PART-C

(Minor Component -Electrical work)

PROFORMA OF SCHEDULES

(FOR MINOR COMPONENT– ELECTRICAL WORKS)

SCHEDULE 'A'		
Schedule of quantities		As enclosed.
SCHEDULE 'D'		
Extra schedule for specific requirements/ document for the work, if any.		Applicable
SCHEDULE 'E'		
Reference to General Conditions of contract:		As per Part A
Name of work		**C/o Training Hostel/Facility including furniture and electrical work at CAFRI Campus Jhansi (U.P.)**
Estimated cost of work		**Rs.65,93,122/-(Electrical Part)**
(i)	Earnest money	As per Part A
(ii)	Performance Guarantee	As per Part A
(iii)	Security Deposit	As per Part A
SCHEDULE 'F' - GENERAL RULES & DIRECTIONS:		
Officer inviting tender		As per Part A
Maximum percentage for quantity of items of work to be executed beyond which rates are to be determined in accordance with clauses 12.2(c)		As per Part A
Definitions:		
2(v)	Engineer-in-Charge	EE (E), CPWD, Gwalior or his successor thereof – for Electrical Works
2(viii)	Accepting Authority	As per Part A
2(x)	Percentage on cost of materials and labour to cover all overheads and profits.	**15% (Fifteen Percent)**
2(xi)	Standard Schedule of Rates	DSR (E&M) 2025& Market Rates for Non Schedule items with correction slips issued up to date of receipt of tender as modified and corrected up-to the previous day of the last date of submission of Bid
2(xii)	Department	Central Public Works Department
9(ii)	Standard CPWD Contract Form	CPWD Form 7 as modified and corrected up-to the previous day of the last date of submission of Bid.
Clause1		
(i)	Time allowed for submission of Performance Guarantee, Programme Chart (Time and Progress) and Applicable labour licenses, Registration with EPFO, ESIC and BOCW Welfare Board or proof of applying thereof from the date of issue of letter of Acceptance	As Per Part-A
(ii)	Maximum allowable extension with late fee @ 0.1% per day of Performance Guarantee amount beyond the period provided in(i) above	As Per Part-A
Clause2		
Authority for fixing compensation under clause 2.		As Per Part-A
Clause5		
Number of days from the date of issue of letter of acceptance for reckoning date of start		As per Part -A

ADDITION....***NIL***, CORRECTION…***NIL***

INSERTION……***NIL***, CUTTING…….***NIL*** AE(E)P EE(E) AE(E)(P),SE,Gwl

Clause 5.1		
Schedule of rate of recovery for delay in submission of the modified programme in terms of delay days.		As per Part -A
Clause 5.2		
Nature of Hindrance Register (either Physical or Electronic)		As Per Part-A
Clause 5.4 TABLE OF MILESTONE		As Per Part-A
	Time allowed for execution of work	As Per Part-A
	Authority to decide:	
(i)	Extension of time	As Per Part-A
(ii)	Rescheduling of milestones	As Per Part-A
(iii)	Shifting of date of start in case of delay in handing over of site	As Per Part-A
Clause 6		
Computerized Measurement Book (CMB)/ Electronic Measurement Book (EMB) through CPWD ERP portal		Applicable
Clause7		
Gross work to be done together with net payment/adjustment of advances for material collected, if any, since the last such payment for being eligible to interim payment		10 lakh
Clause7A		
Whether Clause 7A shall be Applicable		As per Part-A
Clause 8A		
Authority to decide compensation on account if contractor fails to submit completion plans, as built drawings, Services drawing, Standard Measurement Book and Other documents specified in NIT.		As per Part-A
Clause10A		
List of testing equipment to be provided by the contractor at site lab		Applicable
Clause10B		Not applicable
Clause10C Components of labor expressed as percent of value of work:		As per Part-A
Clause10CC to be applicable in contracts with stipulated period of completion exceeding the period shown in next column		As per Part-A
Clause11		
Specifications to be followed for execution of work	CPWD specification for electrical works. **Part-I** (Internal) 20203, **Part-II** External 2023, Part VII D.G. Sets 2013, Heating, Ventilation & Air-Conditioning (HVAC) with correction slips up-to the previous day of the last date of submission of Bid including extension., if any and manufacturer's specification and as per direction of engineer-in-charge.	

Clause12		
	Type of Work	As per Part-A
12.2 (c)	Deviation Limit beyond which clauses 12.2(c) shall apply for building work	As Per Part-A
Clause16		
	Competent Authority for deciding reduced rates	As Per Part-A
Clause18		
	List of mandatory machinery, tools & plants to be deployed by the contractor at site	As per contract conditions (Annexure-A).
Clause19C		
	Authority to decide penalty for each default	Executive Engineer (E), CPWD, Gwalior or his successor thereof
Clause19D		
	Authority to decide penalty for each default	Executive Engineer (E), CPWD, Gwalior or his successor thereof
Clause19G		
	Authority to decide penalty for each default	Executive Engineer (E), CPWD, Gwalior or his successor thereof
Clause19K		
	Authority to decide penalty for each default	Executive Engineer (E), CPWD, Gwalior or his successor thereof
Clause25 Settlement of disputes by Conciliation and Arbitration		As per Part- A
Clause 32 Requirement of Technical Representative(s) and Recovery Rate		As per Part- A

Annexure-A

(As Per Clause 10A & 18)

List of mandatory machinery, tools and plants & testing Equipment to be deployed by the contractor at site.

1. Steel/Aluminium Ladder 1.5 m to 8 m.	-	2 Nos.
2. Chase cutting machines.	-	2 Nos.
3. Electrical wire drawing equipment	-	2 Set.
4. Torque wrench for nut/bolt/screws	-	2 Nos.
5. Conduit die set.	-	2 Set.
6. Pipe vice.	-	1 No.
7. Bench vice.	-	1 No.
8. L.T.Meggar 500/1000 volts.	-	1 No.
9. Tong Tester.	-	1 No.
10. Multimeter.	-	1 No.
11. Hydraulically operated & hand operated crimping machine.	-	1 No.
12. Earth tester.	-	1 No.
13. Electrically operated drilling machine.	-	2 Nos.
14. Electrically operated Hammer drilling machine.	-	2 Nos.
15. Electrically operated Chase cutting machine.	-	1 No.
16. Electrically operated Core cutting machine	-	1 No.

Note : The Engineer In Charge may add or delete above listed mandatory machinery, tools and plants & testing equipments as per actual requirement at site.

BRIEF SCOPE OF WORK

This work is to be carried out in **C/o Training Hostel/Facility including furniture and electrical work at CAFRI Campus Jhansi (U.P.)**

The scope of work under this tender would be execution of all electrical and mechanical services for the building. Main features of the building are as following:

1. Internal Electrical Installations
2. External Service Connection & Street/Compound lighting
3. Solar photo Photovoltaic Power System
4. VRV/VRF/SPLIT Air Conditioning System
5. CCTV System
6. DG set

Works to be carried out by contractor:

1. Contractor has to execute the work related to all the services complete in all respects as per schedule of quantities and as per direction of Engineer-in-charge. All the items have to be executed as per item description, NIT specifications, CPWD specifications and other relevant IS codes as applicable.
2. All the sundry materials required for completion of the works shall be deemed to be included in the scope of work. Contractor has to make good all the damages done by him during execution of the E&M services. Repair work has to be of the quality so that it can match and blend with the work as original. Nothing extra shall be paid in this regard.
3. After award of work, contractor has to submit the shop drawings for all the services. Work has to be carried out as per approved shop drawings only. Drawings must be prepared in accordance to but not limited to the schedule of quantities following the NBC 2016 (as amended upto date) and other relevant CPWD specifications and guidelines.
4. Contractor has to follow the quality assurance plan of CPWD "Quality Assurance Policy & Check List of E & M Services 2016" & "Quality Assurance Manual 2022" as available on CPWD official website. All expenditure to be incurred for testing of samples e.g. packaging, sealing, transportation, loading, unloading etc. including testing charges shall be borne by the contractor.
5. Contractor has to offer all major equipments under the scope of work for pre dispatch inspection at manufacturer's workshop/ factories. Department would reserve the right to waive off any such inspection as it finds suitable. However, this does not give right to the contractor for not offering the equipments for pre dispatch inspection.
6. All the clearances/ no objection certificates (NOCs) for services like firefighting, fire alarm, lifts etc. from local fire authority, electricity authority, lifts inspector etc. shall have to be obtained by contractor from local bodies as applicable pre construction or post construction (before completion and handing over). All the liasioning work has to be done by contractor without any extra cost.
7. Any statutory fees as demanded by local bodies shall be reimbursed to the contractor on production of original receipts/ vouchers. However before depositing any fees to local body, contractor shall take permission from Engineer-in-charge.

SPECIAL CONDITIONS FOR ELECTRICAL WORKS
FOR COMPOSITE TENDERS

1. For electrical works, the bidder should have **valid electrical contractor license from competent authority in the name of the contractor or he will either obtain valid electrical contractor license before start of the work or associate with the contractor having valid electrical contractor license of eligible class whose credentials shall be submitted by contractor before start of the work.**
2. Or else if the main agency does not have electrical license, then the main agency shall have to submit credential of the proposed associated agencies for verification and approval of the department in Performa at **Annexure I.** Consent letter of such selected agencies for association shall also be enclosed in the prescribed format (**Annexure-II**). Main agency may propose up to three names of eligible associates for the specific electrical component for individual E&M services before start of the work.
3. After obtaining concurrence of department for such association, the main agency shall finalize one associate for execution of the (Electrical System (EI) component of the work. The main contractor has to enter into agreement with the contractor associated by him for execution of minor component. Copy of such agreement shall be submitted to EE (E) in charge of electrical component for approval by competent authority. (**As per Annexure - III**)
4. All technical discussions shall be attended by the associate agency and the main agency. Commercial / Technical submissions for the individual electrical works shall be signed and submitted by the associate agency along with the main agency.
5. Price-bid for electrical components shall be submitted by the main agency.
6. Award of work shall be made by the Engineer-in-charge of the major component to the main agency for complete work.
7. The main contractor shall be entirely responsible and answerable for all the works done by his associated electrical contractors regarding their quality, adherence to the laid down specification, terms and conditions, warranty/guarantee etc. and he shall be liable to bear any compensation that may be levied by the department under any of the clauses of the agreement.
8. The manufacturer's guarantee/warrantee for all the electrical accessories shall be for minimum period as specified for the individual E&M services in the NIT from the date of taking over of the installation by the department. Necessary documents of handing / taking over of the installation will be duly signed by the three parties namely EE (E), the main contractor and the associate contractors. The main contractor will ensure that the maintenance during the guarantee period shall also be carried out by the associate contractors. One year/ as specified in the NIT guarantee is to be provided free of cost as per item in the schedule of quantity and specification thereof.
9. The main contractor shall also give necessary general power of attorney under the contract to the associated electrical contractors to enable him to receive instructions from electrical engineers of the department at site, sign the site order book, bill MBs for acceptance of measurement and receive stipulated materials etc.
10. The main contractor shall be responsible for coordinating the activities of all the works and will ensure progress of all works as per the laid down program. The main contractor shall also arrange for proper storage of the electrical accessories at site and will be responsible for their watch and ward.
11. Associate electrical agencies shall submit the fortnightly labour report. Material for use at work shall be procured by the electrical agencies. For this purpose invoice / delivery challan shall be submitted to the department by the associate agencies.
12. Sample of materials like pipe, conduits, wires & cables, of each size etc. may be got tested in the laboratory approved by Engineer -in charge, as and when desired by Engineer-in-charge
13. All the materials intended to be used in the work shall be got approved by Engineer-In-Charge before use at site.
14. Fish wire shall be provided in each conduit where wiring is not carried out.
15. Extra /deviation item etc. shall be carried out only with written permission of competent authority.
16. For power wiring/computer point wiring GI box of 6/8 module shall be in horizontal pattern only.

17. The Contractor has to comply with the following conditions:

(a)The main contractor has to either engage a consultant or himself submit all the shop drawings/ detailed drawings in Autocad for the individual E&M services as well as co-ordinated services drawings in consultation with associate contractors and finally the same shall be submitted to dept. for approval by Engineer-in-charge. Nothing extra will be paid on this account. It is the duty of main agency for all coordination between all the agencies and above consultant, if engaged by main contractor. Work shall be executed as per approved drawings only.

(b) Main contractor must submit technical data sheets of the equipments and the materials duly conforming to technical requirements as per NIT after due examining of correctness in accordance with NIT provisions and codal provisions for approval of Engineer-in charge well in advance. Nothing extra will be paid on this account.

(c) All local body permissions & approvals like fire NOC, Lifts NOC, Electrical substation/ Transformer charging permission or any other permission (pre- construction)/ NOC (post constructions) as applicable have to be obtained by main contractor & deemed to be included within scope of work. No extra claim of cost by contractor in this regard shall be entertained. However, any statutory fees paid to local body by contractor (with prior approval of deptt. CPWD) should be re-imbursed to the contractor on submitting the original proof of payment.

