National Highways & Infrastructure Development Corporation Limited

BUILDING INFRASTRUCTURE - BUILDING THE NATION

Ministry of Road Transport & Highways,
(Govt. of India)

National Competitive Bid

(Through CPP Portal, E-Tendering Mode)

For

"Construction of various RCC infrastructure works for Ladakh Police in the Union Territory of Ladakh."

February, 2020

National Highways & Infrastructure Development Corporation Ltd
3rd floor, PTI Building, 4-Parliament Street,
New Delhi – 110001

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SECTION-I

NOTICE INVITING BID
(E-TENDERING MODE ONLY)

राष्ट्रीय राजमार्ग एवं अवसंरचना विकास निगम लिमिटेड

National Highways & Infrastructure Development Corporation Limited

MINISTRY OF ROAD TRANSPORT & HIGHWAYS,
GOVT. OF INDIA

Notice Inviting Bid

(Online e-tender through Central Public Procurement Portal)

No: NHIDCL/Infra/Ladakh/Police/2020-21/ **Date: 03.02.2021**

RFP for the work of **"Construction of various RCC infrastructure works for Ladakh Police in the Union Territory of Ladakh".**

The Ministry of Road Transport & Highways through National Highways & Infrastructure Development Corporation Limited (NHIDCL) is engaged in the development of National Highways and Infrastructure works. As part of this endeavor, it has been decided to undertake **"Construction of various RCC infrastructure works for Ladakh Police in the Union Territory of Ladakh"**

The National Highways & Infrastructure Development Corporation Limited represented by its Managing Director now invites bids from eligible contractors for the following project:

State/UT	Description of the work	Estimated Cost excluding GST (Rs. in Crore)	Completion period	Defect Liability Period
Ladakh	**"Construction of various RCC infrastructure works for Ladakh Police in the Union Territory of Ladakh"**	34.47	12 months	5 year

The complete BID document can be viewed / downloaded from official portal of the CPPP website https://eprocure.gov.in/eprocure/app from 03/02/2021 to 24/02/2021 (upto 1100 hrs IST). Bidder must submit its Financial bid and Technical Bid at https:// eprocure.gov.in/eprocure/app on or before 24/02/2021 (up to 1100 hrs IST). Bids received online shall be opened on 25/02/2021 (at 1130 hrs IST).

Bid through any other mode shall not be entertained. However, Bid Security Declaration, Document fee, Power of Attorney etc. shall be submitted physically by the Bidder on or before the date mentioned in appendix to ITB. Please note that the NHIDCL reserves the right to accept or reject all or any of the BIDs without assigning any reason whatsoever.

(Ashok Kumar Singh),
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(SECTION-II)

INSTRUCTION TO BIDDERS & APPENDIX TO BID

Table of Clauses

Section -II

Instructions to Bidders (ITB)

A. General

1. Scope of Bid

1.1 The Employer (as defined in the Appendix to ITB) invites bids for "as described in these documents and referred to as "the works". The name and identification number of the works is provided in the Appendix to ITB.

1.2 The successful Bidder will be expected to complete the Works by the intended Completion Date specified in the Contract Data (Part I General Conditions of Contract).

1.3 Throughout these bidding documents, the terms "bid" and "tender" and their derivatives (bidder/tenderer, bid/tender, bidding/tendering, etc.) are synonymous.

2. Source of Funds

2.1 The expenditure on this project will be provided by Government of UT of Ladakh to the National Highways & Infrastructure Development Corporation Limited (NHIDCL).

3. Eligible Bidders

3.1 This Invitation for Bids is open to all bidders as defined in the Appendix to ITB.

3.2 Bidders shall not be under a declaration of ineligibility for corrupt and fraudulent practices by the Central Government, the State Government or any public undertaking, autonomous body, authority by whatever name called under the Central or the State Government.

4. Qualification of the Bidder

4.1 The bid is open to person/entity from India only and entity/firm/company having any share of the person resident outside India or is controlled by persons resident outside India, is not eligible for the bid.

4.2 All bidders shall include the following information and documents with their bids in Section-3, Qualification Information unless otherwise stated in the Appendix to ITB:

a) Scanned copy of original documents defining the constitution or legal status, ownership details, place of registration, and principal place of business; written power of attorney of the signatory of the Bid to commit the Bidder;
b) Total monetary value of civil engineering construction works performed for each of the last three years;
c) Scanned copy of Experience certificate in works of a similar nature and size for each of the last Five years with certificates from the concerned officer of the minimum rank of Executive Engineer or equivalent;
d) Scanned copy of certificate from Charted Accountant as a proof of turnover for the past three years; (as per format enclosed Annexure-B)

e) Scanned copy of certificate from Charted Accountant as a proof of Net Worth for the latest audited financial year;(as per format enclosed Annexure-A)
f) Scanned copy of Information regarding any litigation or arbitration during the last five years in which the Bidder is involved, the parties concerned, the disputed amount, and the matter;
g) Scanned copy of the affidavit on the Stamp Paper, duly attested from the Notary Public, that the information furnished with the bid documents is correct in all respects.
h) Scanned copy of Undertakings as mentioned in Section III Cl.2.
i) Any other information/documents required to be completed and submitted by bidders, as specified in the Appendix to ITB & Section III, and to be uploaded by bidder on e-tender portal
j) Scanned copy of proof of payment for cost of tender documents
k) Scanned copy of Bid Security Declaration
l) A detail Technical proposal of the said project which includes the following detail :
   - Detailed structural design and drawing of work.
   - Structural form, materials and structural principles.
   - Methodology of work.
   - Details of various components such as water supply, sanitary system, flooring, Panels used in the construction work, type of foundation proposed,

