TENDER DOCUMENTS

FOR EXTERNAL ELECTRIFICATION WORK OF SARAGARHI SARAI FOR SRI DARBAR SAHIB, SECRETARY, SGPC, SRI AMRITSAR

Architects : architects atelier pvt. ltd.,
s.c.o. 8, sector 17-e,
chandigarh.

Owner : Secretary
SGPC, SRI AMRITSAR

Project : EXTERNAL ELECTRIFICATION work of SARAGARHI SARAI for SGPC at SRI AMRITSAR

Tender issued to dated

architects atelier pvt. ltd.,
s.c.o. 8, sector 17-e,
chandigarh

Secretary
SGPC, SRI AMRITSAR

TENDER DOCUMENTS

FOR EXTERNAL ELECTRIFICATION WORK OF SARAGARHI SARAI FOR SGPC AT SRI AMRITSAR

1.01 NOTICE INVITING TENDERS

1.02 Sealed item rate Tenders are hereby invited by the SGPC, Sri Amritsar for the following works :

Name of Project	:	EXTERNAL ELECTRIFICATION work of SARAGARHI SARAI for SGPC, SRI AMRITSAR .
Estimated Cost	:	Rs. 95,00,000/- (Ninety five lacs)
Earnest Money	:	Rs. 2,00,000/- (Two lacs)

1.03 The Tender Documents can be downloaded from www.sgpc.net downloaded tenders shall attach the technical bid document failing which the tender document shall be rejected.

1.04 The Notice Inviting Tenders and enclosed Specifications, General Conditions, Schedule of Quantities along with its tender drawings etc. shall form the Tender Documents.

1.05 The rates should be quoted on item rate basis and to assist him, item wise tentative quantities are stated in Schedule of Quantities. Although all precautions have been taken while working out the quantities but owner does not take any guarantee for correctness of the same. The payment will be made for the actually executed and measured quantities at agreed rates.

1.06 The rates should be quoted in figures and words and the respective amounts or total shall be given by each Tenderer. In case of any difference in rates in figures/word, those given in words shall hold good as quoted rate.

1.07 The tenders shall remain valid for acceptance for 90 days from the last date of submission.

1.08 The site is available and is free from any encumbrances and each Tenderer shall be deemed to have visited the site and seen the site conditions before quoting his Tender. No claim on ground for want of such knowledge/site inspection shall be entertained at any stage.

1.09 The Owner reserves the right to reject any/all Tenders without assigning any reason and shall not be bound to accept the lowest or any other Tender.

1.10 Incomplete and late Tenders shall be rejected without any further reference.

1.11 The Time for completion of work is 2 months (Two Months) from date of letter of award.

1.12 The tender proceedings shall be held as per the following schedule.

Date of issue of tender :

Last date for receipt of tender :

Date of opening of tender :

1.13 Tender Document consisting of Plans, Specifications, the Schedule of Quantities of the various classes of work to be done and the set of terms and conditions of contract to be complied with by the contractor whose tender may be accepted and the other necessary documents can downloaded before the last date of receipt of tender.

1.14. **The Secretary, SGPC** does not bind himself to accept the lowest or any other tender, and reserves to himself the authority to reject any or all of the tenders received without the assignment of a reason. All tenders, in which any of prescribed conditions is not fulfilled or any condition including that of conditional rebate is put forth by the tenderer shall be summarily rejected.

1.15. **The Secretary, SGPC** reserves to himself the right of accepting the whole or any part of the tender and the tenderer shall be bound to perform the same at the rate quoted.

1.16. The Tenderers are not allowed to make additions and alterations in the tender document. Any additions and alterations shall be at tenderers risk. Conditional / modified Tenders are liable to be rejected.

1.17. It will be obligatory on the part of the tenderer to sign the tender document for all the components (The Schedule of Quantities, Conditions and Special Conditions etc.) on each page.

1.18. The tender for the works shall remain open for acceptance for a period of ninety days from the date of opening of tenders. If any tenderer withdraws his tender before the said period or makes any modifications in the terms and conditions of the tender which are not acceptable to the competent authority, then **The Secretary, SGPC** shall, without prejudice to any other right or remedy, be at liberty to forfeit 50% of the said earnest money as aforesaid.

1.19. This Notice Inviting Tender shall form a part of the contract document. The successful tenderer contractor, on acceptance of his tender by the Accepting Authority, shall within **10 days** from the stipulated date of start of the work sign the contract consisting of:

a) The Notice Inviting Tender, all the documents including additional conditions, specifications and drawings, if any, forming the tender as issued at the time of the invitation of tender and acceptance thereof together with any correspondence leading thereto.

C. PREPARATION OF BIDS

1. LANGUAGE OF BID

The bid, and all correspondence and documents related to the bid exchanged between the bidder and the Employer shall be written in the English language. Supporting documents and printed literature furnished by the bidder may be in another language provided they are accompanied by an accurate translation of the relevant passages in the English language, in which case, for purposes of interpretation of the bid, the English translation shall prevail.

2 DOCUMENTS COMPRISING THE BID

2.1 The bids shall be submitted in two parts which comprise the following documents:-

PART-I: TECHNICAL BID

i) **Earnest Money** for an amount of Rs 2 Lacs which shall be payable in the form of **demand draft only** at the time of submitting the tender document.

ii) Power of Attorney of the person Authorized to sign on behalf of the firm.

iii) Any other material / information required to be submitted in accordance with these **Instructions To Bidders (ITB).**

PART-II: FINANCIAL BID:

v) **Schedule 'A'** Priced Schedule of Quantities - duly filled in and signed on each page

Each part shall be separately sealed and marked.

2.2 The bidder shall prepare and submit the bid in original.

3. QUOTED RATES

3.1 The rates quoted by the tenderer shall include for transportation of men and material at higher or lower level. The quoted rates shall be inclusive and cover the cost of material including wastage, freight, all types of taxes, duties, royalties, fees, rents, erection, construction, testing of materials, samples / brought / bought for approval, tools and tackles, plants and equipments, supervision, overheads, profit and any other expenditure incurred for completion of work as per drawings, specifications and to the full satisfaction of the Employer.

3.2 The rates quoted by the tenderer in the schedule of rates will be deemed to be for the finished work and shall also include all charges for following wherever applicable.

a) Labour, maintenance, fixing, arranging, clearing, making good hauling etc.

b) No tools and plants shall be issued by the Employer under the Contract.

4 CURRENCIES OF BID AND PAYMENT

4.1 The unit rates and the prices shall be quoted by the bidder entirely in Indian Rupees

4.2 All payments including advances, if any, shall be made in Indian Rupees.

Dated : _____ 2015

Secretary,
SGPC
Sri amritsar.

2.0 INSTRUCTIONS TO TENDERERS

1 Tender not properly filled, mutilated with incorrect calculations or generally not complying with the conditions may be rejected. Conditional tenders are liable to be summarily rejected.

2. Tenderer should quote their rates both in figures and in words.

3. The schedule of quantities as mentioned must be fully priced and the total of each page along with carried over figures of the previous page shall be given in ink and signed by the tenderer.

4. If the tender is submitted by or on behalf of a company incorporated under the Company Act (1959) it shall be signed by Managing Director or by one of the Directors duly authorized on their behalf. If it is, submitted by a partnership firm it shall be signed with the Co-partnership firm name by a member of the firm who shall sign his own name and give the name and address of each partner of the firm and attach a copy of Power of Attorney with the tender authorizing him to sign on behalf of the partners. A certified copy of the registered partnership deed shall also be submitted along with the tender. The tender should be in the sealed cover.

5. A schedule of approximate quantities for various items accompanies the tender. It shall be definitely understood that the owner do not accept any responsibility for the correctness or completeness of the schedule in respect of items and quantities. This schedule is liable to alteration by omission, deductions or additions at the discretion of the owner without affecting the terms of contract and without any extra claim on account of any reason or reasons.

6. All quoted rates shall include the cost of all materials and labour and transportation of materials to the site, all Government taxes and revenues such as Sales Tax, Turnover Tax, Sales Tax on Work Contract, Royalties, Toll Tax, Income Tax, Excise Duty, Service tax and Octroi., Contractors profit and overheads ESI, PF, labour cess etc. and the fixing or placing in position for which the items of work is intended to be operated as per specifications.

7. No alteration shall be made by the tenderer in the Instructions to the Tenderers or NIT, Contract Form, conditions of the Contract, Drawings and specifications and if any such alteration are made or any special condition attached, the tender is liable to be rejected.

8. The acceptance of the tender rests with the owner, who reserves the right of rejecting any or all the tenders including the lowest tender without assigning any reasons whatsoever.

9. The owner reserves the rights of accepting the whole or any part of a tender received and the tenderer shall be bound to perform the same at the quoted rates.

10. Every tenderer shall furnish alongwith the tender, latest income tax clearance certificate and the Registration No. / certificate from Sales Deptt. for work Contract tax etc. failing which his tender is liable to be rejected.

11. From the date of actual handing over of the works to the owner, the contractor shall be responsible to make good any defects which may occur within a period of 12 months and this period is treated as “Defect Liability Period”.

12. The Contractor shall not be entitled to any compensation for any loss suffered by hindrance on account of delays in commencing or executing the work, whatever the cause for such delays may be including delays in procuring Government controlled or other materials.

13. The rates of different items are of all heights, depths, curvatures, and width unless otherwise specified in the item of work.

14. The detailed schedule of programme in the form of a BAR CHART for the whole work shall be drawn and submitted by the contractor within 10 days of the award of work order. The work shall be progressed from month to month and completed in the order and according to the schedule after approval of the same by the Architects & engineer-in-charge.

15. If the Owner wants to occupy areas in part, the contractor shall have to complete the work of these areas in consultation with the owner and hand over the same without affecting any of the clauses of contract agreement.

16. After acceptance of the tender the tenderers shall sign the necessary contract papers within 7 days from the receipt of the above intimation. In case of delay the “Earnest Money” may be forfeited and the tender cancelled or the contract enforced as per the terms of the tender and the tenderer shall thus be bound to execute the work even though the formal agreement has not been executed and signed.

17. Electricity : The contractor will make his own arrangement for electricity. The electric connection if required will be arranged by the Contractor himself. Necessary cabling etc. will be done by him at his cost and he will also pay for consumption at the prevailing rates of charges to Punjab Electricity Board, Sri amritsar as per bills. The Contractor will purchase or hire generator to meet the requirement of electricity for the works and its cost for running/maintenance will be borne by contractor himself. The owner will have no responsibility in this connection/

18. Water : Water will be arranged by the contractor himself. Contractor will make his own arrangement for storage of water and further piping etc. No responsibility lies with the owner. The water used should be suitable for construction purpose and should be got tested from approved laboratory by contractor at his own cost before start of work.

19. Weather : No extension of time will be allowed to the Contractor due to weather conditions prevalent in the area. The contractor is expected to take all the precautions at his own risk and cost so that the workmanship, the materials and progress of work are not affected in the inclement weather.

20. Cleaning up and Handing over : Upon completion of the work all the site area should be cleaned. All works shall be cleaned in manner which will render the work acceptable to the owner. All rubbish shall be removed from the site and shall not be dumped in the surrounding area.

21. The work as described in the drawings and schedule of quantities shall be completed on or before the stipulated date of completion.

22. The contractor shall not be allowed to possess any space or rooms inside the premises.

23. The contractor should quote their offer keeping in view the basic minimum rates of labour wages with upto date corrections as on the day of submission of the tender as per notification by Punjab PWD & Delhi Schedule of rates.

24. The Contractor shall include in his rate all taxes viz Octroi, royalties, sales tax, work contract tax, labour cess and all duties and no claim on this account will be entertained.

25. The Income Tax and Work contract tax as specified will be deducted as per Govt. Notification/regulation from the bills for paying to the Government and by the Employer.

26. The rate quoted by the Contractor shall remain firm till the work is completed.

27. The following specified works shall be got carried out by the contractor through specialized firms or manufactures with the approval of architect/owner.

a) Water proofing : 10 years guarantee bond shall be obtained on stamp paper.

b) Anti Termite : 10 years guarantee bond shall be obtained on stamp paper.

c) AMC of equipment : 5 years guarantee bond shall be obtained on stamp paper.

28. Proper record for all the materials required for the above work shall be kept at site by the contractor jointly with Engineer-in-charge.

29. The owner reserves the right to reject any or all the tenders without assigning any reason, and at the same time is not bound to accept the lowest tenderer.

The owner also reserves the right to accept the tender in full or in parts and in the latter case the tenderer is bound to execute the work at his quoted rates.

Dated : 2015

Secretary,
SGPC,
Sri amritsar.

3.00 FORWARDING LETTER

From :

To
Secretary
SGPC
Sri amritsar

Sub : EXTERNAL ELECTRIFICATION WORK OF SARAGARHI SARAI FOR SGPC AT SRI AMRITSAR.

Dear Sir,

With reference to the tenders invited by you for the above work, I/we do hereby offer to perform, provide, execute and complete the above work in conformity with the drawings, terms and conditions and specifications for the amount as shown in the schedule of quality attached hereto.

I/We have satisfied ourselves to the location and conditions of the site and have read the articles of agreement, conditions of contract and specifications etc. and we understand that the work are to be completed within the specified period and fully understood that the time will be the essence of this contract. I/we enclose herewith the total earnest money vide demand draft/pay order for **Rs. 2,00,000/-** (Rupees **Two Lacs**) in the name of Secretary, SGPC payable at Amritsar. This amount shall not bear any interest and should this tender be accepted). I/we hereby agree that this amount will be forfeited if I/we, fail to start the execution within the stipulated time.

Name of the partners/Directors

1. _____ Yours faithfully

Signatures

2. _____

Date

3. _____

Address

4.0 ARTICLES OF AGREEMENT

ARTICLES OF AGREEMENT made the_____ day of 2015, between SGPC (herein after called "The owner") of one part and M/s _____ whose registered office situated at _____ (hereinafter called "The Contractor") of the other part.

WHEREAS the Owner is desirous of EXTERNAL ELECTRIFICATION work of SARAGARHI SARAI for SGPC at Sri amritsar and has caused Drawing and bill of quantities showing and describing the work to be done to be prepared by or under the direction of architects atelier, sco 8, sector 17-e, Chandigarh.

AND WHEREAS the Contractor has supplied the Owner with a fully priced copy of the said bills of quantities (which copy is hereinafter referred to as "the contract bills" and whereas the said drawing (hereinafter referred to as "the contract drawings") and the contract bills have been signed by or on behalf of the parties hereto.

AND WHEREAS the contractor has deposited the sum of Rs. _____ (Rupees only) with the Owner for the due performance of this agreement.

NOW IT IS HEREBY AGREED AS FOLLOWS :

For the consideration hereinafter mentioned the Contractor will upon and subject to the conditions annexed carry out and complete the work shown upon the contract drawings and described by or referred to in the Contract bills in the said conditions.

The owner will pay the contractor the said amount of Rs. _____ (Rupees) or such other sum as shall become payable, hereunder at the ties and in the manner specified in the said contractors.

The term "The Architect" in the said conditions shall means the said Mr. Amit Saini / S.K Saini of architects atelier, s.c.o. 8, sector 17-e, chandigarh or in the event of his death or ceasing to be the Architect for the purpose of this contract, such other person as the firm shall nominate for that purpose.

The said conditions and Appendix thereto shall be read and constructed as forming part of this agreement and the parties hereto shall respectively abide by, submit themselves to the said conditions and perform the agreements on their parts respectively in the such conditions contained.

Notwithstanding anything contained in this agreement, the Secretary, SGPC, Sri amritsar shall have power to review the decisions/recommendations made or proposed to be made about any

matter connected with the work to be executed under this contract, before/after these are implemented, call for additional information from the Architect/Contractor or any other source, hold discussions if necessary and arrive at his decision. This decision would be applicable for the work. If the contractor feels aggrieved by this decision, he would be free to raise this matter as a dispute for arbitration, under the agreement but would not stop the work on any pretext and proceed with the work in accordance with this decision.

As witness the hands of the said parties

Signed by the said in the presence of witness

Owner

Name
Address :
Signed by the said

Contractor

SPECIAL CONDITIONS OF CONTRACT SCHEDULE OF FISCAL ASPECTS

Name Of Work	:	EXTERNAL ELECTRIFICATION work of SARAGARHI SARAI for SGPC at Sri amritsar.
Defect Liability Period	:	12 months after completion of entire work. During Defect Liability Period of 12 months the contractor will depute his staff for attending to all types of construction defects included under his scope of contract and rectify the defects free of cost.
Period of Final Measurements and Valuation	:	Within 3 months from date of handing over the work.
Date of Commencement	:	After 7 days of issue of the award letter from the owner.
Time for Completion	:	The whole works will be completed within 2 months.
Agreed Liquidated Damages	:	Architect/Owner will have the full power to decide on the quantum of liquidated damages upto 0.2% on the contract sum of the works per day of delay.
Minimum value of work for interim certificate	:	Rs. 20,00,000/- (Rs. Twenty lacs)
Security Deposit Percentage	:	5% from Gross amount of each bill as per conditions of contract. Earnest Money will be adjusted towards Security Deposit.
Limit of Security Deposit	:	5% of the Gross amount of work.
Refund of Security Deposit after Completion	:	50% after 6 months of completion of the works subject to finalization of bill and rest 50% after defect liability period of 12 months subject to all defects rectified and complete running & maintainence by the contractor.
Period of Honouring Certificate	:	75% within 7 days of submission of bills, duly certified by the Site Engineer and Executive Engineer balance within 15 days to submission of bill duly measurement checked and verified by the accountant and certified by the Chartered Accountant.
Erratic rates for each item	:	If the rates quoted by the tenderer are lower than 10% of the estimated rates then the

		tenderer shall have to deposit a bank guarantee of the shortfall before award of work or the owner shall release the payment of running bills after withholding the shortfall till the completion of work. If the rates quoted by the tenderer are above 10% of the estimated cost then the owner shall withhold the extra amount over the estimates cost+10% value till the completion of the entire work.
Splitting /withdrawal of works	:	The owner reserves the right to withdraw/ split any item wholly or partly from the bill of quantities at any time during/before the execution/award of work.
Specialized works	:	The contractor shall use specialized agencies for carrying out specialized works wherever mentioned in the contract. In case the contractor fails to do this the owner shall have the right to award the work directly to the agency and debit the entire payment from the bill of the contractor at the rates quoted by him even if the agency has charged higher rates than quoted by the contractor.
Taxes after award of work		Any new taxes levied by the central government after the award of work shall be borne by the owner. The owner may ask to contractor to produce the original deposit receipt of the same for release of this amount or may deposit it directly themselves. However all other increase or decrease in taxes, duties, octroi, cess, toll etc shall be borne by the contractor till the completion of the work.
Escalation clause		No escalation shall be payable on any account
Mobilization Advance		No mobilization advance shall be payable to the contractor. If the contractor does not start construction on the site within 15 days of award of LOI then the earnest money of the contractor shall be forfeited and his contract shall be terminated.

6.0 GENERAL CONDITIONS OF CONTRACT

1. DEFINITIONS

1.0 The contract document consists of the Agreement, the General Conditions of the Contract, Special Terms & Conditions, Specifications and Schedule of Quantities and Rates contained therein including all modifications thereof incorporated in the document before execution and the Contract Drawings prepared by the ARCHITECT from time to time.

1.1 The OWNER
The ARCHITECT
THE CONTRACTOR
ENGINEER-IN-CHARGE
Are those mentioned as such in the Agreement and shall include their legal representatives, assigns or successors. They are treated throughout the Contract Document as if each were of the singular number and masculine gender.

1.2 "The Site" shall mean the site of the contract work including any building and erections thereon and any other land allotted by the OWNER *for* Contractor's use.

1.3 The term “Sub-Contractor", as employed herein. includes those having a direct contract with the Contractor and it includes one who furnished material worked to a special design according to the plans or specifications of this work but docs not include one who merely furnished material not so worked.

Anyone doing work on a piece rate basis shall be deemed to be a Sub-contractor.

1.4 "Written notice" shall be deemed to have been duly served if delivered in person to the individual or to a member of the firm to an office of the corporation for whom it is intended, or if delivered at or sent by registered mail to the last business address known to him who gives the notice.

1.5 The term "Work" of the Contractor or Sub-contractor includes labour or material or both.

1.6 All time limits stated in the Contract Document are the essence of the Contract.

1.7 The law of the place of work shall govern EXTERNAL ELECTRIFICATION work under contract.

1.8 The date, of virtual: completion, of a work or specified area of a. work is the date when EXTERNAL ELECTRIFICATION work is sufficiently: completed, in accordance with the Contract Documents as modified by any change or variation orders agreed to by the parties, so that the OWNER can occupy the works for the use it was intended.

2. CONTRACT DOCUMENT

The following documents shall constitute the contract document:

i) Articles of Agreement
ii) General Conditions of the Contract
iii) Special Terms & Conditions
iv) Specifications
v) Schedule of Quantities
vi) Drawings

All parts of the Contract document are complementary, what is called *for* in anyone shall be binding, as if called for ball.

The Contract Document shall remain in the custody of the OWNER so as to be available at all reasonable times for the inspection of the ARCHITECT or of the Contractor Immediately after the execution of the contract one copy of the Contract Document and two copies of the Contract Drawings shall without charge be supplied by the ARCHITECT to the Contractor and one copy of the Contract Document retained with him. Original contract documents and two sets of contract drawings will be sent to the OWNER.

So soon as is possible after the execution of the contract two copies of the Specifications, descriptive schedule or other like document necessary for use in carrying the work shall without charge be supplied by the ARCHITECT to the Contractor.

Provided that nothing contained in the said Specification. Descriptive schedules or other documents shall impose any obligation beyond those imposed by the Contract Document namely by the contract Drawings, the Contract Bills, the Articles of Agreement and these conditions.

After the award of the Contract the Contractor shall without charge be supplied with all such other drawings and details as may be prepared by the ARCHITECT and his CONSULTANT, from time to time as the work proceeds as are reasonably necessary either to explain or amplify the Contract drawings to enable the Contractor to carry out and complete the work in accordance with these conditions of the contract and all such drawings shall be a reasonable development of the work described in the Contract documents.

The Contractor shall keep one copy of the Specifications, Descriptive schedule or other like documents referred to in this clause and one copy of the contract. Drawings and such other drawings and documents supplied to him from time to time and referred to in this clause and written instructions referred to clause and sub-clauses 9,16.1, 16.2 and 29 shall be kept upon the site so as to be available to the ARCHITECT or his representative at reasonable times.

None of the documents herein before mentioned shall be used by the CONTRACTOR for any purpose other than this contract and neither the OWNER nor the ARCHITECT shall divulge or use except for the purpose of this contract any of the prices in the contract bills.

Upon final payment under clause 30.6 of these conditions the Contractor shall if so requested by the ARCHITECT forthwith return to the ARCHITECT forthwith return to the ARCHITECT all Drawings, Details, Specifications, Described Schedule and other Documents of like nature which bears his name or that of the CONSULTANT.

3. TYPE OF CONTRACT

The Contract shall be an item rate contract. The contractor shall be paid for the actual quantity of work done; as measured at site, at the rates quoted by him in the "Contract Bills" and accepted by OWNER.

4. SCHEDULE OF QUANTITIES

The Schedule of Quantities given in the "Contract Bill" are provisional and are meant to indicate the intent of the work and to provide a uniform basis for tendering. The OWNER reserves the right to increase or decrease any of the quantities upto any extent or to totally omit any item of work and the Contractor shall not claim any extras or damages on these grounds.

Any error in description or in quantity or omission of items from the "Contract Bill" shall not vitiate this Contract but shall be treated as a variation.

5. CONTRACT DRAWINGS

5.1 In general the Drawings shall indicate dimensions, position and type of construction the Specifications shall indicate the qualities and the methods; and the Schedule of Quantities shall indicate the quantum and the rate for each Item of work. Any work indicated on the Drawings and not mentioned in the Specification or vice versa shall be furnished as though fully set forth in both. Work not specifically detailed marked or specified shall be the same as similar parts that are detailed, marked or specified.

5.2 The Contractor's work shall not deviate from the Drawings and Specification. The OWNER & ARCHITECT interpretation of these documents shall be final.

5.3. Errors or inconsistencies discovered in the Drawings and Specification shall be promptly brought to the attention of the ARCHITECT, through the ENGINEER-IN-CHARGE, for interpretation or correction Local conditions which may affect the work shall likewise be brought to the ARCHITECT attention. If at any time it is discovered that the work is being done which is not in accordance with the Contract Drawings and specifications, the Contractor shall correct the work immediately. Corrections of defective work shall not be a basis for any claim for extension of time or for any additional sum (s). The Contractor shall not carry on work except with the knowledge of the ENGINEER-IN-CHARGE.
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5.3 Figured dimensions on the Scale Drawings and large size details shall govern. Large details shall take precedence over small scale drawings. Any work done before receipt of such details, if not .in accordance with the same, shall be removed and replaced or adjusted, as directed. by the Contractor without expense to the OWNER The general conditions apply with equal force to all the work including authorised extra works.

5.4 All drawings, Schedule of Quantities and Specifications and copies thereof furnished by the ARCHITECT are his property. They shall not be used on any other work and shall be returned to the ARCHITECT at his request on completion or termination of the Contract.

5.5 Reinforcing steel bar bending schedules-shall. be. submitted to, the Engineer-in-charge at least , fifteen days: prior to the fabrication of the reinforcement.

6. CONTRACT SUM

The "Contract Sum" shall not be adjusted' or altered' in 'any way what so ever otherwise that in accordance with express provisions; of these conditions, and subject to clause 5.2 of these conditions any error whether of Arithmetic or in the computation of the Contract :Sum shall be deemed to have been accepted by the parties hereto.

7. CONTRACT BILLS

Monthly Payments : Based on joint measurements recorded by Engineer-in-charge and contractor’s representative, the Contractor will submit his bill in quadruplicate in approved proforma monthly for payment. All such payments shall be considered as advance payment against Final bill. Payment will be made to the contractor @ 75% of the billed amount within 10 days duly certified by Engineer-in-charge and balance within 20 days from the date of

submission of bill. The contractor shall raise a bill only as per provisions of the special conditions of the contract.

8. SCOPE AND INTENT

8.1 Scope: The general character and the scope of the work is illustrated and defined by the Specifications and the Schedule of Quantities herewith attached and by the signed Drawings. If the Contactor finds any discrepancy in or divergence between the "Contract Drawing" and or the "Contract Bills" he shall immediately give to the ARCHITECT a written notice specifying the discrepancy or divergence and the ARCHITECT shall issue instruction in regard thereto.

8.2 Extent: The Contractor shall carry out and complete the work in every respect in accordance with the contract and with the directions of and to the reasonable satisfaction of the ARCHITECT. The OWNER/ ARCHITECT may in his absolute discretion and from time to time issue further drawings, details and/or written instructions, written directions and written explanations all of which are collectively referred to as ARCHITECT instructions All such drawings and instructions shall be consistent with the Contract Document, true development thereof and reasonably inferable there from.

8.3 Intent: The intention of the documents is to include all labour and materials equipment and transportation necessary for the proper execution of the work. Materials of work described in word which so applied have a well known technical or trade meaning shall be held to refer to such recognized standard.

9. ARCHITECT'S INSTRUCTIONS

9.1 The Contractor shall forthwith comply with and duly execute any work comprised in such instructions issued to him by the ARCHITECT in regard to any matter in respect of which the ARCHITECT is expressly empowered by these conditions to issue instructions, provided always that verbal instructions, directions and explanations given to the Contractor or his work - representative by the ARCHITECT shall, if involving a variation, be confirmed in writing.