All the associate electrical contractors for individual minor components should submit technical data sheets of the equipments and the materials duly conforming to technical requirements as per NIT for approval of Engineer-in-charge well in advance.

18. **For Composite Tenders**

18.1.1 The Executive Engineer in charge of the major work will call tenders for the composite work. The cost of tender document and Earnest money will be fixed with respect to the combined estimated cost put to tender for the composite tender.

18.1.2 The tender document will include following three components:

Part -A: CPWD - 6, CPWD-7/8 including schedule A to F for the major component of the work, Standard General conditions of Contract for CPWD 2023 amended / modified upto last date of receipt of tender or latest edition as applicable with all amendments / modifications up to last date of receipt of tender.

Part -B: General / specific conditions, specifications and schedule of quantities applicable to major component of the work.

Part-C: General / specific conditions, specifications and schedule of quantities applicable for minor component of the work (SE/EE in charge of Work shall also be competent authority under clause 2 and clause 5 as mentioned in schedule A to F for major components) General / specific conditions, specifications and schedule of quantities applicable to minor component(s) of the work.

18.1.3 The tenderer must associate with himself, agencies of the appropriate class or experience eligible to tender for each of the minor component individually.

18.1.4 The eligible tenderers shall quote rates for all items of major component as well as for all items of minor components of work.

18.1.5 After acceptance of the tender by competent authority, the EE in charge of the work shall issue letter of award on behalf of the President of India.

18.1.6 Entire work under the scope of composite tender including major and all minor components shall be executed under one agreement.

18.1.7 The main contractor has to associate agency(s) for minor component(s) conforming to eligibility criteria as defined below and has to submit detail of such agency(s) to Engineer-in charge within one month of award of work. Name of the agency(s) to be associated shall be approved by Executive Engineer (E) of minor component(s).

18.1.8 In case the main contractor intends to change any of the above agency/agencies during the operation of the contract, he shall obtain prior approval of competent authority, who had earlier approved the same. The new agency/agencies shall also have to satisfy the laid down eligibility criteria. In case Engineer-in-charge is not satisfied with the performance of any agency, he can direct the contractor to change the agency executing such items of work and this shall be binding on the contractor.

18.1.9 The main contractor has to enter into agreement with contractor(s) associated by him for execution of minor component(s). Copy of such agreement shall be submitted to EE. In case of change of associate contractor, the main contractor has to enter into agreement with the new contractor associated by him.

18.1.10 It will be obligatory on the part of the firm/ agency to sign the tender documents for all components before the first payment is released.

19. **Eligibility criteria of specialized work**

The main agency has to submit names of three agencies that he wants to associate for each specialized work within 30 days of award of work. The competent authority of the department will give approval for association with one of the party, which will be final and binding on the main agency. After approval of associate agency, change is possible with prior approval of competent authority of the department. Also on written direction the main agency has to remove the associate contractor and has to re submit the names of three associate agencies for the approval of the department.

Executing agreement between composite category contractor and specialized agency shall be submitted within 30 days of approval of associate contractor by the competent authority of department.

In event of not following above by the main contractor the department reserves the right to get the specialized work executed at risk and cost of contractor and the same will be final and binding on the contractor.

The composite contract associates other agency(s) for execution of each of the work(s) which fulfills the followings eligibility criteria: -

(Experience of having successfully completed works during last seven years ending on last day of the month previous to the one in which tenders have been called.)

1. **For Electrical Installations:**
   (SH I: Total Est. Cost : Rs. 46,09,190/-
   Eligible registered contractor in appropriate class having valid electrical contractor licence.

2. **For Solar Photovoltaic Power Plant (SHII: Est. Cost: 13,57,000/- (Definition of similar works -SITC of Solar Photovoltaic Power Plant.)**
   Three similar works each of value not less than 40% of the estimated cost put to tender.
   OR
   Two similar works each of value not less than 60% of the estimated cost put to tender.
   OR
   One similar works each of value not less than 80% of the estimated cost put to tender.

3. **For DG set (SH III: Est. Cost: 4,22,786/- (Definition of similar works - SITC of DG set)**
   Three similar works each of value not less than 40% of the estimated cost put to tender.
   OR
   Two similar works each of value not less than 60% of the estimated cost put to tender.
   OR
   One similar works each of value not less than 80% of the estimated cost put to tender.

4. **For CCTV System (SH IV : Est. Cost: 2,04,146/-) (Definition of similar works - SITC of CCTV System.)**
   Three similar works each of value not less than 40% of the estimated cost put to tender.
   OR
   Two similar works each of value not less than 60% of the estimated cost put to tender.
   OR
   One similar works each of value not less than 80% of the estimated cost put to tender.

Note:-

1. The above work experience combination shall be either of consolidated of individual nature.
2. In case, a composite category contractor produces evidences of fulfilling the eligibility conditions required for a specialized work, he need not associate a specialized agency for that work.
3. Tripartite agreement between composite category contractor, department and specialized agency shall be submitted within prescribed time to Engineer- in – Charge for approval by competent authority.
4. The value of executed works shall be brought to current costing level by enhancing the actual value of work at simple rate of 7% per annum; calculated from the date of completion to last date of receipt of applications for bids. The certificate should be signed by minimum EE level officer.

Annexure I

PROPOSAL FOR ASSOCIATING AGENCIES

For Sub Head……

We hereby propose the following agencies as per details mentioned against each.
Their consent letters are also attached as per Annexure II

S No.	Name of contractor/Firm	Category and class of registration in CPWD	Registration No.	Electrical License (if applicable)	Validity of registration	Consent letter attached (yes/No)
1.						
2.						
3.						

Note :- A copy of registration order shall be attached for each agency.

Contractor's signature

Annexure II

CONSENT LETTER

I/We hereby give my/ our consent to work as associate contractor till the completion of work and I/we will be responsible for necessary action to hand over the work and for rectification of defects and repair during the maintenance period. I/we will execute the work as per CPWD specification and addition conditions of the works.

I/we will also engage suitable Engineer for the work as per condition of work. I further certify that the above particulars pertaining to me are correct.

Signature of associate contractor

Annexure III

MEMORANDUM OF UNDERSTANDING (MOU) FOR ASSOCIATED CONTRACTOR

M/s. (Name of the firm with full address) …….
(Henceforth called the Main Contractor)
And
M/s. (Name of the firm with full address) …….

(Henceforth, called the Associated Contractor)

Name of work: ……..
…….
NIT No. ……. This MoU is made at ……. on …… between the ……. (herewith called the main contractor) and …….
(herewith called the Associated contractor).

Whereas the main contractor has agreed to entrust the …….. of opted technology only to the associated contractor.

We state that MoU between us will be treated as an agreement and has legality as per Indian Contract Act (amended up to date) and the department (CPWD) can enforce all the terms and conditions of this agreement for execution of the ……. of opted technology only in respect of above work. Both of us shall be responsible for the execution of ……. as per the agreement to the extent this MoU allows. In case of any delay in the payment by the main contractor, the associated contractor can apply to the CPWD to release the payment under Clause 7B and deduct the same from the bills of the main contractor. In case of any dispute, either of us will go for mediation by the CE or SE (as the case may be) and his decision shall be final and binding on both of us.

We have further agreed as under:

1. The Associated Contactor will execute …….. of opted Technology works as per terms and conditions of this agreement.
2. All the machinery and equipment, tools and tackles required for execution of the ……. of opted Technology works, as per this MoU, shall be the responsibility of the Associated Contractor.

3. The site staff required for the execution of ……. of opted Technology work shall be arranged by the Associated Contractor as per terms and conditions of this MoU.
4. All the correspondence regarding execution of the ……. of Opted Technology work shall be done by the department with the main contractor. In case of non-compliance of the provisions of agreement of the work by the associated contractor, the main contractor shall be held responsible and action will be taken against him as per agreement provisions.

5. In case of non-performance, associated contractor will be debarred from participation or association in the CPWD tenders by the CPWD.

(Authorized Signatory)	(Authorized Signatory)
SIGNATURE OF THE MAIN CONTRACTOR	SIGNATURE OF ASSOCIATED CONTRACTOR Date : .....
Date :	
Place :	Place : .....
1. Witness with address	1. Witness with address
(From main contractor side)	(From associated contractor side)

ADDITIONAL TERMS & CONDITIONS
(Electrical& Mechanical Works)

1. For Electrical works, the bidder should have valid electrical contractor license from competent authority in the name of the contractor or he will either obtain valid electrical contractor license within one month of award of work or associate with the contractor having valid electrical contractor license of eligible class whose credentials shall be submitted by contractor within prescribed time of award of work.
2. In case the main contractor himself meets the required eligibility criteria as laid down by the department for any minor component(s) of work, he shall be allowed to execute this minor component(s) after due verification & approval of the Engineer-in-charge of this component.
3. The main contractor if required has to submit the following documents for association of electrical contractor:
   a) Copy of valid registration in appropriate Class with CPWD as on the date of submission of proposal for associate to Engineer-in-charge of this work to establish the eligibility of proposed associate to execute IEI works.
   b) Copy of valid Electrical License with appropriate authority with an undertaking that it shall be get renewed time to time during currency of agreement.
   c) Willingness letter from the proposed associate.
   d) Undertaking from proposed associate that all the provisions of integrity Pact applicable on main contractor shall also be applicable on him.
   e) After approval of the agency for association to the Engineer-in-charge of this component, the main contractor has to enter in agreement with the approved associate contractor for execution of minor component (internal & external electrical installation) as per stipulated technical specification and term & condition of main contract and copy of such agreement shall be submitted to the Engineer-in-charge of this component as well as the Engineer-in-charge of major component.
4. The main contractor/associates are advised to visit the site of work / all architectural drawings to have an idea of the scope / nature of work. Failure to do so shall not absolve their responsibility to do the work as specified in agreement.
5. In the event of the concerned E&M agency not performing satisfactorily or failure of associate/ sub-contractor to complete the E&M work, the main contractor on the written direction of the department, shall remove the Associate/sub-contractor deployed on the work and shall submit name of new associate who fulfill the conditions mentioned in NIT to execute the leftover work without any loss of time or variation in cost to the department in this regard. Such associates shall also enter into agreement / contract with the main contractor and shall meet all the guarantee for the equipments already supplied for which payment has been released by the Department in part or full.
6. If any equipment supplied for the work, during the currency of the earlier associate / sub- contractor and paid in part or full by the department, becomes redundant or not in a position to be installed and commissioned and put to beneficial use, the main contractor shall be liable for replacement of such equipment(s) at no cost to department. Prior approval of Engineer-in-charge is required for change in associated contractor.
7. The main contractor shall not indulge in procurement of items and getting the work done on labour contract with the associate electrical contractor. The whole E&M component shall be executed by the eligible associate electrical contractor on a turnkey basis i.e. procurement of material, engaging labour, execution, testing & commissioning etc. The associate electrical contractor shall submit the completion certificate of E&M work executed by him along with necessary test reports, guarantee bond/certificate, completion plan etc.
8. The main contractor shall be responsible and liable for proper and complete execution of all components of work. Main contractor is also responsible to ensure coordination among various associates / sub contractor to complete the whole scope of work.
9. The associate or sub contractor shall attend the inspection of the work by the Engineer-in-Charge of E&M works as and when required.
10. All sundry fittings, assemblies, accessories, hardware items, foundation bolts, termination lugs for electrical connections as required, and all other sundry items which are useful and necessary for proper assembly and efficient working of the various components of the work shall be deemed to have been included in the tender, whether such items are specifically mentioned in the tender documents or not.

