Balmer Lawrie & Co. Ltd. (बामर लॉरी एंड कंपनी लिमिटेड)
(A Government of India Enterprise) (भारत सरकार का एक उद्यम)
Engineering & Projects (इंजीनियरिंग और परियोजनाएं)
21, Netaji Subhas Road (21, नेताजी सुभाष रोड**)**
Kolkata - 700 001 (कोलकाता – 700 001**)**

Warehouse illumination and allied work (वेयरहाउस रोशनी और संबद्ध कार्य)

at (पर)

Container Freight Station, P-3/1, Transport Depot Road, Kolkata-700088 (कंटेनर फ्रेट स्टेशन, P-3/1, ट्रांसपोर्ट डिपो रोड, कोलकाता-700088)

Tender No. EP/CFS/KOL/WH/ELE/04/R1

Tender Date: 25.10.2021

Due Date: 15.11.2021, 16:00 Hrs

UNPRICED PART (PART-I)

TENDERER'S CHECKLIST POINTS

Tenderer shall require filling in the table below appropriately:

Sl No.	Submission of Document	Tenderer's Confirmation/Submission (Yes / No)
1	Earnest Money Deposit	
2	120 days validity of the offer confirmation	
3	Audited Annual Reports (for past three years)	
4	Copy of Work Order and Completion Certificates for similar job as per Pre-qualification Criteria	
5	Power of Attorney of the Signatory	
6	PAN	
7	Provident Fund Registration	
8	GSTIN Registration	
9	Valid MSE registration certificate as per tender if applicable	
10	Compliance of Company's HSE policy	
11	**Price Schedule** in Un-priced Bid duly blanked out and signed	
12	**Tender Document** (along with addendum if any) duly signed and stamped on all pages	
13	**Price quoted** strictly as per Tender price schedule	
14	**Payment Terms** in compliance to tender requirement	
15	**Completion Period** in compliance to tender requirement	
16	**LD clause** in compliance to tender requirement	
17	**Warranties and Guarantee** in compliance to tender requirement	
18	All others Technical & Commercial Terms & Conditions shall remain unaltered as per Tender document	

Hard copies of the above confirmatory documents must be sent before due date of submission of online tenders

Bidder's Information

Sl no.	Description	Details to be filled up by Bidder
1	Name1 (max. 35 char.)	
2	Name2 (max. 40 char.)	
3	Street/House No. (max. 50 char.)	
4	Street1 (max. 40 char.)	
5	Street2 (max. 40 char.)	
6	PIN Code (Postal Index No. e.g. "700001") (max. 6 char.)	
7	City/Place (e.g. "Kolkata" or "Dehradun") (max. 40 char.) or as the name of the city	
8	Country ("India" or "England" or as the name of country be)	
9	State (Name the state from where the office of Bidder operates)	
10	First Tel. No. (With STD Code): (e.g. 033-22225280 or 022-66552814) (max. 30 char.)	
11	First Fax No. (with STD Code)	
12	Contact Person	
13	First Mobile No.	
14	E-mail Address) (max. 40 char.)	
15	PAN No. :	
16	GSTIN Registration No. :	
17	GSP Name (GST Suvidha Provider)	
18	Bank Name (max. 60 char.)	
19	Street (max. 35 char.)	
20	City (max. 35 char.)	
21	Branch (max. 40 char.)	
22	IFSC Code	
23	MICR Code	
24	Account No.	
25	Type of Account (Current, Savings, etc.)	

LIST OF CONTENT:

UN-PRICED PART (PART I)

PRICED PART (PART II)

NOTICE INVITING TENDER
Tender No. EP/CFS/KOL/WH/ELE/04/R1

1.0 Balmer Lawrie & Co. Ltd. invite **ONLINE BIDS in Two Part System** from experienced, competent and resourceful contractors with sound technical and financial capabilities for illumination and allied work for Proposed Warehouse at Container Freight Station, P-3/1, Transport Depot Road, Kolkata-700088.

2.0 **SCOPE OF WORK**

The tender under reference covers supply, installation, testing, commissioning of Lighting, cabling and other associated work for industrial warehouse as per the notice inviting tender, condition of contract, technical specification, tender drawing, data sheet, schedule of work etc.

Quantities mentioned in the Schedule of Work are estimate only. Successful bidder needs to prepare and submit detailed drawings along with bill of quantities for owner's approval before procurement.

3.0 **COMPLETION PERIOD**

Time is the essence of the contract. The time schedule for total work according to the contract shall be **12 (Twelve) Weeks** from the date of placement of order or **8 (Eight) weeks** from the date of formal handing over of work-front whichever is later.

4.0 **EARNEST MONEY DEPOSIT**

Unpriced Part of the Bid should be accompanied by a Demand Draft or Bank Guarantee of **Rs 15250.00** (**Rupees Fifteen Thousand Two hundred and Fifty Only)** towards Earnest Money Deposit (EMD) executed by any scheduled bank drawn in favour of M/s Balmer Lawrie & Co. Ltd. payable at Kolkata as per format enclosed. EMD submitted by way of Bank Guarantee should be valid for a minimum period of 120 days after the due date of tender submission.

Earnest Money deposit (EMD) is exempted for agencies registered under NSIC or coming under the definition of Micro and Small Industries and holding valid registration certificates covering the tendered items/services. Declaration of Udyog Aadhar Memorandum (UAM) by the MSE parties on Central Public Procurement Portal (CPPP) shall be mandatory. However, valid NSIC certificate or "Micro and Small" industry certificate must be submitted in this regard.

4.1 For the successful bidder, the EMD will be refunded only after completion of the work. No interest shall be payable towards EMD amount.

4.2 For the unsuccessful bidders, the EMD will be refunded only after the successful bidder has accepted the work order and the acknowledgment of the same has been received by the owner.

4.3 EMD is liable to forfeiture in the event of:

a) Withdrawal of offers during validity period of the offer
b) Non-acceptance of orders by the bidder within the stipulated time after placement of order.
c) Any unilateral revision made by the bidder during the validity period of the offer.
d) Non-performance of the bidder during the tenure of work.
e) Bidders submitting false/fabricated/bogus documents in support of their credentials

5.0 PRE-QUALIFICATION CRITERIA

5.1 Average annual turnover of the tenderer shall be minimum of **Rs 42.5 Lakhs** during last three financial years ending 31st March, 2020.

5.2 The tenderer should have successfully executed **Electrical Installation Work** during past seven years ending last day of month previous to the one in which the tender is invited: -

a. 3 jobs each of value not less than **Rs 12 Lakhs** or
b. 2 jobs each of value not less than **Rs 15 Lakhs** or
c. 1 job of value not less than **Rs 24 Lakhs**

Copy of work orders and completion certificates / commissioning report from the owner/ consultant should be enclosed as supportive documents. Order copy issued by the owner to the consultant shall also be furnished if the completion certificate is issued by the consultant on behalf of the owner.

5.3 Tenderer should have PAN, GSTIN registration, PF registration, ESI registration. Copy of the same shall be submitted along with techno commercial offer.

6.0 TENDER DOCUMENTS

Tender Documents comprises two parts viz. Part-I (Un-priced) and Part-II (Priced). The Un-priced Part consists of Notice Inviting Tender, Condition of Contract, Technical Specification and Drawings. The Priced Part consists of Priced Schedule. Bidders are requested to download the tender document and read all the terms and conditions mentioned in the tender document and seek clarification if any, from **Soumyadip Sanyal, Dy. Manager, Mob (7439626033)**. Any clause defining offline bid submission in the tender document shall not be considered.

7.0 TENDER SUBMISSION

The intending tenderers shall be deemed to have visited the site and familiarise themselves thoroughly with the prevailing site conditions before submission of the tender. Non-familiarity with the site conditions will not be considered reason either for extra claim or for not carrying out the work in strict conformity with the drawing, specification and time schedule.

The tenderer is required to register on the e-procurement site https://balmerlawrie.eproc.in and submit their bids online.

For registration and online bid submission tenderer may contact the following officials at the HELP DESK of M/s C1 India on browsing to the website https://balmerlawrie.eproc.in during business hours (10:00 a.m. to 06:30 p.m.) from Monday to Friday (Excluding holidays of the Company):

Dedicated Helpdesk for Balmer Lawrie			
Contact Person	**E-Mail ID**	**Tel. No.**	**Days**
1. Mr. Tirtha Das (Kolkata)	tirtha.das@c1india.com	+91-9163254290	MON - FRI
2. Mr. CH. Mani Sankar (Chennai)	chikkavarapu.manisankar@c1india.com	+91-6374241783	MON - SAT
3. Ms. Ujwala Shimpi (Mumbai)	ujwala.shimpi@c1india.com	+91-22-66865608	MON - FRI
4. Helpdesk Support (Kolkata)	blsupport@c1india.com	+91-8017272644	MON - SAT
Escalation Level 1			
Mr. Tuhin Ghosh	tuhin.ghosh@c1india.com	+91-8981165071	
Escalation Level 2			
Mr. Sandeep Bhandari	sandeep.bhandari@c1india.com	+91-8826814007	
Escalation Level 3			
Mr. Achal Garg	achal.garg@c1india.com		
In case, you are unable to get in touch with any of the Technical Support Associates, kindly drop a mail at blsupport@c1india.com mentioning your Name and Mobile No. One of C1 India's associates will get back shortly.			

The tenderer shall authenticate the bid with his Digital Certificate for submitting the bid electronically on e-procurement platform and the bids not authenticated by digital certificate of the tenderer will not be accepted on the e-procurement platform.

All the tenderers who do not have digital certificates need to obtain Digital Certificate **(with both Signing and Encryption Components).** They may contact help desk of M/s C1 India.

The tenderer shall furnish the original Demand Draft /BG for EMD to the tender inviting authority so as to reach on or before the due date and time of the Tender either personally or through courier or by post and the receipt of the same within the stipulated time shall be the responsibility of tenderer. The Company shall not take any responsibility for any delay or non-receipt. If any of the documents furnished by the tenderer is found to be false/fabricated/bogus, the tenderer is liable for blacklisting, forfeiture of the EMD, cancellation of work and criminal prosecution. The tenderer is requested to get a confirmed acknowledgement from the Tender Inviting Authority as a proof of Hardcopies submission to avoid any discrepancy.

The bidders found defaulting in submission of hard copies of original Demand Draft / BG for EMD and other documents to the Tender Inviting Authority on or before the stipulated time in the Tender will not be permitted to participate in the Tender.

The bidder is requested to read all the terms and conditions mentioned in the tender Document and seek clarification if any from if in doubt.

The bidder should keep track of any Addendum / Corrigendum / Amendment issued by the Tender Inviting Authority on time-to-time basis in Company's website (www. Balmerlawrie.com) and e-procurement site (https://balmerlawrie.eproc.in). No separate newspaper advertisement shall be published for such Addendum / Corrigendum / Amendment etc. The Company calling for tenders shall not be responsible for any claims/problems arising out of this.

The tenderer should complete all the processes and steps required for bid submission. The successful bid submission can be ascertained once acknowledgement is given by the system through bid submission number after completing all the process and steps. M/s C1 India is not responsible for incomplete bid submission by users. Tenderers may also note that the incomplete bids will not be saved by the system and are not available for the Tender Inviting Authority for processing.

Neither the Company (Balmer Lawrie & Co. Ltd.) nor the service provider (M/s C1 India) is responsible for any failure or non-submission of bids due to failure of internet or other connectivity problems or reasons thereof.

The hardcopies of the Bid Documents as explained above and also defined in clause no. 2.0 of Conditions of Contract under sealed envelope should reach the office of **Head (Engineering & Projects), Balmer Lawrie & Co Ltd, Engineering & Projects Department, 21 Netaji Subhas Road, Kolkata 700001**, on or before the due date of submission of tender. The Bidders who are submitting the Bids in person are requested to drop the same in our tender box located at the entrance of 2nd floor at the above address.

8.0 **SUPPLY OF MATERIAL**

All materials required for the work shall be supplied by the Tenderer.

9.0 **TAXES & DUTIES**

All taxes and duties other than GST shall be included in the quoted rates. GST shall be quoted separately at applicable rate in the price bid format.

10.0 **DEVIATION**

It is expected that bidders will submit their bid strictly based on the terms and conditions and specifications contained in the bidding documents and will not stipulate any deviations. Should it, however, become unavoidable, deviations should be submitted (in bidder's letter head, stamped & signed) along with the unpriced Bid (Part-I). Deviations mentioned in any other place shall not be considered by the owner.

11.0 **BASIS OF EVALUATION**

Bidders will be selected through evaluation of their Unpriced Bids based on fulfilment of pre-qualification criteria i.e. submission of all required PQ documents and other required documents, EMD/MSE Certificate as per the instructions contained in the tender document. Price Bids will be opened only for the bidders whose Unpriced Bids (Part-I) are found to be acceptable. It is mandatory to quote for all the items failing which bid may be rejected. L1 Bidder will be determined based on total basic amount comprising of all items.

12.0 **INSTALLATION, COMMISSIONING & TRAINING**

The installation, testing and commissioning of the equipment/illumination system shall be carried out by competent engineers/technicians of the Tenderer at the work site. After commissioning, the successful bidder's engineer / technician shall impart necessary training to Owner's personnel in operating and maintaining the illumination system and related Lighting DBs. No separate charge shall be payable by the Owner for the purpose.

13.0 **NON-CONFORMANCE**

Tenders not conforming to the above-mentioned requirements are liable to be rejected.

14.0 **VALIDITY OF OFFER**

Tendered shall keep their offer valid for a period of 120 days from the date of opening of Unpriced bid.

15.0 **QUANITITY VARIATION**

The quantity as mentioned in the Schedule of Work/ Price Bid is indicative. The selected bidder/Contractor shall however ascertain the exact quantity required at site, obtain approval from the owner on quantity, supply and install accordingly. As the work progresses, it is possible that there will be quantity variations to any extent & omission of items. Specially, the quantity of lighting fixtures, cables may vary extensively based on detailed design requirement/site conditions. Under all such circumstances, the rates should be firm.

16.0 **FIRM PRICE**

The price should be firm and irrevocable and not subject to any change till the completion of Scope of Work.

17.0 **RATES AND OTHER ENTRIES**

(a) The tenderer should quote for all items in the Schedule of Rates. If there is any discrepancy between unit rate and total amount, the unit rate will prevail.

(b) The rates should be quoted in the same units as mentioned in the tender schedule of quantities.

(c) All entries in the tender documents should be in ink / type. Corrections if any should be attested by full signature of the tenderer.

(d) Every page of the tender document including annexure / enclosures shall be stamped and signed by the tenderer or his authorized representative thereby indicating that each and every page has been read and the points noted.

18.0 **RIGHT TO ACCEPT OR REJECT TENDER**

18.1 M/s Balmer Lawrie & Co Ltd reserves the right to accept or reject any or every tender without assigning any reason whatsoever / or to negotiate with the tenderer (s) in the manner it considers suitable. In the event of receipt of lowest price from more than one (1) bidders, fresh price bids shall be invited from the lowest bidders only to determine final lowest bidder for placement of order.

18.2 Bids of any tenderer may be rejected if a conflict of interest between the bidder and Company (Balmer Lawrie) is detected at any stage.

18.3 All the bids will be evaluated based on Pre-qualification and other criteria as mentioned in this NIT. Tenders of those bidders who are not meeting the pre-qualification criteria will not be considered for commercial evaluation.

18.4 Tender if submitted through e-mail or fax shall be summarily rejected.

18.5 Hard copy of Price Bid should not be submitted in the envelope containing Un-priced documents failing which the bid will be summarily rejected.

18.6 Clarifications /exceptions / deviations to the tender terms & conditions and specifications:

Balmer Lawrie & Co. Ltd. expects Tenderers to confirm compliance to tender terms & conditions and specifications, failing which the Tenderers are liable to be rejected. Hence all Tenderers in their own interest are advised to submit their bids in all respects confirming to all terms & conditions of the bid document.

Bids shall be evaluated based on the information / documents available in the bid. Hence Tenderers are advised to ensure that they submit appropriate and relevant supporting documentation alongwith their proposal in the first instance itself. Bids not complying the requirements of bid documents will be rejected without any further opportunity.

For any Technical clarifications / queries Tenderers are requested to contact from Soumyadip Sanyal, Dy. Manager, Mob (7439626033) (from 10.00AM to 06.00PM, Monday - Friday).

for **Balmer Lawrie & Co Ltd**

(G C Saha)
Head (Engineering & Projects)

CONDITIONS OF CONTRACT

1.0 DEFINITIONS

The following expressions hereunder and elsewhere in the contract documents used shall have the following meanings respectively assigned to them namely,

1.1 The “Owner/Client” shall mean M/s **Balmer Lawrie & Co. Ltd**; a company incorporated in India and having its Registered Office at 21, Netaji Subhas Road, Kolkata - 700 001, and shall include its successors and assigns.

1.2 The "Project" shall mean “Warehouse illumination and allied Work” for ongoing warehouse work at Container Freight Station, P-3/1, Transport Depot Road, Kolkata-700088.

1.3 The 'Engineer-In-Charge'/'Engineer' shall mean the Engineer /Officer authorized by the ‘Owner’ for the purpose of the contract for overall Supervision and Co-ordination of site activity and certification of billing.

2.0 DETAILS OF HARD COPIES TO BE SUBMITTED ALONG WITH THE TENDER

The tender, as submitted, shall consist of the following:

(i) Hard copy of Un-priced Tender Document duly filled in, stamped and signed by the Tenderer as prescribed in different clauses of Tender documents. **No hard copy of priced bid shall be submitted**. Priced bid shall only be submitted online. The price bid file in pdf format shall be downloaded from the website, bidder to fill in their item-wise rates & amounts on hard copy, stamp, sign, scan and upload the same. Tenderer may like to upload scan copy of stamped & signed tender document and in such case no hard copy is required to be submitted. A line of email communication shall be made for confirmation.

(ii) Earnest money amounting to and in the manner specified along with the Un-priced bid or valid NSIC/ MSE Certificate

(iii) Copy of Power of Attorney or authorisation, or any other document consisting of adequate proof of the ability of the signatory to bind the bidder. No Power of Attorney is required if the tender document is signed by the proprietor. Proof of proprietorship shall be established.

(iv) Similar work in past Seven years by the tenderer with copy of work orders and completion document from the client/ consultant appointed by the client.

(v) Audited annual report for last three financial years. CA certificate for year 2019-20 shall be acceptable in case the report is not audited.

(vi) PAN / GST / PF /ESI

(vii) Bank details and any other details as per enclosed format required in terms of this tender.

3.0 RATES AND OTHER ENTRIES

(a) The tenderer should quote for all items in the Schedule of Rates. Where discrepancy exists between the two, the rates expressed in words will prevail. Similarly, if there is any discrepancy between unit rate and total amount, the unit rate will prevail.

(b) The rates should be quoted in the same units as mentioned in the tender schedule of quantities.

(c) All entries in the tender documents should be in ink / type. Corrections if any should be attested by full signature of the tenderer.

(d) Every page of the tender document including annexure / enclosures shall be stamped and signed by the tenderer or his authorised representative thereby indicating that each and every page has been read and the points noted.

4.0 RIGHT TO ACCEPT OR REJECT TENDER

The Owner reserves the right to accept or reject any or every tender without assigning any reason whatsoever / or to negotiate with the tenderer(s) in the manner the Owner considers suitable. The work may be split up if considered expedient.

5.0 SECURITY DEPOSIT

(i) On acceptance of the Bid, Bidder shall within fifteen (15) days, deposit with Owner an Initial Security Deposit of **3% of the Basic Contract value** (i.e. order value excluding taxes) and the same shall be in any of the following form:

a) Bank draft drawn on a Kolkata Branch of any Scheduled Bank in favour of Balmer Lawrie & Co Ltd.

b) Bank Guarantee executed by any Scheduled Bank as per proforma enclosed and shall be valid at least sixty days after the completion of work.

(ii) If the Bidder fails to provide the Security Deposit within the period specified, such failure will constitute a breach of the Contract and Owner shall be entitled to award the Work elsewhere at Supplier's risk and cost. The EMD of the bidder to whom Contract was awarded, shall be forfeited

(iii) No interest shall be payable against Security Deposit.

(iv) Owner can permit Bidder to replace the initial Security Deposit as Retention Money after successful completion of the work.

(v) Wherever the Security Deposit / Retention Money is furnished by Bidder in any form other than in cash or Demand Draft, Bidder shall be entirely responsible to keep such form of security deposit enforceable by extending the validity thereof before one month of date of expiry and keep them enforceable, until released by Owner after the Defect Liability Period.

(vi) The Security Deposit / Retention Money shall remain at the entire disposal of Owner as a security for satisfactory execution and completion of the Work(s). Owner shall be at liberty to deduct and appropriate from the Security Deposit / Retention Money such damages (liquidated or otherwise) and other dues and recoveries from Bidder under this Contract and the amount by which Security Deposit / Retention Money is reduced by such appropriations, will be made by further deductions from Bidder's subsequent bills to that extent as to make up the Security Deposit / Retention Money.

(vii) Notwithstanding anything to contrary, in as much as the Security Deposit is to be in cash with Owner, Owner shall be entitled to enforce any of the approved forms of Security Deposit furnished by Bidder at any time and realise cash thereof irrespective of whether or not Bidder disputes such right. However, if Bidder obtains the extension of the time limit, if any, for the enforceability of such form of Security Deposit and intimates Owner of such extension within one month before expiry, Owner may not enforce such form of Security Deposit, unless it has otherwise become enforceable.

