ Schneider or reputed equivalent subject SBI approval.
- xiv. Vendor shall submit the detailed GA, SLD, BOM, MQP etc of ACDBs for SBI approval during detailed engineering.

**8) Cables & Wirings:**

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

Sl.	Item	Description
<b>1.0</b>	<b>DC Cable</b>	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) – 1976 or IS 1554 or IS9537/IEC60227/IS694. <b>The voltage drop shall not exceed more than 2% of peak power voltage</b>
1.2	Size	<b>The minimum DC cable size shall be 6.0 mm<sup>2</sup> copper.</b>
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.
<b>2.0</b>	<b>AC Cable</b>	From inverter to ACDB and ACDB to distribution panel/LT panel
2.1	Type	1.1 kV grade heavy duty PVC insulated Aluminum armored XLPE stranded cables as per IS: 7098 (Part I & II) – 1976 or IS 1554 or IS9537/IEC60227/IS694. <b>The voltage drop shall not exceed more than 2% of peak power voltage</b> ➤ Outdoor AC cables shall have a UV-stabilized outer sheath.
2.2	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.

**a) Procedure of cable laying:**

- i. **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.**
- ii. Only terminal cable joints shall be accepted. Cable joint to join two cable ends shall not be accepted.
- iii. 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.

- iv. All fasteners will be made of Stainless steel or Aluminum or UV Protected PVC.
- v. All power, control, communication cables running from buildings shall be routed from one building to another building through underground cable trench (direct burying) as per IS: 1255.
- vi. The DC cables from the SPV module array shall run through a UV stabilised PVC conduit pipe of adequate diameter with a minimum wall thickness of 1.5mm. The conduits shall not run across the path way of the terrace. Flexible corrugated PVC conduits shall not be used.
- vii. Cables and wires used for the interconnection of solar PV modules shall be provided with solar PV connectors (MC4) and couplers.
- viii. All cables and conduit pipes shall be clamped to the rooftop, walls and ceilings with thermo-plastic clamps at intervals not exceeding 50 cm. The minimum DC cable size shall be 6.0 mm<sup>2</sup> copper. The minimum AC cable size shall be 4.0 mm<sup>2</sup> copper. In three phase systems, the size of the neutral wire size shall be equal to the size of the phase wires. The following colour coding 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
- ix. Cables and conduits that have to pass through walls or ceilings shall be taken through a PVC pipe sleeve.
- x. 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.
- xi. The total voltage drop on the DC cable segments from the solar PV modules to the solar grid inverter shall not exceed 2.0%. Conductor size of less than 6 sq. mm shall not be accepted.
- xii. Cable/wire connections shall be soldered, crimp-on type or split bolt type. Wire nut connections shall not be used.
- xiii. The wiring must be carried out in pvc precesion make conduit only.
- xiv. Cable Routing/ Marking: All cable/wires are to be routed in a GI/PVC cable tray and suitably tagged and marked with proper manner by good quality ferule or by other means so that the cable easily identified use
- xv. The Cable should be so selected that it should be compatible up to the life of the solar PV panels i.e. 25 years.
- xvi. The size of each type of AC cable selected shall be based on minimum voltage drop however; the maximum drop shall be limited to 2 %.

#### **9) LTPDB combiner boxes:**

AC outputs from ACDB installed at the Roof top of building are terminated at a LT power distribution board (LTPDB) which is located in the ground floor of the same building where LT evacuation point is provided. Supply and installation LTPDB is in vendor scope.



- i. LTPDB suitable for 100 KWp Solar power system/comprises of 320A/400A, 4 Pole MCCB and suitable for termination of cable coming from AC Distribution Board. PVC insulated AL armoured cable coming from solar ACDB at incoming end shall be provided in main control room with Out going of 320A, 4 Pole MCCB The panel shall be 3-phase, 50Hz, 415VAC, 1.1kV system voltage, outdoor, with canopy, cubicle design, compartmentalized (Breaker/ control box/ CTPT chamber etc), floor mounted, free standing IP55, neoprene gasket for doors/ frame joints, CRCA sheets 2mm (main frame)/ 1.6mm (door)/ 3mm (removable gland plate bottom side), painting seven tank process, panel illumination lamp, space heater, thermostat etc. CU bus bars as per SLD, RYB colour coded heat-shrinkable sleeves for bus bars, SMC/DMC insulator supports for the incoming and outgoing power cables, nickel plated brass double compression glands, Al cable lugs, SS304 plain/ spring washers shall be provided.
- ii. Vendor shall provide bus bar extension at LT panel if Spare breakers are not available for LT evacuation.
- iii. Digital MFM shall be EM6300 of Schneider along with Indicator lamps shall be L&T/ C&S or reputed equivalent subject to SBI approval
- iv. MCCB: L&T/ C&S/ ABB/ Siemens/ Schneider or reputed equivalent subject to SBI approval
- v. Vendor shall install the LTPDB panels near to Customer LT evacuation point
- vi. Laying and termination of cables from ACDB box to LTPDB box:
  - a. Cables are 1.1kV, Al, XLPE, armoured as per IS: 7098 part-1 shall be in vendor scope of supply and installation for laying between ACDB to LTPDB.
  - b. These cables shall be routed using the same type of GI cable trays/ accessories/ hardware used for 1Cx4 cables up to the ground level outside the buildings.
  - c. All power, control, communication cables running from buildings shall be routed from one building to another building through underground cable trench (direct burying) as per IS:1255.

## 10) PROTECTIONS

The system should be provided with all necessary protections like earthing, Lightning, and grid islanding as follows:

### **i. LIGHTNING PROTECTION:**

The SPV power plants shall be provided with lightning & overvoltage protection. The entire space occupying the SPV array shall be suitably protected against Lightning by deploying required number of Lightning Arrestors. Lightning protection should be provided as per IEC 62305 /IS 2309 standard. The protection against induced high-voltages shall be provided by the use of metal oxide varistors (MOVs) and suitable earthing such that induced transients find an alternate route to earth. ESE Lightning and surge protection for the SPV plant shall be provided using adequate number of earthing kits but not less than two independent earthing stations. It shall be ensured that all the earth are bonded together to bring them to the same potential. *Earth resistance shall not be more than 5 ohms with earthing Strip of 25x6mm GI.*

- a) Lightning Arrester is composed of one main striking point, emission device, fixing element, and a connection to the down conductor.

- b) The area protected by LA is determined using the early streamer emission test method as per NFC 17 102 Standard and it is preferred to have LA installed on the highest part of the structure.
- c) Lightning arrester is advanced ESE type and provides protection radius of 107m in Level IV.
- d) Our ESE lightning arrester is testable from external tester for internal configuration as well as magnetic field test. Carries 30 years warranty.

Tested as per NFC 17-102 standard for:

- Short circuit test of 115KA
- Advance triggering time of 63 microseconds.
- Temperature withstand test of -50 to +120 degree Centigrade
- Salt mist and humid sulphur test
- CE marking
- Internal test report available for each unique serial numbered rod provided with each lightning rod.

## **ii. SURGE PROTECTION:**

Surge protection shall be provided on both the DC and the AC side of the solar system. The DC surge protection devices (SPDs) shall be installed in the DC distribution box adjacent to the solar grid inverter.

The AC SPDs shall be installed in the AC distribution box adjacent to the solar grid inverter. The SPDs earthing terminal shall be connected to earth through the above mentioned dedicated earthing system. The SPDs shall be of type 2 as per IEC 60364-5-53.

## **iii. EARTHING PROTECTION:**

Body and lightning protection system earthing shall be provided with maintenance free earthing (MFE) system comprising of 17mm (3M length) dia copper bonded stainless/ nickel steel alloy rods suitably joined together with thread less/compression couplers made of copper alloy including supply of copper rods and all other accessories required for the total erection of the earthing system. The rod shall be driven in earth with augured hole dia of 75- 100 mm in ground filled with conductivity/earth enhancement compound.

Earth pit chamber with RCC cover as per standards shall be constructed for each maintenance free earth rod. Earthing conductor of size not less than 25x3mm GI strip on roof/wall mounting for body Earthing system shall be provided with proper clamping arrangement using GI spacer and saddles over a suitable concrete blocks on roof and with necessary fixing materials with a spacing of not less than 600mm. Earth resistance shall not be more than 5 ohms. All metal casing/shielding of the plant shall be thoroughly grounded to ensure safety of the solar power plant

### **EARTHING SPECIFICATIONS:**

- Electrode : Material - Cu. Bonded
- Diameter - Ø17 mm.
- Length - 2 m. long
- Earthing Chemical / Enhancement compound: 15- 25 kg.

Minimum four (06) numbers (ACDB, DCDB, PCU, SPD, LA & Structures) of separate earth pit needs to be provided in each location. Minimum required gap shall be provided in between earth pits as per relevant standard. Body earthing shall be provided in inverter, each panel, module mounting structure, kiosk and in any other item as required. Separate dedicated earthing for LA & SPD.

## **1) TOOLS, TACKLES AND SPARES**

The Installer shall keep ready stock of tools, tackles and essential spares that will be needed for the day-to-day maintenance of the solar PV system. This shall include but not be limited to, the following:

- I. Screw driver suitable for the junction boxes and combiner boxes.
- II. Screw driver and / or Allen key suitable for the connectors, power distribution blocks, Circuit breaker terminals and surge arrestor terminals.
- III. Spanners / box spanners suitable for the removal of solar PV modules from the solar PV module support structure.
- IV. Solar panel mounting clamps.
- V. Cleaning tools for the cleaning of the solar PV modules.
- VI. Spare fuses

## **2) CAUTION SIGNS**

In addition to the standard caution and danger boards or labels as per Indian Electricity Rules, the cable junction box near the solar grid-tie inverter, the building PCC board to which the AC output of the solar PV system is connected shall be provided with a non-corrosive caution label

The size of the caution label shall be minimum 105mm (width) x 20mm (height) with white letters on a red background.

## **3) FIRE EXTINGUISHERS:**

The firefighting system for the proposed power plant(s) for fire protection shall be consisting of: Portable fire extinguishers in the control room for fire caused by electrical short circuits. The installation of Fire Extinguishers should confirm to TAC regulations and BIS standards. The suitable fire extinguishers shall be provided in the control room housing as well as near the Roof or site where the PV arrays have been installed. Separate payment will not be made for the provision of fire prevention measures.

## **4) DOCUMENTATION TO ACCOMPANY FOR HANDING OVER THE PROJECT (Part- A,B,C)**

### **Part A: DOCUMENTATION**

- 1) The complete documentation should be as per IEC 62446 and submitted to Bank.
- 2) One set of operation manuals complete with drawing, parts list (with part codes) circuit diagrams with list ratings of components and list of do's and don'ts for the main equipment as well as the sub-systems should be submitted to Bank.
- 3) One set of maintenance manuals with full information on drawings, circuit diagrams, list and suppliers addresses for bought out parts, troubleshooting charts, programs of built in controllers etc. for the main equipments as well as for the sub-system.
- 4) These manuals should be in the form of hard (printed) copy in English Language as well as in electronic storage form (disc pen drive etc.)
- 5) A certificate for the adequacy of the manuals should be obtained and provided with the manuals. Such certificate must be signed by the QA engineer of the manufacturer.
- 6) The Installer shall supply the following documentation also:
  - a) System description with working principles.
  - b) System single line diagram.
  - c) Solar PV array lay-out.
  - d) Routing diagram of cables and wires.
  - e) Data sheets and user manuals of the solar PV panels and the solar grid-tie inverter.
  - f) A system operation and maintenance manual.

- g) Name, address, mobile number and email address of the service centre to be contacted in case of failure or complaint.
- h) Guarantee & Warranty cards of the components supplied with seal and signature of the manufacturer.
- i) Maintenance Register

**Part B: TEST CERTIFICATES AND REPORTS TO BE FURNISHED**

- a. Test Certificates / Reports from IECQ / NABL accredited laboratory or MNRE approved test centers for relevant IEC / equivalent BIS standard for quoted components shall be furnished.
- b. Type Test Certificates shall be provided for the solar modules and the solar grid inverters to provide evidence of compliance with standards as specified in relevant articles of this Technical Specification.
- c. Bank reserves the right to ask for additional test certificates or (random) tests to establish compliance with the specified standards.