11. The several documents forming the contract are to be taken as mutually explanatory to one another, detailed drawings being followed in preference to small scale drawings and figured dimensions in preference to scale and additional/special conditions in preference to general conditions.
12. In the case of discrepancy between the schedule of quantities, the specification and/or the drawings, the following order of preference shall be observed:-
    a) Description of schedule of quantities.
    b) TERMS & CONDITIONS, if any.
    c) Additional specifications, if any
    d) Additional/special conditions, if any.
    e) General conditions, if any.
    f) Drawings.
    g) Contract Clauses of General conditions of contract for CPWD 2023.
    h) CPWD specifications.
    i) Indian standard specifications of BIS.
    j) Sound engineering practice as per directions of the Engineer-in-charge.
    k) Manufacturers' specifications.
13. A reference made to any Indian Standard Specifications in these documents, shall imply reference to the latest version of that standard, including such revisions/amendments as issued by the Bureau of Indian Standards upto last date of submission of tenders. The contractor shall keep at his own cost all such publications of relevant Indian Standards applicable to the work at site.
14. **Works to be done by the contractor:**
    Unless and otherwise mentioned in the tender documents, the following works shall be done by the contractor, and therefore their cost shall be deemed to be included in their tendered cost:-
    (i) Cutting and making good all damages caused during installation and restoring the same to their original finish.
    (ii) Sealing of all floor openings provided by him for pipes and cables, from fire safety point of view, after laying of the same.
    (iii) Painting at site of all exposed metal surfaces of the installation other than pre-painted items like fittings, fans, switchgear/distribution gear items, cubical switchboard etc. Damages to finished surfaces of these items while handling and erection, shall however be rectified to the satisfaction of the Engineer-in-Charge.
    (iv) Execution of work at height of 6 to 10 mtr.
    (v) Testing and commissioning of completed installation.
    (vi) Minor building work necessary for installation of equipments, making opening in the wall/floors/slabs/tables or modifications in the existing openings wherever provided and restoring the same to their original condition/ finish and necessary grouting etc. as required. Opening in the slab/retaining walls/brick wall etc. shall be made by means of core cutting machines only.
    (vii) Suspenders, brackets and floor/wall supports for suspending/supporting cable tray, cables etc.
    (viii) Removal & disposal of the all the malba/ debris occurs during the execution of work from the site.
15. **Storage and Custody of Materials:**
    The contractor has to make his own arrangement for the storage of the material at site & necessary watch and ward of the same till handing over of the complete work to the department. No extra payment will be made on this account.
16. **Electric Power Supply and Water Supply:**
    Power and water supply shall be arranged by the contractor for the execution of the work.
17. **Tools for handling and Erecting:**
    All tools and tackles required for handling of equipment's and materials at site of work as well as for their assembly and erection and also necessary test instruments shall be the responsibility of the contractor.

18. **Payment Terms:**
Payment shall be made as per the relevant clauses of form PWD 7/8 forming part of the tender documents.

19. **SECURITY DEPOSIT**
A sum @2.5% of the gross amount of the bill shall be deducted from each running bill of the contractor, till the sum becomes @ 2.5% of the tendered amount of the work. This is in addition to the performance guarantee that the contractor is required to deposit.

20. **Co-ordination with other agencies:**
The work will be carried out in close coordination with the building work and other agencies, so as the work of other agencies are not hindered. Conduits will be laid in the slab within the specified time and it will have to be ensured that the casting of slabs is not delayed for want of laying of conduits. The conduits will also be laid in walls before the Plaster work is undertaken so as to avoid breaking cutting of plaster while making chase for laying of conduits subsequently. The contractor will have to employ adequate labour for carrying out the work. No claim regarding the idle labour for any reason will be entertained by the Department.
The main contractor shall be responsible for coordinating the activities of all works and essential progress of works as per milestone and laid down programme.

21. **Care of buildings:**
Care shall be taken by the contractor to avoid damage to the building during execution of his part of the work. He shall be responsible for repairing all damages and restoring the same to their original finish at his cost. He shall also remove, at his costs, all unwanted and waste materials arising out of his work, from the site.

22. **Structural Alterations to Buildings:**
a) No structural member in the building shall be damaged/altered, without prior approval from the competent authority through the Engineer-in-charge.
b) Structural provisions like openings, cutouts, if any, provided by the department for the work, shall be used. If any modifications or fresh provisions are required, such contingent works shall be carried out by the contract at his cost after approval of the engineer-in-charge.
c) All such openings in floors provided by the department shall be closed by the contractor after installing the cables/conduits/rising mains etc. as the case may be, by any suitable means as approved by the Engineer-in-charge without any extra payment.
d) All chases required in connection with the electrical works shall be provided and filled by the contractor at his own cost to the original architectural finish of the buildings.

23. **Addition to an installation:**
Any addition, temporary or permanent, to the existing electrical installation shall not be made without a properly worked out scheme/design by a qualified Electrical Engineer to ensure that such addition does not lead to overloading, safety violation of the existing system.

24. **Drawings:**
The work shall be carried out in accordance with the drawings and the tender documents and also in accordance with modification thereto from time to time as approved by the Engineer-in-charge.
a. All wiring diagrams shall be deemed to be 'Drawings' within the meaning of the term as used in Clause 11 of the conditions of contract (PWD 7 or PWD 8). They shall indicate the main switch board, the distribution boards (with circuit numbers controlled by them), the runs of various mains and sub mains and the position of all points with their controls.
b. All circuits shall be indicated and numbered in the wiring diagram and the points shall be given the same number as the circuit to which they are electrically connected.
c. After award of the work, the firm will be required to submit the drawings for the proposed work including layout plan, conduit routes etc. Work will be carried out as per the approved drawings.

25. The contractor shall take all safety precautions to avoid accidents by exhibiting caution boards, red flags, red lights and by providing necessary barriers and all other measures required from time to time. The contractor shall be responsible for all damages and accidents due to negligence on his part.

26. The contractor shall give due notices to Municipality, Police and/or other authorities that may be required under

the law/rules under force and obtain all requisite permissions/licenses for temporary obstructions/enclosures and pay all charges which may be leviable on account of his execution of the work under the agreement. Nothing extra shall be payable on this account.

27. All tools, plant and machinery provided by the contractor shall, when brought at the site, be deemed to be exclusively intended for the construction and completion of this work and the contractor shall not remove the same or any part thereof (save for the purpose of moving it from one part of the site to another) without the consent of the Engineer-in-charge.
28. All materials shall be got checked & approved by the Engineer-in-charge on receipt of the same at site before use in the work. The rejected material is to be removed from the site immediately.
29. No foreign exchange shall be made available by the department for the purchase of equipments, plants, machinery, materials of any kind or any other items required to be carried out in execution of work.
30. The contractor shall give the Engineer-in-charge in every fortnight, a progress report of the work done during the previous fortnight and the targets for the next fortnight. The progress of work will be reviewed periodically by the Engineer-in-Charge with the contractor and shortfalls, if any, sorted out. The contractor shall thereupon take such action as may be necessary to bring back his work to schedule without any additional cost to the department.
31. It shall be responsibility of the main contractor to sort out any dispute involved with the associated contractor without any time and cost overrun to the department. The main contractor shall be solely responsible for settling the dispute/litigation arising out of his agreement with the associate contractor. The contractor shall ensure that the work shall not suffer on this account.
32. The contractor will have to ensure that the skilled labours. wireman etc., engaged in the execution of the work must possess valid electrical license, otherwise he will not be permitted to execute the work.
33. The associate contractors executing the electrical works must possess the valid electrical contractor license otherwise they will not be permitted to execute the electrical works.
34. The contractor shall be responsible for removal of all defects in the work during the defect liability/guarantee/warranty period. The department shall carry out routine maintenance only. However, if any failure is noticed during this period which is attributable to poor quality of material and bad workmanship, the contractor will be required to rectify the same at his own cost, failure of which the department will be at liberty to get the defects rectified at the risk & cost of the contractor. The contractor will also be required to carry out his own inspection/testing during the guarantee/warranty period and attend to any defect taking place during this period.
35. Material required for the work shall be brought at site at the appropriate time keeping in view the requirement of material depending on progress of the work.
36. In case the main contractor fails to make the payment to the contractor associated by him as per mutually agreed terms & conditions and associated contractor makes a written complain to Engineer-in-charge, he shall serve the notice to main contractor to show cause within 7 days that why recovery for non payment to associated contractor shall not be made from the next running/final bill. In case no cause is shown by the main contractor within the giving time or the cause shown is not to the satisfaction of Engineer-in-charge, the Engineer-in-charge of minor component will recover the due amount from the main contractor and pay to associate contractor. In case sufficient amount is not available, the same shall be recovered from any other amounts available with the department/Government. **Also Engineer-in-charge can make payment to the associate contractor directly in such situation, subject to mutually agreed terms and condition between main contractor and associate contractor**
37. If the main contractor fails to associate contractor for execution of this minor components within prescribed time or furnishes incomplete details or furnishes details of ineligible agencies even after the main contractor is given due opportunity, the entire scope of such component of works shall be withdrawn from the main contractor and the same shall be got executed by the Engineer-in-Charge at the risk and cost of the main contractor.
38. The main contractor/associates are advised to visit the site of work / all architectural drawings to have an idea of the scope / nature of work. Failure to do so shall not absolve their responsibility to do the work as specified in agreement.

39. In the event of the concerned E&M agency not performing satisfactorily or failure of associate/ sub-contractor to complete the E&M work, the main contractor on the written direction of the department, shall remove the Associate/sub-contractor deployed on the work and shall submit name of new associate who fulfils the conditions mentioned in NIT to execute the leftover work without any loss of time or variation in cost to the department in this regard. Such associates shall also enter into agreement / contract with the main contractor and shall meet all the guarantee for the equipments already supplied for which payment has been released by the Department in part or full.
40. If any equipment supplied for the work, during the currency of the earlier associate / sub-contractor and paid in part or full by the department, becomes redundant or not in a position to be installed and commissioned and put to beneficial use, the main contractor shall be liable for replacement of such equipment(s) at no cost to department**.** Prior approval of Engineer-in-charge of minor component is required for change in associated contractor.
41. The main contractor shall not indulge in procurement of items and getting the work done on labour contract with the associate. The whole E&M component shall be executed by the eligible associate contractor on a turnkey basis i.e. procurement of material, engaging labour, execution, testing & commissioning etc. The associate electrical contractor shall submit the completion certificate of E&M work executed by him along with necessary test reports, guarantee bond/certificate, completion plan etc.
42. The main contractor shall be responsible and liable for proper and complete execution of all components of work. Main contractor is also responsible to ensure coordination among various associates to complete the whole scope of work.
43. The associate shall attend the inspection of the work by the Engineer-in-Charge of the work as and when required.
44. A reference made to any Indian Standard Specifications in these documents, shall imply reference to the latest version of that standard, including such revisions/amendments as issued by the Bureau of Indian Standards upto last date of submission of tenders. The contractor shall keep at his own cost all such publications of relevant Indian Standards applicable to the work at site.
45. **BYE-LAWS AND REGULATIONS**

    The work shall be carried out to the satisfaction of the Owner's site representative and in accordance with the Specifications, Regulations of the Electric Supply Authority, Indian Electricity Rules and Regulations, latest Indian Standards and as per the requirements of the Chief Fire Officer.
46. **FEES AND PERMITS**

    The Contractor shall pay any and all fees and obtain permits required for the installation of this work. On completion of the work, the contractor shall obtain and deliver to the Owner, certificate of final inspection and approval by the local fire authority (CFO/ Municipal, State/Central govt. whichever is applicable).
47. **SHOP DRAWINGS**

    a) All the shop drawings shall be prepared on computer through AutoCAD System based on Architectural Drawings, site measurements and Interior Designer's Drawings. Within eight weeks of the approval of the associate, contractor shall furnish, for the approval of the engineer-in-charge, two set of detailed shop drawings of all equipment and materials including layouts for all conduit layouts, distribution panels, and any other requirement to be fabricated or purchased by the contractor.

    b) These shop drawings shall contain all information required to complete the Project as per specifications and as required by the engineer-in-charge. These drawings shall contain details of construction, size, arrangement, operating clearances, performance characteristics and capacity of all items of equipment, also the details of all related items of work by other contractors. Each shop drawing shall contain tabulation of all measurable items of equipment/ materials/ works and progressive cumulative totals from other related drawings to arrive at a variation-in-quantity statement at the completion of all shop drawings.

    Each item of equipment/material proposed shall be a standard catalogue product of an established manufacturer strictly from the list of approved manufacturer attached in this minor component.

    When the engineer-in-charge makes any amendments in the above drawings, the contractor shall supply two fresh sets of drawings with the amendments duly incorporated along with check print, for approval. The contractor shall submit further six sets of shop drawings to the engineer-in-charge. No material or equipment may be delivered or installed at the job site until the contractor has in his possession, the

approved shop drawing for the particular material/equipment/ installation.

c) Shop drawings shall be submitted for approval sufficiently in advance of planned delivery and installation of any material to allow engineer-in- charge ample time for scrutiny. No claims for extension of time shall be entertained because of any delay in the work due to his failure to produce shop drawings at the right time, in accordance with the approved programme.

d) Manufacturers' drawings, catalogues, pamphlets and other documents submitted for approval shall be in four sets. Each item in each set shall be properly labelled, indicating the specific services for which material or equipment is to be used, giving reference to the governing section and clause number and clearly identifying in ink the items and the operating characteristics. Data of general nature shall not be accepted.

e) Samples of all materials like conduits, accessories, switches, wires, control cables etc shall be submitted to the engineer-in-charge prior to procurement. These shall be submitted in two sets for approval and retention by engineer-in-charge and shall be retained for reference and verification till the completion of the Project.

f) Approval of shop drawings shall not be considered as a guarantee of measurements or of building dimensions. Where drawings are approved, said approval does not mean that the drawings supersede the contract requirements, nor does it in any way relieve the contractor of the responsibility or requirement to furnish material and perform work as required by the contract.

g) Where the contractor proposes to use an item of equipment, other than that specified or detailed on the drawings, which requires any redesign of the structure, partitions, foundation, wiring or any other part of the mechanical, electrical or architectural layouts; all such re-design, and all new drawings and detailing required therefore, shall be prepared by the contractor at his own expense and gotten approved by the engineer-in-charge.

h) The contractor shall prepare composite working drawings and sections at a suitable scale, not less than 1:50, clearly showing how his work is to be installed in relation to the work of other trades. If the Contractor installs his work before coordinating with other trades, or so as to cause any interference with work of other trades, he shall make all the necessary changes without extra cost to the engineer-in-charge.

i) Within four weeks of approval of all the relevant shop drawings, the contractor shall submit four copies of a comprehensive variation in quantity statement, and itemized price list of recommended (by manufacturers) imported and local spare parts and tools, covering all equipment and materials in this contract.