(viii) On due and satisfactory performance of all the obligations of Bidder under this Contract including completion of work in all respects, carrying out the obligations of Bidder during Defect Liability Period, Retention Money shall be released by Owner subject to recoveries, deductions and retentions therefrom as provided under the Contract.

6.0 TESTING & INSPECTION

(i) All materials required for the execution of the work should be new and should conform to applicable standard specification and approved by the Engineer-in-Charge before actually put to use. Commencement of work without prior approval shall be entirely at the risk and cost of the Contractor. No delay due to non-availability of the materials, tools, equipment etc. will be entertained by the Owner. In the case of certain Machinery / Equipment, the Engineer-in-Charge may inspect the item for approval, before they are brought to site.

(ii) The Owner shall be entitled at all times at the risk of the Contractor to inspect and/or test by themselves or through any independent person(s) or agency (ies) appointed by the owner and/or to direct the Contractor to inspect and/or test all material(s), items and components whatsoever supplied or proposed for supply, for incorporation in the work inclusive, during the course of manufacture or fabrication by the Contractor and/or at the Contractors work or otherwise, such materials or items or components. The inspection and/or test shall be conducted at the expense of the Contractor and if conducted by the Contractor may be directed by the Owner to be conducted by agency (ies) nominated by Owner and/or in the presence of witness (ess) nominated by the Owner.

(iii) The Contractor shall furnish to the Engineer-in-Charge for approval when requested or as required by the specification or other contract documents, adequate samples of material intended for incorporation in the works. Such sample to be submitted before the work is commenced permitting sufficient time for tests, examination(s) thereto by the Engineer-in-Charge. All materials furnished and incorporated in the work shall conform to the sample(s) in all respects.

(iv) The Engineer-in-Charge shall be entitled to reject at any time any defective materials, item or components, (including special manufactured or fabricated items or components) supplied by the Contractor for incorporation in the works.

(v) The Contractor shall at all times ensure highest standard of workmanship, relating to the work to the satisfaction of the Engineer-in-Charge. The Engineer-in-Charge shall have the power to inspect the work as also to test or instruct the Contractor to test the works or any structure, material or component thereto at the risk and cost of the Contractor, either by the Contractor or by any agency(ies) nominated by the Engineer-in-Charge or Site Engineer on his behalf.

(vi) The Contractor shall provide all facilities, instruments material / labour and accommodation required for testing the works (including checking the set time out of work) and shall provide Engineer-in-Charge all assistance necessary to conduct the test whenever and wherever required.

(vii) The Engineer-in-Charge on inspection or test be not satisfied with the quality or workmanship of any work, structure, material, component (decision of the Engineer-in-Charge being final in this behalf), the Contractor shall re-perform, replace, re-install and / or re-erect as the case may be such work, structure material or component, as no such rejected work, structure, material, item or component shall be re-used without the prior permission of Engineer-in-Charge.

(viii) Notwithstanding any provided in the foregoing clauses hereto and notwithstanding the Engineer-in-Charge/ or his representative has inspected tested and/or approved any particular work, structure, material or component, such inspection, test or approval shall not absolve the Contractor of his full responsibilities under the contract inclusive or relative to the specification, performance guarantee. The said inspection and test procedure being intended basically for satisfaction of the Owner / prima-facie erection and/or material and equipment supplied for incorporation in the work is in order.

(ix) On no account shall the Contractor proceed with the covering up or otherwise placing beyond reach of inspection or measurement any work before necessary inspection, entries are filled in the Site Inspection Register by the Engineer-in-Charge or his authorised representative. Should the Contractor do so the same shall be uncovered at the Contractor's risk and expense for carrying out the inspection and measurement. Measurement of Work shall be recorded as per the direction of Engineer-in-Charge.

(x) If any tests are required to be carried out in connection with the work or materials or workmanship not supplied by the Contractor, such tests shall be carried out by the Contractor as per the instructions of Engineer-in-Charge and cost of such tests shall be reimbursed by the Owner.

(xi) The owner reserves the right to inspect the Equipment at Tenderer's works by them or through a third party nominated by the Owner. Tenderer will provide all assistance to Owner's inspector in carrying out such inspection at Tenderer's works free of any charges.

7.0 PERFORMANCE GUARANTEE:

7.1 Performance Guarantee:

a) The Contractor shall guarantee that the equipment and workmanship of work done and any fittings designed / manufactured / supplied by him are as specified in the tender schedule and wherever there is nothing specifically mentioned shall correspond to the best available grade and quality as required for the application.

b) The Contractor shall also guarantee that the work done and any fittings designed, manufactured, supplied, erected shall be as per prevailing relevant standard, codes and statutory practices / stipulations.

c) The Contractor shall **guarantee** the work done and any fittings designed, manufactured, supplied, erected and tested by him against defective materials, poor workmanship, improper design, operation inadequacies & problems and failure from normal usage, for a period of **12 (twelve) calendar months** after final acceptance of the work by the Owner. Performance Bank Guarantee shall be issued by any Nationalized / Scheduled Bank on basic value of material supplied and shall remain valid for above guarantee period.

7.2 **Warranty:**

The Contractor will repair and/or replace all defective parts, components / fittings, accessories etc. which shall be notified to them in writing within the Defect Liability Period Promptly at free of cost. The Contractor will provide similar warranty on the parts, components, fittings, accessories etc. repaired and/ or replaced.

8.0 SITE PARTICULARS

The intending tenderers shall be deemed to have visited the site and familiarised themselves thoroughly with the site conditions before submitting the tender. Non-familiarity with the site conditions will not be considered reason either for extra claims or for not carrying out the work in strict conformity with the drawings and specifications.

Project site is located at Container Freight Station, P-3/1, Transport Depot Road, Kolkata-700088. Contact Person for Site Visit: Mr Dharmendu Mandal, Dy. Manager (98741 56418)

9.0 SUPPLY OF MATERIAL

9.01 All materials required for the work shall be supplied by the Contractor. In addition, all materials required for temporary and enabling work shall be arranged and provided by the Contractor. All incidental expenses, loading, unloading, transportation, handling etc. shall be the responsibility of the Contractor and cost towards such expenses should be included in the finished item rates.

9.02 All other materials, as required to complete the works in all respects according to the contract rates shall be inclusive of all freights, GST and other taxes, duties, loading, unloading, transporting, handling and storage charges etc.

10.0 TIME FOR COMPLETION OF WORK

Time is the essence of the contract. The tenderer shall submit their plan to complete the whole work according to the overall time allowed for the execution of work as given in the Tender Documents and NIT.

10.0.1 The Contractor shall complete in all respects in accordance with the Contract, the entire work at each job site within the time specified in this behalf in the Time Schedule.

10.0.2 If the Owner so requires, the Progress Schedule in the form of CPM, giving the latest dates of starting and latest dates of finishing of various operations comprising the work as also the activities in the critical path and latest dates for achievement of specific milestones in respect of the work so as to complete in all respects the works (including testing and consequential operations) within the time provided in the Time Schedule. This Progress Schedule should also indicate the interlinking of the various activities and bring to light the specific/ critical items on which the inputs from the owner/ Engineer-in-Charge/ Consultant or other agencies, if any, would be required, to ensure adherence to the schedule.

10.0.3 If the Contractor shall fail to submit to the Owner/ EIC a Progress Schedule as envisaged above or if the Owner/EIC and Contractor fail to agree upon the Progress Schedule as envisaged above, then the Engineer-in-Charge shall prepare the Progress Schedule (the dates of progress as fixed by the Engineer-in-Charge being final and binding upon the Contractor except as herein otherwise expressed provided), and shall issue the Progress Schedule so prepared to the Contractor, which shall then be the Approved Progress Schedule and all the provisions of clauses 10.0.2 shall apply relative thereto.

10.0.4 Any reference in the Contract Documents to the Approved Progress Schedule" or to the "Progress Schedule" shall mean the "Approved Progress Schedule" specified in clause 10.0.2 above or the "Progress Schedule" prepared and issued by the Engineer-in-Charge as specified in clause 10.0.3 above, whichever shall be in existence. In the absence of such approved Progress Schedule or such Progress Schedule prepared by the Engineer-in-Charge, the Progress Schedule first prepared by the Contractor (with incorporation of the Owner's / Engineer-in-Charge's comments thereon if any), shall until such approved

Progress Schedule or such Progress Schedule prepared by the Engineer-in-Charge comes into existence, be deemed to be the Progress Schedule for the purpose of the contract.

10.0.5 Within 7(seven) days of the occurrence of any act, event or omission which, in the opinion of the Contractor, is likely to lead to delay in the commencement or completion of any particular work(s or operation(s) or the entire work at any job site(s) and in such as would entitle the Contractor to an extension of the time specified in this behalf in the Progress Schedule(s), the Contractor shall inform the site engineer and the Engineer-in-Charge in writing of the occurrence of the act, event or omission and the date of commencement of such occurrence. Thereafter, if even upon the cessation of such act or event or the fulfilment of the omission, the Contractor in his opinion that an extension of the time specified in the Progress Schedule relative to the particular operation(s) or item(s) or work or the entire work at the job site(s) is necessary, the Contractor shall within 7 (seven) days after the cessation or fulfilment as aforesaid make a written request to the Engineer-in-Charge for extension of the relative time specified in the Progress Schedule and the Engineer-in-Charge may at any time prior to completion of the work extend the relative time of completion in the Progress Schedule for such period(s) as he considers necessary, if he is of opinion that such act, event or omission constitutes a ground for extension of time in terms of the Contract and that such act, event or omission has in fact resulted in insurmountable delay to the Contractor.

10.0.5.1 The application for extension of time made by the Contractor to the Engineer-in-Charge should contain full details of-

a) The notice under clause 10.0.5 with a copy each of the notice sent to the Engineer-in-Charge and Site Engineer.

b) The activity for the Progress Schedule affected.

c) The bottleneck(s) or obstruction(s) perceived/ experienced, and the reason(s) therefor,

d) Extension required/ necessitated on account of c) above

e) Extension required/ necessitated on account of reasons attributable to the Owner,

f) Extension required/ necessitated on account of force majeure reasons, and

g) The total extension of time (if any) required/ necessitated for completion, taking the above into account and after eliminating all overlaps.

10.0.5.2 The opinion/ decision of the Engineer-in-Charge on this behalf and as to the extension of time necessary shall, subject to the provisions of clause 10.0.6 hereof, be final and binding upon the Contractor.

10.0.6 Subject as elsewhere herein or in the contract documents expressly provided, only the existence of force majeure circumstances as defined in 10.0.7 hereof shall afford the Contractor a ground for extension of time for completion of the work or any part of the

work or any operation(s) involved therein, and specifically without prejudice to the generality of the foregoing, inclement weather, strike, shutdown, third party breach, delay in supply of material(s) or commercial hardship shall not afford the Contractor a ground for extension of time or relieve the Contractor of his/its full obligations under the Contract, nor will any forced shutdown or idleness or other impediment in progress or completion of the work due to any reason whatsoever afford the Contractor a ground for extension of time or relieve the Contractor of his/its full obligations under the Contract except and to the extent otherwise elsewhere herein specifically provided, nor shall any shut down or idle time charges be payable by the Owner to the Contractor for delay in the commencement, progress or completion of the work due to any reason whatsoever, including due to the existence of force majeure circumstances.

10.0.7 The term “Force Majeure” as employed in this contract shall mean wars (declared or undeclared) or revolutions, civil wars, tidal waves, fires, major floods, earthquakes, epidemics, pandemic, quarantine restrictions and freight embargoes and transporters strikes affecting the country as a whole.

10.0.8 Upon an extension of the time for completion of the work or any part of the work or any operation(s) involved therein pursuant to clause 10.0.5 hereof, the extended date/time of completion shall be deemed to be the relative date of completion in the Progress Schedule, and such extension shall constitute the sole remedy of the Contractor for and/or arising out of such delays, and the Contractor hereby waives any and all contrary rights.

10.0.9 The mere fact that the Owner shall not have terminated the contract or that the Owner or Engineer-in-Charge has permitted the Contractor, for the time being to continue with the work for its completion shall not prejudice the full rights and remedies available to the Owner under the contract arising out of the delayed completion, including the right of Liquidated Damages and/or termination. Such permission(s) shall unless specifically stated to be an extension of time under clause 10.0.5, not be construed as extension(s) of time extension under clause 10.0.5, and shall merely constitute an indication or intimation, as the case may be, of the Owner’s willingness, for the time being, to accept the delayed completion, subject to its rights under the contract.

10.0.10 No assurance, representation, promise or other statement by any personnel, engineer or representative of the Owner in relation to extension of time for commencement or completion of any work(s) or operation thereof or of the entire works under the contract shall be binding upon the Owner or shall constitute an extension of time for commencement or completion of the entire works or any part or operation thereof within the provisions of clause 10.0.5, unless the same has been communicated to the Contractor in writing by the Engineer-in-Charge under clause 10.0.5 and in writing specifically states that it embodies an extension of time within the provisions of clause 10.0.5, and without prejudice to the afore-going, the mere agreement or prescription or signing of a Progress Schedule by the site engineer or any site representative of the Owner at variance of the progress schedule, as the case may be, referred to in clauses 10.0.2, 10.0.3 and/or 10.0.4 hereof or containing an extended time of commencement or completion in respect of the

entire work(s) or any part or operation thereof shall not anywise constitute an extension of time in the terms of the Contract so as to bind the Owner or relieve the Contractor of all or any of his liabilities under the Contract, nor shall constitute a promise on behalf of the owner or a waiver by the Owner of any of its rights in terms of the contract relative to the performance of the contract within the time specified or otherwise, but shall be deemed only(at the most) as a guidance to the Contractor for better organising his work on a recognition that the Contractor has failed to organise his work and/or perform the same within the time specified in the Progress Schedule established within the provisions of clause 10.0.2 or clause 10.0.3 or clause 10.0.4 hereof, as the case may be.

11.0 LIQUIDATED DAMAGE (LD)

(i) If the Contractor is unable to complete the work within the period specified in NIT, it may request owner for extension of the time with unconditionally agreeing for payment of LD. Upon receipt of such a request, owner may at its discretion extend the completion period and shall recover from the Contractor's running account bill, as an ascertained and agreed Liquidated Damages, a sum equivalent to **0.5% of basic contract value** for each week of delay or part thereof. The LD shall be limited to **5% of the basic contract value.**

(ii) The parties agree that the sum specified above is not a penalty but a genuine pre-estimate of the loss/ damage which will be suffered by the owner on account of delay/ breach on the part of the CONTRACTOR and the said amount will be payable to the Owner without proof of actual loss or damage caused by such delay/breach by the Owner.

(iii) Notwithstanding what is stated in Clause above, the Owner shall have the right to employ any other agency to get the remaining equipment at the risk and cost of the Contractor, in the event of his failing to complete the Supply within the stipulated time or in the even progress of Contractor's work is behind schedule, as judged by the Engineer-in-Charge.

(iv) Then the Engineer-in-Charge upon receiving necessary approval from competent Authority may in writing make a fair and reasonable extension of completion time as per provision provided further that the Contractor shall constantly use his best endeavour to the satisfaction of the Engineer-in-Charge to proceed with the Supplies. Nothing herein shall prejudice the rights of the Contractor under clause herein above.

(v) The Contractor may seek time extension for delay or anticipated delay as per clause 10.0.5 for reasons not attributable to them and in such case time extension may be given without imposition of LD subject to satisfaction of the Engineer-in-Charge.

12.0 REVISION / CHANGES / QUANTITY VARIATION

(i) Owner may make in writing any revisions or changes in the purchase order, including additions or deletions from the quantities ordered in the specifications or drawings. The Contractor shall carry out such revision / changes and be bound by the same terms and conditions to the extent applicable, though the said revisions/ changes were not incorporated in the initial order.

(ii) Owner reserves the right to increase or decrease the tendered quantity to any extent or replace specification, drawing, design of any or every item or delete them out at any stage of the work. The Contractor's claim for compensation or damages on account of this shall not be entertained. Such deviation shall be adjusted at the rates contained in the order/ contract or by issuing variation order(s) at the prevailing market rates, if the rates are not available in the order/ contract.

13.0 TERMS OF PAYMENT

For all Items

(i) No mobilization advance shall be paid to the Contractor.

(ii) **80%** of rate along with applicable taxes and duties against item wise receipt of materials as certified by the Engineer-in-Charge.

(iii) **20%** of rate along with applicable taxes and duties against item wise installation upon certification by the Engineer- in-Charge.

(iv) No additional retention money shall be deducted from the running account bills. The initial security deposit of 3% shall be treated as retention till the completion of the work. The tenderer shall replace the SD if submitted originally in BG, as PBG of 3% of final executed basic value of work as retention, or otherwise shall be retained in cash. The retention shall be released upon successful completion of defect liability and performance period of 12 calendar months from the date of issuance of job completion certificate by the Engineer-in-Charge.

(v) Final payment shall be released based upon the measured installed quantity only.

(vi) The payment against monthly running accounts bills shall be made as follows: -
100% of the net amount, after deduction of all dues to the Owner, advance, retention and all other money deductible shall be payable within One-month (30) days after submission and obtaining initial approval for payment from Engineer-in-Charge.

14.0 ARBITRATION

Any dispute or difference arising under this Contract shall be referred under jurisdiction of Kolkata to a sole arbitrator to be appointed by the Chairman & Managing Director, Balmer Lawrie & Co. Limited and the provisions of Arbitration and Conciliation (Amendment) Act, 2015 including any statutory modifications or enactment thereof shall apply to the Arbitration proceedings. The fees of the arbitrator, if any, shall be shared equally by both the parties. The award shall be a speaking award stating reason therefor and is final & binding on the parties. The proceeding shall be conducted in English language and courts at Kolkata will have exclusive jurisdiction to settle any dispute arising out of this contract.

15.0 EXTRA ITEMS OF WORK

During the course of execution of the work, should the Contractor come across items of work which are not covered under the Schedule of Rate or not included therein, the Contractor shall draw the attention of the Owner / Engineer-in-Charge to the same and such items of work shall be treated as extra only with the prior approval of Engineer-in-Charge in writing. Contractor shall submit a quotation along with the rate analysis for such accepted extra items before he commences work or purchases the materials in connection with such items.

For extra items, rates shall be derived from similar item rates included in the schedule of work. Where there is no such similar item available in the schedule, rate shall be analysed as follows:

Rate for extra item = Cost of material including transportation upto site (a) + cost of labour inclusive of all necessary tools, tackles, equipment, machinery and consumable (b) required to carry out the work + 15% of (a+b) towards profit and overhead + taxes, duties etc.

16.0 RIGHT OF OWNER TO TERMINATE THE CONTRACT

(i) If the Contractor being an individual or a firm commits any 'Act of Insolvency' or shall be adjudged as insolvent or being an Incorporated Company shall have an order for compulsory winding up made against it, or pass an effective resolution for winding up voluntarily or subject to the supervision of the Court or shall be unable to carry out and fulfil the contract and to give security therefore, is so required by the Engineer-In-Charge.

Or if the Contractor (whether an individual, firm or incorporated company) shall suffer execution to be issued.

Or shall suffer any payment under this Contract to be attached by or on behalf of any of the creditors of the Contractor.

Or shall assign or charge, encumber or sublet this contract without the consent in writing of the Engineer-In-Charge first obtained.

Or shall charge or encumber this contract or any payments due or which may become due to the Contractor thereunder.

Or if the Engineer-In-Charge shall certify in writing to the Owner that the Contractor -

a) has abandoned the Contract or

b) has failed to commence the works, or has without any lawful excuse under these conditions, suspended the progress of the works for 14 days after receiving from the Engineer-In-Charge written notice to proceed or

c) has failed to proceed with the works with such due diligence and failed to make such due progress as would enable the works to be completed within the time agreed upon or

d) has used sub-standard or inferior material or materials not conforming to the specifications or has employed inferior workmanship in carrying out the works or part thereof or has not exercised due diligence in execution of the said work, or

e) has neglected or failed persistently to observe and perform all or any of the acts, deeds, matters or things by this Contract to be observed and performed by the Contractor requiring the Contractor to observe or perform the same, or

f) has to the detriment of good workmanship or in defiance of the Engineer-In-Charge's instructions to the contrary, sub-let or sub-contracted any part of the contract, or

g) has failed to comply with the Engineer-In-Charge's instructions, or

h) has in the opinion of the Engineer-In-Charge committed any breach of this Contract, then and in any of the said cases the Owner with the written consent of the Engineer-In-Charge may notwithstanding any previous waiver, after giving seven days' notice in writing to the Contractor terminate the Contract, but without hereby affecting the right of the Owner of the powers of the Engineer-In-Charge or the obligations and liabilities of the Contractor in respect of work, the contract shall continue enforce as fully as if the contract has not been so determined and the obligations of the Contractor in respect of work subsequently executed shall continue as if the works subsequently executed has been executed by or on behalf of the Contractor. And further, the Owner by its agents or servants shall been titled forthwith to enter upon and take possession of the works and all plants, tools, scaffoldings, sheds, machinery, steam and other power implements, machinery equipment and materials lying upon the site or the adjoining lands or roads and use the same as its own property and to employ the same by means of its own servants and workmen in carrying on and completing the work or by employing any other Contractor and the Contractor shall not in any way interrupt or do any act, matter or things to prevent, intimidate or hinder such other Contractor or other person or persons employed for completing and finishing or using the materials and plant for the work. When the works shall be completed or as soon thereafter as convenient, the Engineer-In-Charge shall give a notice in writing to the Contractor to remove his surplus materials and plant and should the Contractor fail to do so within the period of 14 days after receipt thereof by him, the Owner shall sell the same either by public auction or a private sale and shall be given credit to the Contractor for the amount realized. The Engineer-In-Charge shall thereafter ascertain and certify in writing under this hand what (if anything) shall be due or payable to or by the owner, the expense or loss which the owner shall have been put to in procuring the works to be completed and the amount, if any, owing to the Contractor and the amount which shall be so certified, shall thereupon be paid by the owner to the Contractor or by the Contractor to the Owner, as the case may be and the Certificate of the Engineer-In-Charge shall be final and conclusive and binding on the parties hereto. In the event of termination under this Clause, the Owner shall not be

bound by any provision of this Contract to make any further payment to the Contractor until the said works are completed.