**Part C: INSTRUCTION AND O& M MANUALS**

Four copies of Instruction and Operation and Maintenance Manual should be furnished. The manual shall be furnished at the time of dispatch of the equipment and shall include the following aspects about:

- a. Precautions during unpacking
- b. Instructions for handling at site.
- c. Erection drawings with written assembly instructions.
- d. Detailed instructions and procedures for the installation, operation and maintenance.
- e. Pre-commissioning tests.
- f. Solar PV system—its components and expected performance.
- g. Clear instructions about mounting of PV module (s)
- h. DO's and DONT's.
- i. Specimen log book.
- j. Principle of Operation of various equipment
- k. Safety and reliability aspects
- l. Metering scheme
- m. string inverter software and controls
- n. Clear instructions on regular maintenance and troubleshooting of solar power plant.
- o. Name and address of the person or service centre to be contacted in case of failure or complaint.
- p. Outline dimension drawings showing relevant cross sectional views, earthing details and constructional features.
- q. Rated voltages, current and all other technical information which may be necessary for correct operation of the SV plant.
- r. Catalogue numbers of all the components which are liable to be replaced during life of the SV plant and all the component parts.
- s. Trouble shooting and diagnostic procedure

## **SCOPE OF WORKS UNDER AMC OPERATION AND MAINTENANCE GUIDELINES OF GRID CONNECTED, PV PLANTS FOR NEXT FIVE YEARS AFTER COMPLETION OF WORK**

For the optimal operation of a PV plant, maintenance must be carried out on a regular basis.

All the components should be kept clean. It should be ensured that all the components are fastened well at their due place.

Maintenance guidelines for various components viz. solar panels, inverter, wiring etc. are discussed below:

### **SOLAR PANELS**

1. Although the cleaning frequency for the panels will vary from site to site depending on soiling, it is recommended that
2. The panels are cleaned at least once every fifteen days. Any bird droppings or spots should be cleaned immediately. Use water and a soft sponge or cloth for cleaning.
3. Do not use detergent or any abrasive material for panel cleaning. Iso-propyl alcohol may be used to remove oil or grease stain
4. Do not spray water on the panel if the panel glass is cracked or the back side is perforated.
5. Wipe water from module as soon as possible.
6. Use proper safety belts while cleaning modules at inclined roofs etc. 1 lie modules should not be cleaned when they are excessively hot. Early morning is particularly good time for module cleaning.
7. Check if there are any shade problems due to vegetation or new building. If there are, make arrangements for removing the vegetation or moving the panels to a shade-free place.
8. Ensure that the module terminal connections are not exposed while cleaning; this poses a risk of electric shock.
9. Never use panels for any unintended use, e. g. drying clothes, chips etc.
10. Ensure that monkeys or other animals do not damage the panels.

### **CABLES AND CONNECTION BOXES**

1. Check the connections for corrosion and tightness.
2. Check the connection box to make sure that the wires are tight, and the water seals are not damaged
3. There should be no vermin inside the box.
4. Check the cable insulating sheath for cracks, breaks or burns. If the insulation is damaged, replace the wire.
5. If the wire is outside the building, use wire with weather-resistant insulation.
6. Make sure that the wire is clamped properly and that it should not rub against any sharp edges or corners.
7. If some wire needs to be changed, make sure it is of proper rating and type INVERTER
8. The inverter should be installed in a clean, dry, and ventilated area which is separated from, and not directly above, the battery bank
9. Remove any excess dust in heat sinks and ventilations. This should only be done with a dry cloth or brush. Check that vermin have not infested the inverter. Typical signs of this include spider webs on ventilation grills or wasps' nests in heat sinks.

10. Check functionality, e.g. automatic disconnection upon loss of grid power supply, at least once a month.
11. Verify the state of DC/A C surge arrestors, cable connections, and circuit breakers.

**SHUTTING DOWN THE SYSTEM**

1. Disconnect system from all power sources in accordance with instructions for all other components used in the system.
2. Completely cover system modules with an opaque material to prevent electricity from being generated while disconnecting conductors.
3. To the extent possible, system shutdown will not be done during day time or peak generation.

**INSPECTION AND MAINTENANCE SCHEDULE**

Component	Activity	Description	Interval	By
PV Module	Cleaning	Clean any bird droppings/ dark spots on module	Immediately	Vendor technical staff
	Cleaning	Clean PV modules with plain water or mild dishwashing detergent. Do not use brushes, any types of solvents, abrasives, or harsh detergents.	Monthly or as per the site conditions	Vendor technical staff Vendor technical staff Vendor technical staff
	Inspection (Each Plant )	Use infrared camera to inspect for hot spots; bypass diode failure	Annual	Vendor technical staff
PV Array	Inspection	Check the PV modules and rack for any damage. Note down location and serial number of damaged modules.	Annual	Vendor technical staff
	Inspection	Determine if any new objects, such as vegetation growth, are causing shading of the array and move them if possible.	Annual	Vendor technical staff
	Vermis Removal!	Remove bird nests or vermin from array and rack area.	Annual	Vendor technical staff
Junction Boxes	Inspection	Inspect electrical boxes for corrosion or intrusion of water or insects.	Annual	Vendor technical staff

Component	Activity	Description	Interval	Vendor technical staff
		Seal boxes if required. Check position of switches and breakers. Check operation of all protection devices.		

**SCHEDULE OF TECHNICAL DATA TO BE FINISHED BY THE CONTRACTOR**

a	SPV MODULE	
i.	Manufacture's Name & Address	
ii.	Type of Modules with cat. Reference	
iii.	Design of module at standard test condition	
	a) Peak power watt	
	b) Peak power voltage	
	c) Peak power current	
	d) Open circuit voltage	
iv.	No. of SPV Modules proposed branch wise to achieve minimum <b>KWp DC power</b> (i),ii,iii,iv,v,vi	
v.	Short circuit current of PV module (Amp.)	
vi.	Open circuit voltage of PV Module (V)	
vii.	Max. power rating of one PV Module (KWp) (not less than 540 Wp)	
viii.	Photo electrical conversion efficiency of SPV module ( not less than 14% )	
ix.	Fill factor of the SPV module (> 0.70)	
x	Designated life of the SPV modules	
xi.	Overall dimensions (in mm)	
xii.	Weight	
xiii	Frame materials	

xiv.	Reference of Standards / approval, if any	
xv.	Life of SPV Module (Years of Operation)	
<b>b</b>	<b>PV ARRAY CAPACITY</b>	
	Number of Module in series in each array	
	Peak power rating of one array	
	Number of array considered to achieve the specified output	
<b>c</b>	<b>MODULE MOUNTING STRUCTURE</b>	
i)	Type of structure and its materials used in frame and accessories	
ii)	Type of mounting structures (Fixed or any other type)	
iii)	Overall dimensions	
iv)	Type of mounting	
v)	Surface azimuth angle of PV Modules	
vi	Tilt angle (Slope) of PV module	
vii.	Confirm structure & module frame shall be designed at wind speed 150 km/hr.	
<b>d</b>	<b>POWER CONDITIONING UNITS (PCUs)</b>	
i.	Manufacturer's name & address	
ii.	Type of PCU (Centralized or string type)	
iii.	Number of units proposed	
iv.	Rated capacity of each PCU	
v.	Input DC Voltage range	
vi.	Output voltage	
vii.	Frequency	
viii.	Minimum efficiency at full load	



ix.	Location (outdoor/indoor)	
x.	Output wave shape	
xi.	Dimensions in mm	
xii.	IP protection level	
xiii.	Type of cooling required	
xiv	Type of mounting	
xv.	Suitability for specified Ambient Temp. range & Humidity at	
xvi.	Type of Protection provided	
xvii	Over Load Condition	Yes/No
xviii	Short Circuit Protection	Yes/No
xix	Low/High Voltage Protection	Yes/No
xx	Power Electronic Component Protection Yes/No	Yes/No
<b>e.</b>	<b>METERING</b>	
i.	Nos. of meters proposed to be provided	
ii.	Location of meters	
iii.	Manufacturer's name & address	
iv	Confirm compliance with laid down specification	

f	Item	Quantities	To be filled by the contractor
1	SPV Modules	Total Quantities (nos)	
		No. of Arrays	
		Nos of SPV module in each array	
2	Power Conditioning Units (PCUs) (Centralized/ string type)	Type	
		Quantity	
3	DC Junction Boxes		
4	AC Junction Boxes		
5	Other related items viz. control & power cables, cable trays, surge diverters, earthing etc. for the complete work as required	LOT	

	& specified		

**Signature of the Contractor with Seal**

**B- WARRANTY CERTIFICATE**

Name & Address of the Manufacturer/ supplier	
Name & address of the purchasing Agency	
Date of Erection system	
PV Module (a) Make	
(b) Model	
(C) Serial No. (List enclosed)	
(d) Wattage under STC	
(e) Warrantee valid upto	
(a) Make	
(b) Model	
(C) Serial No. (List enclosed)	
(d) Warrantee valid upto	
Designation & Address of the person to be contacted for claiming Warrantee obligations	
Date: Place:	(Signature) Name Designation Name & Address of the Manufacture/ Supplier (Seal)

### ***Instruction to the Tenderer/ Bidder***

#### **2. Tender documents:**

- i. The applicants who have down-loaded the Tender document from the GeM website, should read the following important instructions carefully before submitting the Tender in Online in GeM portal.
- a) The applicants should go through carefully & ensure that the **complete TENDER document** contains all pages of the document & ensure that **no page** in the down-loaded Tender document is **missing**.
- b) The bidder should visit the site & carryout the survey before quoting their rates and considering wide variation of site conditions, variation in price, logistics and distribution needs, and keeping the quantum and quality of work in mind.
- c) The SBI does not bind itself to accept the lowest or any tender and reserves to itself the right to accept or reject any or all the tenders, either in whole or in part, without assigning any reasons for doing so.
- d) On receipt of intimation from the SBI of the acceptance of his / their tender, by way of Work Order, the successful tenderer shall sign an agreement, subject to approval of Law department of SBI. A work order by the SBI of a tender will constitute a binding contract between the SBI and the bidder so tendering, whether such formal agreement is or is not subsequently executed. The cost of necessary stamp paper for execution of the agreement shall be borne by the successful tenderer.
- e) The tenderer shall not assign the contract and shall not sublet any portion of the contract except with the written consent of the SBI. In case of breach of these conditions, the SBI may serve a notice in writing on the tenderer rescinding the contract whereupon the security deposit shall stand forfeited to the SBI, without prejudice to his other remedies against the tenderer.
- f) The Tenderer shall carry out all the work strictly according to the conditions stipulated in the tender and in accordance with details and instructions of the Bank's concerned Officials. If in the opinion of the Bank's Officials, changes have to be made in the design and with the prior approval in writing of the SBI they desire, the Tenderer shall carry out the same. The Bank's Officials decision in such cases shall be final.
- g) The tenderer shall not be entitled to any compensation for any loss suffered by him on account of delays in commencing or executing the work, whatever the cause of delays may be including delays arising out of modifications to the work entrusted to him or in any subcontract connected therewith or delays in awarding contracts for other trades of the project or in commencement or completion of such works or in procuring government controlled or other building materials or in obtaining water and power connections for construction purpose or for any other reason whatsoever and the SBI shall not be liable for any claim in respect thereof. The SBI does not accept liability for any sum besides the tender amount, subject to such varia-

tions as are provided for herein. The SBI will not entertain any claim at any stage from the successful bidder on the plea of not having sufficiently acquainted himself as to the site conditions.

**h) Vendors should have local presence i.e. Madhya Pradesh (MP) or Chhattisgarh (CG) states. Copy of proof is required to be submitted in Hard copy along with EMD and also upload in GeM portal. Non submission of which will be treated as invalid tender.**

**3. Site Visit:**

The tenderer must obtain himself on his own responsibility and his own expenses all information and data that may be required for the purpose of filling this tender document and enter into a contract for the satisfactory performance of the work. The tenderer is requested satisfy himself regarding the availability of water, power, transport and communication facilities, the character quality and quantity of the materials, labour, the law and order situation, climatic conditions local authorities requirement, traffic regulations etc.