If within seven days after receipt of a written notice from the ARCHITECT requiring compliance with an instruction the Contractor does not comply herewith, then he may employ and pay other persons to execute work whatsoever which may be necessary to give effect to such instructions, and all cost incurred with such employment shall be recoverable from the contractor by the OWNER as a debt, or may be deducted by him from any monies due to the contractor under this contract.

9.2 All instructions issued by the ARCHITECT shall be in writing. Any instruction issued orally shall be of immediate effect but shall be confirmed in writing by the Contractor to the ARCHITECT within seven days and if not dissented in writing by the ARCHITECT to the Contractor within seven days from receipt of the Contractor's confirmation it shall be taken as from the expiration of the latter said seven days.

9.3 Provided Always that if the ARCHITECT within seven days of giving such an oral instruction himself confirms the same in writing, then the Contractor shall not be obliged to confirm as aforesaid, and the shall take effect as from the date of the ARCHITECT confirmations.

10. FACILITIES AND CO-OPERATION

In the case of works indicated on the Drawings but not included in the' contract, the Contractor shall provide necessary facilities and co-operation for any Sub-contractor or supplier who may be approved by the OWNER. The Contractor shall do all cutting, filling or patching of his work that may be required to make its several parts come together properly and fit it to receive or be received by work of other CONTRACTOR shown upon or reasonably implied by the Drawings and Specifications for the completed structure and he shall make good after them as the ARCHITECT may direct. Any cost caused by the defective or ill-timed work shall be borne by party responsible therefore.

The Contractor shall not endanger any work by cutting; excavating or otherwise altering the work and shall nor cut or alter the work of any other Contractor save with the consent of the ARCHITECT.

11. SETTING OUT : The architect/ executive engineer shall determine any lines, levels which may be required for the execution of the work and shall furnish to the Contractor by way of accurately dimensioned drawings such information as shall enable the Contractor to set out the work at ground level.

The Contractor shall set out and laid level the work and shall be responsible for the accuracy of the same. He shall provide all the instruments and attendance required by the ARCHITECT for checking the work. He shall entirely at his own cost amend to the satisfaction of the ARCHITECT/ EXECUTIVE ENGINEER any error found at any stage which may arise through inaccurate setting.

12. SITE

12.1. Visit: Before tendering. the Contractor shall have visited and examined the site and satisfied himself as to the nature of the roads or other means of communication and the character of the soil and of the excavations, the correct dimensions of the work and the facilities for obtaining any special articles, called for in the Contract. Document and shall have obtained generally his own information on all matters affecting the continuation and progress of the works.

No extra charge made in consequence of any misunderstanding or incorrect information on any of these points; or on the grounds of insufficient description, will be allowed. Should the Contractor after visiting the site; find any discrepancies, omissions, ambiguities or conflicts in or among the Contract Documents, or to be in doubt as to their meaning he shall bring the questions to the ARCHITECT''s attention, not later than three days before the last date for submission of the tender.

12.2. Possession: The Contractor shall be allowed admittance to the site on the Date of Commencement stated in. the appendix and he shall there on and forthwith begin the work and shall regularly proceed with and complete the same, on or before the Date of Completion stated .in the-appendix subject nevertheless to the provision for extension of time hereinafter contained.

12.3 Treasures: Any Treasures, Coins or objects of Antiquity, which may be found at site shall be handed over to the OWNER.

Dismantled material and excavated stone to be OWNER's property: All dismantled materials and useful stone obtained during excavation shall be the property of the OWNER. All useful

stone / materials shall be stacked / stored properly and handed over to the ENGINEER-IN-CHARGE against proper receipt. No extra cost will be paid to the Contractor for such operation.

13. SAMPLES AND SHOP DRAWINGS

13.1. After the award' of the Contract, the Contractor shall furnish for the approval of the ARCHITECT, with such promptness as to cause no delay in his work or in that of any other Sub-contractor, samples and shop drawings required by the specifications or by the ARCHITECT. Samples shall be delivered as directed by the ARCHITECT.

13.2. A schedule giving dates for the submission of samples shall be included in the schedule described under clause 14. Unless specifically authorised all samples must be submitted for approval within Ten days of signing the Contract and not less than twenty days before the date the particular work involved, is scheduled to begin.

13.3 The ARCHITECT shall check and approve such samples, with reasonable promptness only for conformity with the design concept of the works and for compliance with the information in the Contract Documents. The work shall be executed in accordance with the approved samples.

14. PROGRESS CHART

The Contractor shall prepare programme/progress charts and submit the same for approval of the ARCHITECT/ EXECUTIVE ENGINEER and for his record within twenty one-day of the award of the Contract. The charts shall indicate the expected date of commencement and completion of each of the items of the work and shall be in a form approved by the ARCHITECT/ EXECUTIVE ENGINEER. The Chart shall also indicate the scheduling of samples, submission of Shop Drawings and approvals.

15. ACCESS FOR OWNER / ARCHITECT TO THE WORKS

The architect/ executive engineer and their representatives shall at all reasonable time have access to works and to the workshop or other places of the contract and when work is to be so being prepared in workshops or other places of a Sub-contractor (whether or not a nominated Sub- contractor as defined in clause 26 of these conditions the contractor shall have a term in the Sub-contract so as to secure a similar right of access to those workshop or places for the ARCHITECT/ EXECUTIVE ENGINEER and his representatives and shall do all things reasonably necessary to make such right effective:

16. ARCHITECT & EXECUTIVE ENGINEER STATUS AND DECISIONS

16.1 The ARCHITECT shall be the OWNER's representative:-The ARCHITECT' may periodically visit the site to familiarize himself generally, with the progress and the quality of the work and to determine in general if the work is proceeding in accordance with the Contract Document. During such 'visits and on the basis; of observations while at the site he shall keep the OWNER informed of the progress of the work, shall; endeavor to guard' the OWNER against defects and deficiencies in the work of the Contractor and he shall condemn work which fails to conform to the Contract Document. He shall have authority to stop the work whenever such stoppage may be necessary in his reasonable opinion to ensure the proper execution of the Contract.

The Architect shall be in the first instance the interpreter of the conditions of the contract and the judge of its performance.

16.2 Decision: The ARCHITECT/ EXECUTIVE ENGINEER shall within a reasonable time take decisions on all claims of the Contractor and all other matters relating to the execution and progress of the work or the interpretation of the Contract Document '

The ARCHITECT may in his absolute discretion and from time to time issue further Drawings. Details and/or written instructions, written directions and written explanations in regards to :

a) Variation or modification of the design
b) The quality or quantity of works or the additions or omission or substitution of any work
c) Any discrepancy in or divergence between the Drawings and / or specifications
d) The removal and / or re-execution of any works executed by the Contractor.
e) The dismissal from the works of any persons employed thereon.
f) The opening up for inspection of any work covered up.
g) The amending and making good of any defects under Defects Liability Period.
h) The removal from the site of any materials brought thereon by the Contractor and the substitution of any other material therefore.
i) Assignment and sub-letting.
j) Delay and extension of time
k) The poEXTERNAL ELECTRIFICATIONonement of any work to be executed under the provision of this Contract.

16.3 Dismissal: The Contractor shall on the instructions of the ARCHITECT/ EXECUTIVE ENGINEER immediately dismiss from the works any person employed thereon by him who may in the opinion of the ARCHITECT/ EXECUTIVE ENGINEER be incompetent or misconduct himself and such person shall not be again employed on the work without the permission of the ARCHITECT/ EXECUTIVE ENGINEER.

17. SECURITY DEPOSIT

The person/persons whose tender(s) may be accepted (hereinafter call the Contractor) shall permit OWNER to deduct such sum at the rate of 5 % of the Gross value of the work done from each Running Bill at the time of making any payment to him for work done under the contract, to deduct such sum as along with the sum already deposited as Earnest Money with tender, out of which 50% shall be released after 6 months of virtual completion subject to finalization of bills and rest 50% after defect liability period of 12 months subject to all defects rectified by the Contractor. All compensation of other sums of money payable by the Contractor under the terms of this contract may be deducted from or paid out of his security deposit from or may become due to the Contractor by the OWNER on any account whatsoever and in the event of Security Deposit being reduced by reasons of any such deductions the CONTRACTOR shall within 10 days make good the same in cash. The Security Deposit shall be collected from the running bills of the Contractor at the rate mentioned above and the earnest money deposited at the time of tenders will be treated as part of the Security Deposit and to be adjusted.

18. ENGINEER-IN-CHARGE

18.1 The term "ENGINEER-IN-CHARGE" shall mean the person nominated by the SGPC and appointed and paid by the OWNER and acting under the instructions of the ARCHITECT to inspect the works in the absence of the Executive Engineer. The Contractor shall afford the ENGINEER-IN-CHARGE every facility and assistance for inspecting the works and materials and for checking and measuring the work and the materials. Neither the ENGINEER-IN-CHARGE nor any representative of the ARCHITECT shall have power to set out works or to revoke, alter, enlarge or relax any requirements of the Contract or to sanction any day work, additions, alternations, deviations or omissions, of any extra work whatever except in so far as such authority may be specially conferred by a written order of the ARCHITECT and Secretary SGPC.

The ENGINEER-IN-CHARGE or any representative of the ARCHITECT, shall have power to give notice to the Contractor or to his representative of non-approval of any work or materials and such work shall be suspended or the use of such materials shall be discontinued until the decision of the ARCHITECT, is obtained. The work will from time to time be examined by the ARCHITECT, the ENGINEER-IN-CHARGE or the ARCHITECT's representative but such examination shall not in any way exonerate the Contractor from the obligation to remedy any defects which may be found to exist at any stage of the work or after the same is completed subject to the limitation of this clause, the Contractor shall take instructions only from the ARCHITECT/ EXECUTIVE ENGINEER.

19. CONTRACTOR'S FIELD ORGANISATION AND EQUIPMENT

19.1 Site Engineer : The contractor shall constantly keep on his work during its progress qualified and competent Site engineer who will be responsible for the carrying out of the works to the true meaning of the Drawings, specifications ad schedule of the Quantities. ARCHITECT/ EXECUTIVE ENGINEER instructions and directions to the satisfaction of the ARCHITECT/ EXECUTIVE ENGINEER shall be deemed to have been issued to the Contractor attention is called to the importance of requesting instructions from the ARCHITECT before undertaking any work where ARCHITECT'S directions or instructions are required. Any such work done in advance of such instructions will be liable to be removed.

19.2 Equipment: The Contractor shall provide and install all necessary hoists, ladders, scaffolding, tools, tackles, plants, all transport for labour materials and plant necessary for the proper carrying on execution and completion of the work to the satisfaction of the ARCHITECT/ EXECUTIVE ENGINEER.

19.3 Office Accommodation: The contractor shall provide / erect and maintain where directed simple water tight office accommodation for the foreman and the Engineer - in - charge. This accommodation shall be well lighted and ventilated and provided with windows, doors with a lock. The engineer - in charge's office shall be a minimum of 100 sqft and shall have a table, chair and drawers for keeping drawings and tack board for displaying drawings. The accommodation to be demolished when directed by OWNER.

19.4 Watchmen: The Contractor shall make his own security arrangements to guard the site and premises at all times, at his own expense. The security arrangements shall be adequate to maintain strict control on the movement of material and labour. The Contractor shall extent the security arrangement to guard the material stored and / or fixed on the premises by the sub-contractors.

19.5 Storage of materials: The Contractor shall provide; erect and maintain proper sheds for the storage and protection of the materials etc. against fire, theft, rains etc and also for the execution of work which may be required on the site.

19.6 Sanitary conveniences: The contractor shall provide and erect all necessary sanitary convenience for the Engineer-in-charge, site staff and the workmen, maintain in a clean orderly condition and clean and deodorize the ground after removal.

19.7 Scaffolding, staging, guardrails: The contractor shall provide scaffolding, staging, guardrails, temporary stairs, which shall be required during construction. The support for the scaffolding, staging, guardrails and temporary stairs shall be strong, adequate for the particular situation. The temporary access to the various parts of the works under construction shall be rigid and strong enough to avoid and chance of mishaps. The arrangement proposed shall be subject to the approval of the ARCHITECT/ EXECUTIVE ENGINEER.

20 TAXES

The Contractor shall include in his rates the various taxes such as octroi, excise duty, sales tax, turnover/works contract tax and any other tax payable and it shall be assumed that his rates cover for all taxes. Revenews Royalties, Excise duties, Toll Tax, and duties etc. and no claim on this account will be entertained.

21 STATUTORY OBLIGATIONS, NOTICES, FEES AND CHARGES

21.1 The Contractor shall comply with and give all notices required by any government authority, and instrument, rule or order made under any Act of Parliament or any regulation or Bye-law of any local authority relating to the work or with whose system the same is or will be connected. The Contractor before making any variation from the Contract Drawings or Contract Bills necessitated by such compliance shall give to the ARCHITECT a written notice specifying and giving reasons for such variations and the ARCHITECT/ EXECUTIVE ENGINEER may issue instructions in regard thereto. If within 10 days of having given the said written notice the Contractor does not receive any instruction in regard to the matters therein specified, he shall proceed with the work confirming to the Act of parliament instrument, 'rule-order, regulations or Bye-law in question and any variation thereby necessitated shall be deemed to be a variation required by the ARCHITECT/ EXECUTIVE ENGINEER.

21.2 The Contractor shall pay and indemnify the OWNER against liability in respect of any fees or charges (including any rates and taxes) legally demandable under any Act of Parliament, instrument, rule or order or any -regulation or Bye-law or any local authority in respect of the Work.

22. ROYALTIES AND PATENT RIGHTS

All royalties or other sums payable in respect of supply and use in carrying out the work as desired by or referred to in the Contract Bills of any patented articles, process or inventions shall be deemed to have been included in the Contract Sum, and the Contractor shall indemnify the OWNER from and against all claims, proceedings, damages, costs and expenses which may be brought or made against the OWNER or to which he may be put by reason of the Contractor infringing or being held to have infringed any patent rights in relation to any such articles, processes and inventions.

23. LICENSES & PERMITS FOR MATERIALS UNDER GOVERNMENT CONTROL

Licenses and permit for all: materials: under Government control shall be obtained by the Contractor through the collaboration and 'help of OWNER, The contractor shall include in his tender all transport charges and other expenses likely to be incurred to bring materials to the site.

24. WATER & ELECTRICITY FOR CONSTRUCTION

Water & electricity will be arranged by the CONTRACTOR himself. CONTRACTOR will make his own arrangement for storage of water and further distribution etc. No responsibilities lies with the OWNER. The water to be used should be suitable for construction purposes and should be got tested from approved laboratory by the CONTRACTOR at his own cost before start of the work and periodically during construction. The CONTRACTOR shall also make his own arrangement for temporary electric connection and shall deposit required payment to the concerned authorities. In case of power failure, he should make arrangement for DG Sets required.

25 ASSIGNMENT OR SUB-LETTING

The Contractor shall not without the written consent of the OWNER assign or sub-let this Contract.

26 SUB-CONTRACTOR;

As soon as practicable and before awarding any sub-contract, the Contractor shall notify the ARCHITECT/EXECUTIVE ENGINEER in writing the names of the Sub-contractor proposed for the principal parts of the work and for such other parts as the ARCHITECT/ EXECUTIVE ENGINEER may direct, and shall not employ any agency to whom the OWNER may have an objection.

The ARCHITECT/ EXECUTIVE ENGINEER however, shall have power to obtain estimate and select other agencies to carry-out any of the work as described in this Contract Document.

27 ARTISTS AND TRADESMEN

The CONTRACTOR shall permit the execution of work not forming part of this contract by artists, tradesmen, or others engaged by the OWNER Every such person shall for the purposes of clause 43 of these conditions be deemed to be a person for whom the OWNER is responsible and not be Sub-contractor.

28 SEPARATE CONTRACT

The OWNER reserves the right to let other CONTRACTORS work at site in connection with this work. The Contractor shall afford other Contractor reasonable opportunity for the introduction and storage of their materials and the execution of their work, and shall properly co- ordinate his work with theirs. If any part of Contractor's or Sub-Contractor' s work depends for proper execution or results upon the work of any other Contractor, or Sub-Contractor, the Contractor shall inspect and promptly report to the ARCHITECT/ EXECUTIVE ENGINEER any defects in such work that render it unsuitable for such proper execution and results. Failure of the CONTRACTOR to so inspect and report shall constitute an acceptance of the other Contractor's work as fit and proper for the rejection his work, except as to defects which may develop in the

other Contractor's or Sub-contractor's work after the execution of the work, to ensure the proper execution of his subsequent work the Contractor shall measure work already in place and shall at once report to the ARCHITECT any discrepancy between the executed work and the Drawings.

29 VARIATIONS

Alteration in Specifications and Orders etc.: The ARCHITECT shall have power to make any alterations or omissions, additions, substitution for the original specifications, drawings, design and instructions, that may appear to him to be necessary during the progress of the work. The contractor shall carry out the work in accordance with any instruction which may be given to him in writing signed by the ARCHITECT and such alterations, omissions, additions to substitution shall not invalidate the contract and orders etc. Any altered additions or substituted work which the Contractor may be directed to do in the manner above specified as part of the work shall be carried out by the Contractor on the same conditions in all respect on which he agreed to do the main work.

i) If the rates for the additions, altered or substituted work are specified in the contract for the work the Contractor is bound to carry out the additional, altered or substituted work at the same rates as are specified in the contract for the work.

ii) If the rates for additional, altered or substituted work are not specifically provided in the contract for the work the rates shall be derived from the rates for a similar class of work as are specified in the contract for the work.

iii) If the altered additional or substituted work includes any work for which no rates is specified in the contract for the work and cannot. be derived from the similar class of work in the contract, then such work shall be carried out at the rates entered in Schedule of Rates of CSR for Civil Works with premium list dated 23-10-2009 at PAR i.e. CSR+C.P.

iv) If the altered additional or substituted work includes any work for which no rates is specified in the contract for the work and cannot be derived from the similar class of work in the contract or from Punjab CSR, then such work shall be carried out at the rates entered in CPWD Schedule of Rates of Delhi 2007 for Civil Works with 20% premium i.e. DSR 2007 basic rate + 20% premium.

iv) If the rates for the altered, additional or substituted work cannot be determined in the manner specified in sub-clauses (i) to (iii) above, then the contractor shall within 7 days of the date of receipt of order to carry out the work inform the ARCHITECT/ EXECUTIVE ENGINEER the rates which he intends to charge for such class of work supported by analysis of the rate or rates claimed and the ARCHITECT/ EXECUTIVE ENGINEER shall determine the rate or rates on the basis of prevailing market rates through the ENGINEER - IN - CHARGE if required and pay the contractor accordingly. However, the architect/ executive engineer by notice in writing will be at liberty to cancel his order to carry out such class of work and arrange to carry it out in such manner as he may consider advisable. **But under no circumstances shall the contractor suspend the works on the plea of non-settlement of rates of extra or such item during currency of the works till completion certificate issued by the ARCHITECT & Executive Engineer. The rate for extra and substituted items shall be determined on the basis of actual cost of materials and labour etc. (for this contractor shall produce the sufficient proof) plus 10% to cover contractor's all over-heads and profits, water, electricity and works contract tax etc**.

29.2 The rates of material / labour in the extra items as forwarded by the Contractor shall be checked / verified by the ENGINEER - IN - CHARGE before forwarding to the ARCHITECT.

29.3 The rates for all above items will be finally approved by the OWNER. However the Engineer - in - charge may allow the provisional rates for such items claimed by the Contractor pending approval of final rates by the OWNER.

30 CERTIFICATES AND PAYMENTS

30.1 At the period of Interim Certificate named in the appendix to these conditions the Executive Engineer shall issue a certificate stating the amount due to the Contractor from the OWNER, and the contractor shall be entitled to payment thereof within the period for honouring certificate named in the appendix to these conditions and interim valuation shall be made whenever the ARCHITECT/ EXECUTIVE ENGINEER considers them to necessary for the purposes of ascertaining the amount to be stated as due in an interim certificate.

30.2 The amount stated as due in an interim certificate shall subject to any agreement between the parties as to stage payments, be the total value of work properly executed and of the materials and goods delivered to or adjacent to the work for use thereon upto and including a date not more than seven days before the date of the said certificate less any amount; which may be retained by the OWNER (as provided in sub-clause (3) of this condition) and less any installments previously paid under this condition provided that such certificate shall only include the value of the said materials and goods as and from such time as they are reasonably, properly and not prematurely brought to or placed adjacent to the work and then only if adequately protected against weather or other casualties.

30.3 The OWNER may retain the percentage of the total value of the work, materials and goods referred to in sub-clause (2) of this condition which is named in the appendix to these conditions as Security Deposit. Provided always that when the sum of the amounts so retained equals the amount named in the said appendix as limit of Security Deposit or that amount, no further amount shall be retained by virtue of this sub-clause.

30.4 The amounts retained by virtue of sub-clause(3) of this conditions shall be subject to the following rules:-

30.4a The OWNER'S interest in any amounts so retained shall be fiduciary as trustee for the contractor (but without obligation to invest), and the contractor's beneficial interest therein shall be subject only to the right of the OWNER to have recourse thereto from time to time for payment of any amount which he is entitled under the provisions of this contract to deduct from any sum due or to become due to the contract.

30.5 The measurements and valuation of the work shall be completed within the period of final measurements and valuation as stated in the appendix to these conditions, and the contractor shall be supplied with a copy of the priced bills of variation not later than the end of the said period and before the issue of the Final Certificate under sub-clause (6) of this condition. Either before or within a reasonable time after Virtual completion of the work the contractor shall send to the ARCHITECT/ EXECUTIVE ENGINEER all documents necessary for the purpose of the computations required by these conditions.

30.6 As soon as is practicable but before the expiration of the period the length of which is stated in the appendix to these conditions or from the end of the "defects liabilities period" also sated in the said appendix or from completion of making good defects under Clause 40 of these

conditions or from receipt by the Executive Engineer of the document referred to sub-clause(5) of this condition, whichever is the latest, the ARCHITECT/ EXECUTIVE ENGINEER shall issue the Final Certificate. The Final Certificate shall state :-

30.6a The sum of the amount paid to the contractor under Interim Certificate and the amount named in the said appendix as limit of Security Deposit, and

30.6b The contract sum adjusted as necessary in accordance with the terms of these conditions, and the difference (if any) between the two sums shall be expressed in the said certificate as a balance due to the CONTACTOR from the OWNER or to the OWNER from the CONTRACTOR as the case may be, and subject to any deductions authorized by these conditions, the said balance shall as from fourteenth day from the issue of the paid certificate be a debt payable as the case may be by the OWNER to the CONTRACTOR or by the CONTRACTOR to the OWNER.

30.7 No certificate of the ARCHITECT/ EXECUTIVE ENGINEER shall of itself be conclusive evidence that any works materials or goods to which it relates are in accordance with this contract documents.

31. CLAIM FOR EXTRA

31.1 When any instruction or decision given at site involve an extra or whereby the contractor may plan to claim an extra, it shall be the responsibility of the Contractor to inform the ARCHITECT/ EXECUTIVE ENGINEER the extra amount and get written authorization from the ARCHITECT & SECRETARY SGPC before proceeding with the work involved.

31.2 Any modification carried out for expanding or simplifying work at the request of the Contractor or his representatives shall not be taken as the basis for claiming an extra. However, if such modification shall also involve an extra the rate for such modification shall be settled in advance and written authorization obtained by the CONTRACTOR from the EXECUTIVE ENGINEER before proceeding with the work involved. If no such information is given by the Contractor in writing to the ARCHITECT & SECRETARY SGPC such modification shall not be accepted as the basis for extra charge.

32. DEDUCTION FOR UNCORRECTED WORK

The EXECUTIVE ENGINEER deems it independent to correct work damaged or not done in accordance with the contract, an equitable deduction from the contract price shall be made therefore.

33. FLUCTUATION

The rates quoted by the CONTRACTOR shall remain firm for entire period of construction including authorized extension of time. No escalation shall be payable for this period including authorized extension of time.

34. UNFIXED GOODS AND MATERIALS

Unfixed materials and goods intended for, delivered and placed on or adjacent to the work shall not be removed except for use upon the work unless the ARCHITECT has consented in writing to such removal which consent shall not be unreasonably with held. Where the value of any such materials or goods has in accordance with clause 30 of these conditions been

included in any Interim Certificate under the Contract for which the Contractor has received payment, such materials and goods shall become the property of the OWNER, but the CONTRATOR shall remain responsible for loss or damage to the same.

35. MATERIALS AND WORKMANSHIP

35.1 All materials and workmanship shall be as laid down in para 1 of special terms and conditions of this contract and of approved quality and make and the contractor shall immediately remove from the works any material and / or workmanship which in the opinion of the ARCHITECT/ EXECUTIVE ENGINEER are defective or unsuitable and shall substitute proper material and or workmanship at his own cost. The term approval used in connection with this contract shall mean the approval of the ARCHITECT/ EXECUTIVE ENGINEER.

35.2 The contractor shall if required submit satisfactory evidence as to the kind and quality of material.

35.3 All material shall be delivered so as to ensure a speedy and uninterrupted progress of the work. Such material shall be stored so as to cause no obstruction and so as to prevent overloading of any portion of the structure, and the CONTRACTOR shall be entirely responsible for damage or loss by weather or other cause.

35.4 Within 15 days after signing the contract, the CONTRACTOR shall submit for approval of the ARCHITECT a complete list of all materials which he and his sub-contractors propose to use in the work of the particular brand of any article where more than one is specified as a standard. He shall also list out items not specifically mentioned in the specifications but which are reasonably inferred necessary for the completion of the work.

35.5 **Inspection :** All materials and workmanship shall be subject to inspection, examination and test by the ARCHITECT/ EXECUTIVE ENGINEER at any and all times during manufacture and / or construction. The ARCHITECT/ EXECUTIVE ENGINEER shall have the right to reject defective material and workmanship or require its correction. Rejected workmanship shall satisfactorily replaced with proper material without additional charge therefore and CONTRATOR shall promptly segregate and remove the rejected material for the works. If the CONTRACTOR fails to proceed at once with the replacement of rejected materials and / or the correction of defective workmanship, the ARCHITECT/ EXECUTIVE ENGINEER may by contract or otherwise replace such materials and / or correct such workmanship and charge the cost thereof to the contractor, or may terminate the right of the contractor to proceed further with the work.

The contractor shall furnish promptly without additionally charge all reasonable facilities, labour and materials necessary for the safe and convenient inspection and the test that may be required by the OWNER.

35.6 ACCOUNTABILITY OF CEMENT & STEEL

a) Variation in the consumption of cement : After the completion of the work, the theoretical quantity of cement used in the work shall be calculated on the basis of cement consumption statement given in the Punjab PWD Specifications. For the item of work not provided in this statement, the consumption shall be worked out on actual observation basis and the EXECUTIVE ENGINEER decision in this regard shall be final. Over this theoretical quantity of cement, a variation of 2% plus or minus shall be allowed. If it is discovered that the quantity of cement used is less than the theoretical consumption (allowing variation on minus side), the

cost of quantity of cement not so used shall be recovered from the Contractor at twice the market rate. However if the quality of cement used is more than the theoretical consumption (allowing variation on plus side), the cost of cement used in excess shall be recovered from the Contractor at twice the issue rate.

b) Variation in consumption of Steel: After the completion of work, and also at any intermediate stage the theoretical quantity of steel used in the work shall be calculated on the basis of the measurements recorded with cross sectional weights as per Punjab PWD Specifications CSR. 3% wastage shall be allowed due to cutting small pieces. Over this theoretical quantity, a variation of 2% pIus or minus shall be allowed as variation due to wastage being more or less. The difference between quantity of steel actually issued and the theoretical required shall be recovered at twice the market rate. If it is discovered that the quantity of steel used is less than the theoretical consumption, such quantity shall be recovered "from the CONTRACTOR: at twice market rate. The steel reinforcement shall be paid as per cross sectional weights mentioned in the Punjab PWD specifications. The Contractor shall procure and submit vouchers in support of total quantum of steel brought by him at site and will also get the total weight of steel verified from Engineer -in-Charge at his cost. Engineer -in-charge will maintain steel received at site diameter wise. No sale/removal of scrap shall be allowed from the site during the currency of the contract.