4.3 a) Bids from joint venture (JV) are allowed. Maximum numbers of JV partners permitted are 03 (three). Lead Partner to qualify 40% of criteria as per clause 4.4 (a) and clause 4.6 and each JV partner to qualify 20% of criteria as per clause 4.4 (a) and clause 4.6. Jointly the JV must qualify 100% of all criteria.

b) **The bidder including individual or any of its JV member, who are either having 2 (two) on-going EPC Project(s) in NHIDCL or on-going Project(s) worth of ₹ 500 Crore (Awarded Cost) or more in NHIDCL, as on date of financial bid opening, shall not be eligible to bid for this Project (Issuance of LOA will be considered as on-going project).**

4.4 **To qualify for award of the contract, each bidder in its name should have the following; -**

a) achieved an average annual financial turnover (in all classes of civil engineering construction/fabrication works only) equivalent to 20% of estimated cost mentioned in NIB during last three year ending 31st March of the previous financial years duly certified by Chartered Accountant and shall have a minimum Net Worth of 5% (five percent) of the Estimated Cost at the close of the preceding financial year

b) Satisfactorily completed (not less than 90% of contract value), as a prime contractor (or as a nominated subcontractor duly approved by Employer, provided further that all other qualification criteria are satisfied) similar works during last **Five** years ending last day of month previous to the one in which bids are invited should be either of the following:

i. One similar completed work** costing not less than amount equals to **80% of estimated cost put to tender.**

or

ii. Two similar completed works** costing not less than amount equals to **60% of estimated cost put to tender**.

or

iii. Three similar completed works** costing not less than amount equals to **40% of estimated cost put to tender**.

(**The "similar work" means Construction of RCC buildings or any other RCC infrastructure work)

(Escalation factor as specified in the appendix to ITB shall be used to bring the value of such completed works at the level of financial year i.e.**2020-21)**

Year	Multiplying Factor
One (1) (2019-20)	1.00
Two (2) (2018-19)	1.05
Three (3) (2017-18)	1.10
Four (4) (2016-17)	1.15
Five (5) (2015-16)	1.20

4.5

a) Each bidder must produce:

(i) An affidavit on a Stamp Paper, duly attested from the Notary Public, that the information furnished with the bid documents is correct in all respects; and

(ii) Such other certificates as defined in the Appendix to ITB.

(iii) Failure to submit the certificates/documents as specified above or in Appendix to ITB shall make the bid **non-responsive.**

4.6 Bidder who meets the minimum qualification criteria will be qualified only if their available bid capacity is equal to the total estimated cost as mentioned in NIB. The available bid capacity will be calculated as under:

Assessed available Bid capacity = (A*2.5-B)

Where

A= Maximum value of civil engineering works executed in any one year during the last **Five** years (updated to the price level of the year indicated in Appendix) taking into account the competed as well as works in progress**.**

B= Value (updated to the price level of the year indicated in table below under note) of existing commitments, works **for which Appointed Date/Commencement Date has been declared or on-going works** to be completed during the period of completion of the works for which bid is invited. For the Sake of clarification, it is mentioned that works for which LOA has been issued but Appointed Date/Commencement Date not declared as on Bid Due Date shall not be considered while calculating value of B.

***Note**: The Statement showing the value of all existing commitments, works **for which Appointed Date/Commencement Date has been declared or on-going works**as well as the stipulated period of completion remaining for each of the works listed should certified from the bidder. For any wrong certificate the bidders shall be debarred for a period of 2 years--- The factors for updation of the value of civil engineering works to the price level of the year are indicated as under:*

Year	Year-1	Year-2	Year-3	Year-4	Year-5

Updation factor	1.00	1.05	1.10	1.15	1.20

4.7 Even though the bidders meet the above qualifying criteria, they are subject to be disqualified if they have:

(i) made misleading or false representations in the forms, statements, affidavits and attachments submitted in proof of the qualification requirements; and/or

(ii) Record of poor performance such as abandoning the works, not properly completing the contract, inordinate delays in completion, litigation history, or financial failures etc. or debarring by Government agencies.

(iii) Tampered the bid document in any manner.

5. One Bid per Bidder

5.1 Each Bidder shall submit only one Bid for the work. A Bidder who submits more than one Bid will cause the proposals with the Bidder's participation to be **disqualified.**

6. Cost of Bidding

6.1 The Bidder shall bear all costs associated with the preparation and submission of his Bid, and the Employer will, in no case, be responsible or liable for those costs.

7. Site Visit and Site Location

7.1 The Bidder, at his own cost, responsibility and risk, is encouraged to visit, examine and familiarise himself with the Site of Works and its surroundings including source of earth, water, road aggregates etc. and obtain all information that may be necessary for preparing the Bid and entering into a contract for construction of the Works. The costs of visiting the Site shall be at the Bidder's own expense. He may contact the person whose contact details are given in the Appendix to ITB.

7.2 The work includes construction of following buildings/structures:

a) Construction of Police Housing Unit (Residential Quarters, Type-2) in District Police Lines Kargil
b) Construction of Police Housing Unit (Residential Quarters, Type-3) in District Police Lines Kargil
c) Construction of Police Jawan Barrack at Baroo in District Kargil for 40 Pax
d) Construction of Multi Storey Police Jawan Barrack at Baroo in District Police Lines Kargil for approx. 200 Pax capacity
e) Construction of Multipurpose Hall for approx. 200 Pax capacity in District Police Lines Kargil
f) Construction of Police Station at Baroo in District Kargil
g) Construction of SP Office building at Baroo in District Kargil

B. Bidding Documents

8. Content of Bidding Documents

8.1 The set of bidding documents comprises the documents listed below and addenda issued in accordance with Clause 10:

Volume- I:-

i. Notice Inviting Tender

ii. Instructions to Bidders & Appendix to Bid

iii. Qualification Information
iv. Forms of Bank Guarantee, Agreement & LOA
v. Conditions of Contract & Contract Data
vi. Scope of work & Technical specifications
vii. List of Approved Makes of Materials
viii. Drawings

Volume - II:-

Bill of Quantities

8.2 The bidder is expected to examine and access the site locations and include all transportation and miscellaneous cost while quoting the bid.