48. **ACCESSIBILITY**

The Contractor shall verify the sufficiency of the size of the shaft openings, clearances in wall cavities and suspended ceilings for proper installation of his conduits cables, cable trays, panels etc. His failure to communicate insufficiency of any of the above shall constitute his acceptance of sufficiency of the same**.** The Contractor shall locate all equipment which must be serviced, operated or maintained in fully accessible positions. The exact location and size of all access panels, required for each concealed control damper, valve or other devices requiring attendance, shall be finalized and communicated in sufficient time, to be provided in the normal course of work. Failing this, the Contractor shall make all the necessary repairs and changes at his own expense. Access panel shall be standardized for each piece of equipment / device / accessory and shall be clearly nomenclature / marked.

49. **MATERIALS AND EQUIPMENT**

All materials and equipment shall confirm to the relevant Indian Standards and shall be of the approved make and design. Makes shall be strictly in conformity with list of approved manufacturers attached in this minor component.

The Contractor shall be responsible for the safe custody of all materials and shall insure them against theft or damage in handling or storage etc. A list of items of materials and equipment, together with a sample of each shall be submitted to the Owner's site representative within 15 days of the award of the contract.

The quantity of material in the BOQ is indicative. Contractor has to assess the actual requirement of material at site before placing the order, keeping in view the drawing and site requirement from the shortest route. No claim for payment for unused excess material shall be entertained.

50. **COMPLETION CERTIFICATE**

On completion of the electrical installation a certificate shall be furnished by the Contractor countersigned by the licensed supervisor, under whose direct supervision the installation was carried out. This certificate shall be in the prescribed form as required by the local, state/central govt./ municipal / fire authorities concerned.

51. **COMPLETION DRAWINGS**

Upon completion of the work and before issuance of certificate of virtual completion the contractor shall submit to the engineer-in-charge four set of layout drawings in progressive manner for individual systems drawn at approved scale indicating the complete wiring system as installed. Drawing shall be prepared on AUTO-CAD (latest version). Along with the hard copies, the contractor shall submit copies of all drawings on CD and one set of all drawings on RTF shall also be submitted. These drawings must provide:

- **a.** Single line distribution diagram including submain circuit wiring etc.
- **b.** Location of all DB's, switch board, panels etc.
- **c.** Any other relevant drawing.

52. **OPERATING INSTRUCTION & MAINTENANCE MANUAL**

Upon completion and commissioning of part Electrical system **t**he contractor shall submit a draft copy of comprehensive operating instructions, maintenance schedule and log sheets for all systems and equipment included in this contract. This shall be supplementary to manufacturer's operating and maintenance manuals. Upon approval of the draft, the contractor shall submit four (4) complete bound sets of typewritten operating instructions and maintenance manuals. These manuals shall also include basis of design, detailed technical data for each piece of equipment as installed, spare parts manual and recommended spares for 4 year period of maintenance of each equipment.

53. **MAINTENANCE DURING DEFECTS LIABILITY PERIOD**

Complaints

The Contractor shall receive calls for any and all problems experienced in the operation of the system under this contract, attend to these within 24 hours of receiving the complaints and shall take steps to immediately correct any deficiencies that may exist.

Repairs

All equipments that require repairing shall be immediately serviced and repaired. Since the period of Mechanical Maintenance runs concurrently with the defects liability period, all replacement parts and labour shall be supplied promptly free-of-charge to the engineer-in-charge.

54. **METHOD OF MEASUREMENT**

The works shall be measured in accordance with CPWD specifications and relevant IS codes notwithstanding any general or local custom except where otherwise specifically described or prescribed in the contract.

55. **DEMONSTRATION TO ENGINEER-IN-CHARGE**

At completion, devices subject to manual operation shall be operated at least five times in presence of engineer-in-charge's site representative to demonstrate satisfactory operation.

56. **PREPARATION AND APPROVAL OF DRAWING**

On award of the work, the contractor has to prepare shop drawings and submit to the Engineer-in-Charge for approval. The work is to be executed as per approved drawings.

57. The associate shall attend the inspection of the work by the Engineer-in-Charge as and when required.

ADDITIONAL SPECIFICATIONS
(For Internal & External Work)

1. All the works shall be carried out as per CPWD General Specification's forElectrical Works Part-I (Internal) 2023& Part-II (External) 2023, amended up to the last date of submission of tender.

2. **Conformity to IE act, IE Rules, and standards:**
All electrical works shall be carried out in accordance with the provisions of Indian Electricity Act, 1910 and Indian Electricity Rules, 1956 amended up to the last date of submission of tender unless specified otherwise. List of rules of particular importance to electrical installations under these General Specifications for internal works is given for reference.

3. **General requirements of components:**
3.1 Quality of material: All materials and equipments supplied by the contractorshall be new. They shall be of such design, size and materials as to satisfactorily function under the rated conditions of operation and to withstand the environmental conditions at site. The model of equivalent make shall be approved by Engineer – in- charge on producing relevant paper of the model and equivalent make shall be equal or more rich specification.
3.2 The model of equivalent make shall be approved by Engineer- in- charge on producing relevant paper of the model and equivalent make shall be equal or more rich specification.

3.3 Use of quality materials: Only quality materials of reputed make as specifiedin the tender will be used in work.

3.4 Samples of all materials, fittings and other materials/articles required for execution of the work shall be got approved from the Engineer-in-charge. Materials / articles manufactured by the firms of repute as indicated in tender documents and approved by the Engineer-in-charge shall only be used. **The date of manufacturing of all the equipment and materials shall not be more than Six months old from the date of award of work.**

3.5 All the materials and equipments shall be procured directly from manufacturer or authorized dealers only.

3.6 Even ISI marked materials shall be subjected to quality test at the discretion of the Engineer-in-charge besides testing of other materials as per the specifications described for the item/material. Whenever ISI marked materials are brought to the site of work; the contractor shall, if required by the Engineer-in-Charge, furnish manufacturers test certificates to establish that the materials procured by the contractor for incorporation in the work satisfy the provisions of IS codes relevant to the material and/or the work done.

3.7 The MCB should be 10 KA breaking Capacity.

3.8 The fan box cover shall be made from 3mm thick phenolic laminated sheet as per CPWD specification.

3.9 The contractor shall provide only metallic junction boxes/looping boxes with cover of required sizes even in PVC conducting and such boxes shall be measured as a part of conduit/wiring without any extra payment.

3.10 The metallic junction boxes & looping boxes shall be covered with approved makes of phenolic laminated sheet. For telephone, television & fire alarm system shall be provided at all the floors within scope of work without any extra cost as per requirement & layout approved by Engineer- in-charge.

4. **Ratings of components:**
4.1 All components in a wiring installation shall be of appropriate ratings of voltage, current and frequency, as required at the respective sections of the electrical installations in which they are used.

4.2 All conductors, switches and accessories shall be of such size as to be capable of carrying the maximum current, which will normally flow through them, without their respective ratings being exceeded.

5. **Conformity to standards:**
5.1 All components shall confirm to relevant Indian Standard Specifications wherever existing. Materials with ISI certification mark shall be preferred.

5.2 Relevant Indian Standards including amendments or revisions thereof up to the last date of submission of tender shall be applicable in the respective contracts for respective items, firm to ensure its compliance.

5.3 The connections of switches, sensors, earthing conductors & interconnections cables shall be made by adequate rating thimbles of approved standard makes only and nothing extra on this account shall be paid.

5.4 Material to be used in the work shall be ISI marked. The make of material have been indicated in the list of acceptable makes. No other make will be acceptable. The material to be used in the work shall be got approved from the Engineer-in-charge before its use at site. The Engineer-in-charge shall reserve the right to instruct the contractor to remove the material which, in his opinion, is not as per specifications.

5.5 Modular type switches / sockets / telephone outlets / TV sockets are to be provided wherever indicated in the items. The same shall be of only one make. The modular plates of switches, sockets, telephone & TV sockets etc. shall be in two parts i.e. plates with frames with in quoted rates.

6. **Interchangeability:**
Similar parts of all switches, lamp holders, distribution fuse boards, Switch gears, ceiling roses, brackets, pendants, fans and all other fittings of the same type shall be interchangeable in each installation.

7. **Inspection of materials and equipments:**

7.1 Materials and equipments to be used in the work shall be inspected by the departmental officers. Such inspection will be of following categories:

7.1.1 Inspection of materials / equipments to be witnessed at the Manufacturer's premises in accordance with relevant BIS / Agreement Inspection Procedure.

7.1.2 To receive materials at site with Manufacturer's Test Certificate(s)

7.1.3 To inspect materials at the authorized dealer's godown to ensure delivery of genuine materials at site.

7.1.4 To receive materials after physical inspection at site.

7.2 Adequate care to ensure that only tested and genuine materials of proper quality are used in work shall be ensured by firm. The firm shall ensure that:

7.2.1 Material will be ordered & delivered at site only with the prior approval of the department to ensure timely delivery.

7.2.2 As and when the order is placed for the fittings / fixtures, cables, switchgears, poles, rising main, other main items etc, its copy shall be endorsed to the CPWD Engineer-in-charge.

7.2.3 The firm will be required to procure material like exhaust fans, MCB's& DB's, switches & sockets, wires & cables, conduits and switchgears etc directly from the manufacturer/ authorized dealers to ensure genuineness & quality and as per the approved makes only. Proof in this regard shall be submitted by the contractor if required by the department.

7.2.4 Inspection at factory or at godown of the manufacturer, as required, shall be arranged by the firm for a mutually agreed date. Certificate for genuineness of the fittings shall have to be provided duly signed by the manufacturer's officer not below the rank of Regional Manager.

7.2.5 Delivery of material shall be taken up only with the consent of department, after clearance of the material.

7.2.6 Department shall reserve the right to waive inspection in lieu of suitable test certificate, at its discretion.

7.3 Similarly, for fabricated equipments, the contractor will first submit dimensional detailed drawings for approval before fabrication is taken up in the factory. Suitable stage inspection at factory also will be made to ensure proper use of materials, workmanship and quality control.

7.4 The contractor shall give a trial run of the equipments and machinery for establishing its capability to achieve the specifications within laid down tolerances to the satisfaction of the Engineer-in-charge before commencement of work.

8. **Workmanship:**

8.1 Good workmanship is an essential requirement to be complied with. The entire work of manufacture/fabrication, assembly and installation shall confirm to sound engineering practice.

8.2 **Proper supervision/skilled workmen**: The contractor shall engage suitablyskilled/licensed workmen of various categories for execution of work duly supervised by technical representative having appropriate qualification and experience to ensure proper execution of work. They will carry out instruction of Engineer-in-charge and his authorized representatives during the progress of work.

8.3 **Fabrication in reputed workshop:**Switch boards and LT panels shall befabricated in a factory/workshop having modern facilities like quality fabrication, seven tank processes, and powder / epoxy paint plant, proper testing facilities, manned by qualified technical personnel. These shall be as per make / item approved.

8.4 The contractor shall have to engage well experienced skilled labour and deploy modern T&P and other equipments to execute the work.

9. **Provisions for services and proper planned work**:-

9.1 The main contractor shall leave such recesses, holes, openings, etc., as may be required for the electric, air conditioning and other related works. The main contractor has also to fix inserts, sleeves, brackets, conduits, base plates, insert plates, clamps etc if any at the time of casting of concrete, stone work & brick work. These inserts, sleeves, brackets, conduits, base plates, insert plates, clamps etc shall be arranged by the contractor and shall be paid accordingly if these are not the part of equipment for which it is being provided.

9.2 The contractor shall ensure quality construction in a planned and time bound manner. Any substandard material or work which is not within permissible tolerance limits shall be summarily rejected by the Engineer-in-Charge.

9.3 The contractor shall make sample as per timeline mentioned in the milestone given of this tender document using all approved materials, for approval of Engineer-in-charge before commencement of execution of mass scale work.

9.4 Check nuts shall be provided while terminating the M.S. conduits in switch board boxes for which nothing extra shall be paid.