35.7 **Secured Advance on Materials**: The OWNER may allow in the running bills payment against non-perishable materials brought to the site of work for incorporation in the works to a maximum of 75% of the value of materials. The Contractor on signing an indenture on proper stamp paper in the form to be specified by the OWNER may be entitled to be paid during progress of the execution of the work a secured advance up to 75% of the estimated value of any materials which are in the opinion of the ARCHITECT/ EXECUTIVE ENGINEER non-perishable and are in accordance with the contract and which have been brought on the site for bonafide incorporation in the work and are protected against damage by weather or other causes, but which have not at the time of advance been incorporated in the works. When materials on account of which an advance has been made under this sub-clause are incorporated in the work, the amount of such advance shall be deducted from the next payment made under any of the clauses of the contract. The contractor shall make arrangements for lockable storage at his cost for materials against which he intends to get secured advance. Under no circumstances shall the contractor remove/modify/replace any material from the site for which he has claimed or been paid secured advance. All items for which secured advance has been paid shall remain in the custody of the owners.

36. DEFECTS

36.1 The Contractor shall: make good at his own cost and to the: satisfaction-of the ARCHITECT/ EXECUTIVE ENGINEER, all defects, shrinkages or small faults, arising in the opinion of the ARCHITECT/ EXECUTIVE ENGINEER from work or materials not being in accordance-with the-drawing or Specifications or, Schedule of Quantities or the instructions of the OWNER which may appear within "Defect Liability Period" referred to in the appendix.

36.2 Such defects, shrinkage's shall upon directions in writing of the OWNER and within such reasonable time as shall be specified therein be amended and made good by the Contractor, at his own cost and in case of default the OWNER may employ and pay other Contractor to amend and make good such defects, shrinkage, settlements or other faults and all damages, loss and expense consequent thereon or incidental thereto shall be made good and borne by the contractor and such damage, loss or expense shall be recoverable from him by the OWNER 'or may become due to. the Contractor or the OWNER may, in lieu of such amending and making

good by the sum to be determined by the ARCHITECT/ EXECUTIVE ENGINEER as equivalent to the cost of amending such work and in the event of the Security Deposit being insufficient recover the balance from the Contractor, together with any expenses the OWNER may have incurred in connection therewith.

37. POSSESSION, COMPLETION AND POEXTERNAL ELECTRIFICATIONONEMENT

37.1 On the date for commencement stated in the appendix to these conditions possession of the site shall be given to the contractor who shall there upon begin the works and regularly and diligently proceed with the same, and who will complete the same on or before the date for completion stated in the said, appendix subject nevertheless to the provisions for extension of time contained in clause 39 of these conditions.

The ARCHITECT may issue instructions in regard to the poEXTERNAL ELECTRIFICATIONonement of any work to be executed under provisions of this Contract.

38 POSSESSION BEFORE VIRTUAL COMPLETION

If at any time or times before *Virtual* Completion of the work the OWNER with the consent of the Contractor shall take possession of any part or parts of same for handing over to the Finishing Contractor or other agency, then not withstanding anything ex-pressed or implied elsewhere in this Contract:

38.1 Such part or parts shall not be deemed to be Virtually Complete.

38.2 Virtual Completion of such part or parts would occur on the completion of the last Part of the structure under this Contract.

38.3 The Contractor shall not claim that part or parts are complete and request for refund of Security Deposit in lieu thereof.

39. EXTENSION

Upon it becoming reasonably apparent that the progress of the work is delayed, the Contractor shall forthwith give written notice of the cause of the delay to the EXECUTIVE ENGINEER,ARCHITECT & SECRETARY SGPC and if in tile opinion of the OWNER the completion of the work is likely to be or has been delayed beyond the date (or completion stated in the appendix to these conditions or beyond any extended time previously fixed under this clause.

39.1 By Force majeure. Or

39.2 By reason of any exceptionally inclement weather, or

39.3 By reason of civil commotion, local combination; of workmen strike or lockout; affecting any of the trades' employed upon the works or any of the trades engaged in the preparation, manufacture or transportation of any of the goods or-materials required for the work, or

39.4 By reason of the Contractor not having-received in due time necessary instructions, drawings details or levels from the ARCHITECT for which he had specifically applied in writing on a date which having regard to the date for completion stated in the appendix to these conditions or to any extension of time then fixed under this clause was neither unreasonably

distant from nor unreasonably close to the date on, which it was necessary for him to receive the same.

39.5 By delay on the part of artists, tradesman or others-engaged by the OWNER executing work not forming part of this Contract, or

39.7 By reason of the opening up for inspection of any work covered up or of the testing of any of the work, materials or goods (including making good in consequence of such opening up or testing) unless the inspection of test showed that the work, materials or goods were not in accordance with this contract or

Then the ARCHITECT/ EXECUTIVE ENGINEER shall as soon as he is able to estimate the length of the delay beyond the date or time aforesaid make in writing a fair reasonable extension of time for completion of the works. Provided always that the Contractor shall use constantly his best endeavors to prevent delay and shall do all that may reasonably be required to the satisfaction of the SGPC/ARCHITECT to proceed with the work.

40.0 DAMAGE FOR NON-COMPLETION

If the Contractor fails to complete the works by the date specified in these conditions or within any extended time fixed under clause 39 of these conditions and the EXECUTIVE ENGINEER certifies in writing that in his opinion the same ought reasonably so to have been completed, the Contractor shall pay or allow to the OWNER a sum calculated at the rate stated in the appendix as agreed Liquidated Damages for the period during which the said work shall so remain or have remained incomplete, the OWNER may deduct such damages from any monies otherwise payable to the Contractor under this Contract.

41. COMPLETION AND DEFECTS LIABILITY PERIOD

41.1 When in the opinion of the ARCHITECT/ EXECUTIVE ENGINEER the works are practically completed, he shall forthwith issue a certificate to that effect and Virtual Completion of the works shall be deemed for all the purpose of this Contract to have taken place on the day named in such certificate.

41.2 Any defects, shrinkage or other faults which shall appear within the "Defects Liability Period" stated in the appendix to these conditions and which are due to materials and workmanship not in accordance with this Contract shall be specified by the ARCHITECT/ EXECUTIVE ENGINEER in a Schedule of Defects which he shall deliver to the Contractor not later than 14 days after the expiration of the said Defects Liability Period and within a reasonable time after receipt of such schedule the Defects, Shrinkage's and other faults therein specified shall be made good by the Contractor and (unless the OWNER shall otherwise instruct in which case the contract sum shall be adjusted accordingly) entirely at his own cost.

41.3 Notwithstanding sub-clause (2) of this condition the ARCHITECT/ EXECUTIVE ENGINEER may whenever he considers it necessary to do so, issue instructions requiring any defects, shrinkages or other fault which shall appear within the Defects Liability Period named in the appendix to these conditions and which is due to materials and workmanship not in accordance with this contract to be made good and the Contractor shall within a reasonable time after receipt of such instructions comply with the same entirely at his own cost, provided that no such instruction shall be issued after 14 day from the expiration of the said defect liability period.

41.4 When in the opinion of the ARCHITECT/ EXECUTIVE ENGINEER any defect, shrinkages or other defaults which he may have required to be made good under sub-clause (2) and (3) of this condition shall have been made good he shall issue a certificate to that effect and completion of making good defects shall be deemed for the all the purposes of this contract to have taken place on the day named in such certificates.

42. PAYMENT WITH HELD

The OWNER may withhold or on account of a subsequently discovered evidence nullify the whole or part of any certificate to such extent as may be necessary in his reasonable opinion to protect the OWNER from loss on account of:

42.1 Defective work not remedied.

42.2 Failure of the Contractor to make payment properly to Sub-Contractor or for materials or labour.

42.3 A reasonable doubt that the Contract can be completed for the balance then unpaid.

42.4 Damage to another Contractor or Sub-contractor.

42.5 Claims filed on reasonable evidence indicating probable filling of claims.

When the above grounds are removed, payment shall be made for amounts withheld because of them.

43. INJURY TO PERSONS AND PROPERTY OWNER

43.1 The Contractor shall be liable for and shall indemnify the OWNER against any liability, loss, claim or proceedings whatsoever arising under any statute or at common law in respect of personal injury to or the death of any person whomsoever arising out of or in the course of or caused by the carrying out of the work, unless due to any act or neglect of the OWNER or of any person for whom the OWNER is responsible.

43.2 Except for such loss or damage as at the risk of the OWNER under clause 45 of these conditions (if applicable) the Contractor shall be liable for and shall indemnify the OWNER against any expense, liability, loss, claim or proceedings in respect of any injury or damage whatsoever to any property real or personal in so far as such injury or damage arises out of or in the course of or by reason of the carrying out of the works, and provided always that the same is due to any negligence omission or default of the Contractor, his servants or agents or of any Sub-Contractor, his servants or agents.

44. INSURANCE AGAINST INJURY TO PERSONS AND PROPERTY

44.1 Without the prejudice to his liability to indemnify the OWNER under clause 43 of these conditions the Contractor shall maintain and shall cause any Sub-Contractor to maintain.

44.1a Such insurance as are necessary to cover the liability of the Contractor or as the case may be of Sub-Contractor in respect of personal injuries or death arising out of or in the course of or caused by the carrying out of the work.
44.1b Such insurance as may be specifically required by the Contract Bills in respect of injury or damage to property real or personal arising out of or in the course of or by reason of the

carrying out of the work, and caused by any negligence, omission or default of the Contractor, his servants or agents or, as the case may be of such sub-contractor, his servants or agents. The Contractor shall produce or cause any Sub-Contractor to produce for inspection the relevant policy or policies of insurance together with the receipts in respect of premiums paid under such policy or policies as and when required to do so by the ARCHITECT/ EXECUTIVE ENGINEER provided always that as and when may be reasonably required by the OWNER the production by either the Contractor or any sub-Contractor of a current certificate of insurance from the company or firm which shall have issued the policy or policies aforesaid shall be a good discharge of the Contractor's obligation to produce or to cause the production of the policy/policies and the receipts in respect of premium paid.

44.2a The Contractor shall maintain in the joint names of the OWNER and Contractor such insurance as may be required in respect of any expense, liability, loss, claim or proceedings which the OWNER may incur or sustain by reason of injury or damage to property real or personal arising out of or in the course of or by reason of the carrying out the work, and caused otherwise than by the negligence, omission or default of the Contractor, his servants, his servants or agents.

44.2b Any such insurance as is referred to in the immediately preceding paragraph shall be placed with insurers to be approved by the ARCHITECT/ EXECUTIVE ENGINEER and the CONTRACTOR shall have to deposit with him the policy or policies and the receipt in respect premiums paid.

44.3 Should the Contractor or any sub-Contractor make default in insuring or in continuing to insure as provided in sub-clause (1) and (2) of this condition the OWNER may himself insure against any risk with respect to which the default shall have occurred and may deduct a sum equivalent to the amount paid in respect of premiums from any monies due to or become due to the Contractor.

45 INSURANCE OF THE WORKS AGAINST FIRE, ETC.

45.1 The Contractor shall in the joint names of the OWNER and Contractor insure against by taking all risk policy from a Govt. approved Insurance Company against any defects, loss or damage by fire, storm, tempest, lighting, flood, earthquake, aircraft or anything dropped there from, aerial objects, riot and civil commotion for the full value thereof, all work executed and all unfixed materials and goods intended for, delivered to and placed on or adjacent to the work, but excluding, temporary building plant, tools and equipment owned or hired by the Contractor or any Sub-Contractor and shall keep such work materials and goods so insured until Virtual Completion of the work. Such insurance shall be approved by the ARCHITECT/ EXECUTIVE ENGINEER and the Contractor shall deposit with the ARCHITECT/ EXECUTIVE ENGINEER the policy or policies and the receipts in respect of premiums paid and should the Contractor make default in insuring or continuing to insure as aforesaid the OWNER may himself insure against any risk with respect of which the default shall have occurred and deduct a sum equivalent to the amount paid by him in respect of premium from any monies due to or to become due to the contractor. Provided always that if the insurance which covers (internal) the said work, materials and goods against the aforesaid contingencies to the full value thereof, then the maintenance by the contractor of such policy shall if the Owner's interest is endorsed thereon, be a discharge of the CONTRACTOR'S obligation to insure in the joint names of the OWNER and Contactor and the production by the Contractor as and when may reasonably be required by the ARCHITECT/ EXECUTIVE ENGINEER of a current certificate of insurance from the company or firm which shall have issued the said policy shall be a discharge of the

Contractor's obligation to deposit with the ARCHITECT/ EXECUTIVE ENGINEER policy or policies and the receipts in respect of premium paid.

45.1 Upon settlement of any claim under the insurance aforesaid, the Contractor with due diligence shall restore work damage, replace or repair unfixed materials or goods which have been destroyed or injured, remove or dispose of any debris and proceed with the carrying out and completion of the work. All monies received from such insurance shall be paid to the Contractor by installment under certificates of the ARCHITECT/ EXECUTIVE ENGINEER issued at the period of interim certificates named in the appendix to these conditions. The Contractor shall be not be entitled to payment in respect of the restoration of work damaged, the replacement and repair of any unfixed materials or goods and the removal and disposal and debris other than the monies received under the said insurance.

45.2 All work executed and all unfixed materials and good intended for, delivered to and placed on or adjacent to work (except temporary buildings, plant, tools and equipment owned or hired by the Contractor or any Sub-Contractor) shall be at the sole risk of the Contractor as regards loss or damage by firm, storm, tempest, lighting, flood, earthquake, aircraft or anything dropped therefrom, aerial objects, riot and civil commotion. If any loss or damage affecting the work or any part thereof or such unfixed materials or goods is occasioned by anyone or more of the said contingencies, then.

45.2(a) The occurrence of such loss or damage shall be disregarded in computing any amounts payable to the Contractor under or by virtue of this contract.

45.2(b) The Contractor with due diligence shall restore work damage, replace or repair any unfixed materials or goods which have been destroyed or injured, remove and dispose off any debris and proceed with carrying out and completion of the work. The restoration of work damaged, the replacement and repair of unfixed material and goods and the removal and disposal of debris shall be done by the Contractor at his cost.

45.3 If the Contractor fails to take insurance of the work against fire etc the OWNER can take such insurance at the cost of the contractor or recover from the Contractor the premium that he would have paid for such insurance.

45.4 All insurance polices shall be valid upto Date of expiry of Defect Liability Period.

46. DETERMINATION BY OWNER

46.1 Default: If the Contractor makes default in anyone or more of the following respects, that is say.

46.1(a) If he without reasonable cause suspends the carrying out of the works before completion thereof or

46.1(b) If he fails to proceed regularly and diligently with the works or

46.1(c) If he refuses or persistently neglects to comply with a written notice from the ARCHITECT/ EXECUTIVE ENGINEER requiring him to remove defective work or improper materials or goods and by such refusal or neglect the work is materially affected, then the ARCHITECT/ EXECUTIVE ENGINEER may give him the notice by registered post or recorded delivery specifying the default, and if the Contractor either continues such a default for 14 days after receipt of such a notice and shall at any time thereafter repeat such a default (whether

previously repeated or not) then the OWNER without prejudice to any other rights or remedies may within 10 days after such continuance or repetition of notice by registered post or recorded delivery forthwith determine the employment of the Contractor under this Contract.

46.2 Bankruptcy of Contractor: In the event of the Contractor becoming bankrupt or making a composition or arrangement with his creditors or being a company having a winding up order made or (except for purposes of reconstruction) a resolution for voluntary winding up passed or a receiver or manager of his business or undertaking duly appointed or possession taken by or on behalf of the holder of any debentures secured by a floating charge, of any property comprised in or subject to the floating charge, the employment of the Contractor under this Contract shall be forthwith automatically determined but the said employment may be reinstated and continued if the OWNER and the Contractor, his trustee in bankruptcy liquidate, receiver or manager as the case may be shall so agree.

46.3 The OWNER shall be entitled to determine the employment of the Contractor under this Contract if the Contractor has offered or given or agreed to given to any person any gift or consideration of any kind as an inducement or reward for doing or forbearing to do or for having done or forborne to do any action in relation to the obtaining or execution of this contract with the OWNER, or for showing or forbearing to show favour or disfavor to any person in relation to this Contract or any other Contract with OWNER, or if the like acts have been done by any person employed by the Contractor or action on his behalf (whether with or without the knowledge of the contractor), or if in relation to this Contract or any other Contract with the OWNER, the Contractor or any person employed by him or acting on his behalf has committed any offence under the prevention of corruption act, or has given any fee or reward, the receipt of which is an offence under the Local Government Act.

46.4 In the event of the employment of the Contractor being determined as aforesaid and so long as it has not been reinstated and continued, the following shall be the respective rights and duties of the OWNER and Contractor.

46.4a. The OWNER may employ and pay other persons to carry out and complete the works and he or they may enter upon the works use all temporary buildings, plant, machinery, appliances, goods and materials intended for, delivered to and placed on or adjacent to the works and may purchase all materials and goods necessary for the carrying out and completion of the works.

46.4b. The Contractor shall if so required by the OWNER within 14 days of the date of determination assign to the OWNER without payment the benefit of any Agreement for the supply of materials or goods and or for the execution of any works for the purposes of this Contract but on the terms that a supplier or Sub-Contractor shall not be entitled to make any reasonable objection any further assignment thereof by the OWNER.

46.4c. The Contractor shall as and when required in writing by the ARCHITECT/ EXECUTIVE ENGINEER to do so (but not before) remove from the works and temporary buildings, plant, tool, equipments, goods and materials belonging to or hired by him. If within a reasonable time after any such requirements has been made, the Contractor has not complied therewith, then the OWNER may (but without being responsible for any loss or damage) remove and sell any such property of the Contractor, holing the proceeds less all cost incurred to the credit of the Contractor.

46.4 The Contractor shall allow or pay to the OWNER in the manner hereinafter appearing the amount of any direct loss and/or damage caused to the OWNER by the determination. Until

after completion of the works under paragraph (a) of this Sub-Clause that OWNER shall not be bound by any provisions of this Contract to make any further payment to the Contractor, but upon such completion and the verification within a reasonable time of the accounts therefore the ARCHITECT/ EXECUTIVE ENGINEER shall certify the amount of expense properly incurred by the OWNER and the amount of any direct loss and/ or damage caused to the OWNER by the determination and if such amount when added to the monies paid to the Contractor before the date of determination exceed the total amount which would have been payable on due completion in accordance with this Contract, the differences shall be a debt payable to the owner by the Contractor, and if the said amount when added to the said monies be less than the said total amount, the difference shall be a debt payable by the OWNER to the Contractor.

47. CO-ORDINATION OF WORK

At the commencement of work, and from time to time, the Contractor shall confer with the Sub-contractors, persons engaged on separate contracts in connection with the work, and with the ARCHITECT/ EXECUTIVE ENGINEER for the purpose of the co-ordination and execution of the various phases of the work. The Contractor shall ascertain the Sub-contractor, persons engaged on separate contracts in connection with the works, the extent of all chasing, cuttings and forming of all openings, holes, grooves, etc, as may be required to accommodate the various services, the Contractor shall ascertain the routes of all services, and the positions of all Light Points, Junctions Boxes etc, In connection with the installation of plant and services and arrange for the Construction of work accordingly. The breaking and cutting of completed work must be avoided.

48. LABOUR

The Contractor shall employ no child labour under 14 years of age on the work. If female labours engaged, the Contractor shall make necessary provision for safeguarding small children and keeping them clear of the site of operations. No labourer shall reside within the compound except authorised guards.

49. PROTECTION OF TREES AND SHRUBS

Trees and Shrubs designated by the ARCHITECT/ EXECUTIVE ENGINEER shall be protected from damage during the course of the work and the earth level shall not be changed within three feet of such tree. Where necessary such trees and shrubs shall be protected by means of temporary fencing.

50. GUARANTEE

50.1 Besides guarantees required elsewhere, the Contractor shall guarantee the work in general for one year as noted under clause of the Conditions.

50.2 All required guarantees shall be submitted to the EXECUTIVE ENGINEER by the Contractor when requesting certification of accounts for payment by the OWNER.

51. ANTIQUITIES

51.1 All fossils, antiquities, and other objects of interest or value which may be found on the site or in excavating the same during the progress of the work shall become the property of the

OWNER The Contractor shall carefully take out and preserve all such objects and shall immediately or as soon as conveniently may be after the discovery of such articles deliver the same into the possession of the ARCHITECT or of the ENGINEER-IN-CHARGE unlearned and as excavated.

51.2 If in the opinion of the ARCHITECT/ EXECUTIVE ENGINEER compliance with the provisions of the proceeding sub-clause has involved the contractor in direct loss and / or expense for which he would not be reimbursed by a payment made under any other provision in this contract, then the ARCHITECT/ EXECUTIVE ENGINEER shall ascertain the amount of such loss and / or expense, any amount from time to time so ascertain shall be added to the Contract sum, and if an Interim Certificate is issued after the date of ascertainment any such amount shall be added to the amount which would otherwise be stated as due in such certificates.

52. ARBITRATION

Except where otherwise provided in the contract all questions and disputes relating to the meaning of the specifications designs, drawings and instructions herein before mentioned and as to the quality or workmanship or materials used on the work or as to any other question, claim, right, matter or thing whatsoever in any way arising out of or relating to the contract, designs, drawings, specifications, estimates, instructions, orders or these conditions or otherwise concerning the works, or the execution or failure to execute the same whether arising during the progress of the work or after the completion of, abandonment thereof shall be referred to the sole arbitration of the person appointed by the President, SGPC. The arbitrator to whom the matter is originally referred being transferred or vacating his office or being unable to act for any reason then the PRESIDENT, SGPC, Sri amritsar at the time of such transfer, vacation of office or inability to act, shall appoint another person to act as Arbitrator in accordance with the terms of the contract. Such person shall be entitled to proceed with the reference from the stage at which his predecessor left it.

Subject as aforesaid the provisions of the latest Arbitration Act or any statutory modification or re-enactment thereof and the rules made thereunder and for the time being in force shall apply to the arbitration proceeding under this clause. It is also a term of the contract that the party invoking arbitration shall specify the dispute or disputes to be referred to arbitration under this clause together with the amount or amounts claimed in respect of each such dispute.

It is also a term of the contract that if the Contractor (s) do / does not make any demand for arbitration in respect of any claim(s) in writing within 90 days of receiving the intimation from the OWNER that the final bill is ready for payment the claim of the Contractor (s) will be deemed to have been waived and absolutely barred and the Director shall be discharged and released of all liabilities under the contract in respect of these claims. The Arbitrator shall give a reasoned award if the amount of award is more than Rs. 50,000/-.

53. PROTECTION AND CLEANING

53.1 The Contractor shall protect and preserve the work from all damages or accidents by providing necessary protections / temporary works etc. or other constructions as required by the ARCHITECT/ EXECUTIVE ENGINEER. This protection shall be provided for all property adjacent to the site as well as on the site.

53.2 The Contractor shall properly clean the work as it progresses and shall remove all rubbish and debris from the site from time to time as is necessary and as directed. On completion the contractor shall ensure that the premises and / or site are cleaned of surplus materials debris, shed etc. areas under floors cleared of rubbish, gutters and drains cleaned, doors and windows and sashes eased, locks and fastenings oiled. Keys clearly labeled and handed over to the ENGINEER-IN-CHARGE so that the whole work is left fit for immediate occupation or use and to the satisfaction of the ARCHITECT/ EXECUTIVE ENGINEER.

54. TOLERANCE

The Contractor shall exercise every care to ensure that all structural members are sufficiently plumb and true to dimensions called for on the drawings to receive finishing elements such as concrete copings, railings, gates, cladding, washed grit finishes etc. any variations may require rectification in the structural members or may involve remaking or replacing the finishing elements, fabricated to fit into the openings or spaces, as called for on the Drawings.

In case of separate contract, the contractor whose work does not conform to dimensions called for, shall be liable for all the expenses which may have to be incurred for rectification or replacement as may be required by the ARCHITECT/ EXECUTIVE ENGINEER for the proper installation of the finishing elements. The ARCHITECT/ EXECUTIVE ENGINEER decision in this respect shall be final and binding on the parties concerned.

7.00 SPECIAL CONDITIONS OF CONTRACT

1. GENERAL

i. The entire work shall be done as per Punjab PWD Specifications (with upto date correction slips) and CPWD Schedule of rates

However, in case of any discrepancy in description of any items as given in the Schedule of Quantities appended with the tender and the specification relating to the relevant item as per Punjab PWD specifications, the former shall prevail. If the specifications for any items are not available in the Punjab PWD specifications referred above, relevant ISI specifications shall be followed. In case ISI specifications are also not available the decision of the OWNER / ARCHITECT shall be final.

Wherever any reference to any Indian standard Specifications occurs in the document referring to this contract, the same shall be inclusive of all the amendments issued thereto or revisions there of, if any, upto the date of receipt of tenders.

ii. Samples of all building materials required for execution of the work shall be got approved from the ARCHITECT. Articles manufactured by firms of repute and approved by the ARCHITECT shall only be used. Articles classified as first quality by the manufacturer shall be used unless otherwise specified.

Preference shall be given to those articles, which bear ISI certification mark. In case articles bearing ISI certification mark are not available the quality of samples brought by the Contractor shall be judged by the standards laid down in the relevant ISI specifications. All materials and articles brought by the Contractor to the site for use shall conform to the sample approved which shall be preserved till the completion of the work.

iii. The work shall be carried out in the manner complying in all respects with requirements of relevant bye laws of the local body under jurisdiction of which the work is to be executed as directed by the ARCHITECT/ EXECUTIVE ENGINEER and nothing extra shall be paid on this account.

iv. The work will be carried out in accordance with the ARCHITECT drawings and structural drawings. The structural and Architectural drawings shall at all times have to be properly co-related before executing the work. ARCHITECT's requirement shall have to be fully satisfied. For finishing items samples shall be prepared for prior approval of the ARCHITECT before starting the particular items of work.

v. The Contractor shall carry out performance tests for the entire installations as per standard specifications before the work is finally accepted and nothing whatsoever shall be payable to the contractor without such tests.

vi. The contractor shall carry out all tests required and pay all charges in connection therewith including fee for testing as may be specified to be conducted by an approved testing authority by the ARCHITECT/ EXECUTIVE ENGINEER. Unless otherwise specified. In all such cases cost of samples and to and for carriage shall be borne by the Contractor. Nothing extra shall be payable to the Contractor on account of above testing charges.

vii. The ENGINEER-IN-CHARGE / Contractor should maintain the Register for cement, steel, paints, etc. and other registers required by the ARCHITECT and these should be signed by the Contractor or his authorized agent and the ENGINEER-IN-CHARGE of the work.

viii. The rates of all items of work shall be considered as inclusive of pumping out or bailing out water if required for which no extra payment will be made. This will include water available from any source such as rains, floods, sub-soil water table being high up or due to any other cause whatsoever.

ix. The CONTRACTOR shall be responsible to arrange at his own cost all necessary tools and plants required for the execution of work.

x. The CONTRACTOR shall provide suitable weighing, measuring and levelling arrangement at site for checking the weight, dimensions, and levels as may be necessary for execution of work.

xi. The CONTRACTOR shall have such openings etc. as may be required for the electric and sanitary works and nothing extra shall be paid on this account.

xii. The work of electrification, horticulture and other internal and external services may be carried out simultaneously by other agencies. The CONTRACTOR shall afford necessary facilities for the same. No claim in the matter shall be entertained and nothing extra over the agreement rates shall be paid for fixing, laying / burying in the work pipes, cables, conduits, clamps, junction boxes, etc.

xiii. The rates for items of work included in the Schedule of Quantities shall be applicable for all heights and depths except for items where specified otherwise.

xiv. Nothing extra whatsoever shall be payable to the CONTRACTOR for executing the work as per specification and conditions referred in all the above paras.