8.3 The bidder is expected to examine carefully all instructions, conditions of contract, contract data, forms, terms, and specifications, bill of quantities, forms and drawings in the Bid Document. Failure to comply with the requirements of Bid Documents shall be at the bidder's own risk. Pursuant to clause 26 hereof, bids, which are not substantially responsive to the requirements of the Bid Documents, shall be **rejected.**

9. Clarification of Bidding Documents

9.1 A prospective Bidder requiring any clarification on the bid document may notify the Employer in writing or by e-mail (scanned copy) at the Employer's address indicated in the Notice Inviting Tender. The Employer will respond to any request for clarification received earlier than 7 days prior to the deadline for submission of bids. Copies of the Employer's response will be hosted on website or which are required in the opinion of the Employer including a description of the enquiry, but without identifying its source.

10. Amendment of Bidding Documents

10.1 Before the deadline for submission of bids, the Employer may modify the bidding documents by issuing addenda.

10.2 Any addendum thus issued shall be part of the bidding documents and shall be hosted on the NHIDCL website/e-procurement portal only.

10.3 To give prospective bidders reasonable time in which to take an addendum into account in preparing their bids, the Employer shall extend, as necessary, the deadline for submission of bids, in accordance with Clause 20.2.

C. Preparation of Bids

11. Language of Bid

11.1 All documents relating to the Bid shall be in the language specified in the Appendix to ITB.

12. Documents Comprising the Bid

12.1 The e-bid submitted by the bidder shall be in two separate parts. Part-I This shall be named Technical Bid and shall comprise of information submitted online as per

Cl. 4.2 in Sec-II. Part-II It shall be named Financial Bid and shall comprise of (i) Priced bill of quantities.

12.2 **Documents comprising Technical and Financial BID**

The Bidder shall first upload all the project details, net worth details, turnover details and all other details required in this RFP for technical qualification. The Bidder shall ensure that all the details are updated as on the due date of submission of this bid.
The Bidder shall then apply for the RFP on the CPPP website https:// eprocure.gov.in/eprocure/app by submitting the documents mentioned below along with the supporting documents which shall comprise of the Technical BID on the CPPP portal :

Technical Bid

(a) Power of Attorney of the signatory of the bidder to commit BID;

(b) Copy of online receipt towards payment of Bid Security Declaration;

(c) Copy of online receipt towards payment of cost of Bid document of required amount;

(d) Affidavit duly notarized and undertakings as per Section III;

(e) Annual financial turnover (in all classes of civil engineering construction & fabrication works only) during last three years ending 31st March of the previous financial year duly certified by Chartered Accountant. (as per Format Annexure-B);

(f) Net worth certificate duly certified by Chartered Accountant. (as per Format Annexure-A);

(g) Scanned copy of Experience certificate in works of a similar nature and size for each of the last Five years with certificates from the concerned officer of the minimum rank of Executive Engineer or equivalent;

(h) Scanned copy of Information regarding any litigation or arbitration during the last five years in which the Bidder is involved, the parties concerned, the disputed amount, and the matter;

(i) A detailed Technical proposal of the project.

Financial Bid

(g) To be submitted online on GoI e-tendering portal
(https://eprocure.gov.in/cppp) on or before Schedule time given in Data Sheet.

12.2.2 The Bidder shall submit the following documents physically by date and time given in Appendix to ITB:

(a) Original Power of Attorney of the signatory of the bidder to commit BID;

(b) Copy of online receipt towards payment of Bid Security Declaration;

(c) Copy of online receipt towards payment of cost of Bid document of required amount;

(d) Original Affidavit duly notarized and undertakings as per Section III;

(e) Annual financial turnover (in all classes of civil engineering construction and fabrication works only) during last three years ending 31st March of the previous financial year duly certified by Chartered Accountant. (as per Format Annexure-B);

(f) Net worth certificate duly certified by Chartered Accountant. (as per Format Annexure-A);

(g) Scanned copy of Experience certificate in works of a similar nature and size for each of the last Five years with certificates from the concerned officer of the minimum rank of Executive Engineer or equivalent;

(h) Scanned copy of Information regarding any litigation or arbitration during the last five years in which the Bidder is involved, the parties concerned, the disputed amount, and the matter;

(i) A detailed Technical proposal of the project.

12.2.3 The documents listed at clause 12.2.2 shall be placed in an envelope, which shall be sealed. The envelope shall clearly bear the identification "BID for (Name of the Project)" and shall clearly indicate the name and address of the Bidder. In addition, the BID Due Date should be indicated on the right hand top corner of the envelope.

12.2.4 The envelope shall be addressed to the officer designated whose Name and Address is given in the Bid document.

12.2.5 If the envelope is not sealed and marked as instructed above, the Authority assumes no responsibility for the misplacement or premature opening of the contents of the BID submitted and consequent losses, if any, suffered by the Bidder.

12.2.6 BIDs submitted by fax, telex, telegram or e-mail shall not be entertained and shall be summarily rejected.

12.3 The following documents, which are not submitted with the bid, will be deemed to be part of the bid.

Section	Particulars
1	Notice Inviting Bid
2	Instruction to the bidders
3	Conditions of Contract
4	Contract Data
5	Scope of work & Technical specifications
6	List of Approved Makes of Materials
7	Drawings

13. Bid Prices

13.1 The Contract shall be for the whole Works, as described in Clause 1.1 based on the priced Bill of Quantities submitted by the Bidder.