(ii) Owner shall, at any time, be entitled to determine and terminate the Contract, if in the opinion of the Owner the cessation of the Work becomes necessary owing to paucity of funds or for any other cause whatsoever, in which case the cost of approved materials at the Site at current market rates as verified and approved by Engineer-In-Charge and of the value of the Work done to date by the Contractor shall be paid for in full at the specified in the Contract. A notice in writing from the Owner to the Contractor of such determination and termination and the reason therefore shall be the conclusive proof of the fact that the Contract has been so determined and terminated by the Owner.

(i) Should the Contract be determined under sub-clause of this clause and the Contractor claims payment to compensate expenditure incurred by him in the expectation of completing the Work, the Owner shall consider and admit such claim as are deemed fair and reasonable and are supported by the vouchers to the satisfaction of the Engineer-In-charge. The Owner's decision on the necessity and propriety of such expenditure shall be final and conclusive and binding on the Contractor.

17.0 LABOUR LAWS

(i) No Labour below the age of eighteen (18) years shall be employed on Work. In case female workers are engaged, requisite provisions shall be made as per the statute.

(ii) Contractor shall not pay less than what is provided under law to labourers engaged by him on Work.

(iii) Contractor shall at his expense comply with all labour laws and keep Owner indemnified in respect thereof.

(iv) In addition to above, rules and regulations as contained in Contract Labour (Regulation and Abolition) Act, 1970 will also be applicable for this contract. For the purpose of registration as per the above Act, Contractor may contact Owner for further details.

(v) Contractor shall secure full safety of the workers / employees engaged by him in the Site premises and shall take at his own cost, insurances and such other safety regulations for the said purpose.

18.0 INSURANCE

Contractor shall at his own expense carry out and maintain insurance with reputable companies to the satisfaction of the Owner as follows:

Employee's Compensation and Liability Insurance:

Contractor shall obtain Workmen Compensation policy in his name in respect of contractor's employees to be engaged for the work towards compensations as admissible under the Employee's Compensation Act, 1923 and Rules framed thereunder upon death/ disablement and also medical treatment of a worker and the same has to be produced to the Engineer-in-Charge before start of the work. Owner should be mentioned as the Beneficiary.

The contractor shall indemnify the Owner against all losses and claims in respect of injuries or damage to any person, including any employee of the Owner, material or physical damage to any property whatsoever including that of the owner arising out of the execution of the works or in the carrying out of the contract, and shall insure against his liability with an insurer until the completion of this contract in terms approved by the owner. Whenever required, the contractor shall produce the insurance policy and the current premium receipts to the Owner.

In addition to what it is stipulated above the successful contractor shall execute Indemnity Bond to indemnify and hold harmless the Owner for complying with the provision of the following:

i) Provident Fund Act for P.F. Scheme for labourers engaged by the Contractor / Subcontractors.
ii) Interstate Migrant Workmen ("Regulation of Employment and Conditions of Services) Act - 1979.
iii) Minimum Wages Act - 1948.
iv) Equal Remuneration Act - 1976.
v) Employee's Compensation Act - 1923.
vi) Contract Labour (Regulation & Abolition) Act - 1970.

If any of the work is sublet, after necessary approval by the Owner, the contractor shall require the Sub-contractor to provide Employee's Compensation and Liability Insurance for the Sub-contractor's employees, if such employees are not covered under the Contractor's Insurance.

19.0 HSE REQUIREMENTS BY CONTRACTORS

Housekeeping

Contractors shall ensure that their work area is kept clean tidy and free from debris. The work areas must be cleaned on a daily basis. Any disposal of waste shall be done by the Contractor.

All equipment, materials and vehicles shall be stored in an orderly manner. Access to emergency equipment, exits, telephones, safety showers, eye washes, fire extinguishers, pull boxes, fire hoses, etc. shall not be blocked or disturbed.

Confined Space

Before commencing Work in a confined space the Contractor must obtain from Owner a Permit to Work, the Permit to Work will define the requirements to be followed.

As minimum Contractors must ensure the following:

a) Confined spaces are kept identified and marked by a sign near the entrance(s).
b) Adequate ventilation is provided
c) Adequate emergency provisions are in place
d) Appropriate air monitoring is performed to ensure oxygen is above 20%.
e) Persons are provided with Confined Space training.
f) All necessary equipment and support personnel required to enter a Confined space is provided.

Tools, Equipment and Machinery

The Contractor must ensure that all tools & equipment provided for use during the Work is:

a) suitable for its intended use;

b) safe for use, maintained in a safe condition and where necessary inspected to ensure this remains the case (any inspection must be carried out by a competent person and records shall be available);

c) Used only by people who have received adequate information, instruction and training to use the tool or equipment.

d) Provided with Earth leakage circuit breaker (ELCBs) at all times when using electric power cords. Use of electrical tape for temporary repairs is prohibited.

Working at Height

Any Work undertaken where there is a risk of fall and injury is considered to be working at height.

For any Contractor Personnel working at height, Contractors shall provide fall prevention whenever possible and fall protection only when fall prevention is not practicable. Before commencing Work in a height the Contractor must obtain from Owner a Permit to Work, the Permit to Work will define the requirements to be followed. Supervisor must be present at all point of time, to ensure no deviation occur during the course of work.

<u>Fall Prevention System</u>

Fall prevention systems (e.g. fixed guardrails, scaffolds, elevated work platforms) must provide protection for areas with open sides, including exposed floor openings.

<u>Fall Protection Systems</u>

(i) Where fall protection systems are used then the Contractor must ensure the following is applied:

(ii) Only approved full body harness and two shock-absorbing lanyards are used,

(iii) Prior establishment of a rescue plan for the immediate rescue of an employee in the event they experience a fall while using the system,

(iv) Anchorage points must be at waist level or higher; and capable of supporting at least the attached weight,

(v) Lifeline systems must be approved by Owner before use.

(vi) Use of ISI marked industrial helmet at all point of time.

Scaffolding

All scaffolds shall subject to a documented inspection by a competent person and clearly marked prior to use. The footings or anchorage for scaffolds shall be sound, rigid and capable of carrying the maximum intended load without settling or displacement. All scaffolding materials should be of MS tubular type.

Guardrails and toe-boards shall be installed on all open sides and ends of scaffold platforms. Scaffolds shall be provided with an access ladder or equivalent safe access. Contractor Personnel shall not climb or work from scaffold handrails, mid-rails or brace members.

Stairways and Ladders

Ladders should only be used for light duty, short-term work or access in line with the below and the Site Requirements.

i) Fabricated ladders are prohibited.

ii) Ladders will be secured to keep them from shifting, slipping, being knocked or blown over.

iii) Ladders will never be tied to facility services piping, conduits, or ventilation ducting.

iv) Ladders will be lowered and securely stored at the end of each workday.

v) Ladders shall be maintained free of oil, grease and other slipping hazards

vi) Ladders will be visually inspected by a competent person and approved for use before being put into service. Each user shall inspect ladders visually before using.

vii) Ladders with structural defects shall be tagged "Do Not Use," immediately taken out of service, and removed from the Site by the end of the day.

Lifting Operations

Cranes and Hoisting Equipment

Contractors shall operate and maintain cranes and hoisting equipment in accordance with manufacturer's specifications and legal requirements.

Only Contractor Personnel trained in the use of cranes and hoists are permitted to use them.

Lifting Equipment and Accessories

All lifting equipment / accessories e.g., slings, chains, webbing, chain blocks, winches, jacks etc shall be indicated with their safe working load have an identification number visible on the unit and be inspected and tested in accordance with legal requirements.

Damaged equipment / accessories and equipment shall be tagged "out of use" and immediately removed from Site.

Lockout Tag out ("LOTO")

Prior to performing work on machines or equipment, the Contractor shall ensure that it is familiar with LOTO and Permit to Work procedures and that all of its affected Contractor Personnel receive the necessary training.

Barricades

Floor openings, stairwells, platforms and walkways, and trenching where a person can fall any distance shall be adequately barricaded and where necessary, well lit. Where there is a risk of injury from a fall then rigid barriers must be used.

Barricades must also be used to prevent personnel entering an area where risk of injury is high e.g., during overhead work activity or electrical testing etc. Such barricading must provide clear visual warning.

Compressed Gas Cylinders

Gas cylinder shall be securely stored and transported, and identified and used in line with the local requirements. Hose lines shall be inspected and tested for leaks in line with local requirements. Flash Back arrestor to be used to prevent any explosion due to back fire.

Electrical Safety

Prior to undertaking any work on live electrical equipment the Contractor must obtain a Permit to Work from Owner. Where ever possible live work should be avoided. Any control measures highlighted shall be implemented prior to work commencing.

The below measures will be taken:

a) Work practices must protect against direct or indirect body contact by means of tools or materials and be suitable for work conditions and the exposed voltage level.

b) Energized panels will be closed after normal working hours and whenever they are unattended. Temporary wiring will be de-energized when not in use.

c) Only qualified electrical Contractor Personnel may enter substations and/or transformer and only after being specifically authorized by Owner.

Hot Works

A Permit to Work must be obtained from Owner prior to any hot works (welding, grinding, open flame work). Suitable fire extinguishing equipment shall be immediately available. Objects to be welded, cut or heated shall be moved to a designated safe location, or, if they cannot be readily moved, all movable fire hazards in the vicinity shall be taken to a safe place. Personnel working around or below the hot works shall be protected from falling or flying objects.

Prior to the use of temporary propane or resistance heating devices approval must be obtained from Owner.

Trenching, Excavating, Drilling and Concreting

A Permit to Work must be obtained from Owner and all underground lines, equipment and electrical cables shall be identified and located prior to beginning the work. The Contractor shall assign a competent Contractor Personnel to all trenching and excavation work.

Safe means of access and egress shall be located in trench excavations. Daily inspections shall be conducted by a competent Contractor Personnel for evidence of a situation that could result in possible cave-ins, indications of failure of protective systems or other hazardous conditions.

Physical barriers shall be placed around or over trenches and excavations. Flashing light barriers shall be provided at night.

Environmental Requirements

Waste Management

The Contractor is responsible to remove any waste generated by the work being done on the Site. The Contractor must dispose of the waste in line with the relevant local legislative requirements. The waste disposal route shall be documented and made available for Owner to review at any time and may be subject to Owner's prior approval.

Wastes (includes rinse from washing of equipment, PPE, tools, etc) are not to be poured into sinks, drains, toilets, or storm sewers, or onto the ground. Solid or liquid wastes that

are hazardous or regulated in any way are not to be disposed of in general site waste receptacles.

Spills

The Contractor is responsible for the provision of adequate spill kits/protection and the clean-up and disposal costs arising from such spills.

Emissions

The Contractor shall identify and quantify any emission sources associated with the Works. The control measures associated with these emission shall be subject to the approval of Owner's Emissions include but are not limited to noise, dust, fumes, vapours.

BANK GUARANTEE VERIFICATION CHECK LIST

	CHECK LIST	YES	NO
I	Does bank guarantee compare verbatim with standard Balmer Lawrie & Co Ltd proforma for BG	_____	_____
II. a.	Has the executing officer of the BG indicated his name, designation and power of attorney No./ Signing Power No. etc. on BG	_____	_____
b.	Is each page of BG duly signed/initialed by the executant and last page is signed with full particulars as required in the Balmer Lawrie's standard proforma of BG and under the seal of the Bank.	_____	_____
c.	Does the last page of the BG carry the signature of two witnesses along side the signature of the executing Bank Manager	_____	_____
III. a.	Does the non judicial stamp paper for BG purchase in the name of BG issuing Bank	_____	_____
b.	**Is the BG on non-judicial Stamp paper of value Rs. 100/- (Rupees One Hundred only)**	_____	_____
c.	Is the date of sale of non-judicial stamp paper shown on the BG and the stamp paper is issued not more than six months prior to date of execution of BG	_____	_____
IV. a.	Are the factual details such as bid specifications No., LOI No., Contract price etc. correct	_____	_____
b.	Whether over-writing/ cutting, if any on the BG authenticated under signature and seal of executant	_____	_____
V. a.	Is the amount of BG in line with contract provisions / agreement /tender	_____	_____
b.	Is the validly of BG in line with contract provisions / agreement /tender	_____	_____
VI.	Covering letter from bank enclosed with the BG	_____	_____
VII.	BG shall be from a Nationalised/ Scheduled Bank only	_____	_____

BANK GUARANTEE
(PERFORMANCE)

Letter of Guarantee No.

Dated : the day of

THE GUARANTEE is executed at Kolkata on the day of ……by ……(set out full name and address of the Bank) (hereinafter referred to as "the Bank" which expression shall unless expressly executed or repugnant to the context or meaning thereof mean and include its successors and assigns).

WHEREAS Balmer Lawrie & Co. Ltd. (local address), …… an existing company within the meaning of the Companies Act, 1956 and having its Registered Office at 21, Netaji Subhas Road, Kolkata – 700 001 (hereinafter referred to as "the Company") issued a Tender being No. dated (hereinafter referred to as "the said Tender") for (set out purpose of the job) and pursuant thereto Messrs/ Mr. ……(set out full name and address of the Contractor) (hereinafter referred to as "the Contractor" which term or expression wherever the context so requires shall mean and include the partner or partners of the
Contractor for the time being/his/its heirs, executors, administrators, successors and assigns) (delete which are not applicable) has accepted the said Tender and field its quotation.

AND WHEREAS the quotation of the Contractor had been accepted by the Company and in pursuance thereof an Order being No…… dated …… (hereinafter referred to as "the said Order") has been placed by the Company on the Contractor for (set out purpose of the job).

AND WHEREAS under the terms of the said Order the Contractor is required to furnish the Company at their/his/its own costs and expenses a Bank Guarantee for Rs……(Rupees …… only) as performance guarantee for the fulfilment of the terms and conditions of the said Tender and to do execute and perform the obligations of the Contractor under the Agreement dated the …… day of …… (hereinafter referred to as "the Agreement ") entered into by and between the Company of the one part and the Contractor of the other part, the terms of the said Tender and the terms contained in the said Order which expression shall include all amendments and/or modifications/or variation thereto.

AND WHEREAS the Contractor had agreed to provide to the Company a Bank Guarantee as security for the due performance of their/his/its obligations truly and faithfully as hereinbefore mentioned.

Contd….2/-

[2]

NOW THIS GUARANTEE WITNESSETH as follows:

1. In consideration of the aforesaid premises at the request of the Contractor, we …… (set out the full name of the Bank) the Bankers of the Contractor shall perform fully and faithfully their/his/its contractual obligations under the Agreement dated the …… day of …… entered into by and between the Company of the one part and the Contractor of the other part, the terms and conditions of the said Tender and the said Order.

2. We, …… (set out full name of the Bank) do hereby undertake to pay to the Company without any deduction whatsoever a sum not exceeding Rs…… (Rupees …… only) without any protest, demur or proof or condition on receipt of a written demand from the Company stating that the amount claimed is due by way of loss and damage caused to or would be caused to or suffered by the Company due to bad workmanship or by reason of breach of any of the terms and conditions of the Agreement, the said Tender and the said Order hereinbefore mentioned.

3. The Guarantee is issued as security against due performance of the obligations of the Contractor or under the Agreement aforesaid and the said Tender and the said Order hereinbefore mentioned and subject to the conditions that our liabilities under this Guarantee is limited to a maximum sum of Rs…… (Rupees …… only) or the amount of loss or damage suffered or to be suffered by the Company in its opinion at any period of time, whichever is lower.

4. We, …… (set out full name of the Bank) further agree that the undertaking herein contained shall remain in full force for a period of months from the date of the satisfactory execution of the Contract.

5. This Guarantee shall not be affected by any amendment or change in the Agreement or change in the constitution of the Bank and/or the Company and/or the Contractor.

6. We …… (set out full name of the Bank) undertake not to revoke this Agreement during its currency except with the previous consent of the Company in writing.

7. All claim under this Guarantee must be presented to us within the time stipulated after which date the Company's claim/right under this Guarantee shall be forfeited and we, ……(set out full name of the Bank) shall be released and discharged from all liabilities hereunder.

Contd….3/-

[3]

8. This instrument shall be returned upon its expiry or settlement of claim(s) if any, thereunder.

9. Notwithstanding anything contained hereinbefore our total liabilities under this Guarantee shall not exceed a sum of Rs..... (Rupees ..... only) and unless a demand or claim in writing under this Guarantee reaches us on or before the date of ..... (last date of claim) and if no claim is received by us by that date all rights and claims of the Company under this Guarantee shall be forfeited and we, ...(set out full name of the Bank) shall be released and discharged of all our liabilities under this Guarantee thereafter.

10. We have power to issue this guarantee in your favour under our Memorandum and Articles of Association and the undersigned has full power to execute this Guarantee under Power of Attorney dated the ..... day of ..... granted to him by the Bank.

Place :

Date :

PROFORMA OF THE GUARANTEE
(SECURITY DEPOSIT)

Balmer Lawrie & Co. Ltd.
Kolkata- 700 001

Dear Sir,

That Messrs/Mr. ……..(set out full name and address and constitution of the Contractor) (hereinafter referred to as "the Contractor") filed their/his/its quotation against your Tender being Tender No. …….. dated …….. (hereinafter referred as "the said Tender") for the work …….. (set out the purpose of the job) and in pursuance thereto an Order being No. …….. dated ……. (hereinafter to as "the Order") was issued by you to the Contractor.
The conditions of the said Tender, inter alia, requires that the Contractor shall pay a sum of Rs…….. only) as full security deposit (hereinafter referred to as "the security deposit") in the form therein mentioned. The form of payment of security deposit includes a guarantee to be executed by a Scheduled Bank.

The said Messrs/Mr. …….. (set out full name of the Contractor) have/has approached us and at their/his/its request and in consideration of the premises We …….. (set out full name of the Bank) having our office, inter alia at …….. (state the address of the Bank) have agreed to give such guarantee in the manner following :

3 We, …….. (set out full name of the Bank), hereby undertake with you if default is made by Messrs/Mr. …….. (set out full name of the Contractor) in performing any of the terms and conditions of the Tender and/or in payment of the security deposit or any other or in payment of money payable to you. We, …….. (set out full name of the Bank) shall merely on demand from you without demur or protest shall pay you the said amount of Rs…….. (Rupees …….. only) or such portion thereof not exceeding the said sum as you may demand from time to time.

2. We, …….. (set out full name of the Bank), further agree with you that you hereunder to adopt any mode for realisation of your dues from the Contractor and/or to vary any of the Terms and Conditions of your Contract with the said Messrs/Mr. …….. (set out full name of the Contractor), or to extend time of performance by Contractor from time to time or to postpone for any time or from time to time any of the powers exercisable by you against Contractor and to forbear or enforce any of the terms and conditions relating to the Contract and we, …….. (set out full name of the Bank) shall not be relieved from our liability by reason of any such variation, or any indulgence to be given by you to the Contractor or by any such matter or thing whatsoever which under the law relating to sureties would but for this provision have effect of so releasing us.

Contd……2/-

[2]

3. Your right to recover the said sum of Rs..... (Rupees ..... only) from us in the manner aforesaid will not be affected or suspended by reason of the fact that any dispute or disputes is/are pending before any Officer, tribunal, court or any other authority or authorities.

4. The guarantee herein contained shall not be determined or affected by liquidation or winding up, dissolution or change of constitution or insolvency of the said Messrs/Mr. ..... (set out the full name of the Contractor), but shall in all respect, and for all purposes be binding and operative until payment of all the money due to you in respect of such liabilities is paid,

5. Our liability under this guarantee is restricted to Rs. ..... (Rupees ..... only).

6. Our guarantee shall remain in force and effect until ..... (set out the date of expiry) and unless a claim or demand in writing is made against us under this guarantee before the expiry of six months from the aforesaid date i.e. ..... (set out last date of Claim period), the said Guarantee all your rights under this guarantee shall be forfeited and we, ... (set out full name of the Bank) shall be relieved and discharged from all liabilities thereunder.

7. We , ... (set out full name of the Bank) undertake not to revoke this Guarantee during its currency except with your previous consent in writing.

8. We, ... (set out full name of the Bank) have power to issue this Guarantee in your favour under our Memorandum and Articles of Association and the undersigned has full power to execute/sign this Guarantee under the Power of the Attorney dated the ..... day of Two Thousand and Twenty One granted by the Bank.

Yours faithfully,

Dated : ..... (Place)

.....(Date)

.....

(Signature of Officer on behalf of .....)

(Set out name of the Bank)

TECHNICAL SPECIFICATION

1.0.0 GENERAL

1.1.0 Intent of Specification

1.1.1 This specification is intended to cover supply, installation, testing, commissioning of Lighting and other Allied works as per enclosed Schedule of Work, drawings and tender terms & conditions inclusive of the supply of all labour, supervision, tools, equipment and erection materials as necessary.