1(B) SPECIAL CONDITIONS

i. Contractor will submit the running bills on the basis of joint measurements recorded by Engineer-in-Charge and Contractor in quadruplicate with one copy to the OWNER, two copies to Engineer-in-charge. 75% payment will be released to CONTRACTOR within 7 days of submission of bill. The engineer-in-charge after certifying the bill forward one copy of bill to Executive Engineer for certification of scrutiny and approval of balance payment against the bill Executive Engineer will certify the quality of work and work adhering to specification and drawings.

ii. Contractor shall follow all the relevant laws including labour / provident fund / ESI / local authorities as applicable in the state or notified from time to time and will be responsible for any liability accrued on this account and keep the University indemnified of any liability, whatsoever in connection with the execution of this work.

iii. Work contract tax shall be deducted from Contractors bill.

iv. Necessary insurance of labour under Workman Compensation Act and the building including any injuries to labour or damage to building on any account shall be got done by Contractor and the copy of the same sent to OWNER.

v. Contractor shall make his own arrangement for water and electricity for the construction at his own cost by and the generator of suitable capacity to finish the job in time.

vi. Quantities of items are approximate and liable to change to any extent on either side. Any variation in quantities shall not vitiate the contract.

vii. Contractor shall not sub let the work to any other Contractor or Agency without written consent of the owner.

viii. The owner has right to withdraw any item of work from the contract or add / delete or change the same. Contractor shall make no extra claim for the same.

ix. The work shall be completed within the time as per appendix to General Condition of Contract Timely completion is essence of this order and Contractor shall pay liquidated damages @ 0.2% on the Contract sum of the work per day for each day of delay.

After a period of two weeks, the contract will come to end and the owner shall be at liberty to withdraw the work and get it executed from any other agency at Contractor risk and cost and the site shall be vacated by Contractor immediately.

x. No escalation in prices shall be allowed as this is a short term contract.

xi. No mobilization advance will be payable.

xii. Ready mix concrete used for RCC work should be of approved manufacturers on the approval of ENGINEER-IN-CHARGE / ARCHITECT.

xiii. Minimum amount of running bill would be as per appendix to General condition of Contract.

xiv. Tender should be unconditioned as conditional tenders are liable to be rejected.

xv. In addition to mandatory tests as specified the Contractor will get tests conducted on other materials as per instructions of the Owner / Architect/ engineer in charge. The cost of all these tests shall be borne by the Contractor.

xvi. Engineer-in-charge will work under the instructions of ARCHITECT.

The contractor shall be responsible to obtain all connections i.e. Water connection, electric connection etc. from the Concerned Authorities. The Contractor shall get all approval from concerned authorities, to obtain completion certificate and supplying 3 sets of as built - up drawings of all modifications carried out at site.

All govt. charges shall however to be reimbursed to Contractor on production of original deposit receipts.

2. R.C.C. WORK

2.1 In respect of projected balconies and projected verandahs, the payment for the RCC work shall be made under the items of RCC work (RCC slabs). The payment for centering shuttering shall similarly be made under the items of centering and shuttering for RCC slabs. Nothing extra shall be paid for the side shuttering at the edges of slabs, projected balconies and projected verandahs. All the exposed edges shall however be finished as per specifications and nothing extra shall be paid.

2.2 In the item of RCC walls the Railings as per ARCHITECT's design of any thickness, holes, slits etc. nothing extra shall be paid for these provisions. The finished railing should be perfectly straight and in one plane.

2.3 The centering and shuttering for all the RCC and RB work shall be of steel or ply of approved quality and thickness.

2.4 Precast RCC

For the work of providing and fixing RCC lintels shelves etc. the fond work shall be of wooden planking with steel sheet lining or of steel plates stiffened by steel angles as per Punjab PWD Specifications.

The compaction of the concrete shall be done by mechanical vibrating tables or external vibrators as approved by the Engineer-incharge and as per clause 5.4.3.2 of specification for works at Delhi 1996. The rates quoted for the item shall include for both the form work and mechanical vibrators.

3. BRICK WORK

3.1 Where fractions of half bricks occur due to Architectural or other reason the work shall measured as follows:

a. If as per drawings, the use of fraction of half bricks, is required, the measurements shall be made for half brick.

b. If the thickness of the walls is required to be increased upto 2cm (3/4") beyond the structural thickness of half brick multiples, the same shall be made up in mortar and paid for the specified thickness.

c. Brick work in steps / treads of stairs, pillars (square or rectangular) shall be payable under respective item no. 4.01 or 4.02 of the Schedule of Quantities (Volume - II) and nothing extra shall be payable on any account whatsoever, it may be

All sunken floors of toilet shall be provide with brick coba water proofing treatment after giving proper slope. All CI pipes shall be covered with cement concrete 1:2:4 alround. In the sunken toilet lean concrete shall be filled. One spout of 1.5" dia pipe provided over the water proofing treatment for draining.

4. WOOD WORK

4.1 Joinery : The CONTRACTOR shall take in hand joinery work immediately after the award of work. The frames and shutters shall not be painted or otherwise treated and fixed in position before these are approved by the ARCHITECT / ENGINEER - IN - CHARGE in writing.

4.2 Timber required for all wood work shall be kiln seasoned to the satisfaction of the ENGINEER - IN - CHARGE / ARCHITECT and moisture content shall be as per Punjab PWD Specifications.

4.3 The timber shall be brought well in advance after getting it seasoned in kilns and stacked at site in such a way that air circulates well in the stacks. A certificate of kiln seasoning shall be produced with each lot of timber brought at site.

4.4 Secured advance shall be given on timber brought at site @ 75% of market value of timber after the timber is got insured against fire and theft.

4.5 The quality of the timber to be used in the work shall be got tested in the Laboratory as per the instructions of ARCHITECT/ EXECUTIVE ENGINEER. The entire cost of testing including the cost of shutters and or samples of the materials shall be borne by the CONTRACTOR.

5. SPECIFICATIONS FOR ANODIZED ALUMINIUM WORK

5.1 General

The work shall be carried out as per approved ARCHITECTURAL drawings as per instructions of ENGINEER-IN-CHARGE. Special dimensions or directions in these specifications / nomenclature of the items shall supersede all else.

5.2 Material

5.2.1 Inspection of Material and Works : All materials brought to the site CONTRACTOR, for use in the work as well as fabricated work shall be on inspection and approval by ENGINEER-IN-CHARGE. The CONTRACTOR is directed by ENGINEER-IN-CHARGE, get necessary tests carried out on material work at his own cost from laboratories / test houses approved by OWNERS.

5.2.2 Removal of rejected material / works: In case any material / works are rejected by the ENGINEER - IN - CHARGE the same shall be removed from the site within 48 days failing which the same may be removed by the ENGINEER - IN - CHARGE at the risk of the cost of the CONTRACTOR.

5.2.3 Manufacturer's Test Certificate: The CONTRACTOR shall, if required by ENGINEER-IN-CHARGE, produce manufacturer's test certificate for any material of particular batch of material supplied by him. The test(s) carried out shall be as per relevant specifications / Indian Standard Code.

5.2.4 Approval of Samples: The CONTRACTOR shall submit to the ENGINEER-IN-CHARGE shop drawing of all doors / windows / ventilators/glazing etc. alongwith samples of all the materials for approval and no work shall commence before such samples are approved. Samples of unanodised as well as anodized sections, PVC / Neoprene / EPDM gaskets, hardware fittings and fixtures, glass, screws, etc. any other material / work shall be supplied and samples will be retained as standards of materials and workmanship. The cost of the shop drawings and samples shall be borne by the COTNRACTOR.

5.3 ALUMINIUM SECTIONS

5.3.1 The aluminum sections shall confirm to IS designation HE 9 WP / HV 9 WP alloy with chemical composition and technical properties as per IS 733 and IS 1285. The aluminium section shall confirm to the following parameters also.

a) The minimum tensile strength shall be 19 kg f/ mm.
b) The maximum allowable deviation in length from a straight line shall be 0.5mm / metre.
c) The maximum allowable deviation from straight shall be one degree.
d) The maximum permissible twist shall be 0.5mm / metre.
e) The maximum variation in flatness shall be not more than 0.125 x 25 width.

5.3.2 Aluminium sections manufactures by reputed companies like HINDALCO / Jindal shall be used but the unit weight of the section should be not less than the unit weight of various components as specified in the drawings or in the nomenclature of item of works. For any excess weight of section used nothing extra shall be paid. However, weights of finished anodized sections shall be considered for payment.

5.4 FABRICATION

5.4.1 All joints shall be accurately fabricated and be have like in appearance. The finished surface shall be free from visible defects.

5.4.2 All hardwares used shall conform to the relevant ISI a specifications and sanction shall be got approved from the Engineer - in - charge before actual use. Each open window and ventilators shall have an Anodized Aluminium handle and a stay at door shall have handles, tower bolts, six lever brass mortise lock 70mm size with one side key arrangement and to be fixed counter sunk machine screws. Handles, tower bolts etc. to be fixed with necessary nickle plated self tapping hardened steel screws.

5.4.3 All aluminium works shall be deemed to include in various items complete works including making arrangements for all fittings, fixtures etc. as directed and approved by the Engineer - in - Charge.

5.4.4 All doors, glazings etc. shall be made completely leak proof against water and air and for which no extra payment shall be made.

5.4.5 Frames shall be square and flat, the corners of the frames being fabricated to be true right angle. Joints can be preferably mitred. all members shall be accurately machine mitered and fitted to form hairline joints.

5.4.6 All aluminium works should provide for replacing damaged / broken glass pane without having to remove or damage any member of interior finishing materials.

5.5 ANODIZING

5.5.1 All aluminium sections shall be anodized as per IS 7085. anodizing to conform to IS 1868 and shall be AC 15 grade with minimum thickness of 15 microns when measured as per IS 6012.

5.5.2 The CONTRACTOR should satisfy himself by 100% checking in the factory that the thickness of the anodic coating is found to be minimum 15 microns. Testing shall be done for thickness at CONTRACTOR's cost. If any material is found sub-standard this shall be rejected by the ENGINEER - IN - CHARGE.

5.5.3 The anodized aluminium works shall conform to relevant IS codes relating to materials, workmanship, fabrication, finishing, erection, installation etc. In this connection relevant IS Codes including Nos. 1868, IS 733, IS 1948, IS 7085, IS 6012, 1285, IS 740 are considered applicable by the ENGINEER - IN - CHARGE and shall be followed.

5.5.4 Protective paper tape shall be applied on the anodized sections before they are brought on site. Then protective paper tape shall be removed after installation is complete.

5.6 GLAZING

5.6.1 All glass panes shall be retained within aluminium framing by use of exterior grade PVC / neoprene / EPDM gaskets. No water leakage shall occur on the interior even if water penetrates exterior neoprene gaskets. Glass edges shall be clean cut into exact size. Glass with chipped or damaged edge shall be rejected.

5.6.2 For doors, glass of 5.5 mm thickness conforming to classification 'A' quality or selected quality of IS 2835, shall be used.

5.7 FIXING

The screws used for fixing aluminium member shall be of nickle plated hardened steel (Nettle fold or equivalent) threads of machine screws used shall conform to requirement of IS 4218.

5.8 PROTECTION AND CLEANING

After the work is completed Aluminium works including glass panes shall be washed with a suitable thinner and water to remove all marks and blemishes etc. in order to give a uniform clear appearance.

6 ROOFING – As per NIT.

7.0 KOTA STONE WATER PROOFING TREATMENT

7.1 On Base Surface

a) Operation I : A layer of cement slurry mixed with approved specialized Acrylic Chemical shall be done on RCC slab after proper cleaning.

b) Operation II : A layer of 25mm thick acrylic based cement mortar in 1:3 (1 cement : 3 coarse sand) with approved Acrylic Chemical shall be done & finished smooth with stone chips 10mm and down are embedded in the mortar.

c) Operation III: A layer of rough Kota stone 20mm thick with 15mm joints sealed with neat cement slurry mixed with acrylic chemical shall be laid over the cement mortar layer.

d) Operation IV: The joints between the stone slabs are raked and cleaned. Acrylic chemical and cement grout is filled in the joints.

e) Operation V: A layer of 25mm thick cement mortar 1:3 (1 cement : 3 coarse sand) mixed with acrylic chemical shall be applied and finished smooth. Stone chips 10mm down size are embedded in the mortar.

7.2 On walls (Vertical)

a) Operation I: 20mm thick Kota stone slab fixed with cement paste on wall with a gap of about 15 to 20mm gap grouted between the stone and wall with neat cement slurry mixed with Acrylic Chemical.

b) Operation-II : A layer of 20mm thick cement plaster 1:4 (1 cement : 4 coarse sand) mixed with Acrylic Chemical on external face of rough stone shall be done and finished smooth.

8. MAITENANCE

The CONTRACTOR shall maintain in good condition all work executed till the completion of entire work allotted to the CONTRACTOR.

9. TAXES

Royalty, octroi / terminal taxes, sales tax, excise duty, turn over tax, works contract tax etc. at prevalent rates shall have to be paid and borne by the CONTRACTOR on all the boulder, metal, shingle, stone, sand earth, bajri and all other material etc. collected by him for the execution of the work to the revenue authorities of states government etc. and on work / sub works executed.

10. SAFETY

The CONTRACTOR must take all safety measures and precautions to avoid accidents by exhibiting day and night necessary caution boards, speed limit boards, red flags and red lights and by providing attended barriers, railings etc. The COTNRACTOR shall be responsible for all damages and accidents caused due to negligence of his part of his labour or his SUB-CONTRACTOR. No hindrance shall be caused to traffic during execution of work.

11. CLEANING SITE

CONTRACTOR shall clean the site thoroughly of all rubbish etc. left out waste debris and his materials periodically, dress the site to be free from filth, mosquitoes, flies and unhygienic conditions like stagnant water.

12. STORAGE

The CONTRACTOR shall consult the ARCHITECT/ EXECUTIVE ENGINEER regarding place for storage stacking of material required for the work. He should not stack any material in any other than those approved by the ARCHITECT / ENGINEER - IN - CHARGE.

13. DAMAGES

Any damage done by the CONTRACTOR to the building work etc. or ground surface, drains, sewerage, existing available drainage system, pipe line etc. will be made good by the CONTRACTOR at his own cost. No compensation shall be paid to the contractor for any damage caused by rain, wind, storm or floods to the work or the material collected for the execution of the work. He will make good all such damages at his cost and no claim on this account will be entertained.

The CONTRACTOR will indemnify the OWNER against all structural damages caused by his negligence, non-conforming use of partially completed structures, non compliance of specification, like removing the shuttering prior to due date or use of faulty material or work. Under such circumstances the CONTRACTOR under written order of ARCHITECT / Engineer-in-charge shall rectify and break all the damaged work at his own cost and rectify the same for which no extra payment will be made. The ARCHITECT/ EXECUTIVE ENGINEER may deduct reasonable amount from the interim bill or final bill or security deposit or any amount due to the CONTRACTOR till it is rectified or get rectified after 7 days notice through other agency and recover the cost there of from the bills of the CONTRACTOR.

14. FACILITIES

The CONTRACTOR will give all facilities at his own cost to the ARCHITECT/ EXECUTIVE ENGINEER and OWNER, their engineers and representative for proper execution of the contract including access to the site works, inspection of all materials and works measurements of quantities etc. and shall work to their entire satisfaction and shall provide, sign board, proper site office with necessary lighting, toilets, furniture (table & chair & drawings racks etc.) at site of work at his own cost.

15. INSTRUCTIONS OF ARCHITECT

All verbal instructions given by the ARCHITECT will be considered as acted upon but the contractor should confirm the same in writing within 7 days from the date of such instruction falling which architect/ executive engineer may not account for items of work arising out of such instructions in the approved bills of the work.

16 INCOME TAX/ WORKS CONTRACT TAX

The Income Tax / W.C.T. as applicable shall be deducted by the OWNER as per Govt. notification / regulation from the bills of payments to the Government.

17 Occupancy

The OWNER shall have the right to occupy the works in parts as and when such parts are completed and declared fit for occupation by the ARCHITECT/ EXECUTIVE ENGINEER. Occupation certificate for the work shall be given by the ARCHITECT/ EXECUTIVE ENGINEER as per conditions for contracts before such occupation.

18. QUOTED RATES/ UNITS

Units of rates as shown in the Schedule of Quantities should be carefully scrutinized and once given by the CONTRACTOR shall remain unchanged and no excuse on this account will be entertained, after the tenders are opened.

19. SITE ORDER BOOK

A site order book will be kept at the site for the work in which instruction shall be recorded by Owner / Architect / Engineer – In- Charge and their representatives. The CONTRACTOR or his authorised agent shall sign the site order book to acknowledge the instruction in all event and their compliance.

20. Specifications Applicable

The CONTRACTORS are expected to have read the relevant specification and I.S. code which will be applicable to the work and with upto date correction slips & the conditions which are mentioned in these contract documents.

21. Samples

Samples of items of work to be executed should be prepared and got approved from the ARCHITECT before execution of such items of work is taken up. If the materials of approved make are not used, the items of work of such materials shall be out rightly rejected and not paid for at all. Sample of each finishing items and others as desired shall also be prepared for approval of the architect before the execution and no extra cost shall be paid towards preparation of sample.

22. WATER & POWER DISTRIBUTION

The CONTRACTOR, shall have to make their own arrangement for pumping and distribution of water and electricity. The CONTRACTOR will make adequate provision by spreading G.I. pipe lines and cables at site for ensuring proper curing etc. as directed by the ARCHITECT/ EXECUTIVE ENGINEER at no extra cost payable to CONTRACTOR.

23. EXTRA WORKS

Any extra item beyond the tender item shall not be executed without the written approval of the ARCHITECT/ EXECUTIVE ENGINEER. (In spite of its being mentioned in the drawings/ verbal instructions)

24 SITE VISIT

The TENDERERS are advised to see the site of the work and they will be deemed to have familiarised themselves with the scope of work, local conditions, drawings, specification conditions of contract, etc before submitting their tenders.

25 DEPUTING REPRESENTATIVE

On acceptance of the tender, the name of the accredited representative of the CONTRACTOR, who would be responsible for taking instruction from the ARCHITECT/ OWNER should be communicated in writing to the OWNER.

26 THE DEVIATION LIMITS :

The quantities of any items hence forth mentioned in schedule of quantities are liable to vary (increase of decrease) upto any extent and can even be deleted or substituted as per scope of work or as per ARCHITECT/ EXECUTIVE ENGINEER'S instructions. The CONTRACTOR shall not have any claim whatsoever on these varied quantities. This condition shall supersede all other clauses regarding the deviation limit.

27. Reinforcement cutting & Bending Schedule

The CONTRACTOR will have to prepare bar bending schedule of reinforcement in triplicate and the same forwarded to Engineer-in-charge and architect for approval. Reinforcement will have to be placed strictly in accordance with approved schedule only.

28 REQUEST FOR DRAWINGS

The drawing will be supplied by the ARCHITECT to the CONTRACTOR. At any stage he will have no excuse to delay the work on this account & would ask well in advance within 15 days, in writing to architect with copy to OWNER.

29 WORKING LATE HOURS

No work shall be done at night (6PM to 8AM) and on National Holiday without the instructions in writing of the ARCHITECT/ Engineer-in-charge.

30. MIXING OF CEMENT CONCRETE OR CEMENT MORTARS

The mixing of cement concrete, cement mortars shall be done in mechanical mixer operated by diesel or by power, Mixer and vibrators would be kept at site all the time.

31. Tests

All mandatory tests shall be carried out as per Punjab PWD specifications The Contractor shall establish a laboratory at site. He shall have all sievers weighting balance measuring glass cylinders etc. Whenever desired by Owners Architect/ executive engineer he shall get the tests conducted in PWD / Sri Ram Test Laboratory. No charges shall be paid to the contractor for carrying the samples & testing the samples from the laboratory.

32 Final Bill

Final bill as based on joint measurements of the work executed and duly accepted by the CONTRACTOR shall be submitted by him within 90 days of the completion of work. The final bill shall then be verified and checked by the ENGINEER IN CHARGE and returned to the OWNER for payment. Should the CONTRACTOR fail to take appropriate action as above, within the period prescribed, the ENGINEER-IN-CHARGE shall take the measurements jointly with the Executive Engineer's representative and prepare final bill which will be final and binding on the CONTRACTOR and the CONTRACTOR shall have no right to dispute the same.

33 CLAIM FOR INTEREST

No claim for interest will be entertained by the OWNER with respect to any earnest money, Security Deposit or balance payments etc. owing to a dispute between owner and the CONTRACTOR or with respect to any delay on the part of the OWNER in making interim of final payment or otherwise.

34 SITE -ENGINEER

The contractor shall appoint full time experienced Graduate Engineers at site, who will be responsible for quality and measurement of the work. In case contractor does not appoint such Engineer Rs. 15,000/- p.m. per person shall be deducted from his bill for the period he has not employed.

35. REJECTION OF BAD WORK

The Architect/ executive engineer shall have full power to accept or reject any work due to bad quality, poor workmanship or poor quality of materials used. No payment will be made for the rejected work.

36. MEETINGS

Pre-fixed weekly meeting will be held which should be attended by the contractor or his authorised representative. In case no desired results are achieved ARCHITECT/ OWNER will be terminate the contract.

37. OWNER SUPPLIED MATERIALS

The Steel to be used at site shall be provided by the OWNER. The contractor shall give in writing the requirement of steel in detail of size in diameter & quantity required for each diameter no less than 15 days before the requirement at site. The contractor shall not give any requirement of less than 50 metric tons at any given time. The contractor shall not get any extension in the completion time on account of delay in supply of steel.

38. Safe Storage

38.1 The contractor shall make all arrangements for storage and safe custody of materials issued by owner or arranged by himself. The contactor shall construct suitable godown at the site of work for storing materials safe against damage due to sun, rain, dampness, fire, theft etc. He should also employ necessary watch & ward establishment for purpose.

38.2 Cement bags shall be stored in separate godown with weather proof roofs and walls. Each godown shall be provided with single door with two locks. The key of one lock shall remain with ENGINEER-IN-CHARGE and that of other lock with the authorized agent of the CONTRACTOR at the site of work so that the cement is removed from the godown according the daily requirement with the knowledge of both the parties. The cement bags shall be stacked on proper floors consisting of two layers of dry bricks laid on well consolidated earth at a level at least one foot above ground level. These stacks shall be in rows of 2 and 10 high with a minimum of 2 feet space clear all around.

38.3 All materials shall be used by the CONTRATOR from his own stocks.

38.4 All material supplied by the OWNER to the CONTRACTOR shall remain the absolute property of the OWNER and shall not be removed by the CONTRACTOR from the site of the work on any account. The CONTRACTOR shall not be entitled to sell, mortgage, loan or dispose off the material in any other way except to use the same in the construction of works. Any material remaining unused and in perfectly good condition at the time of the completion of the contract shall have to be returned to the OWNER in good condition.

39.0 VIOLATION OF CONDITIONS

In case the CONTRACTOR breaks any of the above stipulated conditions, he shall, in addition to throw away himself open to action for contravention of the terms of the Contract and criminal breach of trust he will be liable to pay to the OWNER the cost of such materials at double the market rate.

40 STORAGE OF CEMENT & STEEL

a) Cement shall be arranged by the Contractor himself.

b) **Safe Storage**

i) The CONTRACTOR shall at his own cost, make all arrangements for storage and safe custody of material. The CONTRACTOR shall construct suitable godown at the site of work for storing material safe against damage due to sun, rain, dampness, fire theft etc. He should also employ necessary watch and ward establishment for purpose.

ii) Cement bags shall be stored in separate godown with weather proof roofs and walls. Each godown shall be provided with single door with two locks. The key of one lock shall remain with Engineer-in-charge and that the cement is removed from the godown according to the daily requirement with the knowledge of both the parties. The cement bags shall be stacked on proper floors consisting of two layers of dry bricks laid on well consolidated earth at a level at least one foot above ground level. These stacks shall be in rows of 2 and 10 high with a minimum of 2 feet space clear all around.

iii) The day to day receipt and issue accounts of cement shall be maintained by the Engineer-in-charge and signed daily by the Contractor or his authorized agent. The proforma is given below :-

1. Date of receipt
2. particulars of receipt quantity received
3. progressive total
4. Date of issue
5. Quantity issued
6. Item of work for which issued
7. Quantity returned at the end of day
8. Total issue
9. Progressive total of issues
10. Daily balance in hand
11. Contractor's initial
12. Engineer-in-charge's initial
13. Apart from the above receipt and issue bills to the site shall also be kept by the contractor & duly signed by the Engineer in Charge & maybe scrutinized by the owner at any time.

iv) No material shall be removed by the contractor from the site of the work on any account without the knowledge of engineer - in - charge. The contractor shall not be entitled to sell mortgage, loan or dispose off the material in any other way except to use the same in the construction of works. Any material remaining unused at the time of the completion of the contract shall be removed by contractor with the knowledge of Engineer - in - charge.

Dated : Signature of tenderer

SARAI AT SARAGHARI, AMRITSAR

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A) H.T. SWITCHGEAR PANEL (VACUUM CIRCUIT BREAKER):

1.0 GENERAL:

This specification covers the assembly, factory test, supply, installation, testing and commissioning at site of 11 KV VCB, indoor switchgear, complete in all respects with all equipment fittings and accessories for efficient and trouble-free operation as specified here in under.

The switchboard shall be suitable for the following system:

Rated Voltage	:	3 Phase, 11 KV Earthed System
Maximum System Voltage	:	13 KV
Rated Frequency	:	50 Hz
Ambient Temperature	:	$45^{O}C$

2.0 STANDARD & CODES:

Unless otherwise stated, HT switchboard shall conform to the following relevant Indian standards and Indian Electricity Rules and Regulations.

i)	IS-2516	:	Vacuum Circuit Breakers
ii)	IS-3427	:	Metal enclosed switchgear and control gear for voltage above 1000V but not exceeding 11000V A.C.
iii)	IS-2705	:	Current Transformer
iv)	IS-3156	:	Potential Transformer
v)	IS-1248	:	Electrical Direct acting indicating instruments
vi)	IS-722	:	A.C. electricity Meter of Induction type
vii)	IS-3231	:	Electrical Relays

3.0 EQUIPMENT TO BE FURNISHED:

3.1.a) Equipment to be Furnished (Three Panel Boards):

One complete 11 KV metal clad, cubicle type 3 panel boards, indoor switchgear consisting of the following circuits:

- One (1) no. 11 KV, 630A VCB, 350MVA, Drawout type incomer with CTs.
- Two (2) nos. 11 KV, 630A VCB, 350MVA, Drawout type as outgoings.

3.2 Controls and interlocks as required for the safe operation of the switchgear.

3.3 All supporting structures and installation materials including steel foundation frame, anchor bolts, holding down bolts, etc.