13.2 **The bidder shall quote bid prices on appropriate format enclosed as part of tender document on https:// eprocure.gov.in/eprocure/app.**

13.3 The bidder is required to quote the amount excluding GST. GST at the existing rate & applicable laws will be paid to the contractor along with the each bill, however, the contractor has to submit the proof of GST payment to government before next bill. In case, of non submission of GST proof, the same will be recovered in the next bill.

13.4 Based on the percentage quoted, the rates and prices shall be fixed for the duration of the Contract and shall not be subject to adjustment.

14. Currencies of Bid and Payment

14.1 The price shall be quoted by the bidder entirely in Indian Rupees. All payments shall be made in Indian Rupees.

15. Bid Validity & Bid Document Cost

15.1 Bids shall remain valid for a period of **120 days** after the deadline date for bid submission specified in Clause 20.

15.2 In exceptional circumstances, prior to expiry of the original time limit, the Employer may request that the bidders may extend the period of validity for a specified additional period. The request and the bidders' responses shall be made in writing or by e-mail. A bidder may refuse the request without forfeiting his bid security. A bidder agreeing to the request will not be required or permitted to modify his bid, but will be required to extend the validity of his bid security for a period of the extension, and in compliance with Clause 16 in all respects.

15.3 The Bidder is required to pay a non-refundable fee as mentioned in Appendix to ITB towards cost of Bid Document through RTGS/ NEFT/ other online mode to the NHIDCL's designated bank account. Detailsof designated bank account are as under:

Sr.No.	Particulars	Details
1.	Name of Beneficiary	MD-NHIDCL
2.	Beneficiary Bank Account No.	90621010002610
3.	Beneficiary Bank Branch Name and Address	Canara Bank (erstwhile Syndicate Bank), Transport Bhawan, 1- Parliament Street, NewDelhi110001
4.	Beneficiary Bank Branch IFSC	SYNB0009062
5.	SWIFT Code (For Foreign Bidders)	SYNBINBB126

The Bidder must upload **Copy of the online payment receipt (UTR/ Reference No./Transaction ID)** towards payment of cost of Bid document.

15.4 Any bid not accompanied by Bid document fee/cost, shall be rejected by the Employer as **non-responsive.**

16. Bid Security

16.1 **The Bidder is not required to submit the bid security in Cash/BG/NEFT/RTGS/ FDR/any other online mode.** However, the bidder has to sign a Bid securing declaration accepting that if the bidder withdraw or modify its bid during the period of validity i.e. not less that 180 (one hundred eighty) days from the bid due date or if the bidder is awarded the contract and fail to sign the contract or to submit a performance security before the deadline defined in the request of the bid documents, the bidder will be

suspended for participation in the tendering process for the works of NHIDCL and works under other Centrally Sponsored Scheme, for a period of one year from the bid due date of this work. The bid securing declaration shall be submitted as per the format mentioned in the RFP. A scanned copy of the Bid Securing Declaration shall be uploaded online while applying to the tender.

Note: Forfeiture/ Forfeit and/ or appropriation/ appropriate of bid security mentioned anywhere in the RFP/Contract Agreement shall mean, "the bidder will be suspended for participation in the tendering process for the works of NHIDCL and works under other Centrally Sponsored Schemes, for a period of one year from the bid due date of this work."

16.2 **The Bid Security will be forfeited:**

a) if the Bidder withdraws the Bid after its submission during the period of Bid validity; **or**
b) if the Bidder does not accept the correction of the bid price, pursuant to Clause 27; **or**
c) in the case of a successful Bidder, if the Bidder fails within the specified time limit to
   i. **Sign the Agreement**; and/or
   ii. **Furnish the required Performance Security;** and/or
   iii. **Submit the original documents as specified in Clause 12.2;**
   iv. **Corrupt or Fraudulent Practices as specified in Clause 35.**

17. Alternative Proposals by Bidders

17.1 Bidder shall submit offers that fully comply with the requirement of the bidding document including conditions of contract, conditional offer or alternate offer will not be considered further in the process of tender evaluationand the bid will be declared **non-responsive**.

18. Format and Signing of Bid

18.1 The Bidder shall submit e-bid comprising of the documents as described in Clause 12 of the ITB.

D. Submission of Bids

19. Marking of Bids

19.1 The documents to be submitted in Online Mode should be as per clause 12.2 of ITB

20. Schedule for Submission of Bids

20.1 Complete E-Bid to be uploaded on e-procurementportal before due date & time.

20.2 The Employer may extend the deadline for submission of bids by issuing an amendment in accordance with Clause 10, in which case all rights and obligations of the Employer and the bidders previously subject to the original deadline will then be subject to the new deadline.

20.3 The detailed schedule for submission of bid shall be, as given in Appendix to ITB.

21. Deleted

22. Modification and Withdrawal of Bids

22.1 Bidders may modify or withdraw their e-bids before the deadline prescribed in Clause20.

22.2 No bid may be modified after the deadline for submission of Bids.

22.3 Withdrawal of a Bid between the deadline for submission of bids and the expiration of the original period of bid validity specified in Clause 15.1 above or as extended pursuant to Clause 15.2 shall result in the forfeiture of the Bid security pursuant to Clause 16.

E. Bid Opening and Evaluation

23. Bid Opening

Bid opening shall be carried out in two stages. Firstly, 'Technical Bid' of all the bids received shall be opened on the date and time mentioned in the Appendix to ITB. 'Financial Bid' of those bidders whose technical bid has been determined to be substantially responsive shall be opened on the subsequent date through online process of e-tender, which will be notified to such bidders.

23.1 The Employer will open the "Technical Bid" of all the bids received within due date and time, in the presence of the bidders/bidders' representatives who choose to attend at the time, date and place specified in the **NIB**. In the event of the specified date for the submission of bids being declared a holiday for the Employer, the Bids will be opened at the appointed time and location on the next working day.

23.2 In all other cases, the Bid Security Declaration, forms and validity shall be announced. Thereafter, the Employer at the opening as the Employer may consider appropriate, will announce the bidders' names and such other details.