**4. Earnest Money Deposit:**

- I. *The tenderers are requested to submit the Earnest Money of Rs. 20,000/- (Rs. Twenty thousand only) by means of Demand Draft (Valid for a period of 90 Days) from any Scheduled/ Nationalized Bank drawn in favor of Assistant General Manager (P&E), State Bank of India and payable in Bhopal or submit EMD exemption certificate of MSME/NSIC in hard copy to this office (i.e. The AGM(P&E), State Bank of India, Local Head office, 3rd floor, Hoshangabad road, Bhopal-462011(M.P.)). In case not submitted their tender will not be opened.*
- II. EMD in any other form other than as specified above will not be accepted. Tender not accompanied by the EMD shall be rejected.
- III. No interest will be paid on the EMD.
- IV. EMD of unsuccessful tenderer will be refunded within 30 days of award of Contract.
- V. EMD of successful tenderer will be retained as a part of security deposit.
- VI. Forfeiting Of EMD: The EMD paid or submitted by the Bidder shall be forfeited if:
  - a. The Bidder withdraws his tender before finalization of work order.
  - b. The Bidder does not accept work order.
  - c. The Bidder violates any of the terms and conditions of the tender.
  - d. The Bidder fails to deposit requisite Security deposit.
  - e. The Bidder fails to comply with any of the conditions of the Contract /Tender Document

**5. Security Deposit:**

Total security deposit shall be 5% of the final value of the work. Bank will deduct total 5% of the final value of the work from Final/running bill. 5% of the retention money shall be paid after the defects liability period of 5 Year as specified in the contract. The retention money will be interest free. No interest shall be paid to the amount retained by the Bank as Security Deposit.

**I. Forfeiting Of Security Deposit :**

- a) The security deposit shall be liable to be forfeited wholly or partly at the sole discretion of the SBI, if the Bidder either fails to execute the work of above projects or fails to fulfill the contractual obligations or fails to settle in full his dues to the SBI.
- b) The SBI is empowered to recover from the security deposit for any sum due and for any other sum that may be fixed by the SBI as being the amount or loss or

losses or damages suffered by it due to delay in performance and / or non-performance and / or partial performance of any of the conditions of the contract and / or non-performance of guarantee obligations.

**6. DEFECT LIABILITY PERIOD:**

60 (sixty) months from the date of completion. The contractor has undertaken to attend repairs/rectifying the defects within 48 hours whatsoever during the defects liability period. Any defects or shortcomings found during execution of work and during the defects liability period from the completion of the entire work shall be attended/rectified by the tenderer without any extra cost to the SBI. In case of failure to do so within 10 days from such notice from the Bank, the SBI may get such rectification works carried out through any other firm and expenditure incurred by the Bank shall be recovered from any money due to the Vendor.

**7. Liquidated damage:**

If the work is not completed in the specified time the contractor will be levied liquidated damages @0.5% of the quoted value per week subject to maximum of 5 % of the contract value will be applied for delay in completion of the work.

**9. Labour License:**

The vendor shall adhere to various provision of the contract Labour (Regulation & Abolition) Act 1970, if applicable under the said contract, and fulfill all the statutory requirements. The contractor is required to comply withal acts of Government relating to labour and the rules and regulation made there under from time to time and submit at the times all particulars and settlements required to be furnished to the labour authorities.

**10. Terms of Payments:**

**I. No advance payment shall be paid.**

Total project cost against all materials delivery at site and production of test Certificates and with necessary documents showing requisite quality as mentioned in tender document such as Manufacture's Inspection and Test certificate.

**III. 95 % released after:**

- a) Installation, commissioning, testing, successful trail run.
- b) Including grid synchronization along with supply and installation of net metering, generation meter.
- c) Approvals from local Govt. authorities/MP Discom/ Chhattisgarh Distribution companies/CREDA/ Chief Electrical inspector office as required or applicable.
- d) Submission of Insurance policy documents effective from date of commissioning for CMC period.
- e) On receipt of one month successful performance report generated automatically through Remote Monitoring System as well as manually.

**IV. 5% will be held with us as SD for 5 yrs and could be release against submission of Performance Bank Guarantee from any scheduled/ commercial Bank, other than SBI**

**V. Payment shall be made by way of Electronic fund transfer and the bill will be paid by the SBI. Firm should furnish details of the bank, A/c no, IFSC code.**

**VI. Payments towards the above work shall be made by SBI.**

(The TDS at the source will be deducted as per the Govt. rule and regulations.)

**11. Signing of contract Documents**

The successful tenderer shall be bound to implement the contract by signing an agreement and conditions of contract attached herewith within **15 days** from the receipt of intimation of acceptance of the tender by the Bank. However, the written acceptance of the tenders by the Bank will constitute a binding agreement between the Bank and successful tenderer whether such formal agreement is subsequently entered into or not.

**12. Completion Period**

Time is essence of the contract. The work should be completed in all respect accordance with the terms of contract within a period of **45 days** from the date of award of work.

**13. Validity of tender**

Tenders shall remain valid and open for acceptance for a period of **90 days** from the date of opening price bid or the date of issue of work order, whichever is later. If the tenderer withdraws his/her offer during the value period or makes modifications in his/her original offer which are not acceptable to Bank without prejudice to any other right or remedy the Bank shall be at liberty forfeit the EMD.

**14. Delay and Extension of Time:**

If in the opinion of Bank's Officials, works be delayed by force majeure such as (a) war / hostilities, (b) riots or civil commotion, (c) earthquakes, fire tempest, lightening or other natural / physical disasters, etc., (d) restrictions imposed by the Government which prevent or delay the execution of the order or by any other reasons, a suitable extension of time will be given and no extra claim will be paid by the SBI whatsoever.

**15. Standards:**

The Vendor shall use all materials conforming to relevant BIS/ relevant Code and will use the best materials of approved manufacture. The goods supplied under this contract shall conform to the Standards mentioned in the Technical specification Section as per the MNRE / MP & CG Discom/ Govt. Authorities requirements.

**16. Inspection:**

The vendor shall at the instructions of the SBI within such time as notified, open up for inspection any work and should the vendor refuse or neglect to comply with such instructions, the SBI may employ other workman to open of the same. Such work if it is found not in accordance with approved specifications, or the instructions, expenses of opening up and redoing if required shall be borne by and recoverable from the Vendor from any money due or which may become due to the vendor. Bidder has to strictly follow the specifications given in the work order while carrying out the execution of work.

**17. Transportation:**

Where the Vendor/ Contractor / Agency is required under the contract to transport the goods to specified locations defined as Project sites, transport to such places including insurance, as shall be specified in the contract, shall be arranged by the Vendor/ Contractor / Agency, and the contract price shall include transportation costs.

No mobilization advance shall be paid to the Vendor.

**18. Packing**

The Bidder shall provide such packing of the goods as is required to prevent their damage or deterioration during transit to their final destination as indicated in the contract. The packing shall be sufficient to withstand, without limitation, rough handling and exposure to extreme temperatures during transit and open storage. Packing case size and weights shall take into consideration, where appropriate, the remoteness of the goods final destination and the absence of heavy handlings facilities at all points in transit.

The packing, marking and documentation within and outside the item shall comply strictly with such special requirements as shall be provided for in the contract including additional requirements, if any and in any subsequent instructions ordered by the SBI.

19. Danger plates:

The bidder shall provide at least 8 Danger Notice Plates of 200mm X 150 mm made of mild steel sheet, minimum 2mm thick and vitreous enameled white on both sides and with inscription in signal red colour on front side as required. The inscription shall be in English and local language. Out of eight, four danger notice shall have to be provided at PV Yard & Four-danger notice at Control Room & Battery room.

20. **FIRE EXTINGUISHERS:**

The fire fighting system for the proposed power plant for fire protection shall be consisting of:

- a) Portable fire extinguishers in the control room for fire caused by electrical short circuits
- b) Sand buckets in the control room
- c) The installation of Fire Extinguishers should confirm to TAC regulations and BIS standards. The fire extinguishers shall be provided in the control room housing PCUs as well as on the Roof or site where the PV arrays have been installed.

21. Storage space:

Storage space may be allowed at site as per the availability. The Vendor will have to make his own arrangement for security and locking arrangement of the storage space. The Vendor may be required to vacate the storage space as per SBI's exigency without any extra cost.

22. Staying Arrangements:

The vendor has to make his own arrangement of stay for his employees. Bank will not allow to stay in Bank Premises.

23. Vendor's Representative on Works:

Vendor shall maintain at site responsible, efficient, qualified and well experienced in-charge during the contract period. Any clarifications, explanation, instructions or notices given by the SBI to such in-charge shall be deemed to be given to the vendor and shall be binding on the vendor.

24. **DRAWINGS & MANUALS:**

- a) Two sets of Engineering, electrical drawings and Installation and O&M manuals are to be supplied. Bidders shall provide complete technical data sheets for each equipment giving details of the specifications along with make/makes in their bid along with basic design of the power plant and power evacuation, synchronization along with protection equipment.

- b) Approved ISI and reputed makes for equipment be used.
- c) For complete electro-mechanical works, bidders shall supply complete design, details and drawings for approval to SBI before progressing with the installation work.

## **25. PLANNING AND DESIGNING:**

The bidder should carry out Shadow Analysis at the site and accordingly design strings & arrays layout considering optimal usage of space, material and labour. The bidder should submit the array layout drawings along with Shadow Analysis Report to SBI for approval.

SBI reserves the right to modify the landscaping design, Layout and specification of sub-systems and components at any stage as per local site conditions/requirements.

The bidder shall submit preliminary drawing for approval & based on any modification or recommendation, if any. The bidders submit three sets and soft copy in CD or in pen drive of final drawing for formal approval to proceed with construction work.

## **26. DRAWINGS TO BE FURNISHED BY BIDDER AFTER AWARD OF CONTRACT**

- i. The Contractor shall furnish the following drawings Award/ Intent and obtain approval
- ii. General arrangement and dimensioned layout
- iii. Schematic drawing showing the requirement of SV panel, Power conditioning Unit(s)/ inverter, Junction Boxes, AC and DC Distribution Boards, meters etc.
- iv. Structural drawing along with foundation details for the structure.
- v. Itemized bill of material for complete SV plant covering all the components and associated accessories.
- vi. Layout of solar Power Array
- vii. Shadow analysis of the roof

## **27. SOLAR PV SYSTEM ON THE ROOFTOP FOR MEETING THE ANNUAL ENERGY REQUIREMENT**

The Solar PV system on the rooftop of the selected SBI buildings will be installed for meeting upto 90% of the annual energy requirements depending upon the area of rooftop available and the remaining energy requirement of the office buildings will be met by drawing power from grid at commercial tariff of MP/CG DISCOMs.

## **28. SAFETY MEASURES:**

The bidder shall take entire responsibility for electrical safety of the installation(s) including connectivity with the grid and follow all the safety rules & regulations applicable as per Electricity Act, 2003 and CEA guidelines etc.

## **29. DISPLAY BOARD**

- The bidder has to display a board at the project site mentioning the following:
- a. Plant Name, Capacity, Location, Date of commissioning, estimated Power generation.
  - b. The size and type of board and display shall be approved by Engineer-in-charge before site inspection.

## **30. Dismissal of Workman:**





Vendor shall, on the request of the SBI, immediately dismiss from the work any person in the opinion of SBI be unsuitable or incompetent or who may be guilty of misconduct.

31. Notices:

Notices of the SBI, to the vendor may be served personally or by being left at or sent by registered post to the last known place of the business of the party to whom the same is given or in the case of the vendor by being left on the works. Notices may be served at or sent by registered post to the registered office of the vendor. Any notice sent by registered post shall be deemed to be served at the time when in the ordinary course of post, it would be delivered.

32. Sub-contracts:

Subcontract is strictly prohibited.

The rate quoted in the tender shall include the expenses for obtaining and maintaining power connections and shall pay for the consumption charges as instructed.

33. **TERMINATION OF CONTRACT BY THE SBI:**

If the vendor being an individual or a firm, commit any "Act of Insolvency" or shall be adjudged an insolvent or being an incorporated company shall have an order for compulsory winding up or applies for voluntary winding up or subject to the supervision of the court and of the official assignee or the liquidator, in such acts of insolvency or winding up shall be unable within seven days after notice to him requiring him to do so, to show to the reasonable satisfaction of the SBI that they are able to carry out and fulfill the contract, and to give security, therefore, if so required by the SBI.

OR

if the vendor (whether an individual Firm or Incorporated Company) shall suffer execution to be issued, or shall suffer any payment under this contract to be attached by or on behalf of any of the creditors of the vendor, or shall assign or sublet the contract without the consent in writing of the SBI first obtained.

OR

shall charge or encumber this contract or any payments due or which may become due to the vendor there under.