1.1.2 The specification shall be read in conjunction with the Conditions of Contract, Schedule of Work/Bill of Quantity as enclosed with this Specification. **However, in the event of any conflict between Schedule of Work/Bill of Quantity and Technical Specification or data sheets, item description mentioned in Schedule of Work/Bill of Quantity shall prevail.**

1.2.0 Standards & Codes

The complete supply and installation work for the equipment and accessories covered under this specification shall be designed, manufactured, erected, tested and commissioned in accordance with the latest IS and IEC except where modified and/or supplemented by this specification.

The electrical installation shall meet the requirements of Indian Electricity Rules as amended upto date and relevant Code of Practice. In addition, other rules and regulations applicable to the work shall be followed.

1.3.0 Drawings and Annexures

All drawings and annexures appended to this specification shall form part of this specification and supplement the requirements specified herein.

This specification shall be read and construed in conjunction with the drawings and annexures to determine the scope of work and terminal points.

The quantities shown on drawings and annexures are tentative for bidding purpose only and may vary. Any variation arising during detailed engineering stage will be considered for adjustment of contract price based on unit rates quoted in the bid.

2.0.0 SCOPE OF WORK

2.1.0 The work involves design, manufacturing, testing at works, timely supply and transportation to site in properly packed condition of all equipment and miscellaneous items as indicated hereinafter and required to complete the electrification job under this Specification. For procurement of materials / components items etc. the list of make enclosed with this specification shall be strictly followed.

2.1.1 All equipment, materials, hardware and accessories to be supplied by the bidder shall be brand new ones and make specified in the technical data sheet. For other approved equivalent make, prior written approval of the owner shall be obtained for which detail technical document & Data sheet for all such items with make etc. shall be furnished along with application for owner review and acceptance.

2.1.2 All relevant drawings, technical data sheets and technical leaflets/catalogues, Test Certificates of major items shall be submitted.

2.1.3 Furnishing of all labour, skilled and unskilled, supervisory personnel, tools and tackles for fabrication/erection, testing equipment, implements, supplies, consumables and hardware for timely and efficient execution of the site work.

2.1.4 The item of work to be performed on all equipment and materials shall include but not be limited to the following:

Receiving, unloading of the materials at site
Opening, inspection and reporting all damages and short supply of items.
Arranging to repair and/or re-order all damaged and short supply items.
Storing at site with suitable all-weather protection.
Side-Shifting of materials as directed by Engineer-in Charge
Assembly, erection and complete installation.
Necessary co-ordination between works done by the other contractors.
Final check-up, testing and commissioning in presence of owner's representative.
Trial run for seven days, rectification of defects, if any and adjustment as necessary.

2.1.5 Preparation of AS BUILT DRAWINGS and submission of the same in soft copies (in Auto cad 2004 / Microsoft Word/excel format) as well as in hard copies.

2.1.6 Reference shall be drawn to the "Schedule of Work" for quantity of major items.

2.1.7 Contractor will be given a place (only) for storing his materials, tools, tackles. Contractor shall construct a store (at his own cost) at that designated place to keep his materials, tools & tackles. Contractor shall make proper security arrangement for his materials till the installation is taken over by the owner. Owner will not be responsible for any theft/loss of materials.

2.1.8 Construction Power and water: Contractor shall arrange for water and construction power at his own cost. However, if power is available during execution same may be provide to the contractor on chargeable basis.

3.0.0 TESTS

3.1.0 Pre-commissioning Tests at site

3.1.1 The installation work shall be tested by the contractor after completion of his erection/installation work with an advance notice to the engineer so that he or his authorized representative may witness the same also.

3.1.2 The test result of any installation or equipment or its part, if considered not satisfactory to the engineer, the concerned installation / equipment and its accessories shall be properly

rectified by the contractor and shall be tested again to the satisfaction of the engineer by the contractor at his own cost.

4.0.0 ILLUMINATION SYSTEM

The Lighting Panel (LPB-01) for distribution of illumination power shall receive power from the DB at existing site at 415V and String Inverter of 3 Kwp Solar Panel installed at roof. The lighting Panel LPD-01 and 02 in turn will receive supply from LPB-01. It shall be sheet steel enclosed, dust and vermin proof. Lighting Panels for individual areas shall be wall-mounting type. For hazardous areas flameproof type panels shall be used. Adequate nos. of spare feeders shall be provided in Lighting Panels.
Lighting fixtures either can be controlled in a group, directly from the lighting panels or from local switches provided for individual fixture, fan, socket etc.
Outdoor lighting viz., yard lighting, street lighting shall be automatically controlled through photocells and suitable no. of photocells shall be provided in strategic locations for this purpose, if the same is shown in the drawing or, appeared in the Bill of Materials.
The lighting system inside and outside plant units shall be designed taking into consideration the desired illumination level, architectural arrangement, building dimensions including mounting height, environmental considerations, ease of maintenance and reliability of the lighting distribution network.

The fittings shall be selected to suit the specific environmental requirement. In areas having inflammable vapour, the fittings shall be of vapour-proof design. In hazardous locations, the fittings shall be of flameproof or increased safety design, tested and approved by CMRS.

4.0.1 Outdoor Lighting Fittings

All outdoor flood light / road lighting fittings shall be mounted on steel tubular poles / self-supporting steel towers / building wall with single or double outreach brackets. The fittings shall be cut-off/semi cut-off distribution and integral type.

4.0.2 Lighting Power Supply And Distribution

Power shall be fed to LPB-01. From LPB-01 power shall be distributed to LPD-01 and 02. Each outgoing feeder of lighting panel will feed to lighting fixture/lighting switchboard.
LPB-01 shall have 1 no. 80Amps 10KA 4P MCB, 2 nos. 32Amps 10KA 4P MCB, 3 nos. 16A SP MCB, and 21 nos. 10Amps 10KA SP MCB as outgoing feeders and one no. 125A TPN MCCB with inbuilt thermal trip release as incomer and one Earth Leakage module shall be fitted underneath the MCCB.
LPD-01 shall have 6 nos. 32Amps 10KA SP MCB, 6 nos. 16A SP MCB, and 12 nos. 10Amps 10KA SP MCB as outgoing feeders and one no. 80A FP RCCB with inbuilt thermal trip release as incomer.
LPD-02 shall have 6 nos. 32Amps 10KA SP MCB, 6 nos. 16A SP MCB, and 12 nos. 10Amps 10KA SP MCB as outgoing feeders and one no. 40A FP RCCB with inbuilt thermal trip release as incomer.

Each circuit taken from LP shall control a group of fittings with the loads distributed on all the three phases to the extent possible.

Wiring shall be done with armoured cable in shed area.

Cable sizes for lighting circuits shall be as indicated in drawings / Bill Of Materials.

The lighting installation shall be carried out in accordance with IS: 732 Codes of practice for electrical wiring installations and National Electrical Code as applicable.

All supporting steel fabrication, fittings, and cabling shall be painted in accordance with approved standard.

The Bidder shall carefully consider these lighting levels and layouts in the offer and shall clearly indicate if any change is required to achieve the design lighting levels with the equipment offered.

4.0.3 **Lighting Panel (LP)**

The Lighting Panels (LP) with MCB shall be suitable for 415/240 Volt, 3 phase & neutral system. Each outgoing feeder of lighting panel (LP) will feed fixtures/ Local Switchboards, Receptacles with the loads equally distributed on all the three phases to the extent possible.
LPB-01 shall have 1 no. 80Amps 10KA 4P MCB, 1 no. 32Amps 10KA 4P MCB, 3 nos. 16A SP MCB, and 15 nos. 10Amps 10KA SP MCB as outgoing feeders and one no. 125A TPN MCCB with inbuilt thermal trip release as incomer and one Earth Leakage module shall be fitted underneath the MCCB.
LPD-01 shall have 6 nos. 32Amps 10KA SP MCB, 6 nos. 16A SP MCB, and 12 nos. 10Amps 10KA SP MCB as outgoing feeders and one no. 80A FP RCCB with inbuilt thermal trip release as incomer.
LPD-02 shall have 6 nos. 32Amps 10KA SP MCB, 6 nos. 16A SP MCB, and 12 nos. 10Amps 10KA SP MCB as outgoing feeders and one no. 40A FP RCCB with inbuilt thermal trip release as incomer.
The MCBs shall be suitable for snap fitting on mounting channel by suitable spring loaded clamping arrangement.
The LPs shall be as per IS 8623. Suitable for Flush mounting and surface mounting. With 100A copper busbar for each phase. With Neutral busbar, earth bar and cable ties for cable management. Fully insulated busbar and neutral bar. Door earthing. Supplied with wire set.
MCBs shall be of high breaking capacity (10 KA) and suitable for control & protection of lighting feeders.
Make of Lighting Panel (LPD-01 and 02) shall be Legrand: Ekinoxe TPN DB 6077 17 IP-43 - IK 09 with metal door or, approved equivalent from Standard or, Havells or, Schneider.
Make of Lighting Panel (LPB-01) shall be Legrand: Ekinoxe TPN DB 6077 91 IP-43 - IK 09 with

metal door or, approved equivalent from Standard or, Havells or, Schneider.

4.0.4 **Receptacles**

Receptacle shall be of type RA, RB and RC.

RA type receptacle shall be 240V, 16A, 1ph, 5pin with 16A piano switch.

RB type receptacle shall be 2 nos. 240V, 6/15A, 1ph, 5pin industrial type with 2 nos. 10A switch

RC type receptacle shall be 32A Modular motor starter and 32A 5 pin power socket of North West make (cat. No. C12M01 J)

Receptacle shall be mounted in a sheet steel enclosure of thickness not less than 16 SWG. These receptacle shall be flame proof for hazardous area confirming relevant IS.

4.0.5 **Lighting Fixtures**

The lighting fixtures shall be complete with lamp and accessories like control gears, ballasts, starter, capacitor, terminal block etc.

The accessories shall be mounted as far as possible in the fitting assembly. In case of accommodation problem a separate metal enclosed box shall be provided for housing the accessories with provision for loop-in and loop-out connection of wires.

Each fixture shall be provided with an earthing terminal. All metal or metal enclosed parts or the housing shall be connected to the earthing terminal so as to ensure satisfactory earthing continuity throughout the fixture.

Each fixture shall be provided with an earthing terminal suitable for connection with 1/C 2.5 sq mm PVC insulated copper 1100 V wire.

4.0.6 **LED Lighting Fixtures**

LED Light Fitting shall have cluster of LEDs of proper rating; high power & high efficiency LED chips with Lumen output >120 lumens per W; Protection Class IP65; Make of LED : NICHIA / CREE / SEOUL SEMICONDUCTOR; Colour Temperature : W : 6000-6500 K; Driver included; with properly designed Heat Management System by using MCPCB for faster heat transfer from LEDs; high efficiency 3 stage Driver with efficiency of more than 75% and power factor should be minimum 0.95 (APFC)

4.0.7 **Lamps**

General Lighting Service (GLS) lamps shall be with clear glass and screwed caps.

All fluorescent lamp shall be bi-pin rotary type and either cool daylight or white.

Lamp shall be suitable for use in position and capable of withstanding small vibrations.

Restrictions and special features, if any, shall be clearly indicated in the bid.

LED Lights

Lamp shall be suitable for use in position and capable of withstanding small vibrations. Restrictions and special features, if any, shall be clearly indicated in the bid.

4.0.8 **Ballast**

Ballast shall be heavy duty, low loss, polyester-filled type with copper winding.

Ballast for Mercury/Sodium vapour lamp shall be provided with suitable tapping to set the voltage within the range specified.

Ballast shall be free from hum. The Contractor shall replace ballast, which produces humming sound, free of cost.

In multilamp fixture each lamp shall be provided with individual Ballast.

4.0.9 **Lighting Cables/Wires**

Lighting wires shall be 650 V grade, PVC insulated, stranded, copper conductor, single core wire conforming to IS 694 with latest amendment with colour coded as below :

RED	for	R-Phase
YELLOW	for	Y-Phase
BLUE	for	B-Phase
BLACK	for	NEUTRAL
GREEN	for	Earthing

All 16/6 A, 5 pin sockets shall be connected directly to Lighting Panel (LP) by 2 runs of PVC insulated, single core stranded 2.5 mm sq. Copper wire for phase and one run of PVC insulated, single core stranded 1.5 mm sq. Copper wire for earthing.

Wiring to individual light/fan points shall be carried out by 3 runs of PVC insulated, single core stranded 1.5 mm sq. Copper wire.

4.0.10 **Fans and Regulator**

All ceiling fan shall be 1200 mm (48") sweep & 1400 mm sweep, capacitor type, complete with blades, double ball bearings, canopy, minimum 300 mm down-rod, hanging device with electronic regulator etc. and suitable for 1ph., 240V, 50Hz AC supply.

All exhaust fans shall be wall mounted type, axial flow of 300 mm sweep, 900 rpm suitable for 1ph, 240V, 50Hz, AC supply and complete with fan wheel, motors and complying, protection guards, switches etc.

4.0.11 **Switch and Switch Board**

All switch boards/boxes shall be of bent steel construction, fabricated of 16 SWG M.S. sheet with 6mm thick Perspex cover.

Switch boards / boxes/ Receptacles located in Buildings shall be flush mounted type on brick wall with only the switch knob projecting outside.

Switch boards/boxes shall have conduit knock outs on the sides. Adequate provision shall be made for ventilation of these boxes.

Flush type receptacles where provided shall be so located that only the plug projects outside.

Switches shall have quick-make and quick-break mechanism operated by a suitable external handle complete with position indicator.

All switches for light, fans and receptacle shall be of 240V, 6A, Piano type similar to Anchor make.

5.0.0 SOLAR PANEL

The scope of Supply & Work includes all design, engineering, procurement & supply of equipment and materials, testing at manufacturers works, inspection, packing and forwarding, supply, receipt, unloading and storage at site, preparation of site, associated civil works, services, permits, licences, installation, testing and commissioning of Roof Top mounted Grid Connected Solar PV Power Plant at Balmer Lawrie, CFS, Kolkata.

Total capacity of the PV Modules to be supplied for the Grid connected Solar Power Plant project is minimum 3 KWp (DC) which is the rated capacity of all solar PV module under supply as per relevant IEC standards under Standard Temperature Condition (STC) tested at Factory.

Output from Solar String Inverters shall be fed to the Owner's LT Panel through LPB-01 and through four pole MCCB of suitable current rating installed in the ACDB.

Unidirectional energy meter of suitable current rating shall be provided at the outgoing feeder of ACDB to monitor Solar PV Generation along with suitable CT/PT.

Data logging system with remote monitoring facility shall be provided.

Pvc pipes, cable conduits, cable tray and its coverings shall be provided as required.

The specification mentioned for all the equipment which include Solar modules, PCU, combiner boxes, DC cables, module mounting structures, CT, PT, LT cables, interfacing panels, switchgears, energy meters, water sprinkler system, safety net, safety ladder and other associated equipment etc., to complete the solar PV power generation and evacuation to the designated LT substation.

Adequate capacity of SPV module, PCUs, Junction boxes etc. to ensure generation of power as per design estimates. This is to be done by applying liberal de rating factors for the array and recognizing the efficiency parameters of PCUs, transformers, conductor loss etc.

The power plant must operate in parallel with the grid system which is infinite electrical system. Suitable protective measure is to be in built so that any disturbance of the grid will not cause any damage of the equipment of the solar plant. Very fast responsive microprocessor based directional and reverse power flow protection should be provided to ensure isolation of the solar power plant from the grid at the time of any fault.

SPV power plant should be designed to operate satisfactorily in parallel with the grid within permissible limits of high voltage and frequency fluctuation conditions. It is also extremely important to safeguard the system during major disturbances.

The bidder shall furnish following documents along with their offer :

i) GA drawing of the proposed plant
ii) Schematic diagram of the proposed plant along with design calculation justifying the rating and quantity of the equipment offered
iii) Make, Specifications, Rating, Catalogues, Test Certificates of PV Module, Power Conditioning Unit, DC Combiner Box, ACDB, Data Logger, AC / DC cables and wires, Energy Meters offered.
All test certificates sought specifically elsewhere in the tender specifications.
iv) Detail design and drawing of supporting structure, typical foundation drawings
v) Roof sheet clamping details (if necessary)
vi) GA drawing / technical details of Safety Net and Safety Ladder (if specifically mentioned in the Schedule of Work)

Obtaining all approvals and preparation of documents for obtaining those approvals for Construction and installation and commissioning of the Solar PV Plant from CEA / Local State Electricity Board shall be under the scope of this contract. **Necessary statutory fees shall be arranged by the Owner**.

Obtaining approval for Net (Import / Export) Metering from Local State Electricity Board / Local Statutory Authority and Supply & Installation of the same NET METER including supply of necessary accessories and necessary modification in metering as advised by local EB (meter tested and approved by Local Electricity Board) in the HT side of the Plant Electrical shall be under the scope of this work. For that bidder to visit the project site to gather necessary information of Owner's HT System before submission of their offer.

The plant would be covered under all inclusive comprehensive maintenance contract without spares and consumables for a period of 5 (five) years. This period will be in effect after one year defect liability period.

During the Defect Liability period and AMC period the contractor shall visit site and check the health of PV Plant once in every two months (i.e. six compulsory checking at site every year during one year defect liability period and thereafter five year AMC period).

The down time of PV System should not be more than 120 hours from time of reporting to the Contractor. In case of non-rectification of the problem after 5 days (120 hours) from reporting the complaint, owner may consider repairing/replacing such defective system on the cost of the contractor. Notwithstanding the same, contractor shall continue to have the responsibilities and obligations of the subject contract.

Solar Photovoltaic Module

Modules made by indigenous manufacturers of reputed brand such as BHEL, CEL, REIL, Tata Solar, Vikram Solar, Emmvee, Warrie, Websol, Kotak Solar, Jakson or approved equivalent (IEC Tested) shall only be used in the project.

The solar photovoltaic modules should be qualified the following certification

a) IEC-61215/ IS 14286 : Crystalline silicon terrestrial photovoltaic modules (Design qualification and type approval)

b) IEC-61701 / IS 61701 : Salt mist corrosion testing of photovoltaic modules

c) IEC- 61853 Part 1/ IS 16170 Part 1: Module performance testing and energy rating : Irradiance, temperature performance measurements and power rating

d) IEC-61730-1, 2: Photovoltaic module safety qualification, Part 1 for requirements for construction, Part 2 for requirements for testing.

The proposed PV Module must have the test certificate issued from accredited test laboratories of Ministry of New and Renewable Energy, Government of India.

Type Test certificates issued from IEC accredited laboratories shall also be acceptable.

The Project shall consist of **Poly Crystalline silicon photovoltaic modules**. The solar cell shall have surface anti-reflective coating to help to absorb more light in all weather conditions.

Individual solar photovoltaic module should be of minimum capacity 300 Wp.

Photo electrical conversion efficiency of cells shall be not less than 17%, and module efficiency shall be not less than 15% for poly crystalline silicon based modules with positive tolerance only.

The rated output of the modules shall have positive tolerance of + 5W and no negative tolerance is allowed.

SPV modules of similar output with +/- 2% tolerance in single string shall be employed to avoid array mismatch losses.

Fill factor of the module shall not be less than 72% .

The module frame shall be made of anodised aluminium or corrosion resistant material, which shall be electrolytically compatible with the structural material used for mounting the modules.

Each module shall have low iron tempered glass front for strength & superior light transmission. It shall also have tough multi-layered polymer back sheet for environmental protection against moisture & provide high voltage electrical insulation. Transmission of glass shall be not less than 91%.

The junction box used in the modules shall have protective bypass diodes to prevent hot spots in case of cell mismatch or shading. The material used for junction box shall be made with UV resistant material to avoid degradation during module life and the Junction sealing shall comply IP65 degree of protection.

The EVA used for the modules should be of UV resistant in nature. No yellowing of the back sheet with prolonged exposure shall occur.

The crystalline silicon based modules supplied should be of Potential Induced Degradation (PDA) free modules and the test certificate from third party lab complying with the same shall be provided.

The I-V characteristics of all modules as per specifications to be used in the systems are required to be submitted at the time of supply.

The temperature co-efficient of power for the modules shall not be more than 0.45% / Deg. C.

RF Identification tag for each solar module shall be provided inside or outside the module and must be able to withstand environmental conditions and last the lifetime of the solar module as per MNRE Norms.

The sealant used for edge sealing of PV modules shall have excellent moisture ingress protection with good electrical insulation and with good adhesion strength.

The bird spike shall be provided suitably to avoid bird sitting on the solar modules at the highest point of the array/module structure.

Whenever more than one module is required, identical modules shall be used.

The SPV modules shall be highly reliable, light weight and shall have a service life of more than 25 years.

All materials used for manufacturing solar PV module shall have a proven history of reliability and stable operation in external applications. Module shall perform satisfactorily in relative humidity up to 95% with ambient temperature between -10 Deg C to + 50 Deg C. The material shall withstand adverse climatic conditions, such as high speed wind, blow with dust, sand particles and saline climate / soil conditions. Materials shall also be suitable to withstand adverse environmental conditions of typical chemical plants.

Modules only with the same rating and manufacturer shall be connected to any single inverter.

Bidder shall provide data sheet and type test certficates for Solar PV Module (under STC) along with their offer.

The Owner or its authorised representative reserves the right to inspect the modules at the manufacturer's factory prior to dispatch.