3.4 Tenderer shall be required to supply all his distribution equipment for the control power supply as required.

3.5 Special tools and tackle required for erection, operation and maintenance of equipment.

3.6 Drawings, technical details, installation and maintenance manual for the switchgear and auxiliary equipment.

4.0 GENERAL DESIGN FEATURES:

4.1 The equipment shall be installed indoor in a hot, humid climate. All equipment, accessories and wiring shall be provided with tropical finish to prevent fungus growth. Space heaters shall be provided so that humidity does not effect the components.

4.2 The maximum temperature rise in any part of the equipment at specified rating shall not exceed the permissible limits as stipulated in relevant standards.

The rated peak short circuit current or the rated short time current carried by the equipment shall not cause:

a) Mechanical damage to any part of the switchgear.

b) Separation of contacts

c) Insulation damage of "Current Carrying Part"

4.3 All controls shall be suitable for 110V A/C.

5.0 CONSTRUCTION FEATURES:

5.1 General

The switchgear shall be indoor, metal-clad (cubicle type), floor mounted, draw-out truck type design. Each panel shall comprise essentially of two portions.

a) The fixed portion housing bus bars, current transformers, voltage transformers, relays and instruments, cable pot heads and other accessories.

b) The moving portion comprising of circuit breaker.

The switchgear shall have structural steel framework, enclosed on all sides and top by CRCA sheet of minimum 2mm thickness.

The moving portion of the switchgear shall consist of circuit breaker mounted on a carriage. The operating mechanism of the circuit breaker shall be located at the front of the carriage.

The moving carriage shall be complete with self-aligning primary and secondary disconnecting devices.

The moving carriage shall have three positions -

a) Service

b) Test

c) Isolated

The switchgear shall be required to operate in the following manner.

a) In "service" position all the power contacts and control contacts shall be maintained and the circuit breaker can be closed and tripped in the normal way.

b) In "test" position, the power contacts shall be disconnected and control contacts shall be maintained. In this position, the circuit breaker can only be closed and tripped from local panel only.

c) In "isolated" position, both the power and control contacts shall be disconnected and the carriage shall be ready for removal.

The switchgear shall be designed in such a way that power contacts of the fixed portion shall be covered by a shutter when the moving carriage is withdrawn from the switchgear.

Each switchgear assembly consisting of all the units shall be mounted and bolted to a common channel. The channel in turn shall be bolted to the foundation at site. All equipment foundation, anchor bolts, etc. shall be furnished.

The standard phase arrangement when facing the switchgear shall be R-Y-B from left to right, from top to bottom and front to back. All relays, instruments, other devices, buses and equipment involving three phase circuit shall be arranged and connected in accordance with the standard phase arrangement.

5.2 Bus Bars:

The switchgear buses shall be rated for continuous current of magnitude as specified. Maximum temperature rise of bus and connection shall be limited to 40 ^{O}C over an ambient of 45 ^{O}C.

The bus bars, of the switchgear section shall be of aluminium liberally sized with high safety factor for required current rating and shall be of the same cross-section.

The busbars, connection and their insulated supports shall be mechanically strong, and shall withstand all the stresses which shall be imposed upon them in ordinary working due to fixing, vibration, fluctuation in temperature, short-circuit or other causes.

The bus bars shall have the marking, colour coding and arrangement according to the relevant IS and shall run in a separate bus bar chamber. The bus bars and joints shall be fully insulated and so enclosed as not to leave any exposed live parts.

Provision shall be made for expansion and contraction of the busbars and connections with variation of temperature.

5.3 Circuit Breakers

The circuit breakers shall be vertically and horizontally draw out type VCB mounted on the moving carriage. The circuit breaker shall be of modular design. The rating of the circuit breaker shall be as specified.

a) Normal Service Conditions:
Ambient temperature : 45 degree Celsius

b) System:

- System Voltage : 11 KV, Effectively earthed system
- Highest system voltage : 13 KV
- Frequency : 50 HZ

c) Main circuit terminal : Circuit breaker should be provided with 3 main terminals and 3 load side terminals.

d) Closing mechanism & Antipumping device : Motor operated closing mechanism and Mechanical and electrical antipumping device shall be provided. Motor operating mechanism shall be complete with universal motor, opening spring, closing spring, and all necessary accessories. Spring charged/ discharged indicator shall be provided. The Mechanism shall work on 220 V AC.

e) Coil voltage for shunt trip and release coil : 110V A/C

f) The symmetrical breaking capacity in MVA shall remain constant for 11 KV breaker.

g) Breakers shall be capable of making, carrying and breaking starting and full load currents.

h) Breakers shall be suitable for local electrical operation. Mechanical interlocks shall be provided to prevent:

- A closed circuit breaker from being moved from service position to test position/isolated position.

- Closing and opening of the circuit breaker in an intermediate position between "Service Test".

- Circuit breaker can be racked in to service position only with the front door closed.

i) Breakers shall be complete with the following accessories.

- Mechanical operating device for manual closing and tripping of the breaker.

Device for manual charging of the closing spring.

At least three (3) NO and three (3) NC mechanically operated auxiliary contacts of sufficient rating (in addition to those required for breaker operation) shall be wired out to terminal block for external connection. In the case of 11 KV breaker in addition to the circuit breaker auxiliary contacts provided on breaker trolley for circuit breaker operation, a mechanically operated switch shall be provided on a stationary part of switchgear. This switch shall be positively operated by the breaker mechanism when the breaker is in "service" position but not when the breaker is isolated. The switch shall be provided with at least six(6) normally open and at least six (6) normally closed adequately rated auxiliary contacts for each circuit breaker for inter locking.

In case a switch with six (6) NC contacts cannot be offered as required then a switch with six (6) normally closed and two (2) normally open contacts may be offered along with an auxiliary relay having four (4) normally open and two (2) normally closed contacts (out of which any four contacts shall be wired out), shall be provided on each feeder cubicle.

Each circuit breaker, disconnector and bus VT cubicle shall have necessary limit switches for service and test positions, which shall provide the required contacts for breaker operation and interlocking, position indication and disconnection of remote control circuits.

j) Each breaker shall have the following protections :-

a) Short circuit and overload protection:-
Short circuit and overload protection shall be provided through inverse definite minimum time (IDMT) type of relay. This relay shall be provided with shunt reinforcement alongwith the hand reset flag. Relay rated time shall be less than 1.3 seconds. This relay shall be having the non-directional feature. The relay shall be induction disc type with adjustable time current characteristics. Relay shall be of high torque and shall ensure high contact pressure even at currents near pickup values. The relay shall be of three (3) element type. Two elements for overload protection and one element for earth fault protection. Current setting range of the relay shall be 50-200%.

Earth fault protection shall be provided through an earth fault relay. The relay shall be of heavily damped induction disc type with an adjustable inverse time voltage characteristic. The relay shall have a setting range of 20-80%.

b) Master Trip Relay:-
The relay shall be fast acting multi contact, attracted armature with high mechanical stability. It shall be suitable for tripping duties requiring simultaneous switching operation. The relay shall be suitable on 24 V DC. The operating time shall not exceed more than ten (10) milli second. The number of hand reset contact NO/NC shall be as per final approved scheme plus 25% spare. The contact used for tripping circuit breakers shall be blow out type.

Each breaker shall be power operated by stored energy, charged spring mechanism for both closing and opening operations. Accidental failure of any spring shall not trip or close a breaker. Spring shall be charged full at all times.

Breaker shall close, upon closing a contact in its closing circuit momentarily. A second closing impulse shall have no effect on the closing mechanism.

Red lights, indicating 'Breaker-closed' shall be wired to supervise shunt trip circuit. Green lamps mounted on remote panels indicating 'Breaker-open' shall be wired to light up only when remote/local switch is on 'Remote' position.

All protective relays shall be provided with flag indicators, and all relays directly tripping the breakers shall be provided with hand reset contacts in addition to the flag indicator.

6.0 INSTRUMENT TRANSFORMER:

6.1 Current Transformer

The current transformers shall be of epoxy encapsulated/cast resin type, mounted on stationary portion of the switchgear and shall be easily accessible for maintenance and testing purpose.

The current transformers shall be capable of withstanding the short circuit stresses corresponding to a fault level of the system.

The ratio and ratings of the current transformers shall be suitable to meet the requirements of metering and protection of the corresponding feeder.

The current transformers shall conform to the latest edition of IS. Unless specified otherwise, insulation, temperature rise and all other phases of manufacture and testing shall conform to that given in the standards. A type test certificate of a CT of similar design for temperature rise test shall be furnished along with the offer.

Facilities for shorting and grounding the terminals shall be provided at the terminal block.

6.2 Potential Transformers

The potential transformers shall be epoxy encapsulated /cast resin design and Star type on L.T. side.

A manually operated disconnecting device shall be mounted on the primary side of potential transformer. This device shall be designed to operate externally without access into the line portion of the switchgear.

The connections from main circuit to potential transformers shall be capable of withstanding short circuit stresses of the system.

The high voltage winding of the potential transformer shall be protected by current limiting fuses. Low voltage fuses, sized to prevent harmful overload, shall be installed.

The manufacture, testing, insulating and temperature rise of the potential transformer shall conform to the latest revision of the relevant IS.

The 110V bus in the switchboard shall be sectionalized.

7.0 INSTRUMENTS & METERS:

The instruments shall be the flush type preferably with the square face of 144mm as specified. They shall be fully tropicalised, dust tight and shall conform to the relevant standards.

Marking of the scale shall be black on white background and shall be suitable for direct reading.

Zero adjustment shall be provided for the operation from the front of the cases.

The instruments shall be capable of indicating accurately when operating continuously under the ambient condition specified.

The scale range of the AC ammeter shall generally be equal to 1.5 times the rated primary current of the C.T. feeding them. The scale range of the voltmeter shall be about 15% in excess of the normal circuit voltage.

Ammeter for transformer circuits shall be marked with a red mark to indicate the full load current of the transformer.

8.0 AUXILIARY AND CONTROL POWER SUPPLY:

8.1 AC Power Supply for Space Heater and Cubicle Illumination Lamps:

Each carriage control panel including the breaker operating mechanism shall be provided with thermostatically controlled space heater. The thermostat shall have adjustable range. The space heaters shall be rated for 230 volts, 1 phase, 50 Hz. For cubicle illumination, receptacle arrangement at suitable location of each control panel shall be provided so that hand lamp connection may be taken from this receptacle during inspection and maintenance.

Wiring for space heaters shall be suitably grouped so as to form a more or less balanced conditions on 230 V, 1 phase, 50 Hz supply. Suitable number of space heaters alongwith thermostat may be provided.

Each space heater and hand lamp circuit shall be provided with ON/OFF switch and suitable protection.

8.2 Control Supply:

The power for breaker control and indication shall be taken from 110V A/C supply.

In addition, each cubicle shall be provided with one double pole, single throw switch for its control circuit power supply.

8.3 Fuse:

All control and power fuses shall be link type "HRC" fuses. Plug fuses (screw-in type) shall not be accepted.

9.0 SECONDARY AND SMALL WIRING:

9.1 All wiring for the equipment and devices located on or within the switchgear shall be carried out. The wiring shall be complete in all respects so as to ensure proper functioning of control, indication, measurement, protection and interlocking scheme.

9.2 All the wiring shall be marked in accordance with the relevant standards. Numbered ferrules, reading from the terminals onward shall be provided at both ends of all the wiring for easy identification.

9.3 The internal wiring shall be of PVC insulated cable of 1100 grade of minimum size 2.5 sq.mm copper.

10.0 ALARM ANNUNCIATION SYSTEM:

The annunciator shall be provided on each panel to indicate the various circuit condition and shall be placed at suitable height. The various function shall be as follows:

Circuit breaker closed
Circuit breaker open
Trip circuit healthy
Alarm & Auto trip – fault
C/B in test

Hooter/Buzzer shall be provided with a manually operated switch so that it can be silenced.

It shall have built in test, reset and accept push button.

11.0 CABLE TERMINATION:

11.1 Power Cable

Cable pot heads for termination of 11 KV XLPE type insulated cables shall be furnished.

All power cable entry shall be from the top/bottom and the cable pot heads shall be self-supported, detachable type.

Where more than one cable pot heads are used per phase, the Contractor shall be required to arrange pot heads in such a way that detachment of any pot head is possible without disturbing the other units. The gap between termination & gland plate shall be min. 900mm.

11.2 Control Cable

All control cables shall enter the switchgear from top/bottom. Removable plates at the top/bottom of the panel shall be furnished with compression type cable glands to make entry dust-tight and no weight is transferred on the terminal. The glands shall be suitable for terminating cable armour.

All connections and accessories required to complete the whole installation shall be supplied by the Sub Contractor.

12.0 TERMINAL BLOCKS:

Terminal blocks shall be provided as specified and shall be clipon type. They shall be shrouded preferably by a transparent acrylic sheet. The terminal block of different voltage classes shall be segregated.

13.0 ACCESSORIES:

Following accessories shall be provided for each switchgear:

Channel base and foundation bolts
Lifting lugs
Maintenance closing handle for circuit breaker
Draw handle for circuit breaker
Hook stick, indoor use, 1.5 m long
Test plug for draw out type relay

14.0 NAMEPLATE:

Nameplates of approved design shall be furnished at the front of each compartment of the cubicles. Rating plates for each circuit breaker and at each instrument, relay and auxiliary switches as mounted on the face or inside the cubicle shall also be furnished.

Instruments and devices mounted on the cubicle door of the switchgear shall be identified on the rear also with the respective numbers on or adjacent to the instrument or device case.

15.0 GROUND BUS:

A ground bus of 50 mm x 6 mm Copper flat shall be furnished along with the full length of the panel. Each stationary unit shall be connected directly to this ground bus.

Grounding terminals at two end of the ground bus shall be provided for connection to station ground grid.

The frame of each draw-out carriage containing circuit breaker shall be grounded through heavy multiple finger contacts at all times except when the unit primary disconnecting devices are separated by a safe distance.

16.0 TESTS :

The switchgear unit shall be completely assembled, wired, adjusted and tested for operation under similar conditions to ensure accuracy of wiring, correctness of control schemes and proper functioning of all equipment.

16.1 Routine Test

Each of the following equipment shall be subjected to standard routine tests as per applicable clauses of relevant IS specifications:

Circuit breakers
Bus bar assembly
Instrument transformers
Auxiliary relays
Control switches and indication lamps

16.2 Design Test

Typical type test report of the tests mentioned below conducted on similar equipments in the past shall be furnished alongwith the tender.

Impulse test
One minute power frequency voltage withstand test
Temperature rise test
Short circuit test

16.3 Test Certificates

Test certificate shall be furnished in required number of copies.

The routine and type test certificates shall be furnished to the Engineer-in-charge for approval before despatch of the equipment from the works. The approval in writing shall be required to effect the despatch of the equipment.

The routine and type test certificates of the miscellaneous components shall also be furnished to the Engineer-in-charge for approval.

The report shall furnish complete identification of data including serial number of each equipment.

16.4 Performance Guarantee

The performance guarantee figures quoted on the schedule of technical data shall be guaranteed within the tolerances permitted by standard and will become a part of successful Tenderer's Contract.

17.0 DRAWINGS, DATA AND:

17.1 After award of contract, the successful Bidder shall submit the required number of copies of the following drawings for approval of the Engineer-in-charge :

Confirmed outline dimensional drawing of the various switchgears showing the general arrangement and indicating the following:

Space required in the front for breaker withdrawal.
Control cable entry points and termination arrangement.
Power cable entry points and termination arrangement.
Bus bar clearance phase to phase and phase to ground.
Configuration of bus bar.
Technical detail of supporting insulator and their spacing.
Location of instrument transformers.
Control panel details with equipment layout.
Terminal block details.

17.2 Single and three line diagram of all switchgears showing instrument transformers control switches, instruments and indication, etc.

17.3 Control schematic diagram of each breaker showing all safety and operation interlocks, annunciation, etc.

17.4 Transport/shipping dimensions with weights.

17.5 Foundation and anchor bolt details including dead load and impact load.

17.6 Cross-section with parts list.

17.7 Cubicle wiring diagram with terminal board disposition.

17.8 Any other relevant data, drawing and information necessary for review of items whether specifically mentioned or not, shall be furnished by the Contractor along with those information.

17.9 The responsibility of correctness of wiring diagram shall be with Contractor. The Engineer-in-charge will check the final schematic after submission. If any modification, addition or alteration is considered necessary to comply with the approved schematic drawing as stated herein above, the said modification, addition or alteration shall be carried out by the Contractor either in their works if it is before delivery, or at Site after delivery at no cost to the Owner.

17.10 Before starting manufacture of the equipment, the Contractor shall have to take approval of these design drawings from the Engineer-in-charge in writing. Any manufacturing done prior to approval of drawings shall be rectified in accordance with the approved drawing by the Contractor at his own cost and the equipment shall be supplied within the stipulated period.

APPENDIX A: TECHNICAL PARTICULARS OF THREE PANEL SWITCHGEAR EQUIPMENT

1.	Type	:	Indoor, cubicle type
2.	System rated voltage	:	11 KV
3.	System maximum voltage	:	13 KV
4.	Frequency	:	50 Hz
5.	**Insulation Level**		
	a) 1.2/50 microsecond Impulse withstand voltage	:	75 KV peak
	b) One minute power frequency withstand voltage	:	28 KV rms
6.	**Rated Current:**		
	a) Continuous		
	Incoming Vacuum circuit breaker	:	630 A
	Short time current for 3 seconds	:	18.26 KA
7.	**Vacuum Circuit Breaker:**		
	a) Quantity (Incoming feeder)	:	1 No.
	b) Quantity (Outgoing feeder)	:	2 Nos.
	d) Rated breaking capacity symmetrical	:	350 MVA
	e) Total breaking time	:	3 cycles (maximum)
	f) Operating sequence	:	
	g) Auxiliary voltage		
	- Control circuit	:	110V A/C
	- Space heater and illumination lamp, etc.	:	230 V, 1 Ph, 50 Hz
8.	**Potential Transformers**		
	a) Quantity	:	One on each bus
	b) Voltage ratio	:	11 KV/110V
	c) Over voltage factor	:	As per IS-3156
	d) Accuracy class	:	1.0
	e) Rated burden	:	100 VA

9. Current Transformer

Circuit Incoming	**Ratio**	**Accuracy Class**	**Burden**
For relay	250/125/5A	5P10	15 VA
For metering	150/5A	1.0	15 VA

B) OUTDOOR COMPACT SUB-STATION

1.0.0 SCOPE :

This specification covers the technical requirements of design, fabrication, testing at works, delivery at site, installation and successful commissioning of 11kV, 21kA 8-panel Switchboard complete with all accessories required for receipt, control and distribution of Power for efficient use and trouble free operation. For details on bill of material and bill of quantity .

1.2.0 STANDARDS :

The Package Sub-station offered shall in general comply with the latest issues including amendment of the following standards.

Title	Standards
High Voltage Low Voltage Pre-Fabricated Substation	IEC:61330
High Voltage Switches	IEC 60265
Metal Enclosed High Voltage Switchgear	IEC 60298
High Voltage Switchgear	IEC 60694
Low Voltage Switchgear and Control gear	IEC 60439
Power Transformers	IEC 60076

2.0.0 DESIGN CRITERIA

2.1.0 Package Sub-station consisting of **11KV Non-Extensible SF6 Ring Main Unit alongwith HT metering cabinet + Oil cooled transformer + Low Voltage Switchgear + Automatic Power factor correction panel** with all connection accessories, fitting & auxiliary equipment in an Enclosure to supply Low-voltage energy from high-voltage system as detailed in this specification. The complete unit shall be installed on a substation plinth (base) as **Outdoor substation** located at very congested places. 11KV Isolators connected in the ring control the incoming-outgoing feeder cables of the 11KV distribution system. The Vacuum Circuit Breaker shall be used to control and isolate the 11kV/433V Distribution transformer. The transformer Low Voltage side shall be connected to Low Voltage switchgear. The connection cables to consumer shall be taken out from the Low Voltage switchgear. APFC panel shall be utilized to control and maintain power factor to the required level.

2.2.0 The prefabricated-package substation shall be designed for a) Compactness, b) fast installation, c) maintenance free operation, d) safety for worker/operator & public.

2.3.0 The Switchgear and component thereof shall be capable of withstanding the mechanical and thermal stresses of short circuit listed in ratings and requirements clause without any damage or deterioration of the materials.

2.4.0 For continues operation at specified ratings temperature rise of the various switchgear components shall be limited to permissible values stipulated in the relevant standard and / or this specification.

2.5.0 Service Conditions:

The Package substation shall be suitable for continuous operation under the basic service conditions indicated below

Ambient Temperature:	40 Deg C
Relative Humidity	upto 95%
Altitude of Installation	upto 1000m

The Enclosure of High Voltage switchgear-control gear, Low Voltage switchgear-control gear & Transformer of the package substation shall be designed to be used under **normal outdoor service condition** as mentioned. The enclosure should take minimum space for the installation including the space required for approaching various doors & equipment inside.

3.0.0 SPECIFIC REQUIREMENT

3.1.0 The main components of a prefabricated- package substation are Transformer, High-voltage switchgear-control gear, Low-voltage switchgear-control gear and corresponding interconnections (cable, flexible , bus bars) & auxiliary equipment. The components shall be enclosed, by either common enclosure or by an assembly of enclosure. All the components shall comply with their relevant IEC standards.

3.1.1 **Ratings**:

Description	**Unit**	**Value**
Rated Voltage / Operating Voltage	kV rms	11
Rated frequency & Number of phases	Hz & nos.	50 & 3
Rated maximum power of substation	kVA	Upto 1250 kVA
Rated Ingress protection class of Enclosure	IP:	IP-23 for substation enclosure and IP:54 for LT Switchgear & HT Switchgear enclosure
Rated temp Class of Transformer Compartment		K10
HV Insulation Level		
Rated withstand voltage at power frequency of 50 Hz	kV rms	28
Rated Impulse withstand Voltage	kV peak	75
HV Network & Busbar		
Rated current	Amp	630A
Rated short time withstand current	kA rms / 1sec	21
Making capacity for switch-disconnector & earthing switches	kA peak	52.5kA
Breaking capacity of Isolators (rated full load)	A	630A

LV Network		433V, 50kA for incoming Air circuit breaker and 36kA for outgoing Moulded Case Circuit Breakers
APFC Panel	KVAr	a) 350kVAr for 1250kVA transformer b) 300kVAr for 1000kVA transformer c) 150kVAr for 500kVA transformer Refer detailed BOQ for all other details.

OUTDOOR ENCLOSURE

3.2.0 Outdoor enclosure:

3.2.1 The enclosure shall be made of Sheet Steel tropicalised to local whether conditions. The side walls, roof and doors shall be made of 1.5mm thick GI. The GI shall be protected further by Zinc Rich Primer (ZRP) for forming a base for weather proof paint. Polyurethane wet paint shall be used for the external paint.

3.2.2 Roof of the Compact substation shall be detachable in one piece and fixed to the corner elements by bolts. Roof shall be supported by one beam fitted with ventilation openings.

3.2.3 The walls of the CSS shall not use any bolting / welding. It shall be a modular construction with the self clinched GI modules.

3.2.4 The metal base shall ensure rigidity for easy transport & installation.

3.2.5 The protection degree of the Enclosure shall be **IP54 for LT & HT switchgear compartment & IP23 for Transformer compartment.** Proper / adequate ventilation aperture shall be provided for natural ventilation by way of Louvers etc. The air intake shall be from the doors while the exhaust shall be from the top of the roof.

3.2.6 The doors shall be provided with proper interlocking arrangement for safety of operator. All the doors shall be fitted with stainless steel hinges. The doors shall be fitted with stoppers.

3.2.7 The H.V. & L.V. outgoing of the transformer are to be connected to Vacuum Circuit Breaker of RMU & incomer of the Low Voltage Switchgear by means of Copper Cables / Flexible Busbars.

3.2.8 Internal Fault : Failure within the package substation due either to a defect, an exceptional service condition or mal-operation may initiate an internal arc. Such an event may lead to the risk of injury, if persons are present. It is desirable that the highest practicable degree of protection to persons shall be provided. The Design shall be tested as per IEC 61330.

3.2.9 Covers & Doors : Covers & doors are part of the enclosure. When they are closed, they shall provide the degree of protection specified for the enclosure. Ventilation openings shall be so arranged or shielded that same degree of protection as specified for enclosure is obtained. Additional wire mesh may be used with proper Danger board for safety of the operator. All covers, doors or roof shall be provided with locking facility or it shall not be possible to open or remove them before doors used for normal operation have been opened. The doors shall open outward at an angle of at least 90^0 & be equipped with a device able to maintain them in an open position.

3.2.10 Earthing : All metallic components shall be earthed to a common earthing point. It shall be terminated by an adequate terminal intended for connection to the earth system of the installation, by way of flexible jumpers/strips & Lug arrangement. The continuity of the earth system shall be ensured taking into account the thermal & mechanical stresses caused by the current it may have to carry. The components to be connected to the earth system shall include

a) The enclosure of Package substation,
b) The enclosure of High voltage switchgear & control gear from the terminal provided for the purpose,
c) The metal screen & the high voltage cable earth conductor,
d) The transformer tank or metal frame of transformer,
e) The frame &/or enclosure of low voltage switchgear,
All the internal earthing shall be done through 50x6mm GI.

3.2.11 There shall be an arrangement for internal lighting activated by associated switch for HV , Transformer & LV compartments separately.

3.2.12 Labels: Labels for warning, manufacturer's operating instructions etc. shall be durable & clearly legible.

3.2.13 Cleaning & Painting :

The paints shall be carefully selected to withstand tropical heat and rain. The paint shall not scale off or crinkle or be removed by abrasion due to normal handling.

<u>11KV Non-Ext SF6 RMU with Vacuum Circuit Breaker</u>

3.3.0 11KV Non-Ext SF6 RMU with VCB: The requirement of 11kV Ring Main Unit is as under.

3.3.1 SF6 Gas filled Non-extensible Ring Main Units with Vacuum Circuit Breaker comprising of 3 panels as indicated below:

3.3.2 Panel No.1 & 2 : **Motorised** Isolator panel with one number SF6 insulated load breaking fault making isolator switch with one cable box accessible from the front.

3.3.3 Panel No.3 – Motorised Vacuum Circuit Breaker complete with operating mechanism, protection system and One Number of cable box accessible from the front.

3.3.4 The above Isolators , breaker , Busbars should be mounted inside a robotically welded sealed for life , stainless steel tank of 3 mm thick sheet metal. The tank should be filled with SF6 gas at adequate pressure. The degree of protection for gas tank should be IP67.

3.3.5 The Vacuum Circuit Breaker is required to control 11 kV/433 volts distribution Transformer of rating upto 1250kVA and relay settings shall be selected accordingly.

3.3.6 General Finish: Totally enclosed, metal clad, vermin and dust proof suitable for tropical climate use as detailed in the specification.

3.3.7 Ratings: The busbars shall have continuous rating of 630 Amps. The isolator shall have a continuous rating of 630 Amps; Vacuum Circuit Breaker shall have a continuous rating of 630 Amps. in accordance with relevant IEC standard

3.3.8 Breaking & Making Capacity: The isolators shall be capable for breaking rated full load current. Vacuum Circuit Breaker shall be capable of having rupturing capacity of 21kA symmetrical at 11KV.

3.3.9 Busbar: Switchgear shall be complete with all connection, bus-bars etc. Copper busbars continuous rating shall be 630 Amps. The busbars should be fully encapsulated by SF6 gas inside the steel tank.

3.3.10 Remote Operation: Remote operation of the RMU's Isolators & VCB shall be possible using Motors fitted to the operating mechanism. Auxiliary switche 1NO+1NC shall be provided with all the three functions for status indication at remote substation. Shunt trip rated for 24Vdc shall be provided for the remote tripping of the breaker.