OR

if the vendor

- a. has abandoned the contract or
- b. has failed to commence the works, or has without any lawful excuse under these conditions suspended the progress of the works for seven days after receiving from the SBI written notice to proceed, or
- c. has failed to proceed with the works with such due diligence and failed to make such due progress as would enable the works to be completed within the time agreed upon, or
- d. has failed to remove materials from the site or to pull down and replace work for seven days after receiving from the SBI written notice that the said materials of work were condemned and rejected by the SBI under these conditions or
- e. has neglected or failed persistently to observe and perform all or any of the acts, matters or things by this contract to be observed and performed by the vendor for seven days after written notice shall have been given to the vendor requiring the vendor to observe or perform the same, or

- f. has to the detriment of good workmanship or in defiance of the SBI's instructions to the contrary sublet any part of the contract.

Then and in the event of any of the aforesaid cases, the SBI may, notwithstanding any previous waiver, after giving seven days notice in writing to the vendor, determine the contract but without thereby affecting the powers of the SBI or the obligations and liabilities of the vendor, the whole of which shall continue in force as fully as if the contract has not been so determined and as if the works subsequently executed has been executed by or on behalf of the vendor.

And further, the SBI may enter upon and take possession of the work and all plant, tools, scaffolding, sheds, machinery and materials lying upon the premises or the adjoining lands or roads and use the same as his own property or may employ the same by means of his own servants and workmen in carrying on and completing the works or by employing any other vendors or other persons to complete works, and the vendor shall not in any way interrupt or do any act, matter or thing to prevent or hinder such other vendor or other person or persons employed for completing and finishing or using the materials and plant for the works. When the works shall be completed or as soon thereafter as convenient, the SBI shall give a notice in writing to the vendor to remove his surplus materials and plant, and should the vendor fail to do so within a period of 14 days after the receipt thereof by him, the SBI shall sell the same by public auction, and shall give credit to the vendor for the amount realised on deducting there from the costs of removal and sales.

If any sum shall be due or payable to or by the SBI for the values of the said plant and materials so taken possession of by the SBI and the expense of loss which the SBI shall have been put to in requiring the works to be completed, and the amount, if any, owing to the vendor and the amount which shall be so certified shall thereupon be paid by the SBI to the vendor or by the vendor to the SBI, as the case may be, and the SBI's certificate shall be final and conclusive between the parties.

On termination of the contract, the vendor shall forth with remove himself and his workmen from the work site.

33. Matters To Be Finally Determined By The SBI:

The SBI's decision, opinion, direction, with respect to all or any of the matter such as scope of work, vendor to provide everything necessary, materials and workmanship to conform the description, assignment of subletting, defects after completion, delay & extension of time, opened up works and the schedule of rates as contained in the Price Bid hereof and as to the exercise by them the right to have any works opened up shall be final and conclusive and binding on the vendor. SBI's instructions if any, in this regard in case of any urgency, shall also be complied immediately.

28. Insurance Contract Conditions Vendor's Liability And Insurance

- a. The insurance shall be for an amount equal to 125 percent of the value of the contract on "All Risks" basis, valid until the Completion of the project or handing over whichever is later.
- b. From commencement to completion of works, the Vendor shall take full responsibility for the care of the work and for taking precautions to prevent loss or damage to the works and to minimize the loss or damage to the greatest extent possible and shall be liable for any damage or loss that may happen to the works or any part thereof from any cause whatsoever, inherent defects and failures due to poor workmanship and causes

such as fire, lightening, explosion, earthquake, storm, hurricane, floods, inundation, subsidence, landslides, rock slides, riots (excluding civil war, rebellion, revolution and insurrection) and shall at his own cost repair and make good the same so that at all times the work shall be in good order and condition and in conformity in every respect with the requirements of the Contract.

- c. Without limiting the obligations and responsibilities under this condition, the Vendor shall insure and keep insured the works from commencement to completion, as aforesaid, for their full value provided under this Contract, increased by 25% against the risk of loss or damage from any cause whatsoever including the causes enumerated in the Clause (a) above. In the event of there being a variation in the nature and extent of the work, the Vendor shall from time to time increase or decrease the value of the insurance correspondingly. The entire premium shall be borne and paid by the Vendor. The said insurance shall also provide for the removal of debris of the lost or damaged works.
- d. The Vendor shall at all times indemnify the SBI against all losses, claims or damages or compensation under the provisions of the payment of Wages Act 1936, Minimum Wages Act 1948, Employees Liability Act 1938, Workmen's Compensation Act 1923, The Maternity Benefit Act 1961, Industrial Disputes Act 1947 and Contract Labour and Regulation and Abolition Act 1970, SBI State Insurance Act 1948 or any modification thereof or any other law relating thereto and rules made there under from time to time or as a consequence of any accident or injury to any workman or other persons in or about the work whether in the Employment of the SBI, or Vendor or not and also against all costs, charges and expenses of any suit, action or proceedings whatsoever out of such accident or injury or combination of any such claims.
- e. Before commencing the work, the Vendor shall without limiting his obligations and responsibilities under this condition, insure against any loss of life or injury to any personnel in the employment of Vendor/Sub- Vendor/Nominated Sub-Vendor. For this purpose, insurance shall be taken by the Vendor/Sub-Vendor. Such insurance shall be taken to include both employees/workmen covered by the Workmen's Compensation Act 1923, as well those employees/ workmen not covered by the said Act. Separate insurance policies may be taken for employees/workmen covered by Workmen's Compensation Act 1923, and employees workmen not covered by the said Act. All the premiums shall be paid by the Vendor.
- f. The Vendor shall at all times indemnify and keep indemnified the SBI against all losses and claims for injuries or damage to any person or any property whatsoever which may arise out of or in consequence of the construction and maintenance of the work and against all claims, demands, proceedings, damages, costs, charges and expenses whatsoever in respect of or in relation thereto. Before commencing the execution of the works, the Vendor shall without in any way limiting his obligations and liabilities under this condition, insure at his cost and expense against any damage or loss or injury which may be caused to any person or property including the Employee or servants of the SBI and the Consultants and their property by or in the course of the execution of the works. Such insurance to be known as the Third Party Insurance shall be in a sum equivalent to two percent of the value of the accepted tender, subject to the minimum sum of Rupees Five Lakhs. The Insurance Policy to be so obtained by the Vendor shall be deposited by the Vendor with the SBI within seven days of its issue by the insurer.

- g. The Vendor shall ensure that similar insurance policies are taken out by his sub vendors or nominated vendors, if any, and shall be responsible for any claim or loss resulting from their failure to obtain adequate insurance protection in connection thereof. While taking the insurance policies, vendor should indicate clearly to the insurance companies that policies issued shall cover their sub-vendors and nominated sub-vendors also.
- h. No work shall be commenced by the Vendor unless and until he has obtained the insurance or insurance required to be obtained by him under or by the foregoing clauses and no work shall be carried out or continued by the Vendor unless and until each insurance is current and valid at that time.
- i. In the event of any claim for insurance becoming due on account of any eventuality covered by the respective insurance policy/policies, the Vendor shall reinstate the installation, replace the materials or equipments or pay compensating to the affected personnel/Employees without waiting for settlement of the claim from insurance company.

**Seal and Signature of vendor**

### GENERAL CONDITIONS OF CONTRACT

- 1.0 **Definitions: -**
  - “**Contract**” means the documents forming the tender and the acceptance thereof and the formal agreement executed between SBI and the contractor, together with the documents referred there in including these conditions, the specifications, designs, drawings and instructions issued from time to time by the Architects / Bank and all these documents taken together shall be deemed to form one contract and shall be complementary to one another.
  - 1.1 In the contract the following expressions shall, unless the context otherwise requires, have the meaning hereby respectively assigned to them.
    - 1.1.1 “**The Employer/ Bank**” ‘means the State Bank of India (including branches and other offices) and any of its employees or representative authorized on their behalf, having its Local Head Office, Hoshangabad Road, Bhopal-462011 (M.P.).
    - 1.1.2 ‘**Architects/Consultants**’ shall mean M/s.....
    - 1.1.3 ‘**Site Engineer**’ shall mean an Engineer appointed by the SBI at site as their representative for day-to-day supervision of work and to give instructions to the contractors.
    - 1.1.4 ‘**The Contractor**’ shall mean the individual or firm or company whether incorporate not, undertaking the works and shall include legal personal representative of individual or the composing the firm or company and the permitted assignees of individual or firms of company.
    - 1.1.5 The expression ‘**Works**’ or ‘work’ shall mean the permanent or temporary work description in the “Scope of work” and / or to be executed in accordance with the contract includes materials, apparatus, equipment, temporary supports, fittings and things of kinds to

be provided, the obligations of the contractor hereunder and work to be done by the contractor under the contract.

1.1.6 '**Engineer**' shall mean the representative of the Consultants/ Architects.

1.1.7 '**Drawings**' shall mean the drawings prepared by the Architects and issued by the Engineer and referred to in the specifications and any modifications of such drawings as may be issued by the Engineer from time to time 'Contract value shall mean value of the entire work as stipulated in the letter of acceptance of tender subject such additions there to or deductions there from as may be made under the provide herein after contained.

1.1.8 "**Specifications**" shall mean the specifications referred to in the tender and modifications thereof as may time to time be furnished or approved by the Architect/ Consultant.

1.1.6 "**Month**" means calendar month.

1.1.9 "**Week**" means seven consecutive days.

1.1.10 "**Day**" means a calendar day beginning and ending at 00 Hrs and 24 Hrs respectively.

1.1.11 "SBI's Engineer" shall mean The Civil / Electrical Engineer in - charge of the Project, as nominated by the SBI.

1.1.12 The following shall constitute the Joint Project Committee (herein under referred to as JPC) for assessing and reviewing the progress of the work on the project and to issue instructions or directions from time to time for being observed and followed by the Architects Site Engineer / PMC and other consultants / contractors engaged in the execution of the project.

## CLAUSE

### 1.0 Language

The language in which the contract documents shall be drawn shall be in English.

### 2.0 Errors, omissions and discrepancies

In case of errors, omissions and/ or disagreement between written and scaled dimensions on the drawings or between the drawings and specifications etc., the following order shall apply.

- i) Between scaled and written dimension (or description) on a drawing, the latter shall be adopted.
- ii) Between the written or shown description or dimensions in the drawings and the corresponding one in the specification the former shall be taken as correct.
- iii) Between written description of the item in the specifications and descriptions in bills of quantities of the same item, the former shall be adopted:
  - a) In case of difference between rates written in figures and words, the rate in words shall prevail.
  - b) Between the duplicate / subsequent copies of the tender, the original tender shall be taken as correct.

### 3.0 i) Letter of Acceptance:

Within the validity period of the tender the SBI shall issue a letter of acceptance directly or through the architect by registered post or otherwise depositing at the of the contractor as given in the tender to enter into a Contract for the execution of the work as per the terms of the tender. The letter of acceptance shall constitute a bind contract between the SBI and the contractor.

### ii) Contract Agreement:

On receipt of intimation of the acceptance of tender from the SBI/ Architect the successful tenderer shall be bound to implement the contract and within fifteen days there of shall sign an agreement in a non-judicial stamp paper of appropriate value.

**4.0 Ownership of drawings:**

All drawings, specifications and copies thereof furnished by the SBI or through its Architect / consultants are the properties of the SBI. They are not to be used on other work.

**5.0 Detailed drawings and instructions:**

The SBI through its architects / consultants or directly shall furnish with reasonable proper additional instructions by means of drawings or otherwise necessary for the execution of the work. All such drawings and instructions shall be consistent with contract documents, true developments thereof and reasonably inferable there.

The work shall be executed in conformity therewith and the contractor prepare a detailed programme schedule indicating therein the date of start and completion of various activities on receipt of the work order and submit the same to the SBI.

**6.0 Copies of agreement**

On receipt of intimation from the SBI of the acceptance of his / their tender, by way of Work Order, the successful tenderer shall sign an agreement, subject to approval of Law department of SBI.

**7.0 Liquidated damages:**

If the contractor fails to maintain the required progress in terms of clause 12. 0 of “Instruction to the tenderer “or to complete the work and clear the site including vacating their office on or before the contracted or extended date or completion, without justification in support of the cause of delay, he may be called upon without prejudice to any other right of remedy available under the law to the SBI on account of such breach to pay a liquidated damages at the rate of 0.50% of the contract value per week which subject to a maximum of 5% of the contract value.