9.5 All distribution boards shall be marked with circuits controlling the rooms/area/SDB controlled.

9.6 While deciding the size of switch boxes for light points / fan point / exhaust fan point, two extra modules shall be provided for each fan point for fixing of regulator (fan regulator is to be provided under different item). Wherever extra modules are available, the same shall be provided with blanking plates without any extra cost.

9.7 Contractor will not provide any ceiling rose/connector/looping box etc wherever false ceiling is being provided. The point wiring in that case will be extended up to the fitting/fan etc. directly without provisions of any termination arrangement in between. The wire from the end point up to the fixture shall be considered to be included in the point wiring. Nothing extra shall be paid for the same.

9.8 Wherever providing of rigid conduits is not possible, flexible conduit pipe shall be provided for drawing/running the wires. However, such arrangement has to be kept minimum and only with the prior approval of Engineer-in-charge or his authorized representative.

9.9 Earthing and all items of work that cannot be checked later on are to be got approved from Engineer-in-charge or his authorized representative before proceeding further.

9.10 The firm shall use only electrically operated chase cutting machine for cutting the chases in the wall for recessed conduit wiring.

9.11 The contractor shall follow the shortest route for circuits, sub main, point wiring etc.

9.12 Colour coding as per specification shall be adopted in the wiring system.

9.13 Tinned copper earthing lugs / Thimbles / ferrules shall be provided for termination of earth wire to all Metallic outlet boxes / fittings / fixtures / fan regulator / MCB DB / switch board / Meter board etc., properly crimped / brazed / soldered for which nothing extra shall be paid.

9.14 A suitable brass / tinned copper neutral link shall be fixed at suitable place in the Metallic

9.15 Outlet boxes of all sizes to terminate neutral wire properly. Nothing extra shall be paid on this account.

9.16 To facilitate drawing of wires 16 / 18 SWG GI fish wire shall be provided along with laying of recessed conduit. Nothing extra shall be paid on this account.

9.17 All hardware items such as screws, thimbles, connectors, earth / neutral terminals, wires etc. which are essentially required for completing any item as per specifications will be deemed to have been included in the item even when the same have not been specifically mentioned.

9.18 All hardware material such as nuts / bolts / screws / washers etc. to be used in the work shall be zinc / cadmium plated iron. The galvanised boxes of modular switch / sockets etc. shall be of the same make as of switch / socket etc.

9.19 While laying conduit, suitable minimum number of junction boxes shall be left for pulling the wires. These shall be placed in such a way that the same do not remain noticeable.

9.20 A suitable brass / tinned copper neutral link shall be fixed at suitable place in the Metallic outlet boxes of all sizes to terminate neutral wire properly. Nothing extra shall be paid on this account.

9.21 The ceiling roses wherever required to be provided are included in the scope of work without extra payment and the same shall also be of modular type & of the same make as that of switches & sockets along with earthing provision.

10. **Testing:**
    All tests prescribed in this General Specification to be done before, during and after installation shall be carried out, and the details of test results shall be submitted to the Engineer-in-charge in approved format, that shall form part of the completion certificate of this component.
11. **Commissioning on completion:**
    After the work is completed, it shall be ensured that the installation is tested and commissioned.
12. **Completion plan and completion certificate along with guarantee:**
    12.1 The main contractor through his associate shall submit completion plan as required vide General Specifications for Electrical works (Part-I internal) 2023and (Part-II External) 2023 as applicable within time as stipulated in milestones.
    In case, the main contractor fails to submit the completion plan as aforesaid, he shall be liable to pay a sum equivalent as stipulated in clause–8B of General Condition of Contract – 2023 amended up to last date of submission of tender.
    12.2 Three sets of completion plan as well as in soft copy drawn to a suitable scale indicating the following shall also be submitted:
        12.2.1 General layout of the building.
        12.2.2 Locations of main switchboard and distribution boards, indicating the circuit numbers controlled by them.
        12.2.3 Position of all points and their controls.
        12.2.4 Types of fittings, viz. fluorescent, pendants, brackets, bulk head, fans, exhaust fans etc.
        12.2.5 Name of work, job number, tender reference, actual date of completion, names of Division/Sub-division and name of the main contractor and associate both who executed the work with their signature.
    12.3 **Guarantee:** The complete installation will be handed over to the department after necessary testing and commissioning. The installation will be guaranteed against any defective design / workmanship. Similarly, the materials supplied by the contractor will be guaranteed against any manufacturing defect, inferior quality. The guarantee period will be for a period of 12 months from the date of handing over of installation to the department. Installation/ equipments or components thereof shall be rectified/ repaired to the satisfaction of the Engineer-in-charge. Guarantee on material/equipment given by the manufacturer whatsoever have to be submitted by the main contractor and his associate to the department.
13. The main contractor and his associate has to go through the site order book regularly and has to sign the same by authorised representative and carryout the instructions recorded therein by various officers of the department.
14. The quantities of various items may vary from the quantities given in schedule of work. The agency shall bring the various items & materials as per actual requirement at site. Excess quantities shall not be accepted & paid by the department.
15. The firm to submit LM 79 &LM 80 report of each make and model of **LED fitting**& will be furnish a warrantee Certificate for a period of minimum Five Yearssystem generated.

Solar PV System Commercial and Additional Conditions

1.0 **General**

1.1 This specification covers manufacture, testing as maybe necessary before dispatch, delivery at site, all preparatory work, assembly and installation, commissioning putting into operation of Electrical installations.

1.2 **Location:**
Work shall be carried out at **Training Hostel CAFRI Jhansi.**

1.3 The work shall be executed as per CPWD General Specifications for Electrical works part-I (internal) 2023, Part-II(external)2023, and Part-IV(sub-station) 2013 as amended upto date, relevant I.E. Rules, BIS/IES and as per directions of Engineer-in- charge. These additional specifications/conditions are to be read in conjunction with above and in case of variations; specifications given in these additional conditions shall apply. However, nothing extra shall be paid on account of these additional specifications and conditions, as the same are to be read along with schedule of quantities for the work.

1.4 The tenderer should in his own interest visit the site and get familiarize with the site conditions before tendering.

1.5 No T&P shall be issued by the Department and nothing extra shall be paid on account of this.

2

2.1.1 Submission and opening of e-tender will be as per details given in the information and instructions for contractors for e-tendering posted in the website and CPWD-form 6 for e-tendering forming part of the NIT.

2.1.2 The tenderers are advised not to deviate from the technical specification/ items, commercial terms & Conditions of NIT like terms of payment, guarantee, arbitration clause, escalation etc.

2.1.3 The department reserves the right to reject any of all the price bids and call for fresh prices/ tenders as the case may be without assigning any reason.

3.0 Terms of payment

3.1 Payment shall be made on the basis of running account bill as per progress of execution of work.

Stage of work

i) On pro-rata supply of item received at site in good condition	65%
ii) On completion of pro-rata installation	20%
iii) On commissioning and completion of work	15%

5.1 The tender shall guarantee among other things, the following:-

a) Quality, strength and performance of the materials used.
b) Safe mechanical and electrical stress on all parts under all specified conditions of operation.
c) Satisfactory operation during the maintenance period.

6.3 The contractor has to carry out maintenance as per manufacturer's standards for a period of 24 months from the date of handing over. Nothing extra shall be paid on this account.

7.0 Completeness of Tender

All sundry equipment, fittings, unit assemblies, accessories, hardware items, foundation bolts, termination lugs for electrical connections and all other items which are useful and necessary for efficient assembly and installation of wall fan and components of the work shall be deemed to have been included in the tender irrespective of the face whether such items are specifically mentioned in the tender documents or not.

8.0 Storage and Custody of Materials

For storage of sundry materials and erection equipments or else the agency has to make his own arrangements. No separate storage accommodation shall be provided by the department. Watch and ward of the stores and their safe custody shall be the responsibility of the contractor till the final taking over of the installation by the department.

9.0 Care of the Building

Care shall be taken by the contractor while handling and installing the various equipments and components of the work to avoid damage to the building. He shall be responsible for repairing all damages and restoring the same to their original finish at his cost. He shall also remove at his cost all unwanted and waste materials arising out of the installation from the site of work.

10.0 Guarantee

10.1 All equipment's shall be guaranteed for a period at least of 05 years, from the date of taking over the installation by the department, against unsatisfactory performance and /or breakdown due to defective design, workmanship or material. The equipment's or components, or any part thereof, so found defective during guarantee period shall be forthwith repaired or replaced free of cost, to the satisfaction of the Engineer-in-charge. In case it is felt by the department that undue delay is being caused by the contractor in doing this, the same will be got done by the department at the risk and cost of the contractor. The decision of the Engineer-in-charge in this regard shall be final & building on the contractor.

10.2 The tender shall guarantee among other things, the following: -

a) Quality, strength and performance of the materials used as per manufacturers standards.
b) Safe mechanical and electrical stress on all parts under all specified conditions of operation.

11.0 Power Supply

Arrangement of Electric supply (Three Phase/Single Phase) as required to carry out the work for successful commissioning of the system is to be arranged by the contractor. Department will not pay anything extra on this account. This shall be in the scope of successful firm.

12.0 Water Supply

Arrangement of Water supply for successful installation & completion of the system shall be in the scope of successful firm without any extra cost.

13.0 Acceptable Makes of Various Equipment's

The acceptable makes of various equipment's/components/accessories have been indicated in "Acceptable Makes". The tenderer shall work out the cost of the offer on this basis. Alternate makes are not acceptable.

14.0 The successful tenderer should furnish well in advance three copies of detailed instructions and manuals of manufacturers for all items of equipments regarding installation, adjustments operation and maintenance including preventive maintenance & trouble shooting together with all the relevant data sheets, spare parts catalogue etc all in triplicate.

15.0 Extent of work

15.1 The work shall comprise of entire labour including supervision and all materials necessary to make a complete installation and such tests and adjustments and commissioning, as may be required by the department. The term complete installation shall not only mean major items of the plant and equipments covered by specifications but all incidental sundry components necessary for complete execution and satisfactory performance of installation with all layout charts whether or not those have been mentioned in details in the tender documents in connection with this contract as this is a turnkey job.

16.0 Works to be done by the Department

Unless otherwise mentioned in the tender specifications the following works shall be carried out by the department.

i) To make the site available for the work.. The contractor should select such equipment for installation as can be properly installed in the spaces shown in specification drawings. While no guarantee can be given minor modification required by the contractor if mentioned in the tender or intimated immediately after the receipt of tender shall be carried out if structurally possible.

ii) Provision of storage space at site during the contract period free of cost.

17.0 Exclusion and work to be done by other agencies:
The following shall be excluded from the scope of the work:

a) Major dismantling of any existing building work.

18.0 Inspection and Testing

18.1 All the tests certificate of the equipments are required to submit along with delivery of material.

18.2 Copies of all documents of routine and type test certificates of the equipment, / cable carried out at the manufacturers premises shall be furnished to the Engineer-in-charge and consignee.

18.3 After completion of the work in all respects the contractor shall offer the installation for testing and operation.

19.0 Compliance with Regulations and Indian Standards

19.1 All works shall be carried out in accordance with relevant regulation, both statutory and those specified by the Indian standards related to the works covered by this specification. In particular, the equipment and installation will comply with the following:

i) Factories Act
ii) Indian Electricity Rules
iii) BIS & other standards as applicable
iv) Workmen's compensation Act
v) Statutory norms prescribed by local bodies, Power supply co., etc

19.2 Nothing in this specification shall be construed to relieve the successful tenderer of his responsibility for the design, manufacture and installation of the equipment with all accessories in accordance with currently applicable statutory regulations and safety codes.

19.3 Successful tenderer shall arrange for compliance with statutory provisions of safety regulations and departmental requirements of safety codes in respect of labour employed on the work by the tenderer. Failure to provide such safety requirement would make the tenderer liable for penalty of Rs. 500/- for each default. In addition, the department will be at liberty to make arrangement for the safety requirements at the cost of tenderer and recover the cost thereof from him.

20.0 Indemnity

The successful tenderer shall at all times indemnify the department, consequent on this works contract. The successful tenderer shall be liable, in accordance with the Indian Law and Regulations for any accident occurring due to any cause and the contractor shall be responsible for any accident or damage incurred or claims arising there from during the period of erection, construction and putting into operation the equipments and ancillary equipment under the supervision of the successful tenderer in so far as the latter is responsible. The successful tenderer shall also provide all insurance including their party insurance as may be necessary to cover the risk. No extra payment would be made to the successful tenderer on account of the above.

21.0 Erection Tools

No tools and tackles either for unloading or for shifting the equipments for erection purposes would be made available by the department. The successful tenderer shall make his own arrangement for all these facilities.

22.0 Cooperation with other agencies

The successful tenderer shall co-ordinate with other contractors and agencies engaged in the construction of buildings, if any, and exchange freely all technical information so as to make the execution of this work/contract smooth. No remuneration should be claimed from the department for such technical cooperation. If any unreasonable hindrance is caused to other agencies and any completed portion of the work has to be dismantled and re-done for want of cooperation and coordination by the tenderer during the course of work, such expenditure incurred will be recovered from the successful tenderer if the restoration work to the original condition or specification of the dismantled portion of the work was not undertaken by the tenderer himself.