23.3 The Employer will prepare minutes of the Bid opening, including the information disclosed to those present in accordance with Clause 23.1.

23.4

i. The bids accompanied with bid security declaration will be taken up for evaluation with respect to the Qualification Information and other information furnished in Part I of the bid pursuant to Clause 12.1.

ii. As soon as possible, the Evaluation Committee will finalize the list of responsive bidders whose financial bids are eligible for consideration. However, to assist in the examination, evaluation of technical bids, the Employer may at his discretion, ask any bidder for clarification of his bid, however, no additional documents in support of clarification will be entertained.

23.5 The Employer shall inform the bidders, whose technical bids are found responsive, of the date, time and place of opening of the financial bids. The bidders so informed, or their representative, may attend the meeting of opening of financial bids.

23.6 The financial bids of only the responsive bidders will be opened. The responsive bidders' names, the Bid prices, the total amount of each bid, pursuant to clause 22 and such other details as the Employer may consider appropriate will be announced by the Employer at the time of bid opening.

23.7 The Employer shall prepare the minutes of the opening of the Financial Bids.

24. Process to be Confidential

24.1 Information relating to the examination, clarification, evaluation, and comparison of bids and recommendations for the award of a contract shall not be disclosed to bidders or any other persons not officially concerned with such process until the award to the successful Bidder has been announced. Any attempt by a Bidder to influence the Employer's processing of bids or award decisions may result in the rejection of his Bid.

25. Clarification of Bids and Contacting the Employer

25.1. To assist in the examination, evaluation, and comparison of Bids, the Employer may, at his discretion, ask any Bidder for clarification of his-Bid, including breakdowns of unit rates. The request for clarification and the response shall be in writing or by email, but no change in the price or substance of the Bid shall be sought, offered, or permitted except as required to confirm the correction of arithmetic errors discovered by the Employer in the evaluation of the Bids in accordance with Clause 27.

25.2 Subject to sub-clause 25.1, no Bidder shall contact the Employer on any matter relating to his bid from the time of the bid opening to the time the contract is awarded. If the Bidder wishes to bring additional information to the notice of the Employer, he should do so in writing.

25.3 Any effort by the Bidder to influence the Employer in the Employer's bid evaluation, bid comparison or contract award decisions may result in the rejection of the Bidders' bid.

26. Examination of Bids and Determination of Responsiveness

26.1 During the detailed evaluation of "Technical Bids", the Employer will determine whether each Bid

(a) meets the eligibility criteria defined in Clauses 3 and 4;
(b) the required documents uploaded by the bidder are in order; and
(c) is substantially responsive to the requirements of the bidding documents. During the detailed evaluation of the "Financial Bids", the responsiveness of the bids will be further determined with respect to the remaining bid conditions, i.e., priced bill of quantities, technical specifications and drawings etc.

27. Correction of Errors.

27.1 Financial Bids determined to be substantially responsive will be checked by the Employer for any arithmetic errors.

27.2 The amount stated in the Financial Bid will be corrected by the Employer for the correction of errors and shall be considered as binding upon the Bidder. If the Bidder does not accept the corrected amount, the Bid will be rejected, and the Bid Security shall be forfeited in accordance with Sub-Clause 16.6(b).

28. Evaluation and Comparison of Financial Bids.

28.1 The Employer will evaluate and compare only the bids determined to be substantially responsive in accordance with Clause 26.

28.2 In evaluating the bids, the Employer will determine for each Bid the evaluated Bid price by adjusting the Bid price after making any correction for errors pursuant to Clause 27;

28.3 **If the Bid of the successful Bidder is seriously unbalanced** then an irrevocable and unconditional guarantee from a Bank should also be submitted in the same form given in Section-IV towards an Additional Performance Security **(the "Additional Performance Security"**) for an amount calculated as under:

a) If the Bid Price offered by the Selected Bidder is lower than 15% but upto 20% of the Estimated Project Cost, then the Additional Performance Security shall be 10% of the Bid Price offered by the selected Bidder.

b) If the Bid Price offered by the Selected Bidder is lower than 20% of the Estimated Project Cost, then the Additional Performance Security shall be 20% of the Bid Price offered by the Selected Bidder.

c) This Additional Performance Security shall be treated as part of the Performance Security.

28.4 A bid, which is quoted unrealistically low and which cannot be substantiated satisfactorily by the bidder, may be rejected as non-responsive.

29. Deleted

F. Award of Contract.

30. Award Criteria.

30.1 Subject to Clause 32, the Employer will award the Contract to the Bidder whose Bid has been determined:

i. To be substantially responsive to the bidding documents and who has offered the lowest evaluated Bid price.

31. Employer's Right to accept any Bid and to reject any or all Bids

31.1 Notwithstanding Clause 30, the Employer reserves the right to accept or reject any Bid, and to cancel the bidding process and reject all bids, at any time prior to the award of Contract, without thereby incurring any liability to the affected Bidder or bidders or any obligation to inform the affected Bidder or bidders of the grounds for the Employer's action.

32. Notification of Award and Signing of Agreement.

32.1 The bidder who's Bid has been accepted will be notified of the award by the Employer. This letter (hereinafter and in the Part I *General Conditions of Contract* called the "Letter of Acceptance") will state the sum that the Employer will pay to the Contractor in consideration of the execution, completion and maintenance of the Works, by the Contractor as prescribed by the Contract (hereinafter and in the Contract called the "Contract Price").

32.2. The notification of award will constitute the formation of the Contract.

32.3. The Agreement will incorporate all agreements between the Employer and the successful Bidder. It will be signed by the Employer and the successful Bidder within 7 days of receipt of valid Performance Security for full amount.