**8.0 Materials, Appliances and Employees:**

Unless or otherwise specified the contractor shall provide and pay for all materials, labour, water, power, tools, equipment transportation and any other facilities that are required for the satisfactory execution and completion of the work. Unless or otherwise specified all materials shall be new and both workmanship and materials shall be best quality. The contractor shall at all times enforce strict discipline and good order among his employees and shall not employ on the work any unfit person or anyone not skilled in the work assigned to him. Workman whose work or behavior is found to be unsatisfactory by the SBI /Architect/ consultant he shall be removed from the site immediately.

**9.0 Permits, Laws and Regulations:**

Permits and licenses required for the execution of the work shall be obtained by the contractor at his own expenses. The contractor shall give notices and comply with the regulations, laws, and ordinances rules, applicable to the contract. If the contractor observes any discrepancy between the drawings and specifications, he shall promptly notify the SBI in writing under intimation of the Architect/ Consultant. If the contractor performs any act, which is against the law, rules and regulations he shall meet all the costs arising there from and shall indemnify the SBI any legal actions arising there from.

**10.0 Setting out Work:**

The contractor shall set out the work and shall be responsible for the true and perfect setting out of the same and for the correctness of the positions, levels, dimensions, and alignment of all parts thereof and get it approved by the architect/ consultant before proceeding with the work. If at any time any error in this respect shall appear during the progress of the works, irrespective of the fact that the layout had been approved by, the architect / consultant the contractor shall be responsible for the same and shall his own expenses rectify such error, if so, required to satisfaction of the SBI.

#### **11.0 Protection of works and property:**

The contractor shall continuously maintain adequate protection of all his work from damage and shall protect the SBI's properties from injury or loss arising in connection with contract. He shall make good any such damage, injury, loss, except due to causes beyond his control and due to his fault or negligence except which are due to causes beyond his control.

He shall take adequate care and steps for protection of the adjacent properties. The contractor shall take all precautions for safety and protections of his employees on the works and shall comply with all applicable provisions of Govt. and local bodies' safety laws and building codes to prevent accidents, or injuries to persons or property on about or adjacent to his place of work. The contractor shall take insurance covers as per clause 26.0 at his own cost. The policy may be taken in joint names of the contractor and the SBI and the original policy may be lodged with the SBI.

#### **12.0 Inspection of work:**

The SBI / Architect / Consultant or their representatives shall at all reasonable times have free access to the work site and / or to the workshop, factories, or other places where materials are lying or from where they are obtained and the contractor shall give every facility to the SBI/Architect/consultant and their representatives necessary for inspection and examination and test of the materials and workmanship. No person unless authorized by the SBI / Architect /Consultant except the representative of Public authorities shall be allowed on the work at any time. The proposed work either during its construction stage or its completion can also be inspected by the Chief Technical Examiner's Organization a wing of Central Vigilance commission.

#### **13.0 Assignment and subletting**

The whole of work included in the contract shall be executed the contractor and he shall not directly entrust and engage or indirectly transfer, assign or underlet the contract or any part or share thereof or interest therein without the written consent of the SBI through the Architect and no undertaking shall relieve the contractor from the responsibility of the contractor from active & superintendence of the work during its progress.

#### **14.0 Quality of materials, workmanship & Test**

All materials and workmanship shall be best of the respective kinds described in the contract and in accordance with SBI/Architect's instructions and shall be subject from time to time to such tests as the SBI /Architect may direct at the place of manufacture or fabrication or on the site or an approved testing laboratory.

The contractor shall provide such assistance, instruments, machinery, labour and materials.

Contractor to make arrangement of laboratory on site, where weight of various materials like aluminium extrusions etc. can be done, Contractor should also make available a 3.00 meters, 15.00 meters & a 50.00 meters tape, a Vernier Caliper & Micrometer so any measurements/ tests can be taken on sites itself.

ii) **Samples**

All samples of adequate numbers, size, shades & pattern as per specifications shall be supplied by the contractor without any extra charges. If certain items proposed to be used are of such nature that samples cannot be presented or prepared at the site detailed literature/test certificate of the same shall be provided to the satisfaction of the SBI/Architect. Before submitting the sample/literature the contractor shall satisfy himself that the material/equipment for which he is submitting the samples/literature meet with the requirement of tender specification. Only when the samples are approved in writing by the SBI /Architect the contractor shall proceed with the procurement and installation of the particular material/equipment.

The approved samples shall be signed by the SBI. /Architect for identification and shall be kept on record at site office until the completion of the work for inspection/comparison at any time. The SBI/Architect shall take reasonable time to approve the sample. Any delay that might occur in approving the samples for reasons of its not meeting the specifications or other discrepancies inadequacy in furnishing samples of best qualities from various manufacturers and such other aspects causing delay on the approval of the materials/equipment etc. shall be to the account of the contractor..

iii) **Cost of tests**

The cost of making any test shall be borne by the contractor/ bidder if such test is intended by or provided for in the specification or BOQ (price bid).

iv) **Costs of tests not provided for**

If any test is ordered by the SBI/Architect which is either:

- (a) If so intended by or provided for or (in the cases above mentioned) is not so particularized or through so intended or provided for but ordered by the SBI/ Architect which is either to be carried out by an independent person at any place other than the site or the place of manufacture or fabrication of the materials tested or any Government/approved laboratory, then the cost of such test shall be borne by the contractor.

## **15.0 Obtaining information related to execution of work**

No claim by the contractor for additional payment shall be entertained which is consequent upon failure on his part to obtain correct information as to any matter affecting the execution of the work nor any misunderstanding or the obtaining incorrect information or the failure to obtain correct information relieve him from any risks or from the entire responsibility for the fulfillment of contract.

## **16.0 Contractor's superintendence**

The contractor shall give necessary personal superintendence during the execution of the works and as long, thereafter, as the SBI/ Architect may consider necessary until the expiry of the defects liability period, stated hereto.

## **17.0 Quantities**

- i) The bill of quantities (BOQ) unless or otherwise stated shall be deemed to have been prepared in accordance with the Indian Standard Method of Measurements The rate quot-



ed shall remain valid for variation of quantity against individual item to any extent subject to maximum variation of the contract value by 25%. The entire amount paid under Clause 20 hereof as well as amounts of prime cost and provisional sums, if any, shall be excluded.

Variation exceeding 25%: The items of work executed in relation to variation exceeding 25% shall be paid on the basis of provisions of clause 21(e) hereof.

### **18.0 Works to be measured**

The SBI /Architect may from time to time intimate to the contractor that he required the work to be measured and the contractor shall forthwith attend or send a qualified representative to assist the SBI/Architect in taking such measurements and calculation and to furnish all particulars or to give all assistance required by any of them. Such measurements shall be taken in accordance with the Mode of measurements detailed in the specifications. The representative of the SBI/ Architect shall take joint measurements with the contractor's representative and the measurements shall be entered in the measurement book.

The contractor or his authorized representative shall sign all the pages of the measurement book in which the measurements have been recorded in token of his acceptance. All the corrections shall be duly attested by both representatives. No over writings shall be made in the measurement book. Should the contractor not attend or neglect or omit to depute his representative to take measurements then the measurements recorded by the representative of the SBI/ Architect shall be final. All authorized extra work, omissions and all variations made shall be included in such measurements

### **19.0 Variations**

No alteration, omission or variation ordered in writing by the SBI/Architect shall vitiate the contract. In case the SBI/Architect thinks proper at any time during the progress of works to make any alteration in, or additions to or omission from the works or any alteration in the kind or quality of the materials to be used therein, the Architect/Consultant shall give notice thereof in writing to the contractor or shall confirm in writing within seven days of giving such oral instructions the contractor shall alter to, add to, or omit from as the case may be in accordance with such notice but the contractor shall not do any work extra to or make any alteration or additions to or omissions from the works or any deviation from any of the provisions of the contract, stipulations, specifications or contract drawings without previous consent in writing of the Architect/Consultant and the value of such extras, alterations, additions or omissions shall in all cases be determined by the Architect/Consultant and the same shall be added to or deducted from the contract value, as the case may be

### **20.0 Valuation of Variations**

No claim for an extra shall be allowed unless it shall have been executed under the authority of the Architect / Consultant with the concurrence of the SBI as herein mentioned. Any such extra is herein referred to as authorized extra and shall be made in accordance with the following provisions.

- a) (i) The net rates or prices in the contract shall determine the valuation of the extra work where such extra work is of similar character and executed under similar conditions as the work priced herein.
- (ii) Rates for all items, wherever possible should be derived out of the rates given in the priced BOQ.
- b) The net prices of the original tender shall determine the value of the items omitted, provided if omissions do not vary the conditions under which any remaining items of Works

are carried out, otherwise the prices for the same shall be valued under sub-Clause 'c' hereunder.

- c) Where the extra works are not of similar character and/or executed under similar conditions as aforesaid or where the omissions vary the conditions under which any remaining items or works are carried out, then the contractor shall within 7 days of the receipt of the letter of acceptance inform the SBI /Architect/ consultant of the rate which he intends to charge for such items of work, duly supported by analysis of the rate or rates claimed and the SBI /Architect/ consultant shall fix such rate or prices as in the circumstances in his opinion are reasonable and proper, based on the market rate.
- d) Where extra work cannot be properly measured or valued the contractor shall be allowed day work prices at the net rates stated in the tender, of the BOQ or, if not, so stated then in accordance with the local day work rates and wages for the district; provided that in either case, vouchers specifying the daily time (and if required by the SBI/ Architect/Consultant) the workman's name and materials employed be delivered for verifications to the SBI/ Architect /consultant at or before the end of the week following that in which the work has been executed.
- e) It is further clarified that for all such authorized extra items where rates cannot be derived from the tender, the Contractor shall submit rates duly supported by rate analysis worked on the 'market rate basis for material, labour hire / running charges of equipment and wastages etc. plus 15% towards establishment charges, contractor's overheads and profit. Such items shall, not be eligible for escalation.

#### 21.0 Final measurement

The measurement and valuation in respect of the contract shall be completed within **two months** of the virtual completion of the work.

#### 22.0 Virtual Completion Certificate (VCC)

On successful completion of entire works covered by the contract to the full satisfaction of the SBI, the contractor shall ensure that the following works have been completed the satisfaction of the SBI:

- a) Clear the site of all scaffolding, wiring, pipes, surplus materials, contractor's labour equipment and machinery.
- b) Demolish, dismantle and remove the contractor's site office, temporary works, structure including labour sheds/camps and constructions and other items and things whatsoever brought upon or erected at the site or any land allotted to the contractor by the SBI not incorporated in the permanent works.
- c) Remove all rubbish, debris etc. from the site and the land allotted to the contractor by SBI and shall clear, level and dress, compact the site as required by the SBI
- d) Shall put the SBI in undisputed custody and possession of the site and all land allot by the SBI
- e) Shall hand over the work in a peaceful manner to the SBI.
- f) All defects / imperfections have been attended and rectified as pointed out by the Architects to the full satisfaction of SBI.

Upon the satisfactory fulfillment by the contractor as stated above, the contractor is entitled to apply to the Architect / consultant is satisfied of the completion of work. Relative to which the completion certificate has been sought, the Architect/ consultant shall within fourteen (14) days of the receipt of the application for completion certificate, issue a VCC in respect of the work for which the VCC has applied.

This issuance of a VCC shall not be without prejudice to the SBI's rights and contractor liabilities under the contract including the contractor's liability for defects liability nor shall the issuance of VCC in respect of the works or work at any site be construction as a waiver of any right or claim of the SBI against the contractor in respect of or work at the site and in respect of which the VCC has been issued.

### **23.0 Work by other agencies**

The SBI /Architect reserves the rights to use premises and any portion of the site for execution of any work not included in the scope of this contract which it may desire to have carried out by other persons simultaneously and the contractor shall not only allow but also extend reasonable facilities for the execution of such work. The contractor however shall not be required to provide any plant or material for the execution of such work except by special arrangement with the SBI /SBI. Such work shall be carried out in such manners not to impede the progress of the works included in the contract.

### **24.0 Insurance of works**

- 24.1 a) Before taking up the work, the Contractor shall, obtain and submit to the Employer (Bank/SBI),contractor's all risk policy and a third-party insurance policy in original, issued by any Public-Sector Insurance Company.
- b) The Policy should be issued in the joint names of Employer and contractor with Employer's name appearing first. For Minimum value Rs 5 lacs until completion of project or handing over whichever is later for any type of accident / incidence.
- c) The contractor shall, from time to time, provide documentary evidence as regards payments of premia for all insurance Policies for keeping them valid till the completion of the work.
- d) Without prejudice to any of its obligations and responsibilities specified above, the Contractor shall, within 10 days from the date of work order, submit documentary evidence as required by the Employer in support of having obtain requisite insurance cover.
- e) No work shall be taken up by the Contractor at site unless the Insurance Policies as mentioned above are obtained.
- f) Also, no payment shall be made to the Contractor on expiry of insurance policies unless renewed by them and renewed policy is submitted with the SBI. Nothing extra shall be payable on this account.