23.1 The work will be carried out with least disturbance during shifting & shut down taken in consultation with the client department.

24.0 Verification of correctness of equipment at Destination

The contractor shall have to produce all the relevant records to certify that the genuine equipment's from the manufacturers has been supplied and erected.

25.0 Painting

This shall include cost of painting of the entire installation.

26.0 Maintenance

26.1 Sufficient trained and experienced staff shall be made available to meet any exigency of work during the guarantee period of two years from the handing over of the installation.

26.2 The maintenance, routine as well as preventive, for one year from the date of taking over the installations per manufacturers recommendation shall be carried out on quarterly basis.

27.0 Interpreting specifications

In interpreting the specifications, the following order of decreasing importance shall be followed in case of contradictions:

a) Schedule of quantities
b) Technical specifications
c) Drawing (if any)
d) General specifications
e) Relevant BIS or other international code in case BIS code is not available.

28.0 Warranty:

The solar power plant carries a Five (5) years' warranty against any manufacturing defects, as per existing warranty policy. Solar photovoltaic modules carry a performance warranty against excess of 20% degradation in Twenty Five (25) years as per existing warranty policy.

29.0 Use of Contract Documents and Information:

The programme Implementing Agency shall follow the specification, plan, drawing, pattern as mutually agreed or information furnished by or on behalf of the purchaser in connection therewith, and share with the persons engaged by the Programme Implementing Agency in execution of the contact. The Programme Implementing Agency shall not, without the Purchaser's prior written consent, make use of any document of information except for purposes of performing the contract.

30. The scope of work for the bidder include obtaining No objective Certificate (NOC) from Distribution Company for grid connectivity, complete design, engineer manufacture, supply, storage, civil work, erection, testing and commissioning of the grid connected rooftop Solar PV project**.**

31. The Scope for net metering as per norms of Local electricity should be included with following feature and liasiening / meter charges shall be paid by agency and nothing extra shall be paid on this account.

a)Purchasing of 3 Phase Net Meter if required.
b)Net Meter Agreement as applicable.
c) Application registration
d) Meter testing Charge
e) Meter Installation

32. The installation of PCU for different bldgs. should be different and independent of size of solar PV system as per Engineer-in-charge.

TECHNICAL SPECIFICATIONS

Solar PV system shall consist of following equipment's/ components.

- Solar PV modules consisting of required number of crystalline PV modules.
- Mounting structures and civil structures.
- Earthing and lightening protections.
- IR/UV protected PVC pipes and accessories.

1. SOLAR PHOTOVOLTAIC MODULES:

(i) The PV modules used shall be made in India.

The PV modules must be Tire 1 and conform to the latest edition of IEC/ equivalent BIS Standards for PV module design qualification and type approval: **Crystalline Silicon Terrestrial PV Modules:** IEC 61215-2016, IEC 61730- 2016, IEC 61701, UL 1703, MCS, JET, CEC, CEC-Aus, IEC 62716, IEC 62759, **IEC 62804**, IEC 62782, IEC 60068-2- 68, IEC 61853, IS 14286, IS 61730, Mechanical load test as per IEC & UL Pa5400 Pa-front; 2400 –back.

(ii) The Photovoltaic modules shall be tested & approved by IEC authorised test centres as per relevant and latest IEC standards.

(iii) The module shall have warranty of 25 years with 20% degradation in performance as per industrial standard warranty conditions.

(iv) Each PV module shall have RF Identification Tag (RFID). The RFID can be inside or outside the module laminated, but must be able to withstand harsh environmental conditions. It must contain the following Information;
Name of the manufactures of PV Modules and solar cells.
Month and year of the manufacturer (separately for solar cells and modules).
I-V Curve for the module
Peak wattage, Im, Vm, Voc, Isc and FF for the module.
Unique Serial No. And Model No. of the Module.

(v) The solar photo-voltaic module of ≥330Wp power output under STC to be provided with high efficiency of more than 15% multi or mono crystalline silicon **solar cells.**

(vi) The Toughened glass shall have surface **anti-reflective coating**(ARC) to help to absorb more light in all weather conditions.

(vii) It should have rugged design to withstand tough environmental conditions and high wind speeds (over 150 km/h).It shall perform satisfactorily in relative humidity upto 95% and temperature between **-10 deg C and 85 degC, Maximum system voltage: 1000 V, Maximum test load (+): 5400 Pa (550 kg/m^2), Design load (-): wind 163 kg/m^2 (1600 Pa), Maximum test load (-): 244 kg/m^2 (2400 Pa)**

(viii) PV modules must be designed for their output peak watt capacity, which should not be less than 90% at the end of 10 years and 80% at the end of 25 years.

(ix) The PV module should be IEC 61215-Ed 2 & 61730-1&2 / UL certified and with MNRE (GOI)-SEC test certificate or from other accredited / approved labs. The I-V characteristics of all suitable modules as per specifications, to be used in the systems are required to be submitted at the time of supply.

(x) Fill factor & efficiency of the solar module should not less than 75% & 15%

2. Module Mounting (Array) Structures:

a. Design drawings with material selected shall be submitted for prior approval of department before any construction is done.

b. The module mounting structure to be designed in such a way that it will occupy minimum space without sacrificing the output from suitable number of solar modules in series.

c. The structure shall be designed to allow easy replacement of any module & shall be in line with the site requirements.

d. MMS designed for **55M/Sec or 200 kM/Hr will get** first preference. MMS shall be designed in such way that structure have rectangular frame section for mounting of solar module.

e. Distance between
- Two modules should not be less than 25 mm,
- Module and Metal sheet or roof 100 mm,
- In the case of elevated structure, MMS height should not go beyond 10 feet

f. The frames and leg assemblies of the mounting structure should be of standard M.S. sections of angle, channel, tubes and any other sections conforming to **IS: 2062**.

g. These structures should be hot dip galvanized for the long life in external weather conditions.

h. The mounting structure should be of Fixed Type, Tilt angle suitable to site, Foundation **PCC, Fixing type with SS 304 fastener** with clamp fitted to provide rigidity to the structure.

i. The array structure shall be grounded properly using earthing kit.

j. The frames and leg assemblies of the mounting structure should be of standard M.S. sections of angle, channel, tubes and any other sections conforming to **IS: 2062.**

k. These structures should be hot dip galvanized **(80-120 micron thick coating)** OR cold form steel sections for module mounting structure & galvanization for cold formed steel that conforms to **IS:277** for the long life in external weather conditions.

l. Galvanizing should meet **ASTM A-123 hot dipped** galvanizing or equivalent which provides at least spraying thickness of **80 microns on steel as per IS5905**

m. The mounting structure should be of Fixed Type, Tilt angle suitable to site, Foundation **PCC M-20 (1:1.5:3)**, Fixing type with fastener with clamp fitted to provide rigidity to the structure OR GI

n. Any Aluminum section used in MMS should be **anodized** with **minimum 18 micron coating** and al alloy material should **comply with 6063 T6 standard.**

o. All elevated/ free mounted/ roof integrated structure must use **AL clamp with EPDM/ Antitheft bolt/ A Raymond clip** to tightened the module.

p. For roof integrated system riveted or J hook or SDS based fasteners should be used.

q. For uniform tightening & to avoid over tightening **torque wrench** must be used during INC.

r. EPC should optimize the tilt & orientation to increase the **ground coverage ratio.**

3. Minor Building Works

a. Existing terrace space shall be used to install Solar PV array.

b. The structure for installation of Solar PV array shall be designed to withstand operating environmental conditions for a period of minimum 25 years.

c. It is required to design the RCC block support structure (on which PV module will be installed) in such a way that all loads are transferred to the existing columns of the buildings.

d. Such grid design should be presented to department, which are certified by qualified structural Available drawing of the building will be provided to the agency on request.

e. The support structure should be installed in a manner to leave sufficient space for repair and maintenance aspects of the rooftops, particularly for leakages.

f. **The total load of the structure (when installed with PV modules) on the terrace should be less than 60 kg/m2. For structure weight more than 60kg/m2.**

g. Installation of support structure for solar PV mounting should not tamper with the water proofing of roofs. If tampered, it must be restored with proper waterproofing so that there is no

leakage.

h. The support structure design for each building will require approval from department before installation of structure and PV modules.

i. PV array shall be installed in the terrace space free from **any obstruction and/or shadow.**

j. PV array shall be installed utilizing maximum terrace space to minimize effects of shadows due to adjacent PV panel rows.

k. 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.

l. PV array shall be oriented in the south direction at any suitable tilt angle in order to maximize annual energy yield of the plant.

m. PV panel frames shall be fixed and grouted to RCC blocks, which in turn shall be secured to terrace structure in a seamless manner with no impact on waterproofing of the existing terrace structure**.**

n. Ample clearance shall be provided in the layout of the inverter and DC/AC distribution boxes for adequate cooling and ease of maintenance.

o. Civil works if any required for construction of a suitable control room etc. at the site will be provided by the Agency.

4. PCU / INVERTER:

a. PCU 3-phase with neutral inverter shall be supplied as integrated unit depending upon the size of the solar power system. It should conform to IEC61683 and must additionally conform to the relevant national/ international Electrical Safety Standards IEC60068-2.

b. The PCU shall be mounted either on a suitable MS stand on the floor or on the wall with proper supports in the control room. 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 thePCU.

c. PCU should be communicating on the **Modbus TCP Protocol** and should be provided with Ethernet port(s) for communication. The Modbus register mapping details of the inverter shall be provided to the MPSTDC along with the technical specifications of the PCU in the tender Part-I.

d. Inverter should work under

- Ambient temperature range -25...+60°C (-13...+140°F), with derating above 55°C (131°F), -25...+60°C (-13...140°F) with derating above 50°C (122°F).
- Relative humidity 0...100% condensing.
- Sound pressure level, typical 50 dBA @ 1 m.
- Maximum operating altitude without derating 2000 m / 6560 ft.
- Environmental protection rating IP65, Cooling Natural or forced

The PCU should provide the following minimum Indications (through LEDs & LCD display)

- Inverter ON
- Grid ON
- Inverter under voltage/overvoltage
- Inverter overload
- Inverter over temperature.

Protections:

- Over voltage both at input &output
- Over current both at input &output
- Over/under Grid frequency
- Over temperature

- Short circuit
- Protection against lightening
- Surge voltage induced at output due to external source.

e) The inverter shall be designed for continuous, reliable power supply as per specifications. The inverter shall have high conversion efficiency from 25 percent load to the full rated load.

f) Output Sine wave with less than 3% THD from no load to full load at 0.8 Power Factor lag or lead. The efficiency of the inverter shall be more than 94% at full load and more than 80% at partial load (50%-75%). The supplier shall specify the conversion efficiency in the offer.

g) The inverter shall have internal protection arrangement against any sustained fault in the feeder. The inverter shall have provision for input & output isolation.

h) Inverter shall be tested for islanding protection performance and should be provided. When the mains power is off, the PCU should also get automatically off so that back-feeding to the grid is not possible.

i) The software (Plant Manager & PC for remote monitoring through LAN) and hardware **except PC**, required for interfacing the system are to be supplied.

j) Maximum Power Point Tracker (MPPT) shall be integrated into the PCU to maximize energy drawn from the Solar PV array. The details of working mechanism of MPPT shall be furnished. Each solid-state electronic device shall have to be protected to ensure long life of the inverter as well as smooth functioning of the inverter.

i) The dimension, weight, foundation, makes details etc. of the PCU / Inverter shall be clearly indicated in the detailed technical document. Good quality & reputed proven makes having minimum two years of trouble free successful functioning in similar solar PV system should be supplied.

k) The PCU shall be capable of complete automatic operation, including wake-up, synchronization & shut down

l) Built-in with data logging to remotely monitor system performance through external PC shall provided.

m) Inbuilt Zero export facility/ external device recommended by the inverter manufacturer.

5. Junction box and distribution boards:

a) The junction boxes should be dust, vermin & waterproof & made of FRP/ABS plastic for outdoor use and IP 65 rated (for outdoor) / IP 21 (for indoor) and IEC 62208, for long-term use in PV systems. In addition, the direct connection between the strings and the spring clamp connectors should ensure a durable and safe installation.

b) The junction boxes shall have suitable cable entry points fitted with cable glands of appropriate sizes for both incoming & outgoing cables. Suitable markings shall be provided on the bus bar for easy identification & cable ferrules shall be fitted at the cable.