Entire drawings, detailed test reports and compliance certificates of the offered modules should be submitted for approval of Owner within 45 days from the date of placement of Work Order.

Each module shall carry the indelible markings like Logo, Model No., Sl. No., Year of make, etc. The following details of the module should also be displayed:

- Name, monogram or symbol of manufacturer
- Type or model number
- Serial number
- Power (Pmax)
- Open circuit voltage (Voc)
- Short circuit Current (Isc)
- Voltage at maximum power (Vpm)
- Current at maximum power (Ipm)
- Application Class
- Permissible system voltage
- Maximum over current protection
- Date & place of manufacture
- I-V Curve for the module.

- The RFID should be placed inside the module laminate
- Module shall be tested as per relevant ISS/IEC standards

Material Warranty :
The manufacturer should warrant the Solar Module[s] to be free from the defects and /or failures specified below for a period not less than ten [10] years from the date of sale to the original customer [i.e. EPC Contractor] :

i. Defects and / or failures due to manufacturing
ii. Defects and / or failures due to quality of materials
iii. Non conformity to specifications due to faulty manufacturing and / or inspection process.

Performance Warranty :
The manufacturer shall warrant the output of Solar PV modules for their output peak watt capacity, which should not be less than 90% of the initial value at the end of 10 years and 80% of the initial value at the end of 25 years.

The contractor shall collect the Warranty Certificate for performance of the modules from the manufacturer and submit the same to the Owner. If the solar module[s] fail[s] to exhibit such power output in prescribed time span, during the contractual performance guarantee period of first 12 months the Contractor and after completion of contractual performance guarantee period, the manufacturer will be bound to either deliver additional PV Modules to replace the missing power output with no change in area of site used or replace the PV Modules with no extra cost claimed at Owner's sole option.

PV Array Configurations

The Solar array shall be configured in multiple numbers of sub arrays, providing optimum DC power to available number of sub arrays. The bidder shall submit their own design indicating configuration of PCU and respective sub arrays and associated bill of material.

Module Mounting Structure

The structure design shall be appropriate and innovative. It must follow the existing land / roof profile. A typical Module Mounting Structure dwg has been attached to the tender as guidance for designing Module Mounting Structure.

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

Design drawings with material selected and their standards shall be submitted for prior approval of Employer within 15 days of issuance of Work Order.

The support structure design & foundation shall be designed with reference to Base Wind speed of 200 kmph . For estimation of Design wind speed risk factors k1, k2, k3 shall each be taken as minimum 1.0.

The structure must be designed with considering appropriate factor of safety. The bidder must provide the detail design and calculation for the structure design.

The structure shall be designed for simple mechanical and electrical installation. The SPV modules should be fixed on the structure by using anodised aluminium channels. It shall support SPV modules at a given orientation & tilt, absorb and transfer the mechanical loads to the ground properly. Welding of structure at site shall not be allowed.

The array structure shall be made of mild steel members of suitable sizes with weather protection coating. The coating shall be hot-dipped galvanized with minimum thickness of 80 microns on each sides. It is to be ensured that before application of this coating, the steel surface shall be thoroughly cleaned of any paint, grease, rust, scale acid or alkali or such foreign material as are likely to interfere with the coating process. The Contractor shall ensure that inner side should also be coated.

The array structure shall be so designed that it will occupy minimum space without sacrificing the output from SPV panels at the same time.

The structures shall be PU coated when the installation is in corrosive atmosphere and the same is specifically mentioned in the Scope of Work.

Nut & bolts, washers (packing and spring) supporting structures including Module Mounting Structures shall have to be adequately protected from atmosphere and weather prevailing in the area.

Two numbers of anti-theft fasteners of stainless steel on two diagonally opposite corners for each module shall be provided. All the fasteners and washers for Module Mounting Structures and modules, shall be adequately protected from atmosphere and weather prevailing in the area. Fasteners and washers to be used for erection of mounting structures could be of SS 304/ UNS S 20430 or equivalent, however fasteners used for fixing modules over structures shall be of stainless steel of grade SS 316 or equivalent, and must sustain the adverse climatic conditions to ensure the life of structure for 25 years.

Modules shall be clamped & bolted with the structure properly. The material of clamps shall be Al / Steel having weather resistant properties. Clamp – bolt shall use EPDM rubber and shall be designed in such a way so as not to cast any shadow on the active part of a module.

The array structure shall be grounded properly using maintenance free earthing kit.

The bidder/manufacturer shall specify installation details of the PV modules and the support structures with appropriate diagram and drawings.

The Bidder should design the structure height considering highest flood level at the site. The minimum clearance between the lower edge of the module and the ground shall be the higher of (i) accessed highest flood level at the site and (ii) 500 mm.

For multiple module mounting structures located in a single row, the alignment of all modules shall be within an error limit of maximum 10mm.

Legs of the structures of GI angle shall be fixed and grouted in the PCC foundation columns made with 1:2:4 cement concrete. Civil foundation design for Module Mounting Structures (MMS) shall be made in accordance with the Indian Standard Codes and prevailing soil conditions. The Successful Bidder shall submit the detailed foundation & structural design analysis along with calculations and basis/ standards in the Bid for owner's approval.

Cable should pass from Pipes and Cable-ties shall be used to hold and guide the Pipes (cables/wires) from the modules to junction boxes or inverters. All the cables were aesthetically tied to module mounting structure.

In case the string monitoring unit (SMU or JB) is mounted on the module mounting structure, bidder to take into consideration of the load thus added on the MMS. Accordingly, suitable supporting members for mounting the SMU/ JB must be designed and supplied. Separate structure for mounting of SMU can also be proposed.

Bidder must submit the complete quality documents i.e. test certificates for all tests conducted starting from raw material stage, in process, final testing w.r.t structure.

If the structure is planned to install above inclined asbestoses / aluminium sheet, the solar panels will be fixed to roof purlins using tek screw, suitable clamps and anodised extrusion.

Contractor to confirm that for roof top installation, no damage to existing water proofing of the roof shall be made during the course of installation of the structure on the roof top. Any damage to the waterproofing found during the above should be rectified to the existing roof condition at contractor's cost. All pedestals shall be finished to the existing roof condition to prevent any water seepage later.

Array Junction Box / Combiner Box

Array Junction Boxes / Combiner Boxes shall have to be used for termination of string prior connecting array with each inverter. They shall be equipped with appropriate functionality, safety (including fuses, grounding, contacts etc.) and protection.

The Array Junction Boxes / Combiner Boxes shall be dust, vermin and water proof and made of poly carbonate plastic. The number of PV Array Junction Box / Combiner Box shall be as per plant configuration.

The terminals will be connected to copper bus bar arrangement of proper sizes to be provided. The junction boxes will have suitable cable entry points fitted with cable glands of appropriate sizes for both incoming and outgoing cable. Suitable markings shall be provided on the bus bars for easy identification and UV resistant cable ferrules will be fitted at the cable termination points for identification. Input termination through VDE / UL / TUV approved PV connectors made of Polyamide with IP 65 / IP 67 protection and Output termination through VDE / UL approved Glands made of Polyamide with IP 65 / IP 67 protection.

Junction boxes should be equipped with fuses on both positive & negative input to protect the PV modules from short circuits.

Copper bus bars / terminal blocks housed in the junction box with suitable termination threads.

Earth terminal block for earthing.

Surge Protection Devices are to protect the PV modules as well as the other electrical / electronic systems from transient over voltages created due to lightning and to reduce insulation breakdowns due to lightning.

If the solar PV modules are not equipped with reverse blocking diode, then each Array Junction shall have suitable nature of fuses.

Only DC fuses shall be provided for each string / input and DC disconnector of suitable size should be used.

The Junction Boxes shall have suitable arrangement for the following :

i) Combine groups of modules into independent charging sub arrays.
ii) Provide arrangement for disconnection for each of the groups.
iii) Provide a test point for each subgroup for quick fault location.
iv) To provide group array isolation.
v) The current carrying rating of the Junction Boxes shall be suitable with adequate safety factor to inter connect the Solar PV array.

Bidder shall submit all the test reports / test certificates and compliance certificates before installation at site.

Accepted make : Hensell / Spellsberg / Ensto / Trinity / Nordac or approved equivalent make.

Power Conditioning Unit (PCU)

Power Conditioning Unit (PCU)/ Inverter shall consist of an electronic inverter along with associated control, protection and data logging devices.

The rated power/name plate capacity of the inverters shall be the AC output of the inverter at 50°C. Any inverters with AC output at 50°C, below the name plate/rated power of the inverter shall not be allowed.

The inverter supplied shall have minimum of 25% additional DC input Capacity. (E.g. Inverter is supplied with rated capacity of 100 kW (AC) shall accept at least 125 kW of DC power.)

All PCUs should consist of associated control, protection and data logging devices and remote monitoring hardware and compatible with software used for string level monitoring.

Dimension, weight, cooling arrangement etc. of the PCU shall be indicated by the Bidder in the offer. All PCUs shall be suitable for out-door type installation.
The minimum European efficiency of the inverter shall be 98% load as per IEC 61683 standard for measuring efficiency. The Bidder shall specify the conversion efficiency of different loads i.e. 25%, 50%, 75% and 100% in its offer. The Bidder should specify the overload capacity in the bid.

The PCU shall be tropicalized and design shall be compatible with conditions prevailing at site. Provision of exhaust fan with proper ducting for cooling of PCU's should be incorporated in the PCU's, keeping in mind the extreme climatic condition of the site as per the recommendations of OEM to achieve desired performance and life expectancy.

The inverters shall have minimum protection to IP 65(Outdoor)/IP 21(indoor) and Protection Class II.

Nuts & bolts and the PCU enclosure shall have to be adequately protected taking into consideration the atmosphere and weather prevailing in the area.

Grid Connectivity: Relevant CERC regulations and grid code as amended and revised from time to time shall be complied. The system shall incorporate a unidirectional inverter and should be designed to supply the AC power to the grid at load end. The power conditioning unit shall adjust the voltage & frequency levels to suit the Grid.

All three phases shall be supervised with respect to rise/fall in programmable threshold values of frequency.

The inverter output shall always follow the grid in terms of voltage and frequency. This shall be achieved by sensing the grid voltage and phase and feeding this information to the feedback loop of the inverter. Thus control variable then controls the output voltage and frequency of the inverter, so that inverter is always synchronized with the grid. The inverter shall be self- commutated with Pulse width modulation (PWM) technology.

Operational Requirements for Inverter/ PCU

All PCUs must have the feature to work in tandem with other similar PCU's and be able to be successively switched "ON" and "OFF" automatically based on solar radiation variations during the day. Inverters must operate in synergy and intelligently to optimize the generation at all times with minimum losses.

The PCU shall be capable of controlling power factor dynamically.

Maximum power point tracker (MPPT) shall be integrated in the power conditioner unit to maximize energy drawn from the Solar PV array. The MPPT should be microprocessor based to minimize power losses. The details of working mechanism of MPPT shall be mentioned by the Bidder in its offer. The MPPT unit shall confirm to IEC 62093 for design qualification.

The system shall automatically “wake up” in the morning and begin to export power provided there is sufficient solar energy and the grid voltage and frequency is in range.

Basic System Operation (Full Auto Mode): The control system shall continuously monitor the output of the solar power plant until pre-set value is exceeded & that value to be indicated.

PCU shall have provisions/features to allow interfacing with monitoring software and hardware devices.

Protection against faults for PCU

The PCU shall include appropriate self-protective and self-diagnostic feature to protect itself and the PV array from damage in the event of PCU component failure or from parameters beyond the PCU’s safe operating range due to internal or external causes. The self-protective features shall not allow signals from the PCU front panel to cause the PCU to be operated in a manner which may be unsafe or damaging. Faults due to malfunctioning within the PCU, including commutation failure, shall be cleared by the PCU protective devices. In addition, it shall have following minimum protection against various possible faults.

The PCU shall have the required protection arrangements against grounding leakage faults, Over Voltage & Current, Galvanic Isolation, Anti-islanding, Unequal Phases, supply or sink reactive power.

All inverters/ PCUs shall be three phase using static solid state components. DC lines shall have suitably rated isolators to allow safe start up and shut down of the system. Fuses & Circuit breakers used in the DC lines must be rated suitably.

Standards & Compliances

PCU shall confirm to the following standards and appropriately certified by the labs:

- Efficiency measurement: IEC 61683

- Environmental Testing: IEC 60068-2 or IEC 62093
- EMC, harmonics, etc.: IEC 61000 series, 6-2, 6-4 and other relevant Standards.
- Electrical safety: IEC 62109 (1&2), EN 50178 or equivalent
- Recommended practice for PV – Utility interconnections: IEEE standard 929 – 2000 or equivalent
- Protection against islanding of grid: IEEE1547/ UL1741/ IEC 62116 ore equivalent
- Grid Connectivity: Relevant CEA/ CERC regulation and grid code (amended up to date)
- Reliability test standard: IEC 62093 or equivalent

The Bidder should select the inverter as per its own system design so as to optimize the power output.

Desired Technical Specifications of PCU.

- Sinusoidal current modulation with excellent dynamic response.
- Compact and weather proof housing (indoor/ outdoor)
- Comprehensive network management functions (including the LVRT and capability to inject reactive power to the grid)
- Total Harmonic Distortion (THD) <3%
- No load loss < 1% of rated power and maximum loss in sleep mode shall be less than 0.05%
- Optional VAR control
- Power factor Control range: 0.9 (lead – lag)
- Humidity: 95% Non – Condensing
- Unit wise & integrated Data logging
- Dedicated Prefabs / Ethernet for networking

Inverter/ Power Condition unit must provide protection against:

- Over current
- Sync loss
- Over temperature
- DC bus over voltage
- Cooling Fan failure (If provided)
- Short circuit
- Lightning
- Earth fault
- Surge voltage induced at output due to external source
- Power regulation in the event of thermal overloading
- Set point pre-selection for VAR control
- Integrated protection in the DC and three phase system
- Insulation monitoring of the PV array with sequential fault location

Accepted make : SMA / ABB / Schneider / Reffusol / Siemens / DELTA / KACO or approved equivalent make

Cable and Wires

All cables and connectors for use for installation of solar field must be of solar grade which can withstand harsh environment conditions including High temperatures, UV radiation, rain, humidity, dirt, salt, burial and attack by moss and microbes for 25 years and voltages as per latest IEC standards. (Note: DC cables for outdoor installations should comply with the TUV 2PfG 1169/09.07 for service life expectancy of 25 years)

Insulation: Outer sheath of cables shall be electron beam cross-linked XLPO type and black in colour. In addition, Cable drum no. / Batch no. to be embossed/ printed at every one meter. Cable Jacket should also be electron beam cross-linked XLPO, flame retardant, UV resistant and black in colour.

DC cables used from solar modules to array junction box shall be solar grade copper (Cu) with XLPO insulation and rated for 1.1kV only. However, the cables used from array junction box to inverter can be XLPO Aluminium with 1.1kV rating as per relevant standards. Bidder shall provide the type test report for each type of cable used before dispatch of the cable.

All cables connecting the main junction box/inverters to the owner panel / transformers should be XLPE insulated grade conforming to IS 1554 and cables shall also conform to IEC 60189 for test and measuring the methods.

Acceptable Make:

DC Cable : Lapp / Hellukable / TKD / Sichem / KEI / Finolex or, approved equivalent

AC Cable : Lapp / Hellukable / TKD / Finolex / Havells / Polycab / Gloster / KEI / Sichem / Finolex or approved equivalent

Energy Meter

The meter is provided at ACDB's to measure the electrical energy output from solar power plant.

Acceptable Make: EM 1000 of Schneider or equivalent of L&T only.

Technical Particular Sheets

1.0 Solar PV Module

1.1	PV Module Manufacturer (Name & Country):		
1.2	PV Module type (Crystalline – Mono / Poly)	:	
1.3	No. of PV Cells per module	:	
1.4	No. of PV Modules	:	
1.5	Mounting arrangement for Solar Module	:	
1.6	Solar Module frame material (if framed)	:	
1.7	Module dimensions (in mm)	:	
1.8	Output Cables (viz. Polarised Weatherproof DC rated multi-contact connector)	:	
1.9	Availability of Reverse Blocking Diode and Bypass Diode	:	
1.10	Construction		
	Front Glass description and thickness	:	
	Back sheet details	:	
	Encapsulating Details	:	
1.11	Cell Efficiency (%)	:	
1.12	Module Efficiency (%)	:	
1.13	Nominal Wattage (P_{nom}) (Watt)	:	
1.14	Power Tolerance (≤ + 5V) (Watt)	:	
1.15	Peak Power Voltage (V_{mp}) (volts)	:	
1.16	Peak Power Current (I_{mp}) (amps)	:	
1.17	Open circuit voltage (V_{oc}) (volts)	:	
1.18	Short circuit current (I_{sc}) (amps)	:	
1.19	Weight of each module (kg)	:	
1.20	Fill Factor (%)	:	
1.21	Module is suitable to operate up to 50°C ambient temperature	:	Yes / No
1.22	Compliances (Reference Standards)	:	

2.0 Power Conditioning Unit (PCU)

2.1	PCU Module Manufacturer (Name & Country)	:
2.2	Capacity & nos. of PCU units	:
2.3	Model / Catalogue No.	:
	AC Side	
2.4	Nominal AC Power at 25°C (Kw)	:
2.5	Nominal AC Power at 50°C (Kw)	:
2.6	Output AC voltage (volts)	:
2.7	Output AC current (amps)	:
2.8	Frequency (and variation) (Hz)	:
2.9	Total Harmonic Distortion (< 3%) (%)	:
2.10	AC over/under voltage, over/under Frequency protection	:
2.11	Phase shift (Cos Ø)	:
	DC Side	
2.12	Maximum input DC Power. (Kw)	:
2.13	Maximum DC voltage (volts)	:
2.14	MPPT voltage range (volts)	:
2.15	Maximum DC current (amps)	:
2.16	DC overvoltage protection	:
2.17	DC voltage ripple (%)	:
	Others	
2.18	Maximum Efficiency (%)	:
2.19	Ambient temperature range (°C)	:
2.20	Humidity (non condensing) (RH)	:
2.21	Quiescent power (Kw)	:
2.22	Degree of protection (IP)	:
2.23	Dimension approx.. (H x W x D) (mm)	:
2.24	Weight (Kg)	:
2.25	Compliances (Reference Standards)	:

3.0 Energy Meter

3.1	Make	:
3.2	Model / Catalogue No.	:
3.3	Accuracy class	:
3.4	Voltage	:
3.5	Display	:
3.6	Memory	:
3.7	Communication Compatibility	:
3.8	Battery	:

4.0 DC / AC Junction Box

4.1	Make	:
4.2	Model / Catalogue No.	:
	Enclosure	
4.3	Degree of protection	:
4.4	Enclosure material	:
4.5	Withstanding voltage	:
4.6	Withstanding temperature	:
	Cable entry and exit	
4.7	Position	:
4.8	Cable entry and exit connector type	:
4.9	Cable Gland	:
	Earthing	
4.10	Earthing provision	:
	Terminals	
4.11	Terminals, lugs and busbar material	:

6.0.0 INSTALLATION-GENERAL

6.1.0 Installation work shall be carried out in accordance with good engineering practices and also manufacturer's instructions/recommendations where the same are available.

Equipment shall be installed in a neat workmanlike manner so that it is level, plumb, square and properly aligned and oriented.

Unless otherwise shown, the mounting heights of lighting fixtures and accessories shall be generally as follows:

a) Lighting fixtures in general areas of warehouse etc. :

i) Industrial High bay type : 6000 mm to bottom

b) Bracket lights over door : 300 mm bottom of fixture above opening

c) Receptacles : 500 mm floor to centre

d) Local switches : 1500 mm floor to center

e) Lighting panels : 1500 mm floor to top

For cable/wire numbering, PVC sleeve with cable/wire of number of different colour code shall be used.

Flameproof installation shall be carried out with flameproof G.I. conduits and flameproof accessories and junction boxes.

Unless otherwise noted the size of PVC / GI conduits & junction box shall be as below :

a) Conduits

Cable size	Conduit size					
	20mm	25mm	32mm	40mm	50mm	Maximium no. of conductors Admissible for conduit
i) 10 mm^2 AL	-	2	5	7	8	
ii) 2.5 / 1.5 mm^2 CU	3	5	9	-	-	

b) Junction boxes

Conduit size (MM)	junction box size (mm) 4-way	3-way	straight	90^0
i) 20/25	150x150x100	150x100x100	88	88
ii)32/40	254x200x127	254x200x127	150x150x100	-
iii) 50	254x200x127	254x200x127	254x200x127	-

6.2.0 **Lighting Fixture**

Continuous rows of fluorescent tubes shall be mounted on a continuous M.S. angle for each row of lights.

In pump houses, fixtures shall be mounted to maintain sufficient clearance from the overhead traveling crane trolley.

In plant area where necessary bracket are required for fixture shall be fabricated at site from 38 mm conduits with a reducing socket to suit the fixtures and clamped on to the handrails. The fixing shall be strong enough to with stand vibration and high wind velocity.

If a roof over the plant area is available, the fixture can be pendant mounted.

Floodlights shall be mounted on steel base. Fixing holes shall be provided with slot to turn the fixture about 5 deg. in both the direction. Bolts shall be finally tightened with spring washer.

The Contractor shall supply and install the steel base for fixing the floodlight on the flood light towers.

Terminal connection of the floodlight shall be made through PVC coated flexible metal conduits.

Fixture shall be mounted on plant structures with suitable clamps. No cutting or drilling or plant structure shall be permitted.