### **24.2 Damage to persons and property**

The contractor shall, except if and so far as the contract provides otherwise indemnify the SBI/SBI against all losses and claims in respect of injuries or damages to any person or material or physical damage to any property whatsoever which may arise out of or in consequence of the execution and maintenance of the works and against all claims proceedings, damages, costs, charges and expenses whatsoever in respect of or in relation thereto except any compensation of damages for or with respect to:

- a) The permanent use or occupation of land by or any part thereof.
- b) The right of SBI to execute the works or any part thereof on, over, under, in or through any lands.
- c) Injuries or damages to persons or properties which are unavoidable result of the execution or maintenance of the works in accordance with the contract
- d) Injuries or damage to persons or property resulting from any act or neglect of the SBI. their agents, employees or other contractors not being employed by the contractor or for or in respect of any claims, proceedings, damages, costs,

charges and expenses in respect thereof or in relation thereto or where the injury or damage was contributed to by the contractor, his servants or agents such part of the compensation as may be just and equitable having regard to the extent of the responsibility of the SBI, their employees, or agents or other employees, or agents or other contractors for the damage or injury.

#### **24.3 Contractor to indemnify SBI**

The contractor shall indemnify the SBI against all claims, proceedings, damages, costs, charges and expenses in respect of the matters referred to in the provision sub clause 24.2 of this clause.

#### **24.4 Contractor's superintendence**

The contractor shall fully indemnify and keep indemnified the SBI against any action, claim, or proceeding relating to infringement or use of any patent or design or any alleged patent, design rights and shall pay any royalties which may be payable in respect of any article or part thereof included in the contract. In the event of any claim made under or action brought against SBI in respect of such matters as aforesaid the contractor shall be immediately notified thereof and the contractor shall be at liberty, at his own expenses to settle any dispute or to conduct any litigation that may arise there from, provided that the contractor shall not be liable to indemnify the SBI if the infringement of the patent or design or any alleged patent or design right is the direct result of an order passed by the Architect / consultant in this behalf.

#### **24.5 Third Party Insurance**

24.5.1 Before commencing the execution of the work the contractor but without limiting his obligations and responsibilities under clause 24.0 shall insure against his liability for any material or physical damage, loss, or injury which may occur to any property including that of SBI/SBI, or to any person, including any employee of the SBI/SBI by or arising out of the execution of the works or in the carrying out of the contract, otherwise than due to the matters referred to in the provision to clause 24.0 thereof.

#### **24.5.2 Minimum amount of Third Party Insurance**

Such insurance shall be effected with an insurer and in terms approved by the SBI which approval shall not be reasonably withheld and for at least the amount stated below. The contractor shall, whenever required, produce to the Architect / consultant the policy or policies of insurance cover and receipts for payment of the current premiums.

The minimum insurance cover for physical property, injury, and death is Rs.5 Lakh per occurrence with the number of occurrences limited to four. After each occurrence contractor will pay additional premium necessary to make insurance valid for four occurrences always.

#### **24.6 Accident or Injury to workman:**

24.6.1 The SBI shall not be liable for or in respect of any damages or compensation payable at law in respect or in consequence of any accident or injury to any workmen or other person in the employment of the contractor or any sub-contractor, save and except an accident or injury resulting from any act or default of the SBI/SBI or their agents, or employees. The contractor shall indemnify and keep indemnified SBI/SBI against all such damages and compensation, save and except as aforesaid, and against all claims, proceedings, costs, charges and expenses whatsoever in respect thereof or in relation thereto.

#### **24.6.2 Insurance against accidents etc. to workmen**

The contractor shall insure against such liability with an insurer approved by the SBI during the whole of the time that any persons are employed by him on the works and shall, when

required, produce to the architect / consultant such policy of insurance and receipt for payment of the current premium. Provided always that, in respect of any persons employed by any sub-contractor the contractor's obligation to insured as aforesaid under this sub-clause shall be satisfied if the sub-contractor shall have insured against the liability in respect of such persons in such manner that SBI is indemnified under the policy but the contractor shall require such sub-contractor to produce to the Architect /consultant when such policy of insurance and the receipt for the payment of the current premium.

#### 24.6.3 **Remedy on contractor's failure to insure**

If the contractor fails to effect and keep in force the insurance referred to above or any other insurance which he may be required to effect under the terms of contract, then and in any such case the SBI may effect and keep in force any such insurance and pay such premium or premiums as may be necessary for that purpose and from time to time deduct the amount so paid by the SBI as aforesaid from any amount due or which may become due to the contractor, or recover the same as debt from the contractor.

24.6.4 Without prejudice to the others rights of the SBI against contractors. In respect of such default, the employer shall be entitled to deduct from any sums payable to the contractor the amount of any damages costs, charges, and other expenses paid by the SBI and which are payable by the contractors under this clause. The contractor shall upon settlement by the Insurer of any claim made against the insurer pursuant to a policy taken under this clause, proceed with due diligence to rebuild or repair the works destroyed or damaged. In this event all the monies received from the Insurer in respect of such damage shall be paid to the contractor and the Contractor shall not be entitled to any further payment in respect of the expenditure incurred for rebuilding or repairing of the materials or goods destroyed or damaged.

#### 25.0 **Commencement of Works:**

The date of commencement of the work will be reckoned as the recorded date of handing over site by the SBI/SBI or **7 days** from the date of receipt of Letter of Acceptance/work order from SBI, whichever is later.

#### 26.0 **Time for completion**

Time is the essence of the contract and shall be strictly observed by the contractor. The entire work shall be completed within a period of **45 days from the date of commencement**. If required in the contract or as directed by the SBI/Architect, the contractor shall complete certain portions of work before completion of the entire work. However the completion date shall be reckoned as the date by which the whole work is completed as per the terms of the contract.

#### 27.0 **Rate of progress**

Whole of the materials, plant and labour to be provided by the contractor and the mode, manner and speed of execution and maintenance of the works are to be of a kind and conducted in a manner to the satisfaction of the SBI/SBI/Architect. Should the rate of progress of the work or any part thereof be at any time be in the opinion of the SBI /SBI/Architect too slow to ensure the completion of the whole of the work by the prescribed time or extended time for completion the SBI /SBI/Architect shall thereupon take such steps as considered necessary to expedite progress so as to complete the woks by the prescribed time or extended time. Such communications from the SBI/Architect neither shall relieve the contrac-

tor from fulfilling obligations under the contract nor he shall be entitled to raise any claims arising out of such directions.

## **28.0 Work during nights and holidays**

Subject to any provision to the contrary contained in the contract no permanent work shall save as herein provided be carried on during the night or on holidays without the permission in writing of the SBI/Architect, save when the work is unavoidable or absolutely necessary for the saving of life or property or for the safety of the work in which case the contractor shall immediately advise by SBI/SBI/Architect. However the provision of the clause shall not be applicable in the case of any work which becomes essential to carry by rotary or double shifts in order to achieve the progress and quality of the part of the works being technically required and continued with the prior approval of the SBI/Architect at no extra cost to the SBI.

All work at night after obtaining approval from competent authorities shall be carried out without unreasonable noise and disturbance so as to avoid disputes with the neighbours.

### **29.0 No compensation or restrictions of work**

If at any time after acceptance of the tender SBI shall decide to abandon or reduce the scope of work for any reason whatsoever and hence not require the whole or any part of the work to be carried out, the SBI /Architect shall give notice in writing to that effect to the contractor and the contractor shall act accordingly in the matter. The contractor shall have no claim to any payment of compensation or otherwise whatsoever, on account of any profit or advantage which he might have derived from the execution of the work fully but which he did not derive in consequence of the foreclosure of the whole or part of the work. Provided that the contractor shall be paid the charges on the cartage only of materials actually and bona fide brought to the site of the work by the contractor and rendered surplus as a result of the abandonment, curtailment of the work or any portion thereof and then taken back by the contractor, provided however that the SBI/Architect shall have in such cases the option of taking over all or any such materials at their purchase price or a local current rate whichever is less. In case of such stores having been issued from SBI stores and returned by the contractor to stores, credit shall be given to him at the rates not exceeding those at which were originally issued to the contractor after taking into consideration and deduction for claims on account of any deterioration or damage while in the custody of the contractor and in this respect the decision of SBI/Architect shall be final.

## **30.0 Suspension of work**

i) The contractor shall, on receipt of the order in writing of the Architect / consultant (whose decision shall be final and binding on the contractor) suspend the progress of works or any part thereof for such time and in such manner as Architect /consultant may consider necessary so as not to cause any damage or injury to the work already done or endanger the safety thereof for any of following reasons:

- a) On account any default on the part of the contractor, or
- b) For proper execution of the works or part thereof for reasons other than the default the contractor, or
- c) For safety of the works or part thereof.

The contractor shall, during such suspension, properly protect and secure the works the extent necessary and carry out the instructions given in that behalf by the Architect / consultant.

ii) If the suspension is ordered for reasons (b) and (c) in sub-para (i) above:

The contractor shall be entitled to an extension of time equal to the period of every such suspension. No compensation whatsoever shall be paid on this account.

### **31.0 Action when the whole security deposit is forfeited**

In any case in which under any clause or clauses of this contract, the Contractor shall have rendered himself liable to pay compensation amounting to the whole of his security deposit the Architect / consultant shall have the power to adopt any of the following course as they may deem best suited to the interest of the SBI:

- a) To rescind the contract (of which rescission notice in writing to the contractor by - Architect / consultant shall be conclusive evidence) and in which case the security, deposit of the contractor shall be forfeited and be absolutely at the disposal of SBI.
- b) To employ labour paid by the SBI and to supply materials to carry out the work, or part of the work, debiting the contractor with the cost of the labour and materials cost of such labour and materials as worked out by the Architect/consultant shall final and conclusive against the contractor) and crediting him with the value of the work done, in all respects in the same manner and at the same manner and at the same rates as if it had been carried out by the contractor under the terms of this contract certificate of architect /consultant as to the value of work done shall be final conclusive against the contractor.
- c) To measure up the work of the contractor, and to take such part thereof as shall un-executed, out of his hands, and to give it to another contractor to complete in which case any expenses which may be incurred in excess of the sum which would have been paid to the original contractor, if the whole work had been executed by him ( The amount of which excess the certificates in writing of the Architects / consultant shall final and conclusive) shall be borne by original contractor and may be deducted from any money due to him by SBI under the contract or otherwise, or from his security deposit or the proceeds of sale thereof, or sufficient part thereof.

In the event of any of above courses being adopted by the SBI the contractor shall have no claim to compensation for any loss sustained by him by reasons of his having purchased or procured any material or entered into any engagements or make any advances on account of, or with a view to the execution of the work or the performance of the contract and in case the contract shall be rescind under the provision aforesaid, the contractor shall not be entitled to recover or to be paid any sum or any work thereto for actually performed under this contract, unless, and until the Architect / consultant will have certified in writing the performance of such work and the value payable in respect thereof, and he shall only be entitled to be paid the value so certified.

### **32.0 Owner's right to terminate the contract**

If the contractor being an individual or a firm commit any 'Act of Insolvency' or shall be adjusted an insolvent or being an incorporated company shall have an order for compulsory winding up voluntarily or subject to the supervision of Government and of the Official Assignee of the liquidator in such acts of insolvency or winding up shall be unable within seven days after notice to him to do so, to show to the reasonable satisfaction of the SBI /Architect that he is able to carry out and fulfil the contract, and to give security therefore if so required by the SBI.

Or if the contractor (whether an individual firm or incorporated Company) shall suffer execution to be issued or shall suffer any payment under this contract to be attached by or on behalf of any of the creditors of the contractor.

Or shall assign or sublet this contract without the consent in writing of the SBI through the Architect/Consultant or shall charge or encumber this contract or any payment due to which may become due to the contractor there under.