6. Cables and hardware:

a) **Flexible tinned copper solar grade cables** of appropriate size and voltage rating of 660/1000V to be used in the system and shall conform to IS 694/1554 standards. The cable should have excellent resistance to heat, cold, water, oil, abrasion, UV radiation.

b) Required sizes of flexible copper cables between array interconnections, array to junction boxes, junction boxes to Inverter and copper armoured cable from inverter / AC DB to location of propose Net Meter/ power synchronize point **(approx..250 Metre from 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.

c) Cable Routing/ Marking: All cable 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.

d) As per site requirement Cable laying through underground / across the road by providing necessary GI pipe is within the scope of work of the tenderer.

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

7. Instrumentation, measurement and monitoring:-

a. The scope of work shall include for supply and installation of pyrometer, temperature probes for recording the solar panel temperature, anemometer for measuring the wind speed. All these instruments shall be integrated and the data should be logged for viewing on the PC screen. Necessary software also shall be provided for the same.

b. Data Logging Provision for system monitoring, time and date stamped system data logs for analysis shall me made.

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

PV array energy production:

a. Digital Energy Meters to log the actual value of AC/ DC voltage, Current & Energy generated (each day / cumulatively) by the PV system shall be provided.

b. **Solar Irradiance:** An integrating Pyranometer (Class II)/ silicon based solar sensor shall be provided, with the sensor mounted in the plane of the array. Readout integrated with data logging system.

c. **Temperature:** Temperature probes for recording the Solar panel temperature and ambient temperature to be provided complete with readouts integrated with the data logging system

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

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 (oC)
j. Inverter Status.

8. System protections requirements:

Protective function limits (Viz-AC Over voltage, AC Under voltage, over frequency, under frequency, ground fault, PV starting voltage, PV stopping voltage, over voltage delay, under voltage delay, Ground fault delay, PV starting delay, and PV stopping delay).

9. In addition to above, the system shall be provided with the following:

a) **Earthing:** The structure of the PV arrays will be grounded properly using adequate number of Chemical earthing. All metal casing / shielding of the system shall be thoroughly grounded to ensure safety of the solar systems.

b) **Lightning and O/V protection:** The SPV systems shall be provided with lightning & over voltage 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.

c) Earthing for **LPS shall be** done in accordance IS 3043-1986, provided that Earthing conductors shall have a minimum size of 6 mm2 copper wire or 10 mm2 aluminum wire or 3 mm X 70 mm hot dip galvanized steel flat.

d) All wiring/cables should be in proper conduit or suitable casing and wires should not be hanging loose.

e) All connections are to be made through suitable cable/lug/terminals; crimped properly & with use of Cable Glands.

f) Switches / Circuit Breakers / Connectors-safety IS/ IEC 60947 part I, II & III, EN 50521

g) Fuses to be provided to protect against short circuit conditions.

h) All the components of the systems viz PV modules, Electronics, etc should have type approval / test certificates **as per MNRE guidelines.**

i) All components and materials used in the system should be of good quality & conform to the BIS / IEC standards / specifications, wherever available / applicable.

j) Each system should have number plate with name & logo of the manufacturer and the month / year of installation.

k) Operation and Maintenance / Instruction Manual (with Do's and Don'ts) to be provided with each system.

l) Danger boards should be provided as and where necessary as per IE Act./IE rules as amended up to date.

10.**For Specialized E&M Original Works and other original E&M Works:**

(a) Authorization certificate.

(b) The OEM is unconditionally support the lowest tenderer technically throughout the execution of contract as well as for Maintenance/ Comprehensive Maintenance Contract for the useful life of the system, and.

(c) OEM is provide all the spares required for healthy functioning of the equipment for at least seven years from the date of supply of equipment.

ADDITIONAL TERMS AND CONDITIONS
(DG Set)

1. LOCATION

The DG Set will be installed at site.

SITE INFORMATION

2. The tenderer should, in his own interest, visit the site and familiarizes himself with the site conditions before tendering. For any clarification, tenderer may discuss with the Engineer- in-Charge.

3. CONFORMITY WITH STATUTORY ACTS, RULES, STANDARDS AND CODES

The work shall be executed as per CPWD General Specifications for Electrical Works (Part VII DG Sets – 2013), as per relevant IS and as per directions of Engineer-in-Charge. These additional specifications are to be read in conjunction with above and in case of variations, specifications given in this Additional conditions shall apply. However, nothing extra shall be paid on account of these additional specifications & conditions as the same are to be read alongwith schedule of quantities for the work.

All electrical works shall be carried out in accordance with the provisions of Indian Electricity Act, 2003 and Indian Electricity Rules, 1956 amended to date. They shall also conform to CPWD General specifications for Electrical works, Part-I: Internal, 2023, Part-II: External, 2023 and Part IV (Sub-station) 2013, amended to date.

All components shall conform to relevant Indian Standard Specifications, wherever existing , amended to date as per list of such standards is appended in Appendix 'V' of CPWD General Specification for Electrical Works, Part – VII (DG Sets) 2013.

The department reserves the right to reject any or all the price bids and call for fresh prices/tenders as the case may be without assigning any reason.

4. SAFETY CODES AND LABOUR REGULATIONS

In respect of all labour employed directly or indirectly on the work for the performance of the contractor's part of work, the contractor at his own expense, will arrange for the safety provision as per the statutory provisions , B.I.S. recommendations , factory act, workman's compensation act, CPWD code and instructions issued from time to time. Failure to provide such safety requirements would make the tenderer liable for penalty for Rs. 250/- for each violation. In addition the Engineer-in-Charge , shall be at liberty to make arrangements and provide facilities as aforesaid and recover the cost from the contractor.

The contractor shall provide necessary barriers, warning signals and other safety measures while executing the work of DG Set installation, laying pipelines, cables etc. or wherever necessary so as to avoid accident. He shall also indemnify CPWD against claims for compensation arising out of negligence in this respect. Contractor shall be liable, in accordance with the Indian Law Regulation for any accident occurring due to any cause. The department shall not be responsible for any accident occurred or damage incurred or claims arising there from during the execution of work.No extra payment would be made to the contractor due to the above provisions thereof.

4. WORKS TO BE ARRANGED BY THE DEPARTMENT.

Unless otherwise specified in the tender documents, the following works shall be arranged by the Department.

Space for accommodating all the equipments and components involved in the work. However, watch and ward shall be responsibility of the contractor.

5. WORKS TO BE DONE BY THE CONTRACTOR.

Unless otherwise mentioned in the tender documents, the following works shall be done by the contractor and therefore, their cost shall be deemed to be included in their tendered cost –whether specifically indicated in the schedule of work or not :-

Foundations for equipments including vibration isolation spring/pads cushy foot mounting shall be as per manufacturer/ OEM standard.
Making good all damages caused to the structure during installation and restoring the same to their original finish.
Minor building works necessary for installation of equipments, foundation, making of opening in walls or in floors, and restoring them to their original condition/finish and necessary grouting etc. as required.
Painting of all exposed metal surfaces of equipments and components with appropriate colour.

6. RATES

The rates quoted by the tenderer, shall be firm and inclusive of all taxes like GST and all charges for packing, forwarding , insurance, freight and delivery, installation , testing commissioning etc. at site including temporary constructional storage, risks, overhead charges, general liabilities/ obligations etc.

The contractors has to carry out routine and preventive maintenance as per manufacturer's standards for a period of 12 months from the date of handing over. However, all consumable (fuel/lube oil etc.) and spare parts including filters will be supplied by the department.

8. MACHINERY FOR ERECTION

(i) All tools and tackles required for unloading/handling of equipments and materials at site, their assembly, erection , testing and commission shall be the responsibility of the contractor.

(ii) No T &P shall be issued by the Department and nothing extra shall be paid on account of this.

9. COMPLETENESS OF THE TENDER, SUBMISSION OF PROGRAMME, APPROVAL OF DRAWINGS AND COMMENCEMENT OF WORK.

(i) Completeness of the Tender :-

All sundry equipments, fittings, assemblies, accessories, hardware items foundation bolts, supports, termination lugs for electrical connections, cable glands, junction boxes and all other sundry items for proper assembly and installation of the various equipments and components of the work shall be deemed to have been included in the tender, irrespective of the fact that whether such items are specifically mentioned in the tender documents or not.

(ii) Submission of programme :-

Within fifteen days from the date of receipt of the letter of acceptance , the successful tenderer shall submit his programme for submission of equipment, installed, testing and commissioning and handling over the installation to the Engneer-In-Charge. This programme shall be framed keeping in view the building progress.

(iii) Submission of Drawings :-

The contractor shall submit the drawings to the Engineer-In-Charge for approval before start of work.

(iv) Commission of Works:-

The contractor shall commence work as soon as the drawings submitted by him are approved.

10. DISPATCH OF MATERIALS TO SITE AND THEIR SAFE CUSTODY.

The contractor shall dispatch materials to site in consultation with the Engineer-In-Charge. Suitable lockable storage accommodation shall be made available free of charge temporarily. Watch and ward however, shall be

the responsibility of contractor. Programme of dispatch of material shall be framed keeping in view the building progress. Safe custody of all equipments/items supplied by the contractor shall be the responsibility of the contractor till final taking over by the department.

11. CO-ORDINATION WITH OTHER AGENCIES.

The contractor shall co-ordinate with all other agencies involved at the work so that he work of other agencies is not hampered due to delay in his work.

12. INDEMNITY

The successful tenderer shall at all times indemnify the department, consequent upon this works contract. The successful tenderer shall be liable, in accordance with the Indian Law and Regulation for any accident occurring due to any cause and the contractor shall be responsible for any accident or damage incurred or claims arising there from on the department during the period of erection, construction and putting into operation the equipments and ancillary equipment under the supervision of the successful tenderer in so far as the latter is responsible . No extra payment would be made to the successful tenderer on account of the above.

12. QUALITY OF MATERIALS AND WORKMANSHIP

The components of the installation shall be of such design so as to satisfactorily function under all conditions of operation.

The entire work of manufacturer/fabrication, assembly and installation shall confirm to transmission of noise and vibration to the building structure.

All equipments and materials to be used in work shall be manufactured in factories of good repute having excellent track record of quality manufacturing, performance and proper sales service.

14. CARE OF THE BUILDING.

Care shall be taken by the contractor during execution of the work to avoid damage to the building. He shall be responsible for repairing all such damages and restoring the same to the original finish at his cost. He shall also remove all unwanted and waste materials arising out of the installation from the site of work from time to time .

INSPECTION AND TESTING OF DG SET.

(i) For DG sets of capacity equal to or less than 200 KVA ,testing shall necessarily be carried out at site. However , initial inspection can be done at factory/manufacturer works before dispatch at site of work at the discretion of Engineer in Charge as per details given at clause No. 1.15.2.2 of General Specifications for Electrical Works Part – VII (DG Sets) 2006. All major items /equipments i.e. engine & alternator in assembled condition, electrical control panel etc. shall be offered for initial inspection at factory /manufacturers works. The cost of the Engineer's visit to the factory will be borne by the department .After initial inspection ,DG set and associated electrical panel equipments shall be cleared for dispatch at site.The department may also waive off the inspection & accept the test certificate issued by the manufacturers. The test certificate shall be furnished alongwith the equipment.

(ii) After completion of the installation work in all respects, the contractor shall offer the DG sets for testing DG set will be tested ON load for the rated KW rating .During testing. DG set shall be operated for a period of 12 Hrs. on the rated KW at DG sets KW rating and one Hour. on 10% overload after continous run of the 12 Hrs. Diesel shall be provided by the contractor. Any defect/abnormality noticed during testing shall be rectified. The testing will be declared successful only when no abnormality/failure is noticed during the testing.

(iii) Copies of all documents of routine & type test certificates of the equipments shall be furnished to the Engineer in Charge.

TRIAL RUN/RUNNING-IN-PERIOD.

15. After successful testing of the DG set,a trial run at available load will be carried out for 120 Hrs. or 15 days whichever is earlier. The DG set will be operated and a log of all relevant parameters will be maintained during this period . The arrangement of staff for trial run/running in period will be made by the successful tenderer.However diesel shall be provided by department. The contractor will be free to carry out necessary adjustments. The DG will be said to have successfully completed the trail run,if no break down or abnormal/unsatisfactory operation of any component of the entire installation included in the scope of work of the contract ,occurs during this period .After this the DG set will be made available for beneficial use.After the DG set has operated without any major break down/trouble,it shall be taken over by the department

subject to guarantee clause of this contract. This date of taking over of the DG set,after trouble free operation during the trial run/running-in-period,shall be the date of acceptance/taking over.

16. SAFETY MEASURES

All equipments shall incorporate suitable safety provisions to ensure safety of the operating personnel as per manufacturers standard practice.

17 . GUARANTEE

All equipments shall be guaranteed, against unsatisfactory performance and/or breakdown due to defective design, workmanship or material, for period of 12 months from the date of taking over the installation by the department .Theequipments or components, or any part therof so found during the guarantee period shall be forthwith repaired or replaced free of cost, to the satisfactory of the Engineer-In-Charge. In case it is felt by the department that undue delay is being caused by the contractor in attending the defect/fault removed, the same will be got done by the department at the risk and cost of the contractor. The decision of Engineer-in-Charge in this regard shall be final.