3.4.0 Isolator :

The Isolators offered shall conform to IEC60129. The isolator shall be triple pole, spring assisted, **motorised** type with quick make-break contacts. The isolator shall have three positions 'ON',

‘OFF’ and ‘EARTH’ which shall be clearly marked on the front mimic with suitable arrangement to padlock in any position. A safety arrangement for locking shall be provided by which the isolator operation shall be prevented from ‘ON’ position to ‘EARTH’ position or vice versa in a single operation.

3.6.1 Switchgear:

3.6.1.1 The SF6 RMU shall be Sealed for life, the enclosure shall meet the “sealed pressure system” criteria in accordance with IEC: 298 (a system for which no handling of gas is required through out service life of approximate 25 years.) There shall be no requirement to ‘top up’ the SF6 gas. In addition, manufacturer shall confirm that maximum leakage rate is lower than 0.1% per year. It shall provide full insulation, making the switchgear insensitive to the environment. Thus assembled, the active parts of the switchgear unit shall be maintenance free.

3.6.1.2 The switchgear & switchboard shall be designed so that the position of different devices is visible to the operator on the front of the switchboard & operations are visible as well. The switchboard shall be designed so as to prevent access to all live parts during operation without the use of tools.

3.6.1.3 RMU should be tested for internal arc fault test.

3.6.2 Vacuum Circuit Breaker:

3.6.2.1 The Unit shall consist 630A Tee-off stored spring mechanism , three pole Vacuum circuit breaker, with integral fault making / dead breaking earth switch. The function shall be naturally interlocked to prevent the main & earth switch from being switched ‘ON’ at the same time & the VCB not allowed to trip in ‘Earth On’ position. The selection of the main/earth switch lever on the panel, which is allowed to move only if the main or earth switches in the off position. The lever shall be able to pad locked in either the main or earth position.

3.6.2.2 The motorised operation of the circuit breaker shall not have an effect on the trip spring. This should only be discharged under a fault (electrical) trip condition, the following manual reset operation should recharge the trip spring & reset the CB mechanism in ‘main off’ position.

3.6.3 Protection : **Protection Relays**: The CB shall be fitted with Self powered microprocessor based numerical self powered relay. The relay should be 3Over Current elements and one Earth Fault element with a provision of high set tripping, self powered type, fed by protection CTs mounted in the cable box.

Required protection features of relay

- ☐ RS 485 Communication Port for remote SCADA.
- ☐ Programmable (Non Volatile) setting by local keyboard as well as remote setting by communication port
- ☐ LCD Display for settings / parameters.
- ☐ Display of Fault current as well as Load current on the LCD screen.
- ☐ Selectable Inverse Time Characteristics viz. Normal Inverse, Very Inverse, Extremely Inverse, Long Time Inverse and Define time
- ☐ Separate curve setting for phase and earth fault.
- ☐ Internal Battery for maintaining LCD display and communication during fault condition. Battery shall be rechargeable and remain charged on input current.
- ☐ Latching of Fault Current and storing in a non-volatile memory with time stamping.
- ☐ External status input for Fast trip , Trip block , Remote trip.
- ☐ External latching type potential free contact for remote trip indication.

Protection Settings required as below:

For phase O/C: 20% to 200% in steps of 1%
For Earth fault: 10% to 80% in steps of 1%
For phase instantaneous: 100% to 3000% in steps of 100%

For earth fault instantaneous: 100% to 1200% in steps of 100%

3.7.0 Cable Box:

3.7.1 Every isolator shall be provided with suitable and identical cable boxes in front for connecting 3 core, 11kV cable from vertically below. The cable boxes shall be so located at convenient height to facilitate easy cable jointing work. The height available for cable termination should be minimum **500 mm The Cable termination shall be done by Heat shrinkable Termination method** so adequate clearances shall be maintained between phases for Termination. The cable box covers shall be arc proof and interlocked with the earth switch in such a way that the cable covers can be opened only when the switch is in "Earth" position.

3.7.2 Locking Arrangement : Suitable padlocking arrangements shall be provided as stated below.

a) CB manual operating handle in the "OFF" position.
b) Each feeder Panel operating handle in 'Closed' 'Open" or 'Earth' position.
c) Each isolator operating handle in 'Closed', ' Open', or 'Earth' position.

3.7.3 **Metering CTs**: Ring type Metering CTs appropriate to transformer rating shall be provided on the cable inside the cable box. The secondary terminals shall be wired upto the digital MFM in the HT metering cabinet.

3.8.0 Ratings :

		Non-Extensible ring main unit with VCB
3.8.1	**Switchgear Data**	
A	Service	Indoor inside enclosure
B	Type	Metal clad
C	Number of phases	3
D	Voltage	11000V
E	Rated Frequency	50 Hz
F	Rated Current	630 Amp
G	Short Circuit rating	
H	i) Breaking	21 kA rms for Breaker / 0.630kA for isolator
I	ii) Short time withstand for 3 Sec.	21 KArms
J	iii) Rated S/c making	52.5 kA peak
K	Short duration pwer freq.	28 kV
L	Insulation Level	75 KV peak
M	System earthing	Solidly earthed at substation
3.8.2	*Breaker*	
a)	Type	VCB in SF6 tank
b)	Rated voltage	11kV
c)	Breaking current	
	i) Load breaking	21 KArms.
d)	Making current	52.5 KA peak
e)	Rated current	630 Amps.
f)	No. of poles	3
g)	Operating mechanism.	Trip free & free handle type with mechanically operated indication & pad locking.
3.8.3	**Isolators**	
a)	Type	load breaking and fault making in SF6 tank
b)	Rated current	630 Amps.

d)	Rated breaking capacity	630 Amps.
e)	Fault making capacity	52.5 KA peak
f)	No. of poles	3
g)	Operating mechanism	Operating handle with ON, OFF, Earth positions with arrangement for padlocking in each position.
3.8.4	**Busbars: (If any)**	
a)	Material	Copper
b)	Type	SF6 insulated
c)	Rated Current	630 Amps
d)	Short time rating for 3 Sec.	-

3.5.0 Tests For RMU: Each type of 11kV Switchgear shall be completely assembled, wired, adjusted and tested at the factory as per IEC:60265, IEC:60298.

3.6.0 Routine Tests: The tests shall include but not necessarily limited to the following.

a) Operation under simulated service condition to ensure accuracy of wiring, correctness of control scheme and proper functioning of the equipment.

b) All wiring and current carrying part shall be given appropriate High Voltage test.

3.7.0 **HT Metering:**

A separate HT metering cabinet shall be provided alongwith RMU which shall comprise following,

3nos- 11000/rt3/110/rtV, 50VA, cl 0.5 single phase, resin cast VTs with fuse protection on primary side and MCBs on secondary side.

1 no- Digital multifunction meter as per following specifications,

Features

- ☐ Measurement, display and communication of all power parameters
- ☐ Total Harmonic Distotion measurement and power quality data
- ☐ True RMS measurement
- ☐ Pulsed energy outputs
- ☐ Digital communications
- ☐ Fully programmable PT and CT ratios
- ☐ Simple menu driven interface
- ☐ DIN case style
- ☐ High quality LED display

The meter shall monitor:

- ☐ Voltage: line to line & line to neutral
- ☐ Current, phase and neutral
- ☐ Frequency
- ☐ Power factor
- ☐ Power (active, apparent and reactive)
- ☐ Energy (reactive & active)
- ☐ Total harmonic distortion

Digital Communications

A RS485 communications module shall be made available for direct connection to SCADA systems using the Modbus RTU protocol. Remote monitoring shall enable the user to record the systems parameters in real time, using high resolution numbers.

Programming

Demand Integration Time : 8, 15, 20, 30 minutes

Reset Max demand & active energy registers	
Pulse Output Duration	: 60, 100, 200 ms
Pulse Rate Divisors	: 1, 10, 100, 1000
RS 485 Interface Baud Rate	: 2.4, 4.8, 9.6, 19.2 kB
RS 485 Parity	: Odd / Even / No, 1 or 2 stop bits
Modbus Address	: 1 - 247

DISTRIBUTION TRANSFORMER

4.0.0 **Oil filled Transformer :**

4.1.1 Requirement: 11000/433 Volt Oil immersed, ONAN cooled suitable for installation at outdoor in Enclosure for ground mounting.

4.1.2 Voltage Ratio: No load voltage 11000/433 volts within tolerance as stipulated in IEC 76.

4.1.3 Rating: The transformer shall have a continuous rating as specified at any of the specified tapping position and with the maximum temperature rise specified.

4.1.4 Temperature Rise: The maximum temperature rise at the specified maximum continuous output shall not exceed 40 □C by therm
measured by resistance of winding above ambient temperature, not exceeding 40 □C daily average or 50 □C maximum

4.1.5 Connections: H.V. Delta and L.V Star connected with neutral brought out on the secondary side for connection to earth; Vector group DYn11.

4.1.6 Tapping :

Each transformer shall be provided with **Rotary/Linear type tap switch** so as to provided for a voltage adjustment on H.V. from +5% to –5% of rated voltage of 11000 volts in 4 equal steps (5 position) to obtain rated voltage of 433 volts on LV side. Refer clause no:4.5.4 for details of rotary switch. The tapping shall be provided for following voltage ratios at no load.

4.2.1 Cleaning & Painting :

a) All steel surfaces shall be thoroughly cleaned by sand blasting or chemical agents, as required to produce a smooth surface free of scales, grease and rust.
b) The internal surfaces in contact with insulating oil shall be painted with heat resistant insulation paint which shall not react & be soluble in the insulating liquid used.
c) The external Surfaces, after cleaning, shall be given two coats of high quality epoxy based rust resisting primer followed by filler coats.
d) The transformer shall be furnished with coats of weather resisting battleship gray epoxy based enamel paint specially recommended for transformer use.
e) The paints shall be carefully selected to withstand tropical heat rain, effect of proximity to the sea etc. The paint shall not scale off or crinkle or be removed by abrasion due to normal handling.
f) Special care shall be taken by the manufacturer to ensure against rusting of nuts, bolts and fittings during operation. All bushings and current carrying parts shall be cleaned properly after final painting.

4.2.2 Both H.V. and L.V. bushings shall have creepage corresponding to very heavily polluted atmosphere**.**

4.2.3 Oil: N**ew transformer oil used shall be according to relevant IEC standards**

4.2.4 Phase Marking & Danger Plate: **Phase markings in fluorescent paint on small non-corrodible metallic tags shall be permanently fixed for H.V. and L.V sides. Phase markings tags shall be properly fixed with proper alignment. Danger plates shall be provided on the H.V & LV sides, mentioning the Corresponding Voltages.**

4.3.0 Core and Coil :
4.3.1 Core : The core shall be constructed from high grade, cold rolled, non-ageing, low loss, high permeability, grain oriented, cold-rolled grain oriented silicon steel laminations. The transformer shall be so designed as to have minimum humming noise. The percentage harmonic

potentials with the maximum flux density under any conditions shall be such that capacitors connected in the system shall not be overloaded.

4.3.2 The core and coil assembly shall be securely fixed in position so that no shifting or deformation occurs during movement of transformer. The core and coil assembly shall be capable of withstanding without injury, the thermal and mechanical effects of short circuit at the terminals of any winding.

4.3.3 Noise: The Contractor shall take special precautions to ensure that the noise and vibration level does not exceed which is obtained in good modern practice.

4.3.4 Impedance Volts: The Percentage impedance value at 75 Deg. C at any tap shall be 4.5% for 315KVA & 500KVA and 5.0% for 750kVA subject to tolerance as specified in relevant IEC standards. The value of the impedance volts at each tapping over the specified range shall be specified in the bid.

4.3.5 Regulation: The regulation at 75 C at full load the usual tolerance as per IEC standards shall be specified in the bid.

4.3.6 Power Freq. High Voltage & Insulation Level (Impulse voltage): **The distribution transformer shall be designed so that they are capable of withstanding high voltage & impulse voltages as given below:**
a)Impulse Voltage for 11kV winding: 75 kV (1.2/50 Microsecond wave shape).
b) High Voltage : 28kV rms.

4.3.7 Transformer shall be provided with RTD sensor for temperature indication which shall be monitored through BMS at remote substation.

4.4.0 Guaranteed Particulars of Transformers:

S.No.	**Description**	**Unit**	Guaranteed Particulars
1	Service		Out door type
2	Type		Oil Filled
3	Rating	KVA	As specified in BOQ
4	Rated Frequency	Hz	50
5	Number of phase		
	HV Side		3 Ph
	LV Side		3 Ph, 4 wire
6	Rated Voltage		
	HV winding	KV	11
	LV Winding	KV	0.433
7	Winding		Copper wound
8	Vector Group		Dyn11
9	Type of cooling		ONAN
10	Class of Insulation		Class A / Uniform
11	Insulation Level		
	a) Power frequency withstand (HV/LV)	KVrms	28 /2
	b) impulse withstand (HV/LV)	KVp	75/-
11	Method of Earthing –LV		Solidly earthed
13	Duty		Continuous
14	Taps		
	a) Range	%	+5 to –5
	b) No of steps		5 positions, 4 steps
	c) In steps of		2.5%

S.No.	Description	Unit	Guaranteed Particulars
	d) Tapping provided on HV side		Yes
15	Tap Changer type		Off circuit Tap Changer
16	Impedance voltage at 75 □C		
	a) At Principal tapping	%	5%
17	Temperature rise above 40 □C ambient		
	a) Top of oil by thermometer	□C	40
	b) Winding by resistance	□C	50
18	Terminals		
	a) HV Side		Porcelain open on top
	b) LV Side		Porcelain open on top with bimetallic connectors
19	Losses (at 75 □C and tapping) (with IS tol.)		
	a) No Load at rated voltage & Frequency	W	850 W (Max.)
	b) Load loss at rated current (ONAN)	W	5750 W (Max.)
20	Efficiency at 75 □C and		
	a) At full load (ONAN)	%	98.68%
	b) At 75% load (ONAN)	%	98.91%
	c) At 50% load (ONAN)	%	90.09%
21	Painting		Synthetic enamel (125 Micron) Shade 631 of IS 5.
22	Reference Standards		IS: 2026 (Part 1 to IV)
23	Fittings & Accessories		
	i) Oil temperature indicator with 2 contact alarm		Yes
	ii) OFF circuit tap changer with pad locking arrangement.		Yes
	iii) 2 nos. earthing terminal		Yes
	iv) Rating & Diagram Plate		Yes
	v) Lifting Lugs for complete transformer		Yes
	vi) Cover lifting lugs		Yes
	vii) Pressure Release valve		Yes
	viii) Drain Valve with plug (3/4" BSP)		1 No.
	ix) Filter Valve with plug (3/4" BSP)		1 No.
	x) Oil level indicator		1 No.

4.5.0 Fittings & Accessories For Corrugated Tank Transformer :

4.5.1 The following accessories shall be provided for 11 kV/0.433 kV, distribution transformer.

4.5.2 Two earthing terminals with copper lugs. The lugs shall be provided in such a way that they shall not obstruct the movements of rollers. The earthing continuity for all the connected equipments shall be properly done.

4.5.3 Two lifting lugs for complete transformer as well as enclosure.

4.5.4 Off circuit tapping switch shall be rotary type, 3 pole gang operated, top mounting draw out type only. Tap switch shall be suitable for operating voltage of 11kV and above and shall have rated current of 16.53A/26.54A/39.64Amps. Switch shall be provided with externally operating hand wheel handle with indicator and locking device, with direction changing facility and locking

arrangement. Bidders shall submit with the bid, technical catalogue for the off load tap switch for Purchaser's approval.

4.5.5 Rating plate and diagram plate of durable non-corroding metal giving information as required under IEC 76. Rating plate shall also include Transformer Actual %Z, No-Load Loss & Full-Load Loss at 75 □C along with
marking shall be done with fluorescent colour. Each equipment shall carry individual name-plate with proper instructions & affixed with screws.

4.5.6 Four plain rollers fitting so that the transformer can suitably moved in any direction along with roller direction changing and locking facility shall be provided.
4.5.7 Skid with Haulage lugs.

4.5.8 Instructions & affixed with screws.

4.5.9 Skid with Haulage lugs.

L.T. PANEL

5.1.0 System:-
a) Declared voltage :– 3 Phase,400V (±6%) 50 Hz,
b) Neutral :– Solidly earthed at substation.

5.2.0 General finish:- Tropical, totally enclosed, metal-clad, weather-proof, vermin and dust proof.

5.3.0 Construction :

Enclosure:- Dead Front type of enclosure shall be able to provide the degree of Protection IP:4X.

Busbar: Copper busbars shall be used for the connection of transformer with the LT incomer ACB. Also all the busbars used in the LT panel shall be made of adequate size of copper.

5.4.0 **General Technical Data for ACB / MCCB**

S. No.	Description	Details
1	Approved Make	Siemens/Schnieder/Merlin Gerin/ Hager/ Legrand
2	Rated voltage	690V
3	Rated frequency	50Hz
4	Number of poles	4P
5	Rated current	As per attached BOQ
6	Rated operational voltage	433V
7	Ultimate breaking capacity	As per BOQ
8	Type	Fixed, **Motorised**
9	Type of Release	Built in Microprocessor based release
10	Shunt release	required
11	Auxiliary contacts	Required for status indication

General technical specifications for Air Circuit breaker

1. General

Air circuit breakers shall be incorporated in power control center and motor control centers wherever specified. ACB shall conform to **IEC60947 / IS: 13947** Part-2 1993 in all

respects. ACBs shall be suitable for operation on 690 volts, ± 10%, 3 phase, 50/60 Hz, AC supply. The rated insulation voltage shall be equal to or greater than 1000V.The rated impulse withstand voltage shall be equal to 12kV, so that the device can be used for every installation category, in compliance with the international standards CEI IEC 664-1.

2. Type and construction

All the current carrying parts of the circuit breakers shall be silver-plated. Suitable arcing contacts shall be provided to protect the main contacts. The contacts shall be of spring-loaded design. The sequence of operation of the contacts shall be such that arcing contacts `make' before and `break' after the main contacts. Arcing contacts shall be provided with efficient arc chutes on each pole. The arc chutes shall be suitable for ready replacement. Self-aligning isolating contacts with automatic shutters to screen the live parts shall be provided. The design of the breaker shall be such that all the components are easily accessible to inspection, maintenance and replacement. The ACB at its rated current shall be suitable for operation in extremely tropical humid climate. The manufacturer shall declare ideal de-rating charts at higher temperatures.

There should be total segregation between the power circuit and control circuit, thus making double insulation and ensuring fitting of accessories while the circuit breaker is in the ON position. It shall be possible to inspect the arcing chamber and main contacts. The ACB shall have metal load bearing structures. The main contacts shall be separate from the arc-breaking contacts. It shall be possible to check the wear of the main contacts with the ACB in its racked-out position, removing the arcing chambers. No mechanical junctions in the main contact shall be there so that losses are minimal.

Operating Mechanism

Air circuit breaker shall be provided with a quick-make, trip-free operating mechanism. The operating mechanism shall be strain-free spring operated. The operating shall be "handle front of the panel" type. The design shall be such that the circuit breaker compartment door need not be opened while moving the breaker from completely connected, through test, in to the disconnected position. The spring shall be charged automatically during the closing operation. Mechanical Indication of the position of the spring charge shall be provided.

Interlocking and safety arrangement

The circuit breaker shall provide as a standard feature, the following mechanical indicator in the front Panel

1 Contact portion indicator (on/off)
2. Stored energy status indicator
3. Trip indicator on fault

Rating

The CTs range from 250A to 6300A: all the CTs shall have a structure made of self-extinguishing thermoplastic material. The breaking capacity of the ACB shall be 50kA. The Breaking Capacity of the circuit breaker shall be as indicated in the BOQ. Icu=Ics for all ACBs. Icw rating at 1 sec/3sec should be declared. The minimum Electrical & Mechanical Life of ACB at 415/440V shall be as follows:

Rating of ACB	**Electrical Endurance**	**Mechanical Endurance**
Upto 1600 A	10000 Opns	20000Opns
2000A	5000 Opns	15000 Opns

Accessories

All the accessories like U/V, shunt opening, shunt closing shall be accessible from the front.

Circuit breakers shall be provided with the following Accessories: -

i) Under-voltage relay for the incoming ACB.
ii) Microprocessor based Overload releases with IDMT characteristics.
iii) Microprocessor based Instantaneous earth fault release.
iv) Alarm switches (if specifically asked for)
v) Auxiliary switches
vi) NO and NC auxiliary contacts rated for 10 Amps at 415 V AC and 6 Amp at 48V DC, in addition to ones already in use for the operation of the breaker and will be used in subsequent interlocks to be incorporated in future.

Mounting

i) Circuit breakers shall be mounted as per the standard specification of power control centers.
ii) Thermal protection with a current of 3ith starting from cold conditions.

Protection

The ACB shall be with an integral self-powered microprocessor based current release for Overload, Short-Circuit and Earth Fault protection which works on true rms values for ensuring accurate protection, if specifically asked for. The protection unit should meet the EMI/EMC requirement as per latest standard.

Online Test Fault

To test healthiness of release and ACB shall be provided.

Setting range of protection release

a) Overload protection shall have adjustable setting from 40% to 100% of the ACBs rated current in steps of 10% and adjustable time setting from 3-18m sec.
b) Short circuit protection shall have adjustable current setting from 100% to 1000% of the overload setting and adjustable time delay setting for fault discrimination from 50-500 m sec.
c) E/F protection if specified will have adjustable current setting from 40% to 100% of ACB rated current and adjustable time setting from 100-800m sec. It shall be possible to charge the release setting on load.

General Technical Specifications for Molded Case Circuit Breakers

The rated normal current should be specified at 40°C

1. General

Moulded case circuit breakers shall be incorporated in the switchboard wherever specified. MCCB shall conform to IEC-60947-2 in all respects. MCCB shall be suitable either for single phase AC 230 Volts or three phase 415 volts ± 10%. Suitable discrimination shall be provided between upstream and down stream breakers in the range of 10-20 milli seconds.

MCCB should have current limiting design and provision for load- line reversibility.

MCCB shall indicate its suitability for isolation and this should appear clearly on the MCCB with the symbol as specified in standard IEC 60947

2. Frame Size

The MCCB shall have the following Frame Size:

a)	Upto 160 A. Rating	160 A Frame
b)	From 160 A. to 250 A.	250 A Frame
d)	From 250 A. to 400 A.	400 A Frame
e)	From 400 A. to 630 A.	630 A Frame

3. Construction

The MCCB cover and case shall be made of high strength heat-resistant and flame retardant thermosetting insulating material; operating handle shall be quick make/quick break. The operating handle shall have suitable `ON' `OFF' and `TRIPPED' mechanical indicators notable from outside. Three phase MCCBS shall have a common operating handle for simultaneous operation and tripping of all the three phases.

Suitable arc extinguishing device shall be provided for each contact. Tripping unit shall be Microprocessor based with overload and short circuit protection for MCCB ratings 100A upto 630A as specified provided on each pole and connected by a common trip bar such that tripping of any one pole operates all three poles to open simultaneously. Tripping device shall have IDMT characteristics for sustained over load and short circuits.

4. Contact tips shall be made of suitable arc resistant, sintered alloy for long electrical life. Terminals shall be of liberal design with adequate clearances.

5. Accessories

All the accessories shall be mounted from the front and shall be adjustment free. MCCBs shall have the electrical accessories fitted even without removing the circuit breaker from the switchboard so that site changes, if any, can be carried out easily. MCCB shall be provided with the following accessories, if specified in schedule of quantities:-

i) Under voltage trip
ii) Shunt trip
iii) Alarm switch
iv) Auxiliary switches
v) Rotary and motorized operating mechanism. Motor Operator shall be directly mounted having high mechanical life(similar to MCCB) having option of operating with ac or dc voltage. It should have wide operating voltage.

6. Interlocking

Moulded case circuit breakers shall be provided with the following interlocking devices for interlocking the door of a switchboard.

a) Handle interlock to prevent unnecessary manipulations of the breaker.
b) Door interlock to prevent the door being opened when the breaker is in ON position.
c) Defeat-interlocking device to open the door even if the breaker is in ON position.

7. Rupturing capacity

The moulded case circuit breaker shall have a rupturing capacity as mentioned against each in Schedule of Quantity at 415 volts. Wherever required, higher rupturing capacity breakers to meet the system short circuit fault shall be used.

8. The MCCB shall be current limiting type and comprise of quick make – break switching mechanism. MCCBs shall be capable of defined variable overload adjustment. For thermal magnetic protection the O/L adjustment should be 75%-100% and for microprocessor-based release the adjustment should be 40%- 100% and S/c for 2 to 12 times .All MCCBs rated 200 Amps and above shall have adjustable magnetic short circuit pick-up.

9. Electrical Features

All MCCB's & shall be selected on the basis of rated current and shall have Ics Short Circuit Ratings shall be 100% Icu. Four poles MCCBs shall be always supplied with neutral protection. The MCCBs having 400A & should have category B as per the IEC standards to ensure the selectivity. Minimum Electrical & Mechanical Endurance of MCCB Shall be as follows

	Rating of MCCB	Electrical Endurance	
Mechanical Endurance			
	Upto 160 A	7500 Opns	25000 Opns
	Above 160 A	4000 Opns	20000 Opns

10. The trip command shall override all other commands. The manufacturer shall provide both the discrimination tables (with test certificates) and let-through energy curves.

5.5.0 Earthing:

5.5.1. Earthing arrangement shall be provided for earthing each cable, PVC cable gland, neutral busbar, chassis and frame work of the cubicle with separate earthing terminals at two ends. The main earthing terminals shall be suitably marked .The earthing terminals shall be of adequate size, protected against corrosion, and readily accessible. These shall be identified by means of sign marked in a legible manner on or adjacent to terminals.

5.5.2 Neutral bus bar strip shall be connected to Earthing terminal with help of GI strip of suitable capacity & nut-bolt arrangement.

6.0 POWER FACTOR CORRECTION CAPACITORS

Power factor correction capacitors shall conform to latest IS codes in all respects. Approval of insurance association of India shall be obtain if called for. Capacitors shall be suitable for 3 phase 415 volts 50 HZ supply and shall be available in single and three phase units of 25, 50 & 100 kVAR sizes as specified. Capacitor shall be usable for indoor use, permissible overloads being as below.

- Voltage overloads shall be 10% for continuous operation and 15% for six hours in a 24 hours cycle.
- Current overloads shall be 15 % for continuous operations and 50% for six hours in a 24 hours cycle.
- Over load of 30% continuously and 45% for six hours in a 24 hours cycle.

Capacitors shall be hermetically sealed in sturdy corrosion proof sheet steel containers and impregnated with non inflammable synthetic liquid. Every element of each capacitor unit shall be provided with its own built in protection. Capacitors shall have suitable discharge device to reduce the residual voltage from crest value of the rated voltage to 50 volts or less within one minute after capacitor is disconnected from the source of supply. The loss factor of capacitor shall not exceed 0.005 for capacitors with synthetic impregnants The capacitors shall withstand power frequency test voltage of 2500 volts AC for one minute. Insulation resistance between capacitors terminals and containers when a test voltage of 500 volts DC is applied shall not be less than 50 meg.ohms.

TYPE / ROUTINE TEST ON PACKAGE SUBSTATION:

7.0 TYPE TESTS FOR THE PACKAGE SUBSTATION COMPLETELY ASSEMBLED:

7.1 The Package Substations offered must be type tested as per IEC 61330 in any of the Govt of India approved laboratory. The copy of type test summary should be submitted along with the tender.