- a) Has abandoned the contract; or
- b) Has failed to commence the works, or has without any lawful excuse under these conditions suspended the progress of the works for 14 days after receiving from the SBI through the Architect/Consultant written notice to proceed, or
- c) Has failed to proceed with the works with such diligence and failed to make such due progress as would enable the works to be completed within the time agreed upon, or has failed to remove the materials from the site or to pull down and replace work within seven days after written notice from the SBI through the Architect/ Consultant that the said materials were condemned and rejected by the Architect/ Consultant under these conditions; or has neglected or failed persistently to observe and perform all or any of the acts, matters or things by this contract to be observed and performed by the contractor for seven days after written notice shall have been given to the contractor to observe or perform the same or has to the detriment of good workmanship or in defiance of the SBI or Architect's/Consultant's instructions to the contrary subject any part of the contract. Then and in any of said cases the SBI and or the Architect/Consultant, may not withstanding any previous waiver, after giving seven days' notice in writing to the contractor, determine the contract, but without thereby affecting the powers of the SBI or the Architect/Consultant or the obligation and liabilities of the contractor the whole of which shall continue in force as fully as if the contract had not been so determined and as if the works subsequently had been executed by or on behalf of the contractor. And, further the SBI through the Architect/Consultant, their agents or employees may enter upon and take possession of the work and all plants, tools, scaffoldings, materials, sheds, machineries lying upon the premises or on the adjoining lands or roads, use the same by means of their own employees or workmen in carrying on and completing the work or by engaging any other contractors or persons to complete the work and the contractor shall not in any way interrupt or do any act, matter or thing to prevent or hinder such other contractor or other persons employed for completing and finishing or using the materials and plant for the works. When the works shall be completed or as soon thereafter as convenient to the SBI or the Architect/Consultant shall give a notice in writing to the contractor to remove his surplus materials and plants and should the contractor fail to do so within 14 days after receipt thereof by him the SBI sell the same by public auction after due publication and shall adjust the amount realized by such auction. The contractor shall have no right to question any of the act of the SBI incidental to the sale of the materials etc.

### **33.0 Certificate of payment**

The contractor shall be entitled under the certificates to be issued by the Architect / consultant (if appointed) to the contractor within 10 working days from the date of certificate to payment from SBI from time to time. The SBI shall recover the statutory recovering other dues including the retention amount from the certificate of payment.



Provided always that the issue of any certificate by the Architect / consultant during progress of works or completion shall not have effect as certificate of satisfaction relieve the contractor from his liability under clause.

The Architect / consultant shall have power to withhold the certificate if the work or in part thereof is not carried out to their satisfaction.

The Architect / consultant may by any certificate make any corrections required previous certificate.

The SBI shall modify the certificate of payment as issued by the architect / consultant from time to time while making the payment.

The contractor shall submit interim bills only after taking actual measurements and properly recorded in the Measurement books.

The final bill may be submitted by contractor within a period of one month from the date of virtual completion and Architect / consultant shall issue the certificate of payment within a period of two months. The SBI shall pay the amount within a period of three months from the date of issue of certificate provided there is no dispute in respect of rates and quantities.

The contractor shall submit the interim bills in the prescribed format with all details.

#### 34.0 **A. Settlement of Disputes and Arbitration**

Except where otherwise provided in the contract all questions and disputes to the meaning of the specifications, design, drawings and instructions herein before mentioned and as to the quality of workmanship or materials used on the work or as to any other question , claim, right, matter or thing whatsoever in any way arising out of or relating to the contract, designs, drawings specifications, estimates, instructions orders or these conditions or otherwise concerning the work or the execution or failure to execute the same whether arising during the progress of the work or after the cancellation, termination, completion or abandonment thereof shall be dealt with as mentioned hereinafter:

- i) If the contractor considers that he is entitled to any extra payment or compensation in respect of the works over and above the amounts admitted as payable by the Architect or in case the contractor wants to dispute the validity of any deductions or recoveries made or proposed to be made from the contract or raise any dispute, the contractor shall forthwith give notice in writing of his claim, or dispute to The Regional Manager (in the address as stated above) and endorse a copy of the same to the Architect, if any, within 30 days from the date of disallowance thereof or the date of deduction or recovery. The said notice shall give full particulars of the claim, grounds on which it is based and detailed calculations of the amount claimed and the contractor shall not be entitled to raise any claim nor shall the bank be in any way liable in respect of any claim by the contractor unless notice of such claim have been given by the Contractor to the respective Manager (address as stated above) in the manner and within the time as aforesaid.

The contractor shall be deemed to have waived and extinguished all his rights in respect of any claim not notified to the respective Regional Manager in writing in the manner and within the time aforesaid.

- ii) Regional Manager shall give his decision in writing on the claims notified by the contractor. The contractor may within 30 days of the receipt of the decision of the Assistant General Manager (P&E) submit his claims to the conciliating authority namely the Deputy General Manager & CDO, State Bank of India, LHO Bhopal for

conciliation along with all details and copies of correspondence exchanged between him and the Branch/ RBO

- iii) Contractor If the conciliation proceedings are terminated without settlement of the disputes, the contractor shall, within a period of 30 days of termination thereof shall give a notice to the concerned Chief General Manager of the Bank for appointment of an arbitrator to adjudicate the notified claims failing which the claims of the contractor shall be deemed to have been considered absolutely barred and waived.
- iv) Except where the decision has become final, binding and conclusive in terms of the contract, all disputes of differences arising out of the notified claims of the contractor as aforesaid and all claims of the Bank shall be referred for adjudication through arbitration by the Sole Arbitrator appointed by the Chief General Manager. It will also be no objection to any such appointment that the Arbitrator so appointed is a Bank Officer and that he had to deal with the matters to which the Contract relates in the course of his duties as Bank Officer. If the arbitrator so appointed is unable or unwilling to act or resigns his appointment or vacates his office due to any reason whatsoever another sole arbitrator shall be appointed in the manner aforesaid by the said Chief General Manager. Such person shall be entitled to proceed with the reference from the stage at which it was left by his predecessor.

It is a term of this contract that the party invoking arbitration shall give a list of disputes with amounts claimed in respect of each dispute along with the notice for appointment of arbitrator.

It is also a term of this contract that no person other than a person appointed by such Chief General Manager as aforesaid should act arbitrator. The conciliation and arbitration shall be conducted in accordance with the provisions of the Arbitration & Conciliation Act 1996 or any statutory modification or re-enactment thereof and the rules made there under. It is also a term of the contract that if any fees are payable to the arbitrator these shall be paid equally by both the parties. However, no fees will be payable to the arbitrator if he is a Bank Officer.

It is also a term of the contract that the arbitrator shall be deemed to have entered on the reference on the date he issues notice to both the parties calling them to submit their settlement of claims and counter statement of claims. The venue of the arbitration shall be such place as may be fixed by the arbitrator in his sole discretion. The fees, if any, of the arbitrator shall, if required to be paid before the award is made and published, be paid half and half by each of the parties. The cost of the reference and of the award (including the fees, if any of the arbitrator) shall be in the discretion of the arbitrator who may direct to any by whom and in what manner, such costs or any part thereof, shall be paid and fix or settle the amount of costs to be so paid.

### **35.0 Water & Power Supply**

The contractors for other trades directly appointed by the SBI shall be entitled to take power and water connections from the temporary water and power supply obtained by the contractor. However, the concerned contractor shall make their own arrangements to draw the supply and pay directly the actual consumption charges at mutually agreed rates between them. All municipal charges for drainage and water connection for Construction purposes shall be borne by the contractor and charges payable for permanent connec-

tions, if any, shall be initially paid by the contractor and the SBI will reimburse the amount on production of receipts.

### 36.0 Treasure **trove etc.**

Any treasure trove, coin or object antique which may be found on the site shall be the property of SBI and shall be handed over to the bank immediately.

### 37.0 Method of measurement

Unless otherwise mentioned in the schedule of quantities or in mode of measurement, the measurement will be on the net quantities or work produced in accordance with up to date rules laid down by the Bureau of Indian Standards. In the event any dispute / disagreement the decision of the Architect / consultant shall be final and binding on the corrector.

### 38.0 Maintenance of registers

The contractor shall maintain the following registers as per the enclosed perform at site of work and should produce the same for inspection of SBI /Architect / consultant whenever desired by them. The contractor shall also maintain the records/ registers as required by the local authorities / Govt. from time to time.

- i) Register for secured advance
- ii) Register for hindrance to work
- iii) Register for running account bill
- iv) Register for labour

### 39.0 Force Majeure

39.1 Neither contractor nor SBI shall be considered in default in performance of the obligations if such performance is prevented or delayed by events such as but not war, hostilities revolution, riots, civil commotion, strikes, lockout, conflagrations, epidemics, accidents, fire, storms, floods, droughts, earthquakes or ordinances or any act of or for any other cause beyond the reasonable control of the party affected or prevents or delayed. However, a notice is required to be given within 30 days from the happening of the event with complete details, to the other party to the contract, if it is not possible to serve a notice, within the shortest possible period without delay.

39.2 As soon as the cause of force majeure has been removed the party whose ability perform its obligations has been affected, shall notify the other of such cessation and the actual delay incurred in such affected activity adducing necessary evidence in support thereof.

39.3 From the date of occurrence of a case of force majeure obligations of the party affected shall be suspended during the continuance of any inability so caused. With the caused itself and inability resulting there from having been removed, the agreed time completion of the respective obligations under this agreement shall stand extended a period equal to the period of delay occasioned by such events.

39.4 Should one or both parties be prevented from fulfilling the contractual obligations by state of force majeure lasting to a period of 6 months or wore the two parties, shall each other to decide regarding the future execution of this agreement.

### 50.0 Local laws, Acts Regulations:

The contractor shall strictly adhere to all prevailing labour laws inclusive at contract labour (regulation and abolition act of 1970) and other safety regulations. The contractors should comply with the provision of all labour legislation including the latest requirements of the Acts, laws, any other regulations that are applicable to the execution of the project.

- i) Minimum wages Act 1948 (Amended)

- ii) ii) Payment of wages Act 1936 (Amended)
- iii) Workmen's compensation Act 1923 (Amended)
- iv) Contract labour regulation and abolition act 1970 and central rules 1971 (Amended)
- v) Apprentice act 1961 (amended)
- vii) Industrial employment (standing order) Act 1946 (Amended)
- viii) Personal injuries (Compensation insurance) act 1963 and any other modifications
- viii) Employees' provident fund and miscellaneous provisions Act 1952 and amendment thereof
- ix) Shop and establishment act
- x) Any other act or enactment relating thereto and rules framed there under from time to time.
- xi) Prevailing Indian Electricity rules & act.

#### 41.0 Accidents

The contractor shall immediately on occurrence of any accident at or about the site or in connection with the execution of the work report such accident to the architect/ consultant. The contractor shall also such report immediately to the competent authority whenever such report is required to be lodged by the law and take appropriate actions thereof.

**Note:** - The contractor should obtain prior approval from SBI/ Consultants before placing order for any specific materials SBI may / delete any of the makes or brands out of the above list.

#### 42.0 SAFETY CODE

##### **SAFETY MEASURES AT SITE:**

1. All personnel at site should be provided with Helmets and Safety Boots with some Identification Mark. Visitors also should be provided with Helmets. It should be ensured that these are used properly.
2. First Aid Box should be kept at site with all requisite materials.
3. No one should be allowed to inspect / work at a height without Safety Belt.
4. Suitable scaffolds should be provided for workmen for all Works that cannot safely be done from the ground, or from solid construction except such short period Work as can be done safely from ladders. When a ladder is used an extra Mazdoor shall be engaged for holding the ladder and if the ladder is used for carrying materials as well as suitable footholds and handholds shall be provided on the ladder and the ladder shall be given an inclination not steeper than  $\frac{1}{4}$  to 1 ( $\frac{1}{4}$  horizontal and 1 vertical).
5. Scaffolding or staging more than 3.5 meters above the ground or floors, swung or suspended from an overhead support or erected with stationary support shall have a guard rail properly attached, bolted, braced and otherwise secured at least 1 Meter high above the floor or platform of such scaffolding or staging and extending along the entire length of the outside and ends thereof with only such openings as may be necessary for the delivery of materials. Such scaffolding or staging shall be so fastened as to prevent it from swaying from the building or structure.
6. Working platforms, Gangways, and Stairways should be so constructed that they do not sag unduly or unequally, and if the height of the platform or the Gangway or the Stairway is more than 3-5 Meters above ground level or floor level they should be closely boarded, should have adequate width and should be suitably fenced, as described.