18. PAYMENT TERMS

The following percentage of contract rated shall be payable against the stages of work shown herein:

	Stage of work	Engine – Alternator Set	All other items
I	After delivery at site in good condition on pro-rata basis.	75%	70%
II	On completion of pro-rata installation	15%	20%
III	On commissioning and completion of Successful running in period & taking over of the DG Set by the department.	10%	10%

Deduction of Security Deposit shall be governed by standard/relevant clauses of CPWD 7/8 as amended upto date.

19. TENDER DRAWINGS, DRAWING FOR APPROVAL AND COMPLETION DRAWINGS

(i) Drawings for approval on award of the work.

The contractor shall prepare and submit three sets of following drawings and get them approved from the Engineer-in-Charge before the start of the work. The approval of drawings, however, does not absolve the contractor not to supply the equipments/materials as per agreement, if there is any contradiction between the approved drawings and agreement.

(a) Lay out drawings of the equipments to be installed including control cables, fuel/lube oil pipes and supports/structure for exhaust piping, chimney and bus ducts/cable trays.

(b) Drawings including section, showing the details of erection of entire equipments.

(c) Electrical wiring diagrams from engine-alternator set to electrical control panel, electrical control panel to essential LT board including the sizes and capacities of the various electrical/cables and equipments.

(d) Dimensioned drawings of acoustic enclosure/Engine-Alternator set and electrical control panel.

(e) Drawings showing details of supports for pipes, chimney cable trays, ducts etc.

(f) Any other drawings relevant to the work.

20. Drawings/Documents to be furnished on completion of installation.

(i) Two sets of the following laminated drawings shall be submitted by the

contractor while handling over the installation to the Department.

(a) DG Set installation drawings giving complete details of all the equipments, including their foundations.

(b) Line diagram and layout of all electrical control panels giving switchgear ratings and their disposition, cable feeder sizes and their layout.

(c) Control wiring drawings with all control components and sequence of operations to explain the operation of control of control circuits in control panel/PCC.

Manufacturer's technical catalogues of all equipments and accessories.

Operation and maintenance manual of all major equipments, detailing all adjustments, operation and maintenance procedure.

TERMS & CONDITIONS – CCTV, LAN SYSTEM

1. The items of work detailed in enclosed schedule of quantities should be carried out as per CPWD General Specifications as for as applicable.
2. All materials used in the work as far as applicable shall comply with the relevant Indian Standard specifications with all its upto date amendments. These materials having ISI marked shall have precedence over the ones conforming to ISI specifications. The firm shall quote the rate inclusive of all taxes.
3. All the sundry materials required in the job shall be arranged by the contractor.
4. The contractor shall co-ordinate with other agencies working at site.
5. No T & P shall be issued by the department.
6. The successful contractor shall do servicing of the installation in the year commencing from the date of its handing over within tendered cost.
7. The successful firm shall demonstrate the functioning of the system, after it's commissioning and shall give guarantee for one year.
8. The successful firm shall do free comprehensive maintenance/servicing of the installation during the guarantee period of one year within the quoted cost.
9. The contractor shall submit the three copies of completion plan.
10. Store including watch and ward shall be the responsibility of the successful contractor till handing over of the installation.
11. Contractors shall obtain the approval of make & model of equipments, control panel/wires/pipes etc. before its use from the Engineer in charge.
12. Making hole in existing slabs/wall the same shall be the responsibility of the contractor.
13. The system should be guaranteed for 12 months from the date of taking over of the system. The system should be maintained free of cost for one year from date of taking over of the system.
14. The rates should be inclusive of all taxes, transportation etc. nothing extra other than quoted rate will be paid.
15. The department reserves the right to check the geniuses of material hence the payment of materials will be released only after the satisfaction of Engineer-in-charge.
16. The contractor shall furnish the detailed schematic diagram of the system and get it approved from Engineer - in – charge well in time.
17. All electronic equipment shall conform to the pertinent regulations governing radio frequency electromagnetic interference and should be so labelled.
18. All system components and sub-systems are to be fault tolerant and provide satisfactory operation without damage at + 10% of the rated voltage and at + 3 Hz variation in line frequency.
19. On completion of works "As Built" drawings for completed installation shall be prepared by the Contractor and three copies of the same will be supplied to the Engineer-in-Charge.
20. The onus of incorporating the statutory requirements as per local rules and obtaining necessary approval for various systems shall rest fully with the Contractor.
21. The installation shall be carried out using new Equipment/ Materials complying with applicable standards in a workmanship like manner. Engineer-in-charge reserves the right to reject any part of installation having poor workmanship.
22. All minor Masonry, Carpentry and Civil works such as cutting / opening in Masonry Walls/ Internal Partitions, Chasing on Walls, etc. and making good the same to match existing surface shall be done by the Contractor, wherever asked for by the Engineer-in-charge or his authorized representative. Nothing extra shall be paid on this account.

23. The work shall comprise entire labour including supervision and all materials necessary to make a complete installation to the entire satisfaction of the department. The term complete installation shall mean, not only major items of equipment covered by these specifications, but also incidental sundry components necessary for complete execution and satisfactory performance of the installation, with all labour charges, whether or not these have been mentioned in detail in the tender documents. The work shall include data entry, programming, start-up test and demonstration, training of personnel for maintenance and operation, submission of construction and installation drawings and wiring diagrams, as built documents and system guarantee.
24. The Contractors' scope of work will include all items of work as per these specifications, drawings, terms and conditions of contract etc. and briefly described in schedule of quantities.

LIST OF APPROVED MATERIALS (ELECTRICAL)

Note :

1. Unless otherwise specified, the brand/make of the material as specified in the item nomenclature or in the particular specifications or in the list of approved materials attached in the tender, shall be used in the work.
2. The Contractor shall obtain prior approval from the Engineer-in-charge before placing order for any specific material/ Brand/ Make.
3. Whenever the specified brand of material is not available than, the Engineer-in-charge may approve any material equivalent to that specified subject to proof being offered by the Contractor for its equivalence and its non-availability to his satisfaction.
4. IS confirmed products to be ISI Marked.

Sr. No.	Item	Makes
	INTERNAL ELECTRICAL INSTALLATION	
1.	FRLS PVC insulated Copper wire/TV/ Telephone Cable (ISI Marked)	R.R. Kabel /Finolex / Polycab/ Havells / Grandlay
2.	Steel Conduit & accessories (ISI Marked)	AKG/ BEC/ RMCON/Steel Kraft/ Precision
3.	PVC Conduit & accessories (ISI Marked)	AKG/ BEC/ Polycab/Finolex/Precision
4.	MCB / Industrial socket and plug, Isolator, ELCBS (MCB& DB shall be same make)	Lauritz Knudsen(EXORA)/Siemens (5SL) /Schneider (ACTI9)/ Legrand (DX3)
5.	Distribution Boards	Lauritz Knudsen /Siemens/Schneider/Legrand
6.	MCCB (ICS=100% ICU at 415V) / Changeover Switches.	Lauritz Knudsen (D-sine)/Siemens (3VA)/Schneider (NSX)/ Legrand (DPX3)
7.	Exhaust fan/Wall Fan/Fresh Air Fans	Usha / Crompton / Bajaj/Havells/ Atomberg/ Almonard
8.	Ceiling Fan	Crompton / Usha / Havells /Atomberg/Bajaj
9.	G.I. Pipe / M.S Pipe	Jindal / Tata /SAIL/Prakash surya (All With ISI Marked)
10.	DWC HDPE Pipe	REX/Duraline/Gemini/Durton (ISI marked)
11.	Modular 6/16 Amp. Switch / Socket / Blanking Plate /Metal Switch Box (the gauge of switch Box shall not less than 18 SWG& of the same make that of Switch) Front Plates, Telephone, T.V. Outlets Socket /Computer Socket / Fan Regulator. (ISI Marked)	Legrand (Myrius)/ Schneider (Zencelo) /ABB(IVIE)/ Havells
12.	Octagonal Street light Poles	Transrail /Bajaj/Volmount/Surya/Jindal
13.	XLPE insulated PVC sheathed 1.1 KV grade Aluminum/Copper conductor Armoured Cable (ISI Marked)	R.R. Kabels / Finolex / Polycab / Havells / Grandlay
14.	Gland/Lugs	Dowells/Comet/Jainson/Havells
15.	Indoor Fitting /Out Door Fitting / Street Light Fitting	Philips /Lighting Technologies /Havells/Regent/Bajaj
16.	Cubical Panel Board /Feeder Pillar/APFC Panel	Tricolite / Solution System, Bhopal / Insta Power Control & Equipment/ Pristine /Adlec power pvt ltd./Scimens or authorized channel partner /Amit Power control/ABB or authorized channel partner /Legrand or authorized channel partner / Lauritz Knudsen or authorized channel partner /C & S or authorized channel partner / Bhopal Switchgears.
17.	Geyser / Water heater / Oil immersion heater	Bajaj /Crompton/V-Guard/ Racold /Usha/Havells
	Raising Main, Bus Trunking (Sandwich/Air Insulated) & Tap-off boxes)	Legrand/Schneider / Lauritz Knudsen /Siemens/C&S
	Split AC	O general /Mitsubishi/ Hitachi /Daikin
1.	FBC, Hose pipe, Hydrant valves, Fire Brigade Inlet, Hose Cabinet, First Aid Hose real/ Branch Pipe/ Single & Double Headed GM Landing Valve (ISI Marked) Weather Proof Hose Cabinet/Fire Extinguishers	Life guard/ Minimax/Newage/Superex/Padmini/Ceasefire/Jonson control (Tyco)
2.	LT Switchgear	Lauritz Knudsen /Schneider/Siemens/Legrand
3.	Starter	Crompton/ Lauritz Knudsen /Siemens/Eaton/BCH

4.	Refrigerator	Samsung/LG/Whirlpool / Lloyd
5.	Electric kettle	Havells /Pigeon / Prestige/Bajaj
6.	RO system	Kent/ Ions exchange /Eureka forbes/
7.	Wall Digital Clock	Ajanta/ Titan/Casio
8.	Ammeter/Voltmeter	IMP/AE/MECO/ Lauritz Knudsen
9.	Batteries	Exide/Amaron/luminous/SF
	SOLAR PV SYSTEM	
1	Solar PV Panel/Module	Tata Power Solar /Waaree Energies Solar/Adani Solar /Vikram Solar/Havells Solar
2	GI Pipe	Tata/Jindal/SAIL
3	Hot Dipped Galvanised Iron cable tray	MEM/ OBO/ Legrand ISI approved.
	DG set	
1	Engine	Cummins /Kirloskar /Crompton Greaves/ caterpillar
2	Alternator	Kirloskar electric & Green / Stamford / Leorysomar/Crompton Greaves.
3	Acoustic Enclosure & AMF panel	As per OEM/OEAstandard.
4	Battery	As per OEM standard.
	CCTV & ACCESSORIES	
1.	CCTV Camera/Bullet camera/Dome Camera/ PTZ camera and NVR	Bosch/Sony/Siemens -STQC Certified/ Honeywell/Axis communication.
2.	LED Display/TV	LG/Sony/Samsung/
3.	UPS	APC-SCHNEIDER/VERTIV/EATON/NUMBERIC /RIELLO
4.	All in one Personal Computer/Monitor	HP/DELL/LENOVO
5.	Network Switch	Arista/Cisco/HP/Juniper/Extreme/Netgear/D-Link
5.	LAN Cable, Patch Card & Cable Manager, Patch Panel, CAT 6 A cable, Fiber optic cable, LIU, etc. all related accessories	Legrand/Belden/Systimax (Commscope) /Molex/Panduit
6.	Network Rack	Netrack/Rittal/Legrand (Valrack)
7.	All other items not covered above	As per approval of the Engineer-in-charge.

Note : All the make approved by the O/o ADG, (Region Bhopal), CPWD, Bhopal upto the previous day submission of bid are also approved.

Condition Regarding Approved Makes and Equivalents:-

1. The make/brand of products specified in the Schedule of Quantities (SOQ), Nomenclature of Items, and the List of Approved Makes shall be strictly adhered to. However, in the event that the specified make/brand is not available in the market, the contractor shall submit a request for approval of an equivalent make/brand to the Engineer-in-Charge within thirty (30) days from the date of award of work.

2. Approval of such equivalent make/brand shall be considered only if the originally specified make/brand is not available in the market, and shall be at the sole discretion of the Engineer-in-Charge. In cases where the rate of the approved equivalent make is lower than that of the specified make, the difference in cost shall be adjusted and recovered from the contractor. However, if the rate of the approved equivalent make is higher, no extra payment shall be admissible.

3. For items/materials not appearing in the Schedule of Quantities (SOQ), Nomenclature of Items, and the List of Approved Makes, the decision of the Engineer-in-Charge regarding the make/brand to be used shall be final and binding on the contractor.