33. Performance Security.

33.1 **Within 15 (fifteen) days** after receipt of the Letter of Acceptance, the successful Bidder shall deliver to the Employer a balance Performance Security i.e. **3% percent of the Contract Price**, valid for the period of **28 days** after the expiry of defect liability period from the date of issue of certificate of completion of work plus additional security for unbalanced Bid in accordance with clause 28.3 of ITB and sign the contract. The performance Security for the work shall be as mentioned in the Appendix to ITB.

33.2 The performance security shall be either in the form of a Bank Guarantee in the name of the Employer, from a Bank as per the details specified below or can be submitted by online mode directly into the NHIDCL's bank account as mentioned in **Data sheet.** Bank Guarantee shall be accepted from Public Sector Banks or Scheduled Private Sector Banks having Net Worth of Rs. 1,000/- Crores or more as per latest annual report of the bank. Authority reserves the right to add or remove any of names bank on which BG shall be accepted based on advisory from the Government/RBI. **The BGs issued by 'Foreign Banks' and 'Banks not mentioned in the list below' shall not be accepted.**

List of Public Sector Banks	List of Scheduled Private Sector Banks
1. Bank of Baroda	1. Axis Bank Ltd.
2. Bank of India	2. Bandhan Bank Ltd.
3. Bank of Maharashtra	3. CSB Bank Ltd.
4. Canara Bank	4. City Union Bank Ltd.
5. Central Bank of India	5. DCB Bank Ltd.
6. Indian Bank	6. Federal Bank Ltd.
7. Indian Overseas Bank	7. HDFC Bank Ltd.
8. Punjab National Bank	8. ICICI Bank Ltd.
9. Punjab & Sind Bank	9. Indusind Bank Ltd.
10. State Bank of India	10. IDFC First Bank Ltd.
11. UCO Bank	11. Jammu & Kashmir Bank Ltd.
12. Union Bank of India	12. Karnataka Bank Ltd.
	13. Karur Vysya Bank Ltd.
	14. Kotak Mahindra Bank Ltd.
	15. Lakshmi Vilas Bank Ltd.
	16. RBL Bank Ltd.
	17. South Indian Bank Ltd.
	18. Tamilnadu Mercantile Bank Ltd.
	19. Yes Bank Ltd.
	20. IDBI Bank Ltd.

33.3 Failure of the successful bidder to comply with the requirement of sub-clause 33.1 shall constitute sufficient ground for cancellation of the contract and forfeiture of the bid security converted into Performance Security (part) and debarment for a period of 2 years from the date of debarment.

34. Advances.

34.1 The Employer will provide Mobilization Advance as provided in Part-I General Conditions of Contract.

35. Corrupt or Fraudulent Practices.

The Employer will reject a proposal for award if it determines that the Bidder recommended for award has engaged in corrupt or fraudulent practices in competing for the contract in question and will declare the firm ineligible, either indefinitely or for a stated period of time, to bid for any work with National Highways Authority of India, if it at any time determines that the firm has engaged in corrupt or fraudulent practices in competing for the contract, or in its execution.

For the purpose of this clause, the following terms shall have the meaning hereinafter respectively assigned to them

(a) **" Corrupt practice"** means (i) the offering, giving, receiving, or soliciting, directly or indirectly, of anything of value to influence the actions of any person connected with the Bidding Process (For avoidance of doubt, offering of employment to, or employing, or engaging in any manner whatsoever, directly or indirectly, any official of the Authority who is or has been associated in any manner, directly or indirectly, with Bidding Process, at any time prior to the expiry of one year from the date such official resigns or retires from or otherwise ceases to be in the service of the Authority, shall be deemed to constitute influencing the actions of a person connected with the Bidding Process);

(b) **"Fraudulent practice"** means a misrepresentation or omission of facts or suppression of facts or disclosure of incomplete facts, in order to influence the Bidding Process;

The Employer requires the bidders/Contractors to strictly observe the laws against fraud and corruption enforced in India, namely, Prevention of Corruption Act, 1988.

Appendix to ITB

Clause No.

1.1 The Employer is Managing Director, National Highways & Infrastructure Development Corporation Limited**.**

No. NHIDCL/Infra/Ladakh/Police/2020-21/

"Construction of various RCC infrastructure works for Ladakh Police in the Union Territory of Ladakh"

1.1 **3.1** Bidder may be a natural person, private entity, sole or partnership firm, company incorporated and registered in India**.**

4.4 (a) achieved an average annual financial turnover (in all classes of civil engineering construction only) equivalent to **20% of the Estimated Cost put to tender** during last three year ending 31st March of the previous financial year duly certified by Chartered Accountant and shall have a minimum Net Worth of **5% of the Estimated Cost put to tender** at the close of the preceding financial year.

4.4 (b)

i. One similar completed work** costing not less than amount equals to **80% of the Estimated Cost put to tender**

OR

ii. Two similar completed works** costing not less than amount equals to **60% of the Estimated Cost put to tender**

OR

iii. Three similar completed works** costing not less than amount equals to **40% of the Estimated Cost put to tender.**

(**The "similar work" means Construction of RCC buildings or any other RCC infrastructure work)

15.3 Bid Document fee (Incl. 18% GST): Rs.5,900/- (Rupees Five Thousand Nine Hundred only.)

20.3 Schedule for submission of Bids

Sl. No.	Event Description	Date
1.	Invitation of RFP (NIT)	03.02.2021
2.	Last date for receiving queries through e-mail	11.02.2021 upto 11:00 AM
3.	Pre-BID meeting through VC (Bidder may request link for VC through email)	11.02.2021 at 03:00 PM
4.	Authority response to queries latest by	16.02.2021 upto 11:00 AM
5.	BID submission start date	18.02.2021 (from 11:00 AM IST)
6.	BID Due Date for online submission	24.02.2021 (upto 1100 Hrs IST)
7.	Physical Submission of Bid	Before opening of Financial Bid
8.	Opening of Technical BIDs	25.02.2021 (1130 Hrs IST onwards)
9.	Declaration eligible / qualified bidders	To be intimated later
10.	Opening of Financial BID	To be intimated later
11.	Letter of Award (LOA)	To be intimated later
12.	Validity of BID	120 days from bid due date