7.2 Routine Tests: The routine tests shall be made on each complete prefabricated substation.

a) Voltage tests on auxiliary circuit.
b) Functional test.
c) Verification of complete wiring.

7.3 Test Witness: Routine test shall be performed in presence of Owner's representative if so desired by the Owner. The Contractor shall give at least fifteen (15) days advance notice of the date when the tests are to be carried out.

7.4 Test Certificates:

Certified reports of all the tests carried out at the works shall be furnished in three (3) copies for approval of the Owner.

1. GUARANTEED TECHNICAL PARTICULARS –RMU (To be filled by Bidder)

Electrical data and service conditions

No	***Rated voltage***	KV	
1	Power frequency withstand voltage	KV	
2	**Impulse withstand voltage**	KV	
3	Rated frequency	Hz	
4	Rated current busbars	A	
5	Rated current (cable switch)	A	
6	Rated current (T-off - VCB)	A	
	Breaking capacities:		
7	active load	A	
8	short circuit breaking current (T-off circuit breaker)	kA	
9	Rated making capacity	kAp	
10	Rated short time current 3 sec.	kA	

Ring Main Unit Technical data

No.	***General data, enclosure and dimensions***		
1	Standard to which Switchgear complies	IEC	
2	Type of Ring Main Unit		
3	Number of phases		
4	Whether RMU is type tested		
5	Whether facility is provided with pressure relief		
6	Insulating gas		
7	Nominal operating gas pressure		
8	Gas leakage rate / annum	%	
9	Expected operating lifetime		
10	Whether facilities are provided for gas monitoring		
11	Material used in tank construction		
No	***Operations, degree of protection***		
1	Means of switch operation		
2	Means circuit breaker operation		
3	Rated operating sequence of Circuit Breaker		
4	Total opening time of Circuit Breaker	ms	
5	Closing time of Circuit Breaker		
6	Mechanical operations of switch	CO	
7	Mechanical operations of CO earthing switch	CO	
8	Mechanical operations of circuit breaker	CO	
	Degree of protection:		
9	High Voltage live parts, SF6 tank	IP	
10	Front cover mechanism	IP	
11	Cable covers	IP	

2. GUARANTEED TECHNICAL PARTICULARS –Transformers (To be filled by Bidder)

Sr. No.	Description	UoM	Particulars		
1.	Continuous Rating	kVA	**500**	**1000**	**1250**
2.	Make				
3.	Voltage Ratio (Py/Sy)	KV			
4.	Frequency	Hz			
5.	Vector Group	-			
6.	Type of Transformer				
7.	Type of construction				
8.	Type of Cooling	-			
9.	Class of insulation	-			
10.	Off circuit Tap Switch	-			
11.	Winding Material				
12.	Ambient Max. Temperature	Deg. C			
13.	Temperature rise of winding	Deg. C			
14.	Temperature rise of oil	Deg. C			
15.	No Load Losses at normal Voltage	W			
16.	Load Loss at rated load and 75 Deg. C	W			
17.	Impedance at rated load and 75 Deg. C	%			
18.	Qty. of oil	Ltrs.			
19.	Total Weight Approx.	Kg.			
20.	Regulation at UPF	%			
21.	Regulation at 0.8 PF	%			
22.	Efficiency at UPF 100% Load 75% Load 50%Load 25%Load	%			
23.	Efficiency at 0.8PF 100% Load 75% Load 50%Load 25%Load	%			
24.	Reference Standards				
25.	Test voltage at power frequency (Py/Sy)	KV rms			
26.	Impulse Voltage (Py/Sy)	KVP			
27.	Induced over voltage withstand test. (Py/Sy)	KV rms			
28.	Terminations (Py/Sy)				

SUB-HEAD- E : DIESEL GENERATOR SETS

1.0 INTENT OF SPECIFICATION:

1.1 This specification covers the design, manufacture, assembly, packing, dispatch, transportation to site, supply, erection, testing, commissioning, performance and guarantee testing of **Diesel Gen-Sets,** complete in all respects with all equipment, fitting and accessories for efficient and trouble free operation as specified here under.

2.0 SCOPE OF WORK:

2.1 Scope of Supply & Services:

General Scope of work shall include design, manufacture, assembly, packing, dispatch, transportation to site, supply, erection, testing and commissioning of the following:

a) Diesel engine complete with all accessories, an Alternator directly coupled to the engine through flexible/rigid coupling complete with all accessories for starting, regulation and control, including base frame, interconnecting and accessories, power and control cable, glands and lugs etc.

b) D.G. Local/Remote control panel including all type of control cables, special cables (if any) between D.G. Set's, instrument panel, PCC control panel and Main LT panel etc.

c) Equipment necessary for engine cooling system, **Radiator cooled**, inter connecting pipes etc.

d) Equipment necessary for fuel storing and distribution, day oil tank (990 Lt.), pipings, pumps, valves, level indicators etc.

e) Exhaust piping, flexible connections and residential type silencer of exhaust system, including thermal lagging, cladding etc.

f) Batteries with good quality iron battery stand and battery charging equipment, including their connections as necessary, along with tools & accessories for battery maintenance. (Contractor shall submit the list of tools along with Tender)

g) Anti Vibration Mountings etc.

h) Electrical panel for local equipment, cooling tower pumps etc.

i) Power & Control cabling, cable tray etc.

m) Preparing all related shop drawings for approval from client/consultant and all statutory bodies as required and as applicable.

n) Obtaining statutory approval of the installation including permission for operation of Diesel Generators by the Electrical Inspectorate, Pollution Control bodies and any other statutory bodies as applicable.

o) Minor civil works like chasing, grouting etc. for execution of jobs.

p) Carrying out performance and guarantee test at site at available load which shall not be more than the capacity of D.G. Set.

3.0 CODES AND STANDARDS:

3.1 The equipment furnish under this specification shall conform to the latest Indian and BS Amendment upto date standard, except where modified or supplemented by this specification:

3.2 The installation work shall conform to Indian Electricity act and Indian Electricity Rules as amended upto the date of installation.

The fuel oil installation shall meet all statutory requirements of Govt. of India as amended upto the date of installation. **Any approval required from statutory authorities shall be obtained by the Contractor.** Nothing in this specification shall be construed to relieve the contractor of these responsibilities.

3.3 The Indian standards are available from:

Indian Standards Institution
Manak Bhawan,
9, Bahadur Shah Zafar Marg,
New Delhi - 110 002 (INDIA).

3.4 The Indian electricity Rules and the Electricity act mentioned above can be obtained from:

Kitab Mahal,
State Emporium Building,
Baba Kharak Singh Marg,
New Delhi - 110 001 (INDIA).

3.5 Equipment conforming to any other National/International Standard which ensures equal or better quality may be accepted. In such case the bidder shall furnish copies of the standards in English along with his bid and shall clearly bring out the salient features of comparison with corresponding listed standards.

3.6 The equipment furnished under this specification have to operate in a tropical climate and shall be given tropical and fungicidal treatment as per relevant specification

3.7 Period of Operation/Duty Cycle:

The sets are intended to supply power only during an emergency for all services and may be idle for long periods except for periodic routine tests once in a week. When there is a total failure of main power supply, the sets shall be required to operate continuously at full load for a period which at times may exceed even 24 hours.

4.0 ENGINE:

4.1 Type:

The diesel engine shall be of stationary type four stroke (prime duty), with vertical in line or (V) type cylinder arrangement, Turbo-charged, cooled with radiators.

4.2 Rating:

a) Prime power BHP rating of the engine shall be such that the DG set deliver the specified net electrical output while supplying power/driving all electrical and mechanical auxiliaries connected to alternator terminals and engine shaft at specified site conditions and ambient temperature of 50°C. **(The bidder shall submit the deration calculations if the engine is not designed for 50deg C. ambient temperature).**

b) It shall also be capable of satisfactorily driving the alternator at 10% over load at the rated speed for one hour in any period of 12 hours of continuous running.

The bidder shall have to furnish copy of deration chart from the original manual of the engine manufacturer and supporting calculations to arrive at diesel engine rating.

4.3 Speed and Vibration Levels:

a) Speed shall be 1500 revolutions per minute. Speed governor/over speed protection shall be provided. At due running conditions, speed shall be stabilized at plus or minus 2% nominal speed, regardless of load. At transient condition, engine speed shall vary not more than 10% plus or minus. Governor class shall be A1 (4% drop) for normal application unless otherwise specified.

b) The engine vibration level shall be as latest upto date amended BS standard.

4.4 Lubrications:

a) The engine shall have a closed cycle forced & splash lubricating system with positive oil pressure and a crank chamber for collection/storage of the lubricating oil during circulation. Lubricating oil shall be circulated in the engine by an engine driven pump.

b) A lubricating oil filter of an efficient full flow type of ample capacity shall be provided for operation under normal conditions for a period of 300 hours without the necessity of its replacement or cleaning. Filters shall be capable of removing all foreign matter above a particle size of 5 microns.

c) In case lubricating oil coolers are required it shall be supplied as an integral part of the Diesel Generator Set.

d) Necessary temperature and pressure gauges and other instruments shall be supplied and fitted on the lubrication system.

e) A lubricating oil level dipstick suitably graduated shall be provided and located in the accessible position.

f) The tenderers shall state the guaranteed lubricating oil consumption in litres per hour.

4.5 Fuel System:

a) The engine shall be capable of satisfactory running on all types of diesel fuel oil normally available locally/ in India.

b) The fuel consumption of the engine shall be expressed by the Contractor in the bid in litres per gross/net kWh output from the alternator (after supplying the requirements of auxiliaries) at full, three quarters and half of its rated power output and at 0.8 and unitary power factor.

If guaranteed fuel consumption is exceeded, the contractor shall make such amendments or alterations as are necessary to bring the consumption to within the guaranteed figures. Tolerance of +5% as defined in latest upto date BS shall be allowed.

c) A fuel service tank of 990 liters capacity with each D.G. Set shall be provided on a suitably fabricated steel platform. The tank shall be complete with level indicator marked in liters, filling inlet with removable screen, an outlet, a drain plug, an air vent and necessary piping. The fuel tank shall be painted with oil resistant paint. All pipe joints should be brazed/welded.

4.6 Air Intake System:

The diesel engine shall be provided with special dry type air filters having low resistance to air passage, high dust retaining efficiency and provision for easy cleaning. Filters shall be

suitable for achieving satisfactory engine operation and ensuring the engine life under tropical humid conditions, with sulphur dioxide fumes, abrasive dust and coal particles of 5 to 100 microns present in the atmosphere. The minimum efficiency of filters shall be 90% down to 5 micron size.

4.7 Cooling:

The diesel engine should be **radiator type.**

- ☐ Engine water pump.
- ☐ Radiator.
- ☐ Coolant additive concentrate.

4.8 Engine Governor:

The governor shall be Electronic EFC to maintain zero speed rate or regulation and shall be Al type as per latest BS in order to take care of heavy motor starting. It shall have necessary characteristics to maintain the speed substantially constant even with sudden variation in load. However, a tripping shall be provided if speed exceeds maximum permissible limit. The governor shall be suitable for operation without external power supply.

4.9 Turbo Charger:

It shall be of a robust construction, suitable of being driven by engine exhaust having a common shaft for the turbine and blower. It shall draw air from filter of adequate capacity to suit the requirements of the engine.

4.10 Quietness of Operation:

a) The engine shall be designed to achieve maximum quietness of operation.

b) Efficient residential silencer shall be provided as per engine manufacturer's approved make only for the exhaust.

c) Noise level of the DG set shall be as per The **CPCB Norms**

4.11 Engine Starting:

a) Engine starting shall be by electric starting motor complete with manual/automatic starting arrangement. The starter motor shall conform to latest IS and shall be of adequate power for its duty and be of inertia or pre-engaged type. The pinion shall positively disengage when the engine starts up or when the motor is de-energized. The engine cranking shall be only from the panel both for AMF & DG sets (Manual) and any engine starting devices etc. that are given as original fitment on the engine by engine manufacturers shall be either removed or padlocking arrangement given for this so that all normal start/stop operations could be done only from panel whether the set is AMF or manual.

The engine wiring shall be appropriately modified, ferruled to totally match with schematic drawings of the panel.

b) Time for Run-up to Speed:
From the initial operation of the starting device, the engine shall start, run up to normal speed and be capable of accepting 60% of full load in steps within a maximum time of 20 seconds, and full load within a further 20 second.

4.12 Starter Battery:

a) The battery shall conform to the requirement of latest IS. Starting battery each of 24V, heavy duty high performance approved make/quality shall be provided to enable crank & start the engine even in cold/winter morning conditions. Type/voltage/AH capacity of same on 20 hour rated discharge period shall be indicated in the offer. The battery set shall be capable of performing at least (5) five normal starts without recharging.

b) The battery shall be provided with good quality iron battery stand painted with acid proof black paint with min 3mm thick rubber mat below the battery.

c) Batteries shall be of load container type only and not with PVC moulded sealed container so that each individual cells are available for individual monitoring during its life span. Each cell shall be provided with electrolyte filling cap with level floats for easy monitoring of electrolytic level.

d) The battery shall be provided with 2 Nos. cables, minimum 1.5m long heavy duty rubber/PVC insulated cabling with brazed tinned lug at one end and with brazed tinned brass terminal lug at battery end - for connecting batteries to cranking system - with 0.25 m long inter battery connecting cable.

e) The lugs shall be clearly stamped (+) or (-) and positive cable also red sleeved for easy identification.

f) The batteries Set shall be supplied fully filled and first charged ready to use.

g) Batteries set shall be supplied with spring type hydrometer, thermometer with specific gravity correction scale and cell testing voltmeter etc.

4.13 Battery Charging System:

a) Float rate charging and quick rate charging system shall be provided at the generator panel with appropriate bridge charger system, LC network, rate selector switch and generously rated charging transformer and silicon one rectifier bridge, so that the cranking battery system can be kept fully charged at all times from E.B. supply network with quick charging rate limited to 0.8 times rated discharge current with provision in control transformer and Si rectifier present to enable boost charging the battery at 2 times rated discharge current in case of emergencies. To this and in the mode selector switch boost charge position shall be present which however shall be kept disconnected at mode selector switch normally.

b) DC ammeters to clearly indicate float charging current and quick/boost charging current shall be provided.

c) Dropper resistor network on the load side of battery charger system shall be provided so that higher charger voltages in quick or boost conditions does not get impressed on the I/L and Contactor coils, which voltage shall remain well within +10% of rated voltage.

d) Battery charging subsystem shall be designed for continuous operation at cubicle ambient of $50^{O}C$ corresponding to $45^{O}C$ ambient outside and should be designed to operate at 1.5 times rated maximum current corresponding to boost charge current which can reach in practice as high as 2.5 times or 3 times rated discharge current.

e) Any charger dynamo and dynamo charging current network present on the set shall be made in operative so that both for AMF and manual application the cranking battery system is kept charged from the charger at the panels at all times during or shut down periods of the set.

f) To the above and in case of manual DG sets, the input to charger subsystem viz., 240 V AC is foreseen to be provided from customer network from the portion that is normally supplied by manual DG Set during DG operation or being fed by E.B. System.

4.14 Engine Fitments:

The engine shall be provided with but not limited to following essential basic fitments:

1	Crank case breather	-	Dry type element (Breather outlet shall be fitted with a filter cap capable of preventing entry of dust).
2	Air Cleaner	-	Dry type mounted.
3	Corrosion resistor coolant.	-	to control acidity and impurities from
4	Lubricating Oil Cooler	-	
5	Filters	-	Lub oil & fuel oil, paper element type.
6	Fuel Pumps	-	Priming & Transfer
7	Governor	-	Electronic Class A1.
8	Turbo Charger charged engines.	-	Exhaust gas driven in case of turbo
9	Flywheel with flywheel housing	-	SAE Type
10	Vibration dampers	-	One Set
11	Exhaust/Intake manifolds	-	
12	Oil Sump (crank case) with dip stick		
13	Engine Supports		
14	Residential type silencer in exhaust system		
15	Electrical starter 24 V		
16	Safety controls & instruments		
17	Flexible coupling with guard		

4.15 Engine Instrumentation:

The following instruments mounted on instrument panel shall be essentially present as minimum:
Engine speed tachometer with service hour counter
Lub oil pressure gauge
Coolant temperature gauge

The instrument panel shall be mounted on engine using rubber dampers for vibration isolation.

The gauges shall have clear red marking to identify the limiting dangerous levels, `Zone Markings' on the scale to indicate the normal healthy & abnormal operating zones for the parameters concerned.

The metering could be either normal electro-mechanical analogue type or electronic digital type, latter being preferred as manufacturers fitment only.

The engine control panel must be supplied by the engine manufacturer only.

4.16 Mountings and Foundations:

The engine and direct coupled attenuator shall be rigidly secured to a common rigid base frame fabricated from MS section.

The DG set shall be placed on the RCC floor with approved make anti-vibration mountings. A lifting hook of required capacity shall be provided above the finalized location of the DG set to facilitate installation and subsequent maintenance of the DG Sets.

The design of mounting arrangement with anti-vibration mountings shall be as recommended by the DG manufacturers and shall be such that a maximum of 2% vibration are transmitted to the structure.

The tenderer shall confirm the type & design of mountings provided and the vibration isolation efficiency in the tender.

4.17 Exhaust Piping:

The engine shall be fitted with a residential type silencer (design approved by manufacturer) to reduce the noise level. Silencer outlet shall be connected to exhaust piping carried to the top of the building through shafts provided for the purpose. Exhaust piping shall be fabricated from class 'B' MS pipes of size suitable to limit back pressure to within permissible limit (2.5" of Hg.). **Tenderer shall submit design calculation in support of the back pressure being within limits along with the tender.**

It is important to ensure that the surface temperature of the exhaust piping does not exceed 50°C. For this purpose, the entire length of exhaust piping shall be treated as mentioned in the Bill of Quantities.

Exhaust piping shall connected to the engine by means of flexible section or an expansion joint and shall also be graded to a drain pocket inside the building. The pocket shall be fitted with a drain cock.

4.18 Tools:

Two sets of standard tools kit for maintenance shall be provided by Contractor. Tenderer shall submit a list of the tools along with the tender. (Cost shall be inclusive in the quoted rates)

4.19 Safety Controls:
Low Lubricating Oil Pressure:

Pressure sensors shall be fitted such that in the event of a fall in the lub oil pressure, an alarm and indication shall be actuated. In addition, the engine shall be automatically shut down in the event of lub oil pressure dropping to a predetermined low value.

High Temperature:

An alarm shall be given if the close loop engine jacket cooling temperature exceeds safe limits stipulated by the engine manufacturer due to any reason. The engine shall be shut down when a pre-determined set temperature is reached.

Over Seed:
Speed control shall be so arranged that a 10% increase over normal rated speed shall cut off fuel supply, thus stopping.

Overload Protection:

The engine shall be adequately protected against operating under overload conditions. The requirements shall be met by the provision of a fixed overload limit stop on the fuel pump rack control rod to prevent the set being subject to a load exceeding the site rating plus 10%.

Excess Starting Time:

The starting circuit for the automatic mains failure diesel generator sets shall be arranged to attempt upto three starting cycles, each not exceeding 10 seconds duration with a similar OFF period between each cycle. If the set fails to start upon completion of the third attempt the starting circuit shall be locked out until it is restored manually. An alarm shall be given and "Set failed to start" indication given on the panel.

Fuel Level Protection:

A level sensor shall be provided in the day fuel tanks to give visual and audible alarms if the level in the tank falls to below ¼ of full.

5.0 ALTERNATOR:

A) Alternator for 415V DG Set

5.1 Synchronous alternator of 500 KVA rating, suitable for continuous operation at 1500 RPM generating 415 volts at 0.8 p.f. (lag), 40 Deg C ambient, suitable for 50 Hz, 3 phase, 4 wire system. The alternator shall be Brushless type, self excited & self regulated through an AVR. The alternator will be suitable for tropical climate and shall generally confirm to IS : 4722.

5.2 The alternator shall be in SP-DP enclosure, foot mounted with ball and roller bearings on end shields.

5.3 The alternator shall conform to latest IS/BS and shall be suitable for tropical conditions.

5.4 The alternator shall comply with the following specifications:

Rating	-	as per BOQ (Shall be capable of 10 % over loading at the rated speed for one hour in 12 hours continuous operation without exceeding permissible temperature rise.
Phase	-	3 phase, 4 wire
Voltage	-	415V
Regulation	-	To be filled by the Tenderer
Speed	-	1500 RPM
Frequency	-	50 Hz.
P.F.	-	0.8 lag
Enclosure	-	IP:23
Insulation	-	Class **'H'**
Execution	-	Self excited, self regulated with brushless system and separately excited with PMG static voltage control unit suitably compounded for voltage and current to maintain terminal voltage constant at ± 1% at all load for p.f. not less than 0.8. lag.
Terminal Box	-	Cable chamber
Earthing Studs	-	2 Nos. for each DG Set.

5.5 Neutral Point:

The winding of the alternator shall be star-connected with the neutral connection brought out to a separate terminal.

5.6 Terminal Box and Connection:

The alternator output terminals shall be enclosed in a terminal box mounted in an accessible position on the alternator frame. As far as possible, connections between the exciter and alternator shall be contained within the machine frame and connections carrying A.C. and D.C. shall be segregated from each other. The terminal box shall be of sufficient size to conveniently terminate the size and number of the Owner's cables, which shall be intimated during detailed engineering. Suitable tinned copper pads shall be provided for power cable termination along with all necessary hardware and cable lugs. Glands and lugs shall be provided for control cables also. For single phase cables, gland plate shall be of non-magnetic material. Gland plate shall be removable type.

5.7 The generating set shall be so designed that it is capable of reaching its full voltage and frequency and shall be ready to take full load within 30 seconds of a remote starting impulse being received.

6.0 ENGINE SAFEGUARDS:

Safeguards shall be provided and arranged when necessary to stop the engine automatically by the following:

a) Energising a solenoid coupled to the stop lever on the fuel injection pump rack.
b) De-energising the "fuel on" solenoid
c) Energising the "fuel - cut off" solenoid.

The operation of the safeguard shall at the same time give individual warning of the failure by illuminating an appropriate local visual indicator and remote alarm at generator panel.

The contactors, relays and other devices necessary for signal and control, for above purposes shall be provided at Generator panel.

At the set at a easily accessible place an "EMERGENCY STOP" mushroom head stay put type P.B shall provided to stop the set in emergency mode.

The safe guard to "STOP THE SET" shall stop the set irrespective of mode selection of the set viz Auto, Manual or test for following cases, with simultaneous isolation of alternator ckt.

a) Emergency stop P.B's operation
b) Over speed.
c) Low lube oil pressure.
d) Earth fault
e) Over current
f) High temperature

7.0 TESTS:

7.1 The alternator of each type and rating shall be type tested for the following tests as per latest IS/BS. Test certificates to be provided for routine and type tests from the manufacturers.

8.0 ERECTION, TESTING, COMMISSIONING AND PERFORMANCE & GUARAANTEE TESTS/PROCEDURE AT SITE:

The entire work of erection, testing and commissioning of equipment supplied under this package shall be carried out by contractor and performance and guarantee tests to be conducted at site are also included under the scope of this specification. For this purpose the contractor shall depute suitable qualified technical supervisor to site on advance intimation to the Owner along with all special testing equipment required for testing and performance and guarantee tests. The supervisor(s) shall be responsible for the installation, testing, commissioning checks and performance & guarantee tests mentioned in relevant clauses of this volume and the checks recommend by the contractor.

The contractor shall ensure that the equipment supplied by him are installed in a neat workman like manner such that they are leveled, properly aligned and well oriented. The tolerances shall be established in Contractors drawings and/or as stipulated by the Owner.

All special tools and tackles and spares required for erection, testing and commissioning of equipment shall be supplied by the contractor.

Erection, testing and commissioning manuals and procedures shall be supplied, prior to dispatch of the equipment.

The contractor shall ensure that the drawings, instruction and recommendations are correctly followed while handling, setting, testing and commissioning the equipment.

8.1 Commissioning Check Tests/Performance and Guarantee Test:

In addition to the checks and test recommended by the manufacturer, the contractor shall supervise the following acceptance tests to be carried out on each test at site.

i. Load Test:

The DG Set shall be given load test at site for a period of at least 6 hours depending upon the actual power factor of the load and set shall be subjected to the maximum achievable load without exceeding the engine or alternator capacity.

This full load test is to be followed immediately by a 10% overload run for one hour. The performance of the engine, alternator shall be satisfactory at the end of this overload run.

During the load test half hourly records of the following shall be taken:

a) Ambient temperature
b) Cooling temp.
c) Lubricating oil pressure.
d) Speed
e) Voltage, wattage and current output.
f) Oil tank level

ii. Speed and Governing:

The speed of the engine shall be verified to ensure that it conforms to the requirement of latest BS.

iii. Check of Fuel Consumption:

A check of the fuel consumption shall be made through out the test run of constant full load and constant overload.

iv. Noise Level:

The noise level shall be as per latest **CPCB norms**.

9.0 RADIO INTERFERENCE:

All equipment provided under this specification shall be so designed that it will not cause interference with radio equipment. In the event of the inherent characteristics of the equipment being such that radio interference is possible, efficient devices to nullify the same shall provided. Suppressers shall be as per the relevant latest IS/BS Standards. Nothing extra shall be paid to the contractor on this account.

10.0 PRE-COMMISSIONING CHECKS:

All standards checks including the ones elaborated in the specifications to ensure that the installation of the DG sets and associated systems has been carried out satisfactorily shall be done on completion of installation. These shall include:

a) DG Sets:
Checking of piping interconnections
Checking of electrical interconnections
Checking of insulation resistance
Checking of earthing
Checking of instruments and controls
Checking of alignment
Checking of vibration transmission to building a structure
Checking of expansion joints
b) Cooling System:
c) Exhaust System:
Checking of silencer operation
Checking of surface temperature of exhaust piping
Checking of back pressure.
d) Fuel System:
Checking of automatic operation of fuel transfer pumps

15.0 PERFORMANCE TESTING AND TYPE TESTS:

15.1 Performance Testing:

DG sets shall be tested at varying loads at manufacturers works prior to dispatch of the sets to site. The performance tests at the works shall be carried out in presence of authorized representative from the Owners to enable them to arrange for their representatives for his inspection to be at manufacturers works for this inspection and testing. **Inspection waiver shall be solely as per owner wish.**

The performance test on each DG sets shall be of minimum 8 hours duration.

All instruments, materials, consumables (fuel oil, lube oil etc.) load and labour required for carrying out of the test shall be provided by the Contractor.

Following test acceptance criteria shall be applicable:

1	Fuel consumption at 50%, 75%, 100% and 110% load	±5% of guaranteed performance. Actual alternator efficiencies as determined in the manufacturers works tests shall be used as the basis of calculation of specific fuel consumption ratio.
2	Voltage regulation from no load to full load	±1%
3	Frequency regulation from no load to full load	±0.5%
4	Maximum temperature	±5% of guaranteed performance
5	Maximum Lub Oil temperature	±5% of guaranteed performance
6	Minimum Lub Oil pressure	±5% of guaranteed performance
7	Lub Oil Consumption	±5% of guaranteed performance

15.2 Type Test:

Copies of manufacturers type test for the engine and the alternator of all ratings shall be enclosed along with the dispatch of the DG sets.

16. TECHNICAL SPECIFICATION OF ACOUSTIC ENCLOSURE

☐ DG Set container shall be of modular construction with the provision to assemble and dismantle easily at site. DG set container shall be CAP-IN-TYPE suitable for assembly at site.

☐ The enclosure is fabricated out of CRCA sheet of 14 SWG.