7. Every opening in the floor of a building or in a working platform be provided with suitable means to prevent the fall of persons or materials by providing suitable fencing or railing whose minimum height shall be 1 Meter.
8. Safe means of access shall be provided to all working platforms and other working places. Every ladder shall be securely fixed. No portable single ladder shall be over 9 Meters in length while the width between side rails in rung ladder shall in no case be less than 30cms for ladder upto and including Meters in length. For longer ladders this width should be increased at least 6mm for each additional 30 cms. Uniform step spacing shall not exceed 30 cms.
9. Adequate precautions shall be taken to prevent danger from electrical equipment. For electrical on line works gloves, rubber mats, and rubber shoes shall be used.
10. All trenches 1.2 Meters or more in depth shall at all times be supplied with at least one ladder for each 30 Meters length or fraction thereof. Ladder shall be extended from bottom of the trench to at least 1 Meter above the surface of the ground. The sides of the trenches, which are 1.5 Meters or more in depth shall be stepped back to give suitable slope, or securely held by timber bracing, so as to avoid the danger of sides collapsing. The excavated materials shall not be placed within 1.5 Meters of the edge of the trench or half of the depth of the trench whichever is more cuttings shall be done from top to bottom. Under no circumstances undermining or under cutting shall be done.
11. Before any demolition work is commenced and also during the process of the work:-
  - a) All roads and open areas adjacent to the Work Site shall either be closed or suitably protected;
  - b) No electrical cable or apparatus which is liable to be a source of danger over a cable or apparatus used by the operator shall remain electrically charged.
  - c) All practical steps shall be taken to prevent danger to persons employed from risk or fire or explosion or flooding. No floor, roof or other part of the building shall be so over- loaded with debris or materials as to render it unsafe.
  - d) All necessary personal safety equipment as considered adequate by the Site Engineer should be kept available for the use of the persons employed on the Site and maintained in a condition suitable for immediate use; and the Contractor should take adequate steps to ensure proper use of equipment by those concerned.
  - e) Workers employed on mixing Asphaltic materials, cement and lime mortars shall be provided with protective footwear and protective goggles.
  - f) Those engaged in white washing and mixing or stacking of cement bags or any materials which are injurious to the eyes shall be provided with protective goggles.
  - g) Those engaged in welding works shall be provided with Welder's protective eye-shields.
  - h) Stone breakers shall be provided with protective goggles and protective clothing and seated at sufficiently safe intervals.
  - i) When workers are employed in sewers and manholes, which are in use, the Contractor shall ensure that the manhole covers are opened and are ventilated at least for an hour before the workers are allowed to get into the manholes and the manholes so opened shall be cordoned off with suitable railing and provided with warning signals and boards to prevent accident to the Public.

12. Use of hoisting machines and tackle including their attachments, anchorage and support shall conform to the following standard or conditions:-

- a) These shall be of good mechanical construction, sound material and adequate strength and free from patent defect and shall be kept in good repairs and in good working order.
- b) Every rope used in hoisting or lowering materials or as a means of suspension shall be of durable quality and adequate strength, and free from patent defects.
- c) Every crane driver or hoisting appliance operator shall be properly qualified and no person under the age of 21 years should be in-charge of any hoisting machine including any scaffold, winch or give signals to the operator.
- d) In case of every hoisting machine and of every chain ring hook, shackle swivel and pulley block used in hoisting or lowering or as means of suspension the safe working load shall be ascertained by adequate means.
- e) Every hoisting machine and all gear referred to above shall be plainly marked with the safe working load. In case of hoisting machine having a variable safe working load, each safe working load of the conditions under which it is applicable shall be clearly indicated. No part of any machine or of any gear referred to above in this paragraph shall be loaded beyond the safe working load except for the purpose of testing.
- f) Motor, Gearing, Transmission, Electric wiring and other dangerous parts of hoisting appliances should be provided with efficient safeguards, hoisting appliances should be provided with such means as will reduce to the minimum the risk of accidental descent of the load, adequate precautions should be taken to reduce to the minimum the risk of any part of a suspended load becoming accidentally displaced.
- g) When workers are employed on electrical installation, which are already energized, insulating mats, wearing apparel such as gloves, rubber footwear etc.

**Seal & Signature of Vendor**

#### **1.22 DRAWINGS TO BE FURNISHED BY BIDDER AFTER AWARD OF CONTRACT:**

- i. The Contractor shall furnish the following drawings Award/Intent and obtain approval.
- ii. General arrangement and dimensioned layout Schematic drawing showing the requirement of SV panel, Power conditioning Unit(s)/ inverter, Junction Boxes, AC and DC Distribution Boards, meters etc. Structural drawing along with foundation details for the structure.
- iii. Itemized bill of material for complete SV plant covering all the components and associated accessories.
- iv. Layout of solar Power Array.

**1.23 Safety - The bidder shall take entire responsibility for electrical safety of the installation(s) including connectivity with the grid and follow all the safety rules & regulations applicable as per Electricity Act, 2003 and CEA guidelines etc.**

**QUALITY CERTIFICATION, STANDARDS AND TESTING FOR GRID-CONNECTED ROOFTOP SOLAR PV SYSTEMS/ POWER PLANTS**

Quality certification and standards for grid-connected rooftop solar PV systems are essential for the implementation of this technology. Hence, all components of grid-connected rooftop solar PV system/ plant must conform to the relevant standards and certifications given below:

<b>Solar Monocrystalline Half cut PV Modules/ Panels designed for 25 Years of power output warranty</b>	
IEC 61215/ IS 14286	Design Qualification and Type Approval for Crystalline Silicon Terrestrial Photovoltaic (PV) Modules
IEC 61646 / Equivalent IS (Under Dev.)	Thin Film Terrestrial PV Modules
IEC 62108	Concentrator PV Modules & Assemblies
IEC 61701	Salt Mist Corrosion Testing of Photovoltaic (PV) Modules
IEC 61853- Part 1/ IS 16170: Part 1	Photovoltaic (PV) module performance testing and energy rating –: Irradiance and temperature performance measurements, and power rating
IEC 62716	Photovoltaic (PV) Modules – Ammonia (NH <sub>3</sub> ) Corrosion Testing (As per the site condition like dairies, toilets)
IEC 61730-1,2	Photovoltaic (PV) Module Safety Qualification – Part 1: Requirements for Construction, Part 2: Requirements for Testing
<b>Solar PV Inverters (5 Years warranty)</b>	
IEC 62109-1, IEC 62109-2	Safety of power converters for use in photovoltaic power systems – Part 1: General requirements, and Safety of power converters for use in photovoltaic power systems;  Part 2: Particular requirement for inverters. Safety compliance (Protection degree IP 65 for outdoor mounting, IP 54 for indoor mounting)
IEC/IS 61683 (as applicable)	Photovoltaic Systems – Power conditioners: Procedure for Measuring Efficiency (10%, 25%, 50%, 75% & 90-100% Loading Conditions)
IEC 62116/ UL 1741/ IEEE 1547 (as applicable)	Utility-interconnected Photovoltaic Inverters - Test Procedure of Is-landing Prevention Measures
IEC 60255-27	Measuring relays and protection equipment – Part 27: Product safety requirements
IEC 60068-2 / IEC 62093 (as applicable)	Environmental Testing of PV System – Power Conditioners and Inverters
<b>Fuses</b>	
IS/IEC 60947 (Part 1, 2 & 3), EN 50521	General safety requirements for connectors, switches, circuit breakers (AC/DC): a) Low-voltage Switchgear and Control-gear, Part 1: General rules b) Low-Voltage Switchgear and Control-gear, Part 2: Circuit Breakers c) Low-voltage switchgear and Control-gear, Part 3: Switches, disconnectors, switch-disconnectors and fuse-combination units d) EN 50521: Connectors for photovoltaic systems – Safety requirements and tests

IEC 60269-6	Low-voltage fuses - Part 6: Supplementary requirements for fuse-links for the protection of solar photovoltaic energy systems
<b>Surge Arrestors</b>	
BFC 17-102:2011	Lightening Protection Standard
IEC 60364-5-53/ IS 15086-5 (SPD)	Electrical installations of buildings - Part 5-53: Selection and erection of electrical equipment - Isolation, switching and control
IEC 61643-11:2011	Low-voltage surge protective devices - Part 11: Surge protective devices connected to low-voltage power systems – Requirements and test methods
<b>Cables</b>	
IEC 60227/IS 694, IEC 60502/IS 1554 (Part 1 & 2)/ IEC69947 (as applicable)	General test and measuring method for PVC (Polyvinyl chloride) insulated cables (for working voltages up to and including 1100 V, and UV resistant for outdoor installation)
BS EN 50618	Electric cables for photovoltaic systems
(BT(DE/NOT)258)	mainly for DC Cables
<b>Earthing/ Lightning</b>	
IEC 62561	Series (Chemical earthing) (as applicable)
IEC 62561-1	Lightning protection system components (LPSC) - Part 1: Requirements for connection components
IEC 62561-2	Lightning protection system components (LPSC) - Part 2: Requirements for conductors and earth electrodes
IEC 62561-7	Lightning protection system components (LPSC) - Part 7: Requirements for earthing enhancing compounds
<b>Junction Boxes</b>	
IEC 60529 IEC 529	Junction boxes and solar panel terminal boxes shall be of the thermoplastic type with IP 65 protection for outdoor use, and IP 54 protection for indoor use
<b>Energy Meter</b>	
IS 16444 or as specified by the DISCOMs	A.C. Static direct connected watt-hour Smart Meter Class 1 and 2—Specification (with Import & Export/Net energy measurements)
<b>Solar PV Roof Mounting Structure</b>	
IS 2062/IS 4759	Material for the structure mounting
IEC 62548	PV arrays – Design requirements

### APPROVED MAKE

1	Solar PV modules (mono crystalline only)	Vikram Solar/ Waaree Solar/ Goldi Green Technologies/ Tata Power Solar Systems Ltd./ BEL/ BHEL/ Renewsys / REIL/ Adani or equivalent MNRE ALMM approved
2	Inverters:	DELTA/ SMA/ /Solar age /Polycab/ k solare/ Sungrow/ Growatt or equivalent BIS approved / relevant IEC approved
3	AC/ DC cables	Havells/ Finolex/RR kable Equivalent
4	AC Distribution Board	Legrand/Schneider/ MDS/Hager or Equivalent BIS approved
5	DC Distribution Board	Legrand/Schneider/ MDS/ Hager or Equivalent BIS approved



		proved
6	LV Switchgear	ABB/L&T/Schneider/ MDS or Equivalent approved
7	String Combiner Box	Robotina/Trinity Touch/Hensel/Cape Electric, AKG or Equivalent BIS approved
8	Weather Monitoring station	Pyranometer: Kipp & Zonnen or Equivalent
9	Energy Meter	Secure/L&T/Schneider/ABB or Equivalent
11	Connectors	MC4/or Equivalent
12	Surge protection (spd)	MDS/ L&T/ Hager/ Schneider/ABB/Legrand/HPL or Equivalent
13	Solar Charge Controller	Morningstar/ Schneider/ Blue Sky/ Genasun/ Midnite Solar/ Outback Power/ Magnum Energy or Equivalent

**Important:** Please Tick (/) the make of materials considered in the Tender.

**The vendor has to comply with all State & Central Government norms for choosing the make, supply and erection.**

**Note: -**

1. The contractor should obtain prior approval from SBI before placing order for any specific materials. All materials should conform to relevant standards and codes of BIS. Materials with I.S.I. mark shall be used duly approved by the SBI Engineer.
2. Any material is found to be not up to the mark, the contractor will have to produce original bills/certificate from the manufacturer or his authorized Distributor for authenticity and genuineness of the material for consideration and as per make approved by the SBI. The same will not be considered for payment.
3. The contractor should obtain prior approval from SBI/ Consultants before placing order for any specific materials SBI may / delete any of the makes or brands out of the above list.
4. All materials should conform to relevant standards and codes of BIS. Materials with I.S.I. mark shall be used duly approved by the SBI Engineer/Architect.
5. Any material is found to be not up to the mark, the contractor will have to produce original bills/certificate from the manufacturer or his authorized Distributor for authenticity and genuineness of the material for consideration and as per make approved by the SBI. The same will not be considered for payment.
6. Any additional item as per BOQ specifications or as per the instructions of the bank / Consultants. Any of the above items / other items if any will be as approved by the Consultants & Engineer-in-charge.

**Signature of contractor With Seal**