33.1 Performance Security : 3% of the Contract Price.

33.2 Bank Account details of NHIDCL **(only for Performance Security)** are given below:

Sr.No.	Particulars	Details
1	Name of Beneficiary	MD-NHIDCL
2	Beneficiary Bank Account No.	90621010002659
3	Beneficiary Bank Branch Name and Address	Canara Bank (erstwhile Syndicate Bank), Transport Bhawan, 1- Parliament Street, NewDelhi110001
4	Beneficiary Bank Branch IFSC	SYNB0009062
5	SWIFT Code (For Foreign Bidders)	SYNBINBB126

Format for CV

Photo

Format of Curriculum Vitae (CV) For Proposed Key Staff

1. Proposed Position: _____
2. Name of Staff: _____
3. Date of Birth: _____**(Please furnish proof of age)**
4. Nationality: _____
5. Educational Qualification:

(*Summarize college/university and other specialized education of staff member, giving names of schools, dates attended and degrees obtained).* ***(Please furnish proof of qualification)***
Contact Address with Phone and mobile numbers:

6. Membership of Professional Societies: _____
7. Publication:

(List of details of major technical reports/papers published in recognized national and international journals)

8. Employment Record:

(Starting with present position, list in reversed order, every employment held. List all positions held by staff member since graduation, giving dates, names of employing organization, title of positions held and location of assignments. For experience ***period of specific assignment must be clearly mentioned*****,** also give client references, where appropriate).

9. Summary of the CV

(Furnish a summary of the above CV. The information in the summary shall be precise and accurate. The information in the summary will have bearing on the evaluation of the CV).

A) Education:
i) Field of Diploma/Graduation and year
ii) Field of post-graduation and year
iii) Any other specific qualification
B) Experience:
i) Total experience : _____ Yrs
ii) Responsibilities held:

a) _____Yrs.
b) _____ Yrs.
c) _____ Yrs.
d) Relevant Experience: _____ Yrs.
C)Permanent Employment with the Firm (Yes/No):

If yes, how many years:
If no, what is the employment?
Arrangement with the firm?
Certification:

1 *I am willing to work on the project and I will be available for entire duration of the project assignment and I will not engage myself in any other assignment during the currency of this assignment on the project*

2 I, the undersigned, certify that to the best of my knowledge and belief, this bio-data correctly describes myself my qualification and my experience.

Signature of the Candidate _____

Place _____
Date _____

Signature of the Authorized Representative of the firm_____
Place _____
Date _____

Note: Each page of the CV shall be signed in ink by both the staff member and the Authorized Representative of the firm.

(SECTION –III)

QUALIFICATION INFORMATION

The information to be filled in by the Bidder in this section on E-portal & **Scanned Copies of documents to be submitted online** will be used for the purposes of post qualification as provided for in Clause 4 of the Instructions to Bidders.

1. For Individual Bidders

1.1 Constitution or legal status of Bidder

[Upload scanned copy of Original]

Details of Ownership _____

Place of registration: _____

Principal place of business: _____

1.2 Power of attorney of signatory of Bid
[Upload scanned copy & also submit Original copy in physical form]

1.3 Total value of Civil Engineering construction work performed in the last three years (in Rs. Lakh) Refer ITB Clause 4.5 A(a)
(Upload scanned copies of Turnover certificates from Chartered Accountant & also submit original certificate from Chartered Accountant)

2017-2018----------
2018-2019----------
2019-2020----------

Total ----------
Average per year ----------

1.4 **(a)** Work performed as prime contractor, work performed in the past as a nominated sub- contractor duly approved by Employer will also be considered, provided further that all other qualification criteria are satisfied (in the same name) on works of a similar nature during the last **Five** years to qualify as per ITB.

Project Name	Name of the Employer*	Description of work	Contract No.	Value of Contract (Rs. Crore)	Date of issue of work order	Stipulated period of completion	Actual date of completion *	Remarks explaining reasons for delay & work Completed

** Attach certificate(s) from the minimum rank of Executive Engineer or equivalent*

Note: In case of nominated sub-contractor – a certificate from the minimum rank of Executive Engineer or equivalent of the Prime Employer should be obtained from whom an approval for subcontractor has been obtained.

(b) Information on Bid Capacity (works for which bids have been submitted and accepted and works which are yet to be completed) as on the date 7 days before the last date for bid submission (as per CI 4.6 of the ITB).

(i) Existing commitments and on-going works (B)

Description of works	Place & State	Contract No.	Name & Address of Employer	Value of Contract (Rs. Cr)	Stipulated Period of Completion	Value of works remaining to be completed in the next N years (Rs Cr)	Escalation factor	Anticipated date of completion	Escalated value of remaining work during completion period of work for which bids are invited
1	2	3	4	5	6	7	8	9	10

ii) Details of works for which bid submitted and accepted (i.e. where contract signing is pending)

Description of works	Place & State	Name & Address of Employer	Date of issue of Latter of Acceptance (LOA)	Value given in LOA	Stipulated period for completion	Value of work during completion period of work for which bids are invited
1	2	3	4	5	6	7

Upload copy of LOA

iii) Bid capacity (Bidder shall calculate, mention his bid capacity and enclose the supporting calculation)
A = Rs _____ Lakh (enclose the details)
B = Rs…_____Lakh (enclose the details)
Assessed Available Bid capacity = (A* 2.5 - B)

1.5. The bidder must provide information regarding Availability of Key Equipment essential for carrying out the Works.

Item of Equipment	**Requirement**	**Availability Proposals**			**Page no. of the proof attached**
		Owned/Leased/rented	**Nos./Capacity**	**Age/Condition**	
Tipper/Trucks					
Hydraulic Excavator					
Batch Mix Plant					

Concrete Mixer					
Water Tanker					
Transit Mixer					
Vibrators					
Concrete Pump					
Crane/Hydra					
Any Other Equipment/ Machinery required to carry out the work					

1.6. Qualifications and Experience of Key Personnel proposed for administration and execution of the Contract. **Attach biographical data for technical personnel.**

Position	**Name**	**Qualification**	**Year of Experience (General)**	**Years of experience in the proposed position**
Etc.				