☐ The sheet metal components are hot dipped seven tank pretreated.

☐ Enclosure is polyester based powder coated (inside as well outside). Nut, bolts & hard - wares are Zinc coated.

☐ The doors are gasketed with EPDM gaskets to avoid leakage of sound.

☐ The door handles are lockable type.

☐ Sound proofing of enclosure is done with high quality rock wool/mineral wool confirming to IS 8183, of 100 mm thickness and density at 48 Kg/M3..

☐ The rock wool is further covered with fibre glass cloth and perforated powder coated ms sheet.

☐ Specially designed attenuators are provided to control sound at air entry to the container and exit from the container.

☐ Adequate ventilation is provided to meet air requirement for combustion and heat removal.

☐ Temperature of enclosure does not exceed beyond 5-7 °C ambient temp.

☐ The noise level insertion loss shall be 25 dBA as per CPCB Norms .

17.0 INTEGRATED DG SET CONTROLLER (PCC 2100) :

Microprocessor based DG set power command module compatible for remote monitoring and data logging with operator interface to the Genset, digital voltage regulation through in built AVR, digital governing and generator set protective function as under:

1. CONTROL:

☐ Run/ Off / Auto Control switch
☐ Emergency stop
☐ Manual /Run / Stop Control switch
☐ Panel Lamp/ Lamp Test Switch.
☐ Digital Engine Speed Governing Control To Provide Isochronous Engine Speed Within ± 0.25 % For Any Steady State Load From No Load To Full Load.
☐ Operator Adjustment For Time Delay Start/ Stop & Alternator Voltage / Frequency.

2. METERING:

A1. Engine

☐ Starting Battery Voltage
☐ Lube Oil Pressure
☐ Engine Coolant Temperature
☐ Data Logs: Stores Running Hours, Number Of Start attempt, KWH Produced Since Last Reset.

A2. Electrical:

☐ Current
☐ Voltmeter
☐ Frequency
☐ KW
☐ KWH
☐ PF
☐ KVA

3. PROTECTION / WARNING

B1. Engine:

☐ Over Speed Shutdown
☐ Low Lube Oil Pressure Warning /Shutdown
☐ High Coolant Temperature Warning / Shutdown
☐ Low Coolant Level Warning / Shutdown
☐ Low Coolant Temperature Warning
☐ Low And High Battery Voltage Warning
☐ Weak Battery Warning
☐ Dead Battery Shutdown
☐ Over Crank Shutdown
☐ Fail To Crank Shutdown

B2. Alternator:

☐ Over Current
☐ Short Circuit
☐ High / Low Voltage
☐ Under / Over Frequency
☐ Reverse Power (KVA & KVAr)
☐ Loss of Voltage sensing Input. (Excitation fault)

4. SPECIAL FEATURE

☐ Digital AVR to provide voltage regulation of ± 0.5 % for any loads between no loads to full load.
☐ Amp Sentry Protection for true alternator over current protection.
☐ Sensor Failure Indication
☐ Compatibility To Remote Monitoring And Data Logging
☐ Smart Starting: Integrated Fuel Ramping To Limit Black Smoke & Frequency Overshoot In Addition To Optimized Cold Weather Starting.

18.0 POWER COMMAND CONTROLLER (PCC1301)

Power Command PCC1301 is a microprocessor based integrated generator set monitoring , metering protection and control system with built-in torque matched volts/Hz overload control.

Single control for all genset functions:
- Digital Governing
- Digital voltage control
- Engine control
- Operator interface
- Protection
- Advanced control functions

Standard features of genset controller

Engine :

Metering	**Protections**	
-RPM	- Low lube oil pressure	- Fail to crank
-Battery Voltage	- High water temperature	- Fail to start
- Lube oil pressure	- High/Low DC voltage	- Sensor failure
- Coolant Temp.	- Weak Battery	
- Running hours	- Over speed	

Alternator :

Metering	**Protections**	
-3 phase voltage (L-L and L-N)	- Under voltage	- Field overload
-3 phase Current	- Over voltage	
- Frequency	- Over current	
- kVA.	- Under/Over frequency	
	- Loss of sensing	

Misc. :
- Battle switch function
- Delay Start/Stop
- Configurable Cranking cycle
- Sleep mode time

OTHERS
- ☐ Vibration damper.
- ☐ Flexible coupling (only for double brg. Alternators).
- ☐ Flywheel with housing.

19.0 CONTROL PANEL

19.1 NEUTRAL GROUNDING RESISTOR PANEL: 1 no

The Neutral Grounding Resistor shall be designed to limit the Volt current to full load value. The Neutral Grounding Resistor will be housed in a cubicle and will be of Stainless Steel or Cu/Ni Alloy. The rating of Neutral Grounding Resistor will be for 10 second with temperature rise limitation of 375° above ambient.

19.2 GENERATOR MONITORING AND PROTECTION PANEL: 1 Nos.

Each monitoring panel shall comprise of the following:

a. Metering and Controls
b. Indication and Annunciation
c. Protections

(a) METERING AND CONTROLS:
Each section will comprise of the following:
1 No. Ammeter with Selector Switch
1 No. Volt Meter with Selector Switch
1 No. Frequency Meter with Selector Switch
1 No. KWH Meter
1 No. KW Meter
1 No. PF Meter
1 No. Engine Start Push Button
1 No. Engine Stop Push Button

1 No. Emergency Push button
1 No. Fault Accept/Reset Push Button
1 No. DOL Starter for lube oil priming pump

(b) INDICATION AND ANNUNCIATION:

Lamp Indication and trip annunciation in the event of following conditions

Conditions	Lamp Indication	Annunciation			
DG Set On	Yes	-			
Load on DG Set	Yes	-			
Circuit Breaker On	Yes	-			
Circuit Breaker Off	Yes	-			
Over Current/ Earth fault		Yes	Yes		
Low fuel level	Yes	Yes			
Differential Fault	Yes	Yes			
Winding Temperature	Yes			Yes	
Bearing Temperature		Yes		Yes	
Master Trip relay operated		Yes	Yes		
Trip ckt Supervision Relay		Yes	Yes		
Restricted Earth fault		Yes			Yes

(c) PROTECTION:

- ☐ Under / Over voltage Relay (Inbuilt in PCC)
- ☐ Under / Over frequency Relay (Inbuilt in PCC)
- ☐ Over Current relay (Inbuilt in PCC)
- ☐ Reverse Power Relay (Inbuilt in PCC)
- ☐ Differential Relay CAG34 type
- ☐ Restricted Earth fault relay CAG 14 type.
- ☐ Master trip relay type VAJH-13 of AREVA or equivalent relay
- ☐ Trip Ckt. Supervision Relay- Type- VAX31

(d) BATTERY CHARGER :

Transformer
Rectifier
Resistance
DC Voltmeter/ Ammeter
Charge Rate Selector Switch.

TECHNICAL PARTICULARS

(Technical Particulars to be filled in by tenderers and enclosed alongwith the tender)

ITEM	**Conformations or comments or data shall be furnished by tenderer against each item**	
	1000KVA, 415Volt	**500 KVA, 415Volt**
Packager of DG Set		
Prime rating of the DG set based on continuous operation 365 days in a year at varying loads. The prime rating as above shall be suitable for continuous operation over an ambient of 50°C. Tenderer to categorically confirm this operation and to furnish design calculation in support of this confirmation.		
DG set to be suitable for 10% overload capacity for 1 hour on 12 hours – over and above the governor capacity being suitable.		
DG Set Dimensions (LxWxH)		
DG Set Weight (in kgs.)		
Diesel Engines:		
Manufacturer of Diesel Engine		
Manufacturers Model No.		
BHP		
RPM		
No. of Cylinder		
Type of Cooling		
Type of Starting		
Aspiration		
Air cleaner type		
Fuel/Lub Oil Filter Type		
Governor type and class		
Flywheel to suit flexible coupling		
Flexible coupling with guard		
Fuel Pump		
Interconnection wiring, cabling and piping as required		
Cooling water quality		
Max. engine water temperature		
Lub Oil pressure		
Max. Lub Oil temperature		
Fuel Consumption:		
Typical fuel consumption gms/BHP/hr		
50% load		
75% load		
100% load		
100% load		
Fuel consumption figures vis-à-vis alternator electrical output – kWh/litre		

50% load		
75% load		
100% load		
100% load		
Fuel air compression ratio		
Suitability for locally available HSD		
Suitability of operation of DG set on cheaper fuel like LDO etc.		
Lub Oil Consumption:		
Lub oil consumption at 100% load		
Alternator:		
Manufacturer		
Enclosure		
Mounting		
KW Rating		
KVA Rating		
Insulation class		
Temperature Rise under continuous operation		
Excitation unit		
Voltage Regulation no load to full load		
Wave from distortion on full load		
Radio Interference		
Telephone Interference		
Stator winding thermistor with trip		
Space heater		
Single step load acceptance		
Peak motor starting KVA		
Sustained short circuit % of rated current for 10 seconds		
Overload rating for:		
15 seconds		
60 seconds		
10 minutes.		
30 minutes		
Terminal Box (Yes/No)		
Instruments and Controls		
Instruments:		
Oil temperature gauge		
Oil pressure gauge		
Water temperature gauge		
A.C. voltmeter with 3 way and OFF selector switch		
A.C. ammeter with 3 way and OFF selector switch		
Frequency meter		
Battery charging ammeter		
Hour meter to show total engine hours run – 10000 hr capacity		
R.P.M. indicator		
Switches:		

Emergency stop push button		
Run/off-reset/auto engine start switch		
Manual Voltage adjustment		
Indication Lamps:		
Battery Charger fault		
Low battery voltage		
Emergency stop		
Generator switch not in auto		
Low fuel		
Pre-alarm high engine temperature		
Pre-alarm low oil pressure		
System ready		
Safety Controls:		
Safety Control – low lub oil pressure		
Safety Control – high lub oil temperature		
Safety Control – high engine temperature		
Safety Control – Over crank		
Safety Control – Over speed		
Safety Control – Over Voltage		
Safety Control – low water level in cooling towers		
Antivibration Mounting:		
Make		
Vibration Isolation Efficiency		
Ventilation requirements:		
for DG set combustion		
for DG set ventilation to maintain 7°C rise in temperature over ambient		
Approvals from following shall be obtained by Contractor prior to commencement of work and after completion as required		
Chief Electrical Inspector to the Local State Government		
State Electricity Authorities/HERC		
Pollution Control Board for air and noise pollution		
Department of Explosives		
Noise Limit (Pollution Norms):		
Confirmation of compliance to noise limits stipulated in Central Government Notification dated July 9, 2002 to comply with Environment (Protection) Third Amendment Rules, 2002 or latest amendment in Pollution norms laid by Statutory Authority.		

D.G. SETS COST OF GENERATION:

ITEM	**Unit**	**Data shall be furnished by tenderer against each item**	
		1000KVA, 415Volt	**500 KVA, 415Volt**
Make of Engine			
Make of DG set			
Engine Model			
DG set rating	KVA		
DG Set rating	KW		
Average Load factor	%		
Units generated per hour	KWH/hour		
Number of hours per year	Hour annum		
Number of units generated per year	KWH/annum		
Fuel Cost:			
Fuel rate	Rs. Per litre		
Fuel consumption	Litres/hour		
Number of units per litre of Diesel	KWH/litre		
Fuel Cost:	Rs. Per KWH		
Lub Oil Consumption Cost:			
Lub oil consumption	Litres/hour		
Cost of lub oil	Rs. Per litre		
Lub oil consumption cost	Rs. Per hour		
Lub Oil Consumption cost	Rs. Per KWH		
Lub Oil Replacement Cost	Rs. Per litre		
Lub Oil replacement period	Hours		
Lub Oil replacement quantity	Litres		
Lub Oil replacement	Litres/hour		
Lub Oil replacement cost	Rs./hour		
Lub Oil replacement Cost	Rs. Per KWH		
Maintenance Cost			
‘B Check” maintenance period	Hours		
‘B Check” maintenance kit cost	Rs.		
‘B Check” maintenance cost	Rs. Per KWH		
‘C Check” maintenance period	Hours		
‘C Check” maintenance kit cost	Rs.		
‘C Check” maintenance cost	**Rs. Per KWH**		
‘D Check” maintenance period	Hours		

‘D Check” maintenance kit cost	Rs.		
‘D Check” maintenance cost	**Rs. Per KWH**		
Air Cleaner element change period	Hours		
Air cleaner Element cost	Rs.		
Air Cleaner Element replacement cost	Rs. Per KWH		
Total Cost per KWH generated			

EMISSION LEVELS – at 100% load

ITEM	**Emission level as per Pollution Control Board Norms**	**Guaranteed emission level of the engine offered to be filled in by the tenderer**	
		1010KVA,415Volt	**500 KVA, 415Volt**
Nox	9.2 g/kW-Hr		
SOx			
CO	3.5 g/kW-Hr		
HC	1.3 g/kW-Hr		
Dust (particulate matter)	0.3 g/kW-Hr		

SUB-HEAD- F : CABLES & CABLE TRAY

A) H.V. CABLES:

1.0 GENERAL :

The cables shall be supplied, inspected, laid, tested and commissioned in accordance with Drawings. Specifications, Indian Standard Specifications as per latest IS and cable manufacturers instructions. The cables shall be of reputed make.

The recommendations of the cable manufacturer with regard to jointing and sealing shall be strictly followed. The installation of cables shall be done by an approved, qualified and experienced person in this trade.

2.0 MATERIAL :

The H.V. cables shall be 33/11 KV, aluminium conductor CROSS LINKED POLYETHYLENE steel tape armoured cable laid underground and or in masonry trenches as shown on Drawings. The conductor shall be made of Electrical purity aluminium wires and stranded together and compacted. The cable shall be of 3 Core type. The insulation shall be of high quality cross linked polyethylene applied by extrusion process. Both conductor and the insulator are provided with shielding made of Semi Conducting compound. Armouring is applied over inner sheath and shall be of flat steel strips. The outer sheath shall be of heat resisting tropodur (PVC) compound. This shall be of black colour.

3.0 INSPECTION :

All cables shall be inspected upon receipt at site and checked for any damage during transit.

4.0 JOINTS IN CABLES :

The contractor shall take care to see that all the cables received at site are apportioned to various locations in such a manner as to ensure maximum utilisation and avoidance of jointing cable. This apportioning shall be got approved by the Owner/Consultant before the cables are cut to lengths. Where joints are unavoidable, the location of such joints shall be got approved by the Owner/Consultants.

5.0 JOINTING BOXES FOR CABLES:

Cable joint boxes shall be of appropriate size, suitable for aluminium conductor XLPE insulated cables of 11000 volts ratings, and shall be manufactured by CCI & Indian Cable Corporation or approved equal.

6.0 JOINTING CABLES:

As per CPWD Specifications

7.0 CABLE TERMINATIONS:

As per CPWD Specification

8.0 BONDING OF CABLES:

Where a cable enters any piece of apparatus, it shall be connected to the casing by means of an approved type of armoured clamp and gland. The clamps must grip the armouring

firmly to the gland or casing, so that in the event of ground movement no undue stress is passed into the cable conductors.

9.0 TESTING OF CABLES:

Prior to burying cables, following tests shall be carried out:

a) Insulation between phases and between phase and earth for each length of cables, before and after jointing.

b) For H.V. cables, high voltage test by applying 17.5KV DC voltage for 15 minutes for each core and earth.

On completion of cable laying work, the following tests shall be conducted in the presence of the Owner/Consultants.

a) Insulation Resistance Test (sectional and overall)

b) Continuity resistance test.

c) Sheathing continuity test.

d) Earth test.

All tests shall be carried out in accordance with relevant Indian standard code of practice and Electricity Rules. The contractor shall provide necessary instruments, equipment and labour for conducting the above tests and shall bear all expenses in connection with such tests.

B) MV CABLES & CABLE TRAY

1.0 STANDARDS OF CODES

This chapter covers the specifications for supply and laying of Medium Voltage XLPE cables.

All equipments, components, materials and entire work shall be carried out in conformity with applicable and relevant Bureau of Indian Standards and Codes of Practice, as amended upto date. In addition, relevant clauses of the Indian Electricity Act 1910 and Indian Electricity Rules 1956 as amended upto date shall also apply. Wherever appropriate Indian Standards are not available, relevant British and /or IEC Standards shall be applicable.

2.0 CABLES

Medium voltage cables shall be aluminium conductor XLPE insulated, PVC sheathed armoured conforming to latest IS. Cables shall be rated for a 1100 Volts.

All Conductor cables shall be as per BOQ.

Conductors shall be insulated with high quality XLPE base compound. A common covering (bedding) shall be applied over the laid up cores by extruded sheath of unvulcanised compound. Armouring shall be applied below outer sheath of PVC sheathing. The outer sheath shall bear the manufacturer's name and trade mark at every meter length. Cores shall be provided with following colour scheme of PVC insulation.

1 Core	**:**	**Red/Black/Yellow/Blue**
2 Core	**:**	**Red and Black**
3 Core	**:**	**Red, Yellow and Blue**
3 ½ /4 Core	**:**	**Red, Yellow, Blue and Black**

E) EXTERNAL LIGHTING:

The specifications covers the supply, installation, testing and commissioning of the following items:

i) Street/Boundary lighting poles complete with all accessories e.g. looping box, clamps MCBs and required hardwares etc.

ii) Street/boundary lighting fixtures complete with all accessories e.g lamps, holders, choke, upto terminal box etc.

iii) Wiring of street light fixtures.

iv) Cable laying, earthing and inter connection. G.I. pipes for cable entry to looping box.

v) Foundation of poles and erection.

vi) All the items should be tested and installed as per the latest Indian standards specifications and all the sundry items such as clamps, bolts, nuts, racks, support miscellaneous wiring etc., required to make the installation complete shall be taken care while quoting the major items.

a) Steel Tubular pole

The poles for street lighting purpose shall be complete in all respects and shall confirm to latest IS unless otherwise specified. All poles shall be complete with base plate of 400 mm x 400 mm x 10 mm thick welded to bottom. The poles shall be provided terminal box for looping in and looping out of cables and shall consists MCB as specified. The looping box shall be suitable for outdoor installation and complete with all hardwares such as clamp, bolts, earthing studs, lockable door etc. and shall be paint also in the same manner as specified for poles. The poles shall be provided with two numbers of GI pipes of suitable dia for cable entry as shown in drawing. The poles shall be painted with two coats of red oxide primer on both outside and the portion of the pole below the ground before erection and two coats of aluminium paint of approved shade after erection over the exposed portion.

b) Erection of pole

While loading, transporting, unloading and erecting the poles care shall be taken so that the poles do not get bent. Out of shape and where necessary such defects shall be rectified before the poles are erected in position. The poles shall be erected in plumb line and correct level as indicated in the drawing and to the satisfaction of the Engineer-in-charge. They shall be kept in this position with the help of manila ropes until the foundation are constructed (for a minimum period of 10 days) and the back filling is complete. Foundation shall be made with reinforced cement concrete (1:2:4) and not less than 200 mm thick all round. The pole base plate shall be fixed over 150 mm thick concrete bed. Foundation shall be continued upto 300 mm or more above ground level as per location of the pole to avoid ingress of water logging etc. The foundation shall be tapered suitably into a collar. The excavated portion shall be filled back with earth and consolidated. The cement concrete foundations shall be cured properly by

covering the same with water soaked or moist gunny bags at least two weeks before loading the pole.

c) Erection of light fixtures

Each light fixture shall be connected to the supply through MCB of a suitable rating mounted in the looping box. The fitting shall be fixed to the pole properly and securely.

d) Wiring of light fixtures

The wiring of lighting fixtures from terminal block by means of 2.5 Sq.mm PVC insulated two core copper conductor through a suitable rated MCB and neutral. Cost of two core connecting cable from junction box to lighting fixture and earth wire complete with connections are included in the quoted rate.

e) Cabling works

All cable installation work shall be done as per relevant clauses of section cable work.

f) Tests

Before handing over the installation, tests on all fittings and cables shall be carried out as per IS specification.

The tests shall include:

- Meggar test
- Continuity test
- Polarity test and phase sequence test

F) EARTHING SYSTEM:

1.0 GENERAL:

This section covers the general arrangement of the earthing, i.e. all non-current carrying metal parts of the electrical installation shall be earthed as per IS 3043(1987) and general specifications for electrical works (part-1, internal) of CPWD specifications 2004. All metal conduits, trunkings, cable sheaths, switchgear, distribution boards, meters, light fixtures, fans and all other metal parts forming part of the work shall be bonded together and connected by two separate and distinct conductors to earth electrodes. Earthing shall also be in conformity with the provisions of Rule 32, 61, 62, 67 and 88 of IER 1956. The earth electrode shall not be situated less than 1.5 meters.

2.0 EARTHING SYSTEMS:

It shall comprise of earth electrodes, earth strips, earth continuity conductor and all earthing conductors shall be of high conductivity copper, GI or aluminum and shall be protected against mechanical damage and corrosion. The size of earth conductors shall not be less than half that of the largest current carrying conductor. The connection of earth continuity conductors of earth bus and earth electrodes shall be strong and sound and shall be rigidly fixed to the walls, cable trenches, cable trays or conduits and cable by using suitable clamps made of non ferrous metals.

3.0 EARTHING ELECTRODES:

Earthing electrodes shall be designed as per the requirement of IS 3043 (1987). The number and size of earth electrodes shall be calculated so that under fault conditions no electrode is loaded above its maximum permissible current density. The resistance of earth electrode shall be as low as possible, the maximum allowable value being one ohm.

Earthing electrodes of either plate type or pipe type may be adopted. The choice of plate or pipe electrode shall be decided according to the anticipated fault level of the network and local soil conditions. Generally, plate electrodes shall be used for substations and large medium voltage network and pipe electrodes for small medium voltage network and installations.

3.1 Location of Earth Electrodes

Normally on earth electrode shall not be situated less than 1.5 m from any building. Care shall be taken that the excavation for earth electrode may not affect the column footings or foundation of the buildings. In such cases electrodes may be further away from the building.

The location of the earth electrode will be such where the soil has reasonable chance of remaining moist. As far as possible, entrances, pavements and road ways, are to be definitely avoided for locating earth electrode.

3.2 Water Arrangement

Method of watering arrangement shall comply with CPWD General Specifications.

3.3 Plate Electrode

Plate electrodes shall be made of MS GI plate of 6 mm thick and 60x60 cm. size. The plate shall be buried vertically in ground at depth of not less than 3.5 meters to the top of the plate, the plate being encased in charcoal to a thickness of 15 cm. all round. It is preferable to bury the electrode to a depth where sub-soil water is present. Earth leads to the electrode shall be laid in a GI pipe and connected to the plate electrode with GI bolts, nuts and washers. A GI pipe of not less than 19 mm dia shall be placed vertically over the plate and terminated in a funnel at 5 cm. above ground. The funnel shall be provided with a wire mesh. The funnel shall be enclosed in masonry chamber of 100 x 50 cm. dimensions. The chamber shall be provided with CI frame cover of 100 x 50 cm size. The earth station shall also be provided with a suitable permanent identification label/tag.

Note : If copper plate is used it shall be of minimum 3mm thickness.

3.4 Pipe electrode shall comprise of a 3.5 Meters long 40 mm dia GI pipe buried vertically in a pit of 35 x 35 cm size and filled with alternate layers of charcoal, salt and river sand and connected at the top to a GI pipe of 19 mm, 1 Mtr. long with a funnel at the other end, 5 cm above the ground in case of copper and chrome plated in case of GI. The earth lead shall be properly fixed to the pipe electrode with brass bolts, nuts and washers. The funnel and earth lead connections shall be enclosed in a masonry chamber of 30 x 30 x 30 cm. dimensions. The chamber shall be provided with a CI frame and CI cover. Proper permanent identification tag/label shall be provided for each electrode.

4.0 INSTALLATION:

4.1 All joints shall be reverted and sweated. Joints in the earth bar shall be copper brazing bolted reverted and the joints faces tinned. Where the diameter of the bolt for connecting earth bar to apparatus exceeds one quarter of the width of the earth bar, the connection to the bolt shall be made with a wider piece of flange of copper jointed to earth bar. These shall be tinned at the point of connection and special care taken to ensure a permanent low resistance contact to iron or steel. All steel bolts, nuts, washers, etc shall be cadmium plated. Main earth bars shall be spaced sufficiently away from the surface to which they are fixed, such as walls or the side of trenches to allow for easy connections. Copper earth bars shall not be fixed by ferrous fittings. The earthing shall be suitably protected from mechanical injury by galvanized iron within ground shall be buried at least 60 cm deep. The earthing lead shall be securely bolted and soldered to the plate or pipe as the case may be. In the case of the plate, the lead shall be connected by means of cable socket with two bolts and nuts. All washers shall be of the same materials as the plate or pipe. All iron bolts, nuts and washers shall be galvanized.

4.2 Method of Installation of watering arrangement

In the case of plate earth electrode a watering pipe of 20 mm dia of medium class GI pipe shall be provided and attached to the electrode. A funnel with mesh shall be provided on the top for watering the pit. In case of pipe earth electrode a 40 mm x 20 mm reducer shall be used for accessing the funnel. The watering funnel attachment shall be housed in

masonry enclosure of not less than 30 cm x 30 cm x 30 cm. A cast iron cover having locking arrangement shall be suitably embedded in the masonry enclosure.

The test link shall be provider at convenient location.

5.0 PRECAUTIONS:

5.1 Earthing system shall be mechanically robust and the joints shall be capable of retaining low resistance even after passages of fault currents.

5.2 Joints shall be soldered, tinned and double riveted. All the joints shall be mechanically and electrically continuous and effective. Joints shall be provided against corrosion.

5.3 The earthing lead from electrode onwards shall be suitably protected from mechanical injury by a 15 mm dia GI pipe in case of wire and by 40 mm dia medium class GI pipe in case of strips. Portion of this protection pipe within the ground shall be buried at least 30 cm deep (to be increased to 60 cm in case of road crossing and pavements). The portion within the building shall be recessed in walls and floor to adequate depth.

6.0 TESTING:

6.1 On the completion of the entire installation, the following tests shall be conducted and no earth electrode shall have Ohm resistance of more than 2 ohm and in rocky soil not more than 3 ohms.

a) Earth resistance of electrodes
b) Impedance of earth continuity conductors as per E-3 of IEE regulations.
c) Effectiveness of earthing as per E-4 & E-5 of IEE regulations.

6.2 All meters, instruments and labour required for the tests shall be provided by the contractor. The test results shall be submitted in triplicate to the Architects for approval.

G) LIST OF APPROVED MAKES:

Details of equipment/ material	Makes	Remark
HT XLPE 11 KV Cable	CCI/RR kabel/ KEI/ Lapp / Batra Henlay	
MV Cable Termination/Glands	Stripwell /Comet/Baliga	
HT Cable Termination/ Jointing Kit	Raychem/3M	
HT Panel Boards	Schneider/ Areva / Siemens / /Legrand / Hager	
Transformer	Schneider/Recon/Andrew & Yule	
L.T. Panel Boards/Sub-Panel/ Meter Boards	Ambit/AARVEE Controls/Adlec/ Beltex engineering/CMPL/IPC	
Annunciation Panel	Schneider/Areva/Kirloskar/ Siemens	
Flame Proof Accessories	FCG/Sudhir – Baliga/Pluto	
Central Control Station for BMS	Compaq / IBM / HP / DELL	
Inverter/UPS	APC/MG/Emerson	

NOTE: -

1. Make of any other item left out shall be approved by Project Manager before procurement.

2. Make of the accessories for Transformer, HT Panel etc. and any other items shall also be approved by Project Manger.

Signature of Tenderer