The fixture after erection shall be marked up indelibly with corresponding circuit number for easy identification of lamp circuit.

For wall mounted type fluorescent fixture for internal illumination, the same shall be installed at a height of 2.6 meters (8'-6") from the finished floor level unless mentioned otherwise. For ceiling mounted type, each fixture shall be suspended by two (2) down rods capable of sustaining the weight of fixture & sufficient length for achieving the mounting height mentioned herein above. The down rod shall be painted without

involving any extra cost.

6.3.0 **Lighting Panels**

Lighting Panels shall be erected at locations indicated in drawings / schedule.

Suitable provisions of foundations for boards needs to be provided. The Contractor shall have to fabricate and erect the necessary support brackets of erection of panels wherever required.

Laying and termination of all lighting cable from MLDB, LP are included in the scope of Contractor.

6.4.0 **Switchboards for light/fan points**

The switchboards shall be installed at height of 1.5 meters above the finished floor level. No switches shall be provided inside the bathroom.

6.5.0 **Ceiling fans**

Unless otherwise specified all ceiling, fans shall be hung not less than 2.73 meters (9') above floor. The suspension rod and clamp shall be painted without involving extra cost.

6.6.0 **Exhaust fans**

Exhaust fans shall be fitted by means of bolts in the wall. The required size of holes in the wall shall be cut out to the required size and furnished neatly with cement plaster and brought to the original finish of the wall.

6.7.0 **Installation of receptacle**

Receptacles shall be located on the walls at a height either 450mm or 900 mm from the floor as indicated in the corresponding drawings.

6.8.0 **Flood Lighting Tower/High Mast Tower**

Flood lighting towers **/** High Mast Towers shall be erected by the Contractor. Purchaser will provide foundations for these towers.

Contractor shall also mount assembled fixture, outdoor type Junction-Box with TPN isolator and fuse, distribution board and install necessary cabling and wiring and make connections for the same.

6.9.0 **Distribution wiring to individual points**

All runs of mains & sub mains, distribution wiring to individual points including the exact positions of light fittings and switch boards shall be first marked on the buildings and shall be approved by the Engineer-in-Charge of the Purchaser before the actual commencement of work.

The 'Point Wiring' shall include, unless otherwise specified, supply and installation of all wires, conduits, wiring; and conduit accessories from the junction boxes to respective

light, fan, receptacle (RA) points, including supply and fixing of junction boxes, switch boards, piano-key switches, receptacles (RA), fixing of fan-regulators making all connections, painting, earthing with continuous 1.5 mm^2 PVC insulated 'CU' wire etc. complete in all respects for the type of wiring specified including breaking the R.C.C./brick work wall/floor and making good the damage to original finish.

'Surface Wiring System' shall be done using casing capping, or through heavy gauge GI or rigid PVC conduit, as specifically mentioned in the corresponding Schedule of Items/single line diagram.

To facilitate drawing of wiring through conduits/ G.I / Steel pipes etc., G.I. fish wire of 14 SWG, wherever needed, shall be provided along with recessed / surface conduit without any extra cost.

6.9.1 **Mains and Sub-Mains Wiring**

Mains and sub-mains shall consist of wires, cables, conduits, casing capping, bends, junction boxes, bushes, check-nuts etc. as specified herein before.

The size and capacities of the conduits, casing capping shall be as stated in the Schedule of Quantities and will commence from main switches to various distribution boards.

Wires shall be drawn in the concealed or surface conduits, casing capping as required without being damaged. For this purpose, draw boxes shall be located at convenient places.

Every main and sub-main will run in an independent conduit with an independent earth wire as specified running along the entire run of conduit.

Necessary provision of wire lengths entering and emerging from the conduit / casing capping must be made for connections.

Measurement will be taken of the actual conduit / casing capping run containing the wires from one point to the other.

Rates quoted shall include all materials, connections, labour etc. as specified

6.9.2 **PVC Casing capping wiring**

PVC Casing & capping shall be rigid PVC built for high impact strength and shall be fire retardant and self-extinguishing. The casing cover shall have a perfect snap fitting with the case trunking and should be such that it will not dislodge or slide or, distort under its own weight or under the weight of wire in the trunking.

The individual casing and capping shall have a standard overall length of not less than 2 M. The accessories of casing and capping, like elbow right angle corners, tees, couplers, external and internal right-angle linkers, 4 way covers, junction boxes etc. shall be made

of same materials as the casing and capping and shall be equally precision snap fitting. The colour of the casing capping accessories shall be perfectly uniform throughout.

The casing and capping of different widths (eg. 20mm, 25 mm, 40 mm, 50 mm etc.) shall have same depth (both internal and external) to present a perfectly level and flush appearance. Proper jointing materials as recommended by manufacturers shall be used for jointing, ensuring matching of casing and capping as far as possible. Diagonal runs for casing and crossing of casings with other casings shall be avoided.

The casing shall be fixed to the mounting surface using wide flat-headed screws fitted at a spacing of 500 mm (approx.) and so tightened that the head is flush with casing face. The screws should be aligned that the full face of the casing is flush with the mounting surface. The wires shall be run in a proper workmanlike manner ensuring that they are perfectly straight and without tension and free from jumbling and crossing. All casing end shall terminate in the switch/point/receptacle mounting boards. The sizes of the casings shall be selected such that wires to be run therein can be accommodated easily without any pressure or tension whatsoever.

6.9.3 **Surface / concealed type Wiring through GI/Rigid PVC Conduit**

Surface wiring system through GI/rigid PVC heavy gauge (minimum thickness of conduit wall 3 mm) conduit shall be done with screwed-type coupler. The conduits less than 19 mm dia shall not be used, unless specified. All conduit accessories for supply shall be threaded type. The conduits shall be properly earthed.

In long distance straight runs of conduit, inspection type screwed coupler is to be provided at reasonable intervals. Threads on conduit pipes in all cases shall be between 13 mm to 27 mm long sufficient to accommodate pipes to full threaded portion of couplers or accessories.

In order to minimise condensation and sweating inside the tube, all outlets of pipe system shall be properly drained and ventilated, but in such a manner as to prevent entry of insects inside the conduit. To protect against rust, the outer surface of the conduit and accessories shall be painted with anti-corrosive preservation.

Conduit shall be fixed by heavy gauge saddles, secured to wall/ceiling by screws driven into wood plugs at an interval of not more than 75 cm apart for vertical run and 60 cm apart for horizontal run, but on either sides of couplers or bend or similar fittings-saddles shall be fixed at a distance of 30 cm from the center of such fittings. The minimum thickness for saddles shall be 24 SWG for conduits upto 25 mm dia and 20 SWG for larger sizes.

Where conduit pipes are to be laid along trusses, steel joints etc. the same shall be secured by means of girder clip. Where it is not possible to drill holes in the truss member, suitable clamps with bolts and nuts shall be used. The width and thickness of girder clips and clamps shall not be less than 19 mm wide and 20 SWG thick for conduits

upto 25 mm dia. and 25mm wide and 18 SWG thick for conduits of dia 31 mm & above.

All necessary bends in the system including diversion shall be done by bending the pipes, or by inserting suitable inspection type bends, elbows or similar fittings or by fixing cast iron inspection boxes whichever is most suitable.

All outlets for fittings, switches etc. shall be fixed on boxes of suitable metal for either surface mounting system or flush mounting system. In case of cast iron boxes the wall thickness shall be at least 3 mm and in case of welded mild steel sheet box the wall thickness shall not be less than 18 gauge for boxes up to a size of 20 cm x 30 cm and above this size 16 gauge M.S. box shall be used. Except where otherwise stated 3 mm thick insulated laminated sheets shall be fixed on the front with screws. Where conduits are terminated special care shall be taken in employing double jam nuts, for securely fixing the conduits to outlets and to provide insulated bushes inside conduits at ends so as to prevent any possibility of damage to cables when drawn.

Only single core PVC insulate cables/ wires shall be used for wiring through conduits. The no. of single core cables in one circuit shall be such that it permits easy drawing in of the cables. Under no circumstances no. of cables drawn in one conduit shall be greater than the maximum set out in Table II of IS 732-1963 code of practice (revised) for electrical installation (system voltage not exceeding 650 volts).

All conduits and accessories for distribution wiring shall be provided with earthing attachment by one no. 16 SWG continuous GI wire for loop earthing GI wires shall be run conduits being fixed with saddles.

Where conduits are run on cable trays, they shall be clamped to supporting steel at an interval of 600 mm.

For embedding directly in soil, the conduits shall be coated with an asphalt - base compound. Concrete pier or anchor shall be provided where necessary to support the conduit rigidly and to hold it in place.

Running threads shall be avoided as far as practicable. Where it is unavoidable, check nuts shall be used.

Conduits shall be kept, wherever possible, at least 300 mm away from hot pipes, heating device etc. when it is evident that such proximity may impair the service life of cables.

6.10.0 **Cabling**

6.10.1 **Cable Laying.**

a) Cable shall be installed in ladder type fabricated trays except for plant buildings, In plant buildings, the same will run in rigid/ flexible conduit for protection or, directly clamped on walls. In outdoor areas, cables shall be laid directly below

ground with bricks/ RC slab protection.

b) Cable laid on trays and risers, run through walls shall be neatly dressed and clamped at an interval of 1500 mm and 900 mm for horizontal and vertical cable runs respectively.

c) Clamps for multicore cables shall be fabricated out of 25 x 3 mm aluminium flats. All power cables shall be clamped individually and control cables shall be clamped in a group of three or four cables.

d) Prior to laying of cable inside both indoor and outdoor trenches, the contractor shall properly clean inside those trenches.

e) In outdoor area, buried cable shall be laid and covered with sand/ riddled earth and protected from damage by bricks at sides and precast slab at top.

f) When buried cable cross road/ railway track, additional protection shall be provided in the form of hume/ galvanised iron pipes/ RCC box culvert.

g) Whenever any wall opening/ floor chipping shall be done, contractor shall also be responsible for repairing such opening/ chipping, to the original architectural finish of the building.

6.10.2 **Cable Tag and Markers**

a) Each cable and conduit run shall be tagged with numbers that appear in the cable conduit schedules. Cables and conduit shall be tagged at their entrance, every 30 M and exit from any equipment, junction box.

b) The tag shall be of aluminium with the number punched on it and securely attached to the cable by not less than two runs of 16 SWG GI Wire.

c) The location of cable joint if any shall be clearly indicated with cable marker with an additional inscription 'cable joint'.

d) The contractor shall furnish and install all tags and markers as stated above.

e) For buried cable, the marker shall project 150 mm above ground and shall be spaced at an interval of 30 Metre and at every change of direction.

6.10.03 **Cable Termination and Connection.**

a) The termination and connection of cables shall be done strictly in accordance with manufacturer's instruction, approved drawings and/ or as directed by the Engineer.

b) The work shall include all clamping, fitting, fixing, soldering, tapping, compound filling, cable jointing, crimping and earthing as required for the complete job. All equipment required for all such operations shall be furnished by the contractor.

c) Furnishing of all material such as soldering material, electrical tape, sealing material as well as cable jointing kit shall be included in the offer.

d) Cable joint kit for all cables shall be supplied by Contractor under this specification. Responsibility for proper termination shall lie on the Contractor. Guarantee for termination shall also have to be given by the Contractor.

e) The equipment shall generally be supplied with undrilled gland plates for cable/ conduit entry and cable end box for power cable.

f) The Contractor shall perform all drilling, cutting on the blank plate and any minor modification work required to complete the job.

g) If the cable end box or the terminal enclosure provided on the equipment is found unsuitable and requires major modification, the same shall be carried out by the contractor at the discretion of the Engineer.

h) Control cable core entering the control panel/ distribution board etc. shall be neatly bunched and served with PVC perforated type trays to keep it in position at the terminal block.

i) The Contractor shall put ferrules on all control cables' cores in all junction boxes and all terminations. The ferrule shall carry terminal numbers as per drawings. All ferrule shall be coloured, plastic and interlocked

j) Spare cores shall be similarly ferruled, crimped with lug and taped on the ends. Spare cores shall be ferruled with individual cable number.

k) Termination and connection shall be carried out in such a manner as to avoid strain on the terminals.

l) All cable entry points shall be properly sealed and made vermin and dust proof. Unusual opening, if any shall be effectively closed. Sealing work shall be carried out with approved sealing compound having fire withstanding capability for at least three hours.

6.10.04 **Cable Trays & Cable Tray Supports**

Cable trays shall be pre-fabricated.

Fabricated trays and supports shall be free from all burrs and sharp cutting edges. Trays and supports shall be made free of scale, grease, rust and welding slags.

Supports shall be provided with two coats high quality primer and two coats of epoxy based paint.

6.10.05 **Conduits and Accessories**

Conduits shall be of rigid steel, hot-dip galvanised, furnished in standard length of 3 metres and threaded at both ends.

Conduit diameter up to and including 25mm size shall be of 16 SWG and conduits above 25 mm diameter shall be of 14 SWG. Minimum diameter of conduits shall be 19mm.

Each price of conduit shall be straight, free from blister and other defects, internal surface shall be of smooth finish and covered with capped bushings at both ends.

Flexible conduits shall be made with bright, cold rolled, annealed and electro-galvanised mild steel strips coated internally with epoxy or steel wire reinforced PVC.

6.10.06 **Junction Boxes**

Junction boxes shall be of 16 SWG sheet or of cast iron and shall be hot dip galvanised, out-door type, dust and damp proof, generally conforming to IP-55.

Junction boxes shall be complete with gasketed inspection cover, conduit knock out/threaded hub and terminal blocks.

Junction boxes for outdoor use shall be weather proof IPW-55 and those for hazardous locations shall be flame-proof type.

Junction boxes shall be of two types viz one suitable for control wiring and the other with terminals for power cable terminations. Junction boxes for power cable terminations shall have minimum nine (9) nos. of terminals.

The junction boxes shall have the following identifiable markings :

1. Circuit nos. on top by white stenciled paint at site.
2. Circuit nos. with ferrules (inside) as per approved drawings.
3. Danger sign in case of 415 V circuit.

6.10.07 **Terminals**

Multi way terminal blocks of approved type, complete with screws, nuts, washers and marking strips shall be furnished for connection of incoming/outgoing wires.

Each control cable terminal shall be suitable for connection of 2 nos. 2.5 sq. mm. stranded copper conductors without any damage to the conductor or looseness of conductors.

6.10.08 **Cable Termination & Jointing Kits**

The Bidder shall supply cable termination and jointing kits for HV. Power Cables, L.V. Power and Control Cables along with all accessories (if necessary).

The cable termination kits of HV. cable and straight through joints including necessary boxes, if any, shall be preferably of RAYCHEM make using either heat shrinkable/prefab push-fit type kits. Cable end terminations on H.V. Electrical equipment shall be suitable for Indoor & Outdoor uses, as the case may be.

The Bidder, in some cases, may have to carry out modification work/provide extension chamber for Motor cable end boxes in order to make them suitable for termination of cable with termination kit being supplied under this specification. The Contractor shall carry out the necessary modification work with the approval of Engineer at site.

For the cable termination and straight through joints for both L.V. Power and control cables, supply of items of jointing kit such as necessary boxes, if any, sealing compounds, ferrules, tapes, lugs, glands shall preferably of reputable make such as Raychem/M-Seal/3 M or equal.

Supply of straight through ferrules shall be included in the supply of straight through jointing kits for both HV and LV cables.

6.10.09 **Cable Glands**

Cable glands shall preferably be tinned brass gland, double compression type complete with necessary armour clamp and tapered washer etc. Cable glands shall match with the sizes of different HV/LV Control cables.

6.10.10 **Cable Lugs**

Cable lugs and straight through ferrules shall preferably be tinned copper/aluminum suitable for termination of different cross-sections of HV/LV/Control cables. Lugs for power cables shall be compression type whereas lugs for Control/Instrumentation/Signaling cables shall be crimping type. Supply of lugs for end termination of control cables shall be included in the end termination charges.

6.10.11 **Cable Opening Sealing Compound**

Sealing compound shall have adequate fire protection rating and shall be fire seal type or approved equivalent suitable for sealing both vertical & horizontal cable penetrations. The sealing compound in conjunction with mineral wool shall form effective fire seals and thickness of coating shall be at least 2 mm. The sealing compound shall have special property to allow for thermal expansion of cables both under normal and short circuit conditions.

6.10.12 **Cable Clamps**

Cable clamps fabricated out of 25mm x 3mm aluminum strips sheathed in PVC or preferably self locking type cable clamps/ties of nylon/FRP material of requisite lengths shall be used for clamping of multi core control cable and multi core HV/LV power cables.

Trefoil cable clamps (Nylon/FRP) suitable for single core HV/LV cables of size 630/500/185 Sq. mm. shall be used for clamping in trefoil formation at intervals of 1500 mm for horizontal tray and 900 mm for vertical tray. Necessary cable clamping hardwares shall also be supplied for fixing the same to the cable trays.

6.10.13 **Grounding Wires and Galvanised Steel Flats**

Specified quantity of 8 SWG GF ground wire and galvanised steel flats shall be supplied.

6.11.00 **Steel Fabrication**

All racks, supports, hangers and brackets wherever necessary shall be fabricated by the Contractor. Necessary steel shall be supplied by the Contractor.

Steel for fabrication shall be straightened and cleaned of rust and grease. All fabrication shall be free of sharp edge.

The Contractor shall maintain a register showing account of receipt of steel in the work and records shall be kept to the satisfaction of the Owner.

For the purpose of certification and accounting the theoretical weights on the basis of relevant Indian Standards will be binding.

6.12.00 **Grounding of Electrical System**

The Contractor is to carry out the grounding of the entire electrical installation under the scope of this specification as directed by the Owner's representative. Junction boxes, joint boxes, switch boards, lighting fixtures, receptacles, conduits, cable, armours etc. and all non-current carrying metallic parts shall be earthed at two separate points. The equipment grounding shall be carried out by GI flat / wire of specified sizes and the same shall be connected to the risers of plant earth mat. In any case, the earth resistance of the grounding system shall be less than 1 ohm. The earth pit shall be 50 mm dia GI pipe and

shall be embedded 3 metre in ground and will be filled with homogenous mixture of charcoal/coke dust and salt throughout the length of the pit as shown in enclosed drawing. A chamber for pit to be provided which will be covered by Cast Iron cover mentioning pit resistance with paint.

The method adopted for system earthing as well as equipment earthing shall be in accordance with the Indian Standards Rules and Regulations of Practice for earthing.

The main ground grid shall be buried in earth at a minimum depth of 600 mm. below finished grade level unless stated otherwise. The size of the ground grid conductor shall be bare 25 x 3 mm GI flat and are connected to ground electrodes.

Earth grid for normal electrical earthing, earth grid for earthing, earth grid for lightning protection and earth grid for electronic equipment earthing shall be all isolated and independent from each other.

All risers from the ground grid shall be 25 x 3 mm GI flat and shall be projected 300 mm above grade level / concrete floor level unless otherwise shown.

All ground conductor connections shall be made by electric arc welding unless otherwise specified. Ground connections shall be made from nearest available plant ground grid risers. All ground conductors above ground shall be painted black for easy identification.

In case of site fabricated cable tray/ladder, the runner angles shall be used as ground conductors and shall be made electrically continuous. Such grounding continuity work on runner angles of cable tray is to be included in erection price of cable trays/racks. Cable screens and armours shall be bonded to earthing system. Also metal pipes and conduits carrying cables shall be bonded and effectively earthed.

In office buildings, laboratories etc. where concealed wiring is adopted, flats or wires for earthing shall be run along the pipes carrying lighting cables. In case where the earth conductors are to be taken through embedded pipe carrying cables, the same shall comprise aluminium conductor insulated cables of green colour for easy identification.

The earthing shall be done by GI Flat or, GI wire of sizes as laid down in earthing drawings and the same shall be connected to the risers of main earth grid.

6.13.00 **Excavation and Back Filling**

The Contractor shall perform all excavation and backfilling as required for buried cable and ground connections.

Excavation shall be performed upto the required depth. Such sheeting and shoring shall be done as may be necessary for protection of the work.

The Contractor shall make use his own arrangements for pumping out any water that may be accumulated in the excavation.

All excavation shall be backfilled to the original level with good consolidation.

6.14.00 **LIGHTNING ARRESTOR**

The system should be consists of following accessories:-

6.14.01 **Early Streamer Emission Air Terminal:-**

a) The lightning protection system should be confirming to international standard NF C 17 102 (Protection of structures & open area against lightning using Early Streamer Emission Air Terminal.) and installation shall follow: BS 6651:1999 (against lightning code of practice).

b) The air terminal should be of early streamer emission type and is sealed in a 304 grade stainless steel shell in order to guarantee resistance to impact, corrosion and chemical agent. It should be suitable for high humidity climate and in exposed industrial sites having ambient temperature of 50 degree Celsius and relative humidity of 95%.

c) The air terminal must be having an embedded system to recognize the chance of lightning before the strike and the system should be sensitive to approaching lightning (both +ve and -ve) and send an appropriate upward streamer to neutralize the lightning strike through down conductor & earth terminal.

d) The system should have inbuilt battery, chargeable by solar day light photovoltaic cells for operation of electronic circuitry.

e) The ESE Air Terminal should be of self-check feature i.e. shall send a radio frequency signal to indicate healthiness of the ESE terminal and same will be received by a Remote Teletester as a confirmation of healthiness of the terminal.

f) The Air Terminal should be with capturing rod diameter of:20 to 25 mm, and Triggering distance should be: 50 to 60 meter at level 3 standard protection.

g) The minimum level of protection offered should be: 100 metre radial distance in generation level-III (Lightning intensity: 16 Kamp and above) with tip height of 4 to 5 meters above Building to be protected.

h) The Air Terminal should have undergone tests at CPRI for impulse current test 8/20 micro seconds at 40 KA and approved by competent authority of State/Central govt. for use in lightning arrestor applications.

i) The Air Terminal should be suitable for effective & satisfactory long term performance. All fitting should be mechanically sound to withstand the atmospheric pressure during wind storm and heavy rain.

j) The weight of Air Terminal should be 4 to 6 Kg.

k) The test & certification must be by: CPRI/CERDA/NABL or other govt. approved institutes.

l) Gaurantee/waranty should be minimum: 02 Years.

6.14.02 **Extension Mast:-**

a) It should be of MS support tower type structure with mounting kit made up of grade 304 stainless steel, 4 to 5 meters in length, suitable to withstand pressure & velocity of the wind pressure during lightning, storm and rains. It shall mounted on the top of existing warehouse at a height of about 13.5 mtr.

b) The extension mast should be suitable for fixing / holding the above ESE Air Terminal.

6.14.03 **Lightning flash Counter:-**

a) It should have six/seven digital LCD display powered by 6 volts/7.2 volts battery. The average battery life should be minimum 03 years.
b) It should count lightning stroke and save the parameters like strike intensity, date & time of the event.
c) It should start detection from range 1 KA to 100 KA.
d) It should be capable of memories & show the history of strikes counted i.e. intensity of strike, date & own time of strikes.
e) It should be installed on the down conductor just 2 meters above the ground level & nearer to the earth terminal.

6.14.04 **Test Point:-**

a) It should be PVC weatherproof enclosure with isolating/disconnecting copper connects arrangements on down conductor between the Air terminal and Earth Pit Terminal for testing of the Earth Resistance.
b) It should be provide just below the Flash Counter & the place should be convenient for periodic Testing of the earth pits.

6.14.05 **Protective Sheath:-**

a) It should be electrically insulated PVC sheathed protected covering over the down conductor up to 02 meters from the ground level.

6.14.06 **EARTHING SYSTEM**

The Advance Earthing System should be consisting's of followings accessories & should give the effective Earth Resistance of below 01 ohms for each earthing system.

a) Earthing Terminal:-Earthing Terminal should be consisting's of 02 Nos. of each Earth Pits per ESE protection system, & should be with the provision of Advance Earthing Electrodes, installed into 4 to 6 inches dia. & 02 to 03 meters deep holes, drilled/excavation into earth surface at recommended distance with the help of pneumatic drilling equipment's & then

filled mineral filling compound. Each earth pit should be providing with earth pit chamber of suitable size with easily operative top cover.

b) Advance Earthing Electrodes:-should be consists of outer body: 50-80 mm dia. ISI-marked GI pipe, inside &outside galvanization, primary conductor hot dip GI strip, 40mm x 06 mm in size, 03 meters in length, filling: super conductive crystalline compound, filled & sealed at both ends, connecting : Brazed terminal connector OR Equivalent rated copper bonded steel electrode, dia: 20 -25 mm, solid, length: 02- 03 meters.

c) Mineral Filling Compound:-
Appearance : Granular from with granulometry up to 0.8 mm, colour : Gray /inodorous, PH value: 5.8 to 7.2 of 1000 gm. / liter at 20 degree Celsius, properties : Hygroscopic, High conductive, capable of reducing soil resistivity,non-corrosive, Long shelf life, Environment friendly, partially soluble in water. The mineral filling compound of 80 to 100 Kg. should be supplied in manufacturers original packing should be used for earthing pits of the system i.e. 02 bags per earth pit.

d) Test Certification of Earthing System etc.:-The test certificate of above Advance Earthing System should be of: CPRI/CERDA/NABL.

6.14.07 **COPPER CONDUCTOR**

Supply installation testing & commissioning of Copper Earthing Conductor for above lightning system: 50 meters. Its installations and characteristics should are as under :-

a) It should be of electrolytic grade, high conductivity bare copper conductor in flat strip type of size: width 25mm x thickness 03 mm. Alternatively PVC Insulated multistrand Copper cable can be provided.
b) It should be laid from ESE Lightning conductor air terminal in continuous run without any sharp runs.
c) However, in an unavoidable situation it should be jointed with proper jointing accessories.
d) It should be mounted on epoxy insulators at the span of 0.5 meters so as to keep the conductor away from the building.
e) It should be connected to Air Terminal by means of specific clamps.
f) A test clamp should be installed at a height of 02 meters high, above the ground level & down conductor should be covered with suitable protective sheath.
g) The lightning flash counter should be installed just above the test clamp so that it is visible for periodic inspection.
h) The down conductor should be provided with protective sheath of PVC or steel or GI up to 02 meters from the ground level.

6.14.08 **TERMS AND CONDITIONS**

a) The materials supplied by the firm should be along with test certificates from original equipment's manufactures i.e. : CPRI / CERDA / NBAL or other govt. approved institutes and valid authorization certificates of the systems offered i.e. ESE Terminal & its accessories, earthing system & its accessories etc.
b) The work will be carried out by the firm on turnkey basis.

c) The ESE Air Terminals will be tested at site before their installations with the help of Teletester in presence of site in charge.
d) If the test results are found satisfactory then only the installations will be permitted.
e) The values of Earth Resistance of each earthing system provided should be below 01 ohms, will be measured by standard Earth Tester in presence of our Site in charge.
f) The test reports should be submitted by the firm in triplicate, separately for each system / installations.
g) The firm will have to give the guarantee/warranty of their works/equipment for minimum 02 years or so.
h) The firm should submit the catalogues, showing technical details of their equipment's etc. in their quotation as well as after installations/complete the works.
i) The exact place for installations of ESE Air Terminal, Route of down conductor & Location of Earth Pits etc. in a given location will be finalized by our site in charge

6.15.0 **COMPLETION DRAWINGS**

After the completion of the work and before issuance of virtual completion, the Contractor shall submit to the Owner completion drawings in the form of three complete set of originals on sepia cloth in ink with two sets of blue prints of layout drawings drawn at approved scale indicating the complete system as installed along with two sets of Compact Disc (CD). These drawings shall give the following:-

6.15.1 Run and size of conduits, location of inspection, Junction and pull boxes.

6.15.2 Location and rating of sockets and switches for the light and power outlets.

6.15.3 Location and details of distribution boards, main switches, switchgears and other particulars.

6.15.4 Complete schematic drawings as installed showing all connections in the complete electrical system.

6.15.5 Location of all earthing stations, route and size of all earthing conductors manholes etc.

6.15.6 Layout and particulars of all cable runs size and type of cables, mode of installation, etc. as installed.

LIST OF APPROVED MAKES OF ELECTRICAL ITEMS

Sl. No.	Item Description	Approved Make
1.	LT Cables:	CCI / Asian / Gloster / Polycab /Havells / Finolex
2.	LT Components:	L&T/ Schneider/Legrand/Siemens/ABB
3.	Meters:	AE/IMP/MECO/Conserve/L&T/Secure/Jayco/Siemens
4.	CT/PT:	Jyoti / C&S/ Kappa /L&T /Pragati/ Precise
5.	Switch/Receptacle:	Northwest / Havells / Clipsal/MK
6.	Wires:	Nicco/Asean/ Polycab/Havells/Panasonic/Finolex
7.	Light Fittings:	Philips / Bajaj /Panasonic
8.	Ceiling Fan:	Polar / Bajaj / Crompton
9.	Cable Glands:	Electromeg/Comet/Flexpro
10.	Cable Lugs:	Dowel/Connectwell
11.	Terminal Blocks:	Elmax/Connectwell
12.	Termination Kit:	Raychem / M-sea
13.	Straight Thru. Jointing Kit:	Raychem / M-sea
14.	Conduit Pipe:	EGA / Clipsal / National / ELPRO
15.	Lighting DB :	Legrand/Schneider/Havells
16.	SPV Module:	BHEL/CEL/REIL/Tata Solar/Vikram Solar/Emmvee/ Warrie/Websol/Kotak Solar/Jakson
17.	Array J.B:	Hensell / Spellsberg / Ensto / Trinity / Nordac
18.	PCU, String Inverter:	SMA / ABB / Schneider / Reffusol / Siemens / DELTA / KACO

19. Solar DC Cable: Lapp / Hellukable / TKD / Sichem / KEI / Finolex

20. Solar AC Cable: Lapp / Hellukable / TKD / Finolex / Havells / Polycab / Gloster / KEI / Sichem / Finolex

21. Uni-Directional Energymeter: EM 1000 of Schneider or L&T equivalent

Besides above mentioned make equivalent approved make (EAM) may also be used. The Contractor shall also obtain prior approval from Owner for the 'Make' and 'Rating' of any other major item not mentioned above.

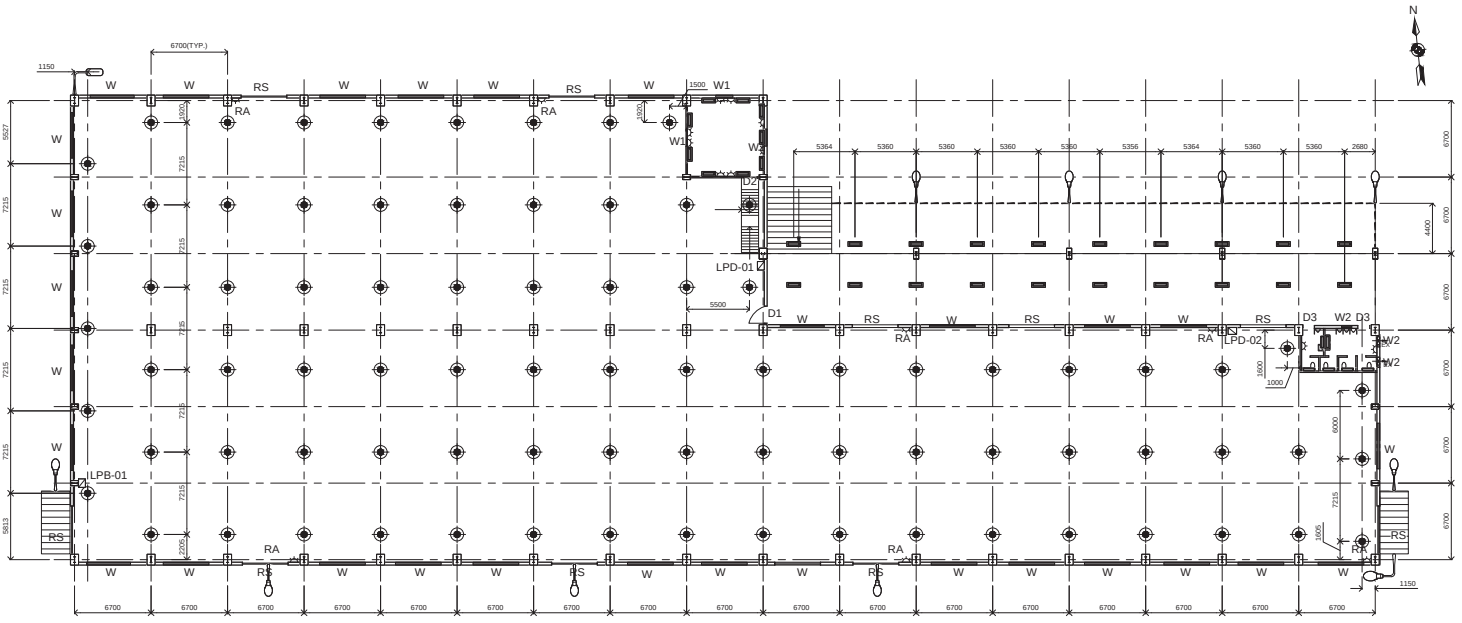
TENDER DRAWING

(Attached as Enclosure-I)

List of Drawings

SN.	Title	Drawing No.	Rev	Date	Sheet
1	Electrical and Illumination layout of CFS, Kolkata	EP/CFS/WH/ELE/04	0	01-02-2021	Sheet 1 of 1
2	Typical Pipe Earthing Detail	EP/CFS/WH/ELE/05	0	01-02-2021	Sheet 1 of 1
3	Roof Plan and Cross-Section of Warehouse at CFS-Kolkata	EP/CFS/WH/06	0	08-10-2020	Sheet 1 of 1

Above mentioned drawings are attached as **Enclosure-I**



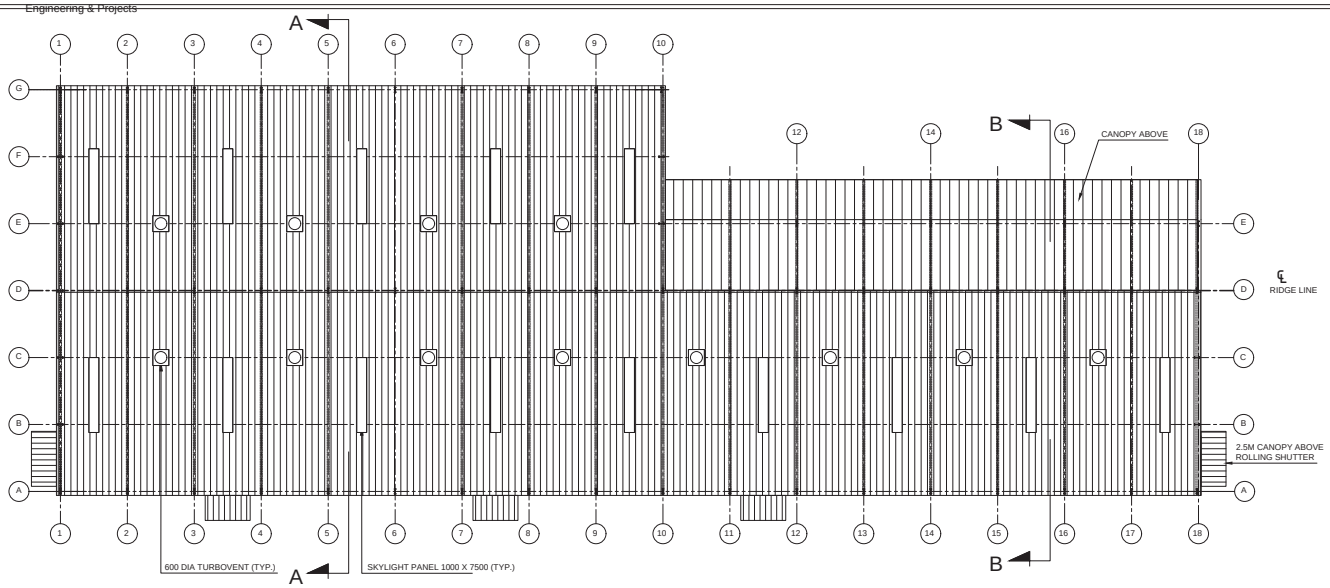
SL NO	PARTICULAR	SYMBOL	QTY.
01.	HB(1X120W) HIGHBAY TYPE	HB(120W)	82
02.	DB (1X40W) OFFICE AREA	DB(40W)	33
03.	STM(200W) LED OUTDOOR	STM(200W)	01
04.	POWER RECEPTACLES	RA/B/C	17
05.	LIGHTING PANEL / SWITCH BOARD	LP/SWBD	03
06.	DB (1X18W) TOILET AREA	DB(18W)	05
07.	250mm. SWEEP EXHAUST FAN.	EX	02
08.	PERIPHERAL LIGHT	STL (60W)	10

TENDER DRAWING

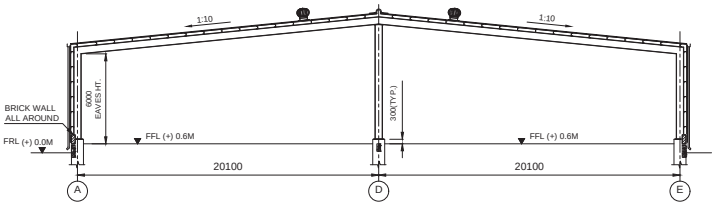
Balmer Lawrie & Co. Ltd.
ENGINEERING & PROJECTS

NO.	DATE	REVISION	BY	CHKD.	APPD.

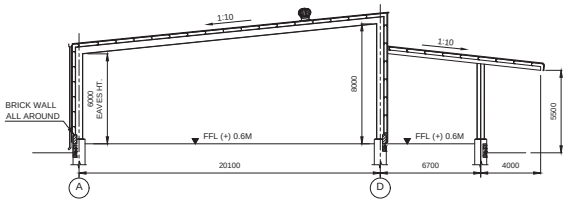
SCALE : 1:1			PROJECT :PROPOSED WAREHOUSE AT CFS,KOLKATA
DRAWN	KD	01.02.2021	OWNER :BALMER LAWRIE & CO. LTD; SBU-LOGISTICS
CHCKD	SS	01.02.2021	TITLE : ELECTRICAL & ILLUMINATION LAYOUT OF CFS, KOLKATA
APPD	SS	01.02.2021	
DWG NO.EP/CFS/WH/ELE/04		SHEET 1 OF 1	REV.00



ROOF PLAN OF WAREHOUSE



SECTION "A - A"



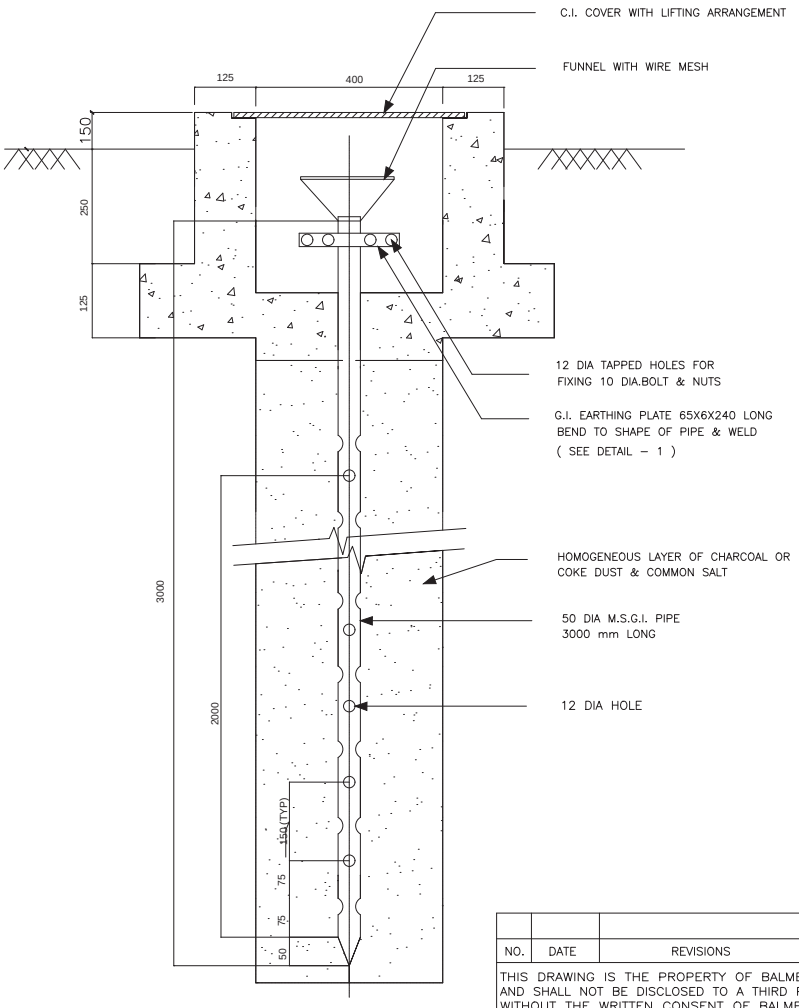
SECTION "B - B"

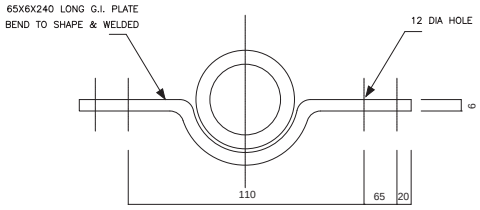
TENDER DRAWING

Balmer Lawrie & Co. Ltd.
ENGINEERING & PROJECTS

NO.	DATE	REVISION	BY	CHKD.	APPD.

SCALE : 1 : 1, 1:1.5			PROJECT :PROPOSED WAREHOUSE AT CFS KOLKATA
DRAWN	KD	08.10.2020	OWNER :BALMER LAWRIE & CO. LTD; SBU-LOGISTICS
CHCKD	DM	08.10.2020	TITLE : ROOF PLAN & CROSS SECTION OF WAREHOUSE AT CFS - KOLKATA
APPD	GCS	08.10.2020	
DWG NO.EP/CFS/WH/06		SHEET 1 OF 1	REV.00





DETAIL–1

TENDER DRAWING

NO.	DATE	REVISIONS	BY	CHKD.	APPD.

THIS DRAWING IS THE PROPERTY OF BALMER LAWRIE & CO. LTD. AND SHALL NOT BE DISCLOSED TO A THIRD PARTY COPIED OR USED WITHOUT THE WRITTEN CONSENT OF BALMER LAWRIE & CO. LTD.

Balmer Lawrie & Co. Ltd.
ENGINEERING & PROJECTS

SCALE:		DATE
DRAWN	KD	01.02.2021
CHECKED	SAJ	01.02.2021
APPROVED	GCS	01.02.2021

PROJECT :PROPOSED WAREHOUSE AT CFS,KOLKATA
OWNER : BALMER LAWRIE & CO. LTD; SBU–LOGISTICS
TITLE: TYPICAL PIPE EARTHING DETAIL

DRG.NO. EP/CFS/WH/ELE/05 | SHT 1 OF 1 | REV.00

Balmer Lawrie & Co. Ltd.

(A Government of India Enterprise)
Engineering & Projects
21, Netaji Subhas Road
Kolkata - 700 001

Warehouse illumination and allied work (वेयरहाउस रोशनी और संबद्ध कार्य)

at (पर)

Container Freight Station, P-3/1, Transport Depot Road, Kolkata-700088 (कंटेनर फ्रेट स्टेशन, P-3/1, ट्रांसपोर्ट डिपो रोड, कोलकाता-700088)

Tender No. EP/CFS/KOL/WH/ELEC/04/R1

PRICED PART (PART-II)

NOTES:

1.0 Details of the items under this Schedule shall be read in conjunction with the corresponding Specifications, Drawings and other Tender Documents.

2.0 The work shall be carried out as per approved drawings, Specifications and the description of the items in this Schedule and/or Engineer's instructions. Drawings enclosed with these documents are only for providing some preliminary of the work involved.

3.0 Items of work provided in this Schedule but not covered in the Specifications shall be executed strictly as per instructions of the Engineer-In-Charge.

4.0 The Quantities of the various items mentioned in the Schedule of Items are approximate and may vary or may be deleted altogether. The Contractor, in his own interest, should get an indication of the probable extent of the work to be executed under any particular item in this Schedule before undertaking any preliminary and enabling work or purchasing bought out components related to the work.

5.0 Engineer's decision shall be final and binding on the Contractor regarding clarification of items in this Schedule with respect to the other sections of the Contract.

6.0 For extra items, rates shall be derived from similar item rates included in the schedule of work. Where there is no such similar item available in the schedule, rate shall be analyzed as follows:
Rate for extra item = Cost of material including transportation for delivery upto site (a) + cost of labour inclusive of all necessary tools, tackles, equipment, machinery and consumable (b) required to carry out the work + 15% of (a+b) towards profit and overhead + taxes, duties etc. as applicable.

7.0 Quoted Rate shall include cost of design, material procurement, fabrication, assembly, Painting, Supply (including Packing & Forwarding, Transportation upto project site, covering the materials under transit insurance), unloading at site with hiring of cranes/forklifts and manpower and safe storage at site, site shifting as required, site assembly, erection, alignment, testing, commissioning and handing over of the system. Necessary equipment, cranes, forklifts, tools & tackles, manpower and consumables required for erection and commissioning shall be included.

8.0 It is mandatory to quote for all the items of Schedule of Work/ Price Schedule. If any bidder does not quote for any item, their bid will be rejected. Bidders shall not change the unit or quantity of any item failing which may lead to cancellation of price bid.

SCHEDULE OF WORK

WAREHOUSE ILLUMINATION AND ALLIED WORK FOR CONTAINER FREIGHT STATION

Sl No.	Description of Item	Unit	Qty	Rate (in Rs)	Amount (in Rs)
	ILLUMINATION SYSTEM				
1.0	**Lighting Distribution Boards**				
	Supply & installation of following LPs/SBs on wall/column or recessed mounted on wall.				
1.0.1	Wall/Column/ Recess mounted IP 43,IK-09 with metal door, **TPN Lighting Distribution Board (LPB-01)** - 125 Amp. FP MCCB (DPX125 type cat no. 250 29) with inbuilt thermal trip release and Underneath Earth Leakage Module (260 13) as Incomer; one no. 415V, 250A, 3 ph, 4 w, Cu fully insulated busbar and outgoing feeders as: 1 no. 80Amp, 10KA 4P MCB (Cat No. 4100 41), 2nos. 32 amp 10 KA 4P MCB (Cat No. 4100 37), 3 nos. 16 Amp, 10KA SP MCB (cat no. 4085 92) 21nos. 10 Amp.,10KA SP MCB (cat. no. 4085 91) (Make :Legrand : IP-43 - IK 09 with metal door or, approved equivalent)	z	1	Do not quote here	
1.0.2	Wall/Column/ Recess mounted IP 43, **TPN Lighting Distribution Board (LPD-01)** - 80 Amp. FP RCCB (cat no. 4117 87) with inbuilt thermal trip release as Incomer; one no. 415V, 100A, 3 ph, 4 w, Cu fully insulated busbar and outgoing feeders as: 12 nos. 10 Amp, 10KA SP MCB (cat no. 4085 91), 6 nos. 16 Amp, 10KA SP MCB (cat no. 4085 92), 6 nos. 32 Amp.,10KA SP MCB (cat. no. 4085 95) (Make :Legrand : Ekinoxe TPN DB 6077 17 IP-43 - IK 09 with metal door or, approved equivalent)	Nos.	1		
1.0.3	Wall/Column/ Recess mounted IP 43, **TPN Lighting Distribution Board (LPD-02)** - 40 Amp. FP RCCB (cat no. 4117 85) with inbuilt thermal trip release as Incomer; one no. 415V, 100A, 3 ph, 4 w, Cu fully insulated busbar and outgoing feeders as: 12 nos. 10 Amp, 10KA SP MCB (cat no. 4085 91), 6 nos. 16 Amp, 10KA SP MCB (cat no. 4085 92), 6 nos. 32 Amp.,10KA SP MCB (cat. no. 4085 95) (Make :Legrand : Ekinoxe TPN DB 6077 17 IP-43 - IK 09 with metal door or, approved equivalent)	Nos.	1		

Sl No.	Description of Item	Unit	Qty	Rate (in Rs)	Amount (in Rs)
1.1	**Switch Boards & Receptacles**				
	Supply & installation of following Switch Boards (along with 10A modular switchs of approved colour, blank cover, GI 2 mm thick GI modular metal box embadded in wall, grid plate, FRONT PLATE with cover of approved colour suitable fot modular switch) on wall/column/ work station or recessed mounted on wall. In case of concealed wiring, the switch board shall be mounted in 2mm thick GI metal box embedded in wall, base plate, face plates of colour approved by owner, (for concealed type wiring), earthing of the outlet boxes . The job includes cutting of walls and making it good (for concealed wiring). Colour of Face Plate and Switch shall be decided by the Owner during execution of work.			Do not quote here	
1.1.1	Switch Board (6 module) (SWA) - Switchboard with 6 nos. one module 10A piano switch; (Surface / Recess Mounted)	Nos.	3		
1.1.2	Switch Board (8 module) (SWE) - Switchboard with 4 nos. one module 10A piano switch; 1 no. 6/15A, 5 pin two module International plug socket with 1 no one module10A switch; (Surface / Recess Mounted)	Nos.	1		
1.1.3	Switch Board (5 module) (SWH) - Switchboard with 2 nos. one module 10A piano switch and 1 no. 6/15A, 5 pin two module International plug socket with 1 no. one module10A switch; (Surface / Recess Mounted)	Nos.	2		
1.2	**Receptacles**				
1.2.1	Modular Power Board (4 module metal box) (RA) - Supply, Installation, Testing and commissioning of 250V, 1 no. Single phase and Neutral 16A, 5 Pin 2/3 module power socket outlets with 1 no. 1 module 16A SP Modular Switch mounted in 2mm thick GI box including embedding of outlet boxes in wall, earthing of the outlet boxes.Leftout module, if any, shall be provided with switch.	pts	5		
1.2.2	Modular Power Board (6 module metal box) (RB) - Supply, Installation, Testing and commissioning of 250V, 2 no. 6/15A, 5 pin two module International plug socket with 2 no one module 10A switch mounted in 2mm thick GI box including embedding of outlet boxes in wall, earthing of the outlet boxes (Surface / Recess Mounted)	pts	4		
1.2.3	Supply & Installation of 32A Modular Motor Starter Unit (3 module) (RC) for Air Conditioning units and 32A, 5 pin power socket unit (3 module) of North west make (cat. No. C12M01 J) mounted in 2mm thick 6 module GI box including embedding of outlet boxes in wall, earthing of the outlet boxes .	pts	2		

Sl No.	Description of Item	Unit	Qty	Rate (in Rs)	Amount (in Rs)
1.3	**Outdoor Lighting**				
1.3.1	**Street Light- TYPE STL-**Supply ,Transportation and fixing of **1X60 W LED** Street Light Fittings Outdoor Area, pipe bracket mounting type **without pole**. It shall be fixed on struture of shed or RCC building with all standard accessories, diffuser and all labour charges etc., complete. Efficacy 120 lm/w,, power factor >=0.9, IP66, IK08.LED light fitting make PHILLIPS / BAJAJ /CROMPTON GREAVES.BL approved Catalouge no. Bajaj ENXT P 72L WH CR PC SD.The fixtures shall be mounted on pipe structures which will be clamped to outdoor. Accordingly, the cost shall include supply of pipes for mounting.	Nos.	11		
1.3.2	**Street Light- TYPE STM-**Supply ,Transportation and fixing of **1X200 W LED Flood** Light Fittings Outdoor Area, angle bracket mounting type **without pole**. It shall be fixed on struture of shed or RCC building with all standard accessories, diffuser and all labour charges etc., complete. Efficacy 120 lm/w,, power factor >=0.95, IP66, IK08.LED light fitting make PHILLIPS / BAJAJ /CROMPTON GREAVES.BL approved Catalouge no. Bajaj BJFL 200W LED I.The fixtures shall be mounted on angle structures which will be clamped to outdoor. Accordingly, the cost shall include supply of pipes for mounting.	Nos.	1	Do not quote here	
1.4	**Indoor Lighting**				
	Supply, Installation, Testing & Commissioning and other associated activities, mounting arrangement, point wiring with FRLS wire 2.5 sq mm Phase & Neutral, 1.5 Earth & 1" ISI FRLS heavy duty PVC conduit, ceiling rose, 10A SP switch, hole cutting & sealing arrangement in PEB 150 mm sheet and with all necessary consumables to complete the job:				
1.4.1	Type HB : LED Light fitting **1 X 120W, Industrial Highbay Area type.** Efficacy 110 lm/w,IP65, IK06, colour temp.Power factor >=0.9. Make BAJAJ/PHILLIPS/CGL. BL approved Catalouge no. Bajaj Tento Nxt B 132L WH NB SD. The fixtures shall be hung from structures whereever required. Accordingly, the cost shall include supply of GI rods for hanging.	Nos.	85		
1.4.2	Type DB(40W) : LED Light fitting **1 X 40W, 4 feet Office / Parking / Stair Area type**. Efficacy 110 lm/w, colour temp. Minimum 6500 K, beam angle:Minimum 120°, power factor >=0.9. Make BAJAJ/PHILLIPS/Panasonic. BL approved Catalouge no. Bajaj BCLAB SP 44L LED CW PC SD with CW LED. The fixtures shall be hung from structures whereever required. Accordingly, the cost shall include supply of GI rods for hanging.	Nos.	30		

Sl No.	Description of Item	Unit	Qty	Rate (in Rs)	Amount (in Rs)
1.4.3	Type DB(18W) : LED Light fitting **1 X 18W, Office / Parking / Stair Area type**. Efficacy 100 lm/w, colour temp. Minimum 6500 K, beam angle:Minimum 120°, power factor >=0.9. Make BAJAJ/PHILLIPS/Panasonic. BL approved Catalouge no. Bajaj BCLSB 18 WH LED with CW LED. The fixtures shall be hung from structures whereever required. Accordingly, the cost shall include supply of GI rods for hanging.	Nos.	5		
1.4.4	Supply, Installation, testing & commissioning of ceiling fans / exhaust fans including all associated masonary work, down rod. Make: Crompton / Bajaj / Havells / or approved equivalent				
1.4.4.1	Exhaust Fan (EX) 250 mm sweep. Cost shall include suporting steel structure and making opening in the wall, finishing as required.	Nos.	2		
1.4.4.2	Exhaust Fan (EX) 600 mm sweep Industrial type. Cost shall include suporting steel structure and making opening in the wall, finishing as required.	Nos.	1		
2.0	**Cabling**				
	Supply (delivery, unloading and storing of cables at site) and laying of cables (including supply of necessary clamping hardwares, cable markers etc.) either through conduits/G.I pipes, or in RCC Trenches or buried underground or on cable tray/ladder, or by clamping hardwares, cable markers etc.) either through conduits/Pipes, or in RCC Trenches or buried underground or on cable tray / ladder, or by clamping with wall / structure / machine frame suitably of following sizes of cables as specified. Item also includes dismantling of PCC, laying of cable through G.I. Pipes in places and making good of PCC thereof.The G.I pipe to be laid at a depth of 600mm. Cost of cable tray, trench, buried trench, G.I Pipe is excluded from this item and covered in some other items).				
	415V LT Cables				
2.0.1	**3 -1/2 Core 70 Sq.mm** stranded Al. Conductor, XLPE insulated, taped PVC inner sheathed, armoured, extruded PVC outersheathed, 1.1 KV grade cable	Mtr	450		
2.0.2	**4 Core 16 Sq.mm** stranded Cu. Conductor, XLPE insulated, taped PVC inner sheathed, armoured, extruded PVC outersheathed, 1.1 KV grade cable	Mtr	175		
2.0.3	**4 -Core 4 Sq.mm** stranded Cu. Conductor, XLPE insulated, taped PVC inner sheathed, armoured, extruded PVC outersheathed, 1.1 KV grade cable	Mtr	370		
3.0	**Cable Termination :** Non-Flameproof Termination of following sizes of XLPE/PVC insulated armoured cables, including supply of double compression type brass cable glands, lugs etc.				
	415V LT Cables				

Sl No.	Description of Item	Unit	Qty	Rate (in Rs)	Amount (in Rs)
3.0.1	**3 -1/2 Core 70 Sq. mm** stranded Al. Conductor, XLPE insulated, taped PVC inner sheathed, armoured, extruded PVC outersheathed, 1.1 KV grade cable	Nos.	2		
3.0.2	**4 Core 16 Sq.mm** stranded Cu. Conductor, XLPE insulated, taped PVC inner sheathed, armoured, extruded PVC outersheathed, 1.1 KV grade cable	Nos.	2		
3.0.3	**4 -Core 4 Sq.mm** stranded Cu. Conductor, XLPE insulated, taped PVC inner sheathed, armoured, extruded PVC outersheathed, 1.1 KV grade cable	Nos.	4		
4.0	**Lighting Wiring**				
	Sub Main Cable Wiring for Outdoor Lighting and Warehouse Indoor Lighting				
4.0.1	**Cabling** from Lighting Distribution Boards [LPA] to indoor lighting fittings, peripheral light fittings, switch boards and Wiring to the RB type power plug points from Lighting / Power DBs : Supply of all materials (including supply of **3 Core 2.5 sq mm copper conductor,** XLPE insulated, taped PVC inner sheathed, **armoured,** extruded PVC outersheathed cable; glands; lugs; saddles; MS JBs of adequate size and entries; GI Spacers etc.), installation, termination, testing, commissioning of cable wiring for lighting by surface wiring with armoured cables. The fixtures shall be mounted from ceiling / wall . (for technical detail of cable pl refer specification).	Mtr.	2400	Do not quote here	
	Concealed - Wiring / Above False Ceiling or, normal Wiring using PVC conduit/ Cabling/Casing Capping				
4.0.2	Supply of **PVC insulated copper conductor 600V Grade stranded flexible FRLS wires** of Havells/Finolex/ Polycab/ National make (for phase, neutral & earth) for interconnection between DBs and switchboards/outlet boxes and routing of wires through 25/32 mm dia heavy duty, PVC conduit including supply and fixing/concealing of conduits and necessary junction boxes in wall/ceiling /floor with cleating, etc and ternination of wires on DBs /Switchboards/outlet boxes. Conduits & accessories shall be of Standard make. The job includes cutting of walls and making it good for concealed wiring. Wires shall be of the following sizes :				
4.0.3	2 nos 2.5 sq.mm.+ 1 nos 1.5 sqmm	RM	550		
4.0.4	2 nos 4.0 sq.mm.+ 1 no 2.5 sqmm	RM	130		
4.0.5	Point Wiring : i) Concealed Wiring / Above False Ceiling or, ii) normal Wiring using 1 inch ISI FRLS Heavy Duty PVC conduit/ Cabling/Casing Capping				
	i) Supply of 1.5 Sq.mm 600 V Grade FRLS PVC insulated copper conductor stranded flexible wires (phase, neutral & earth) of havells/ Finolex/ Polycab/ National make.				

Sl No.	Description of Item	Unit	Qty	Rate (in Rs)	Amount (in Rs)
	ii) Routing of wires through 25 / 32 mm dia heavy duty PVC conduit including supply & fixing of conduits, necessary JBs. The job includes cutting of walls and making it good for concealed wiring. Conduits and accessories shall be of Standard make.				
	iii) Embedding of switch boxes, JBs, earthing, concealing of conduits in wall/ceiling/floor with cleating, casing capping etc.				
4.0.6	One point controlled by one 10 A Switch (average route length 8 mtr)	Nos	20		
4.0.7	Two point controlled by one 10 A Switch (average route length 12 mtr)	Nos	9		
5.0	**Grounding**				
5.0.1	Installation of new earth pit as per IS standard with **50mm dia** class B, GI Pipe 3 meters long, work includes all civil works Backfill materials like charcoal and salt of required quantity has to be put in the pit. Providing necessary frame around the pit, providing pit cover, supply and installation of earth pit display board, funnel for watering,measurement of Earth pit resistance. The job also includes dismantling of PCC for required earth pit installation.	Nos.	2	Do not quote here	
5.0.2	Supply, laying, fixing and connection of equipment earthing lead with different sizes of conductor as specified, including floor chipping and repair (wherever required)				
5.0.2.1	6 swg GI wire (including provision of socket at both end of each piece)	RM	350		
5.0.2.2	**25 x 3 GI Flat**	Mtr	50		

Sl No.	Description of Item	Unit	Qty	Rate (in Rs)	Amount (in Rs)
6.0	**PRE FABRICATED CABLE TRAY**				
	Supply, fabrication, welding, cutting, bending and fixing of pre-fabricated perforated / ladder type Hot dip Galvanised low carbon **steel cable tray** with nominal rung spacing 12 inch, including supply of jointing coupler with nut bolts and washers, fabrication of bends as per requirement, hanger support @ 2.0 Mtr spacing (supply rate will includes supply of pre-fabricated cable tray and couplers, cost of installation includes all other things like supply and installations of other accessories like cable tray support / hanger; touch up galvanised painting at site and other consumables etc. all) However, Steel support made for this shall be paid under seperate item.			Do not quote here	
6.0.1	Cable Tray **50W x 25H x 2 mm** thickness perforated tray	Mtr	1550		
6.0.2	Cable Tray **100W x 25H x 2 mm** thickness perforated tray	Mtr	25		
7.0	Supply, installation, fixing, fitting, testing and commissioning of Advanced New Generation Early streamer emission **(ESE)**technology **lightening protection system** for protection of buildings, equipment etc. against natural lightening. It shall be complete with ESE air terminal made from with stainless steel with coverage of min 100 m,4/5 mtr mast extension, lightning flash counter, test point, Advance Earthing System (2 pits), Copper conductor (50 mtr) and to be mounted at a height of (+) 13.5 m of existing warehouse. Please refer specification for details.	Set	1		
8.0	Design, Supply, Installation, Testing, Commissioning of 3Kwp Photo Voltaic Solar Power Plant to be installed over existing warehouse roof sheeting with necessary mounting (as per technical specification, scope of work and conditions of contract and tender drawings)				
8.0.1	Design, Supply, Installation, Testing, Commissioning of poly-crystalline solar photo-voltaic cells,module mounting structure /rails, Power Conditioning unit (PCU), DCDB, Array Junction Box, AC and Solar Grade Cables, with required earthing, lightning, water pipeline, solar meter, net metering as per Board norms and all other consumables required for execution of the job. This job also includes follow up with local electricity authority and central electricity authority in respect of submission of all relevant documents /drawings /test reports etc. , getting the installation approved from CEA/SEB/PCB or, any other authority on behalf of the Owner (all statutory fees to the supply authority shall be paid by owner / owner's representative). Supply of 1 no. of spare safety ladder for access to rooftop solar panel is also included in this item.	Lot	1	Do not quote here	
8.0.2	AMC for 5 years for cleaning, maintenance and associated jobs of solar panels as per Tender.	Lot	1		

Sl No.	Description of Item	Unit	Qty	Rate (in Rs)	Amount (in Rs)
	Miscellaneous				
9.0	**Steel Work:** Supply, fabrication & erection of cable tray and misc. steel structures for various support, mounting of light fittings, local panels, receptacles etc., including supply & application of two coats of epoxy primer and two coats of synthetic enamel paint.	Kg	1000		
10.0	Supply, installation of **GI Pipe** as per IS: 1239 / IS : 3589)				
10.0.1	3 inch dia GI Pipe- B Class	Mtr	25		
11.0	**Excavation** in hard soil, sand filling, including provision of, sand, 2nd class bricks from sides and 2nd class brick/ recast PCC slab on top for protection of the cables, and backfilling with earth as well as cable tags and markers etc. as per technical specification for cable trenches of following sizes: (Rates shall be inclusive of supply of sand, brick, PCC slab - 40mm thick,cable tag,markers etc).				
11.0.1	**300mm (Wide) x 600mm (Deep)**	Mtr	50		
	TOTAL				
	Add for GST	%	18		
	TOTAL with GST				

Do not quote here