Note : The detailed and signed CV's of all the Key Technical Personnel, signed by the key personnel himself, be uploaded along with the bid as per proforma given in Appendix to ITB.

1.7. Information on litigation/ arbitration history in which the Bidder is involved.

Other Party (ies)	Employer	Cause of Dispute	Amount involved	Remarks showing Present Status

2. Bidders should provide the following affidavits/ undertakings as per formats enclosed hereafter: -

(i) Affidavit (it should be on stamp paper attested by Notary)
(ii) Undertaking that the Bids shall remain valid for the period specified in Clause 15.1.

AFFIDAVIT

(To be notarized by Notary)

1. I, the undersigned, do hereby certify that all the statements made in the required attachments are true and correct.

2. The undersigned also hereby certifies that neither our firm M/s_____ have abandoned any work on National Highways in India nor any contract awarded to us for such works have been rescinded, during last **Five** years prior to the date of this bid.

3. The undersigned hereby authorize(s) and request(s) any bank, person, firm or corporation to furnish pertinent information deemed necessary and requested by the Department to verify this statement or regarding my (our) competence and general reputation.

4. The undersigned understand and agrees that further qualifying information may be requested, and agrees to furnish any such information at the request of the Department Project implementing agency.

_____
(Signed by an Authorized Officer of the Firm)

_____
Title of Officer

_____
Name of Firm

_____
DATE

UNDERTAKING

I, the undersigned do hereby undertake on behalf of our firm M/s [Name of the bidder], that we shall not withdraw or modify our bid during the period of validity from the bid submission date.

I, on behalf of the bidder, [Name of the bidder], also accept the fact that in case the bid is withdrawn or modified during the period of its validity or if we fail to sign the contract in case the work is awarded to us or we fail to submit a performance security before the deadline defined in the Bid, then [Name of the bidder] will be debarred for participation in the tendering process for the works of NHIDCL and other works under other Centrally Sponsored Schemes, for a period of two year from the bid due date of this work.

_____

(Signed by an Authorized Officer of the Firm)

_____

Title of Officer

_____

Name of Firm

_____

DATE

Annexure-A

Letter Head of the Statutory Auditor
(Giving phone number, address and email address)
CERTIFICATE OF NET WORTH BY STATUTORY AUDITOR

1. This certificate is being issued on the request of ……..(Name of the Bidder and address) for participating in tender in respect of National Highways and Infrastructure Development Corporation of India Ltd. in accordance with the applicable auditing standards and guidance Note issued by the Institute of Chartered Accountant of India.
2. We M/s ……..(Name of the Statutory Auditor) are statutory auditors of ……..……..(Name of the Bidder) for the year ended 31st March 20XX (appropriate year may be filled in).

   Note 1: In case the certificate is issued by any firm other than statutory Auditors of a company, the form no. ADT 1.duly filed with the Registrar of Companies is attached.

   Note 2: In cases the Bidder does not have statutory auditor, the firm of chartered accountants that audited last financial statements/books of accounts shall be treated as Statutory Auditor while in case of a company, the statutory auditor shall have same meaning as 'Auditor' defined under the Companies Act, 2013.
3. We have obtained all relevant record and information that were necessary for providing this certificate.
4. We have read and understood the tender documents relating to financial (**e.g. 'Turnover' and 'Net worth**), verified the standalone audited financial statements of …… (Name of the Bidder), books of accounts and other relevant records and information as at 31st March 20XX produced before us by ……..……..(Name of the Bidder), and on basis of such verification, information and explanation given to us, we certify that Net Worth of ……..……..(Name of the Bidder) as on 31 March 20XX has been computed strictly in compliance with the provision of clause 2.2.2.9(ii) of the RFP documents of the NHIDCL and as under:

Sr. No.	Particulars	Amount (₹ in lakh)	Remarks
1	Paid of Equity Share Capital (This does not include advance against equity and application money pending allotment)		
2	Reserves and Surpluses (Other equity in case of Financial Statements are prepared under Ind AS) created out of profits)		
2.1	Accumulated Profits		
2.2	Share/Security premium		
2.3	Other Reserves		
	Total		
	Less Accumulated losses, if any		
	Less Miscellaneous expenditure to the extent not written off or adjusted		
	Less Deferred Revenue Expenditure, if any		
	Less write back of depreciation, if any		
	Less any other reserve created out of profits like amalgamation, capital restructuring, first time adoption of Ind AS or debt		

	restructuring prior to full settlement of debts.		

5. This is certified that the Calculation of Net worth is based on **standalone financial statements** of ……..……..(Name of the Bidder) prepared in conformity with applicable Accounting Standards and it does not include following components:
   i. Advance against equity;
   ii. Share application money, pending allotment;
   iii. Redeemable or non-redeemable Preference share capital ;
   iv. Convertible and non-convertible debentures;
   v. Revaluation Reserves;
   vi. Accumulated losses;
   vii. Write back of depreciation;
   viii. Other comprehensive income, in cases where financial statements are prepared based on Ind AS;
   ix. Reserves created from restructuring of debt etc till their settlement of debts;
   x. Deferred Tax Liabilities; and
   xi. Impact of restructuring or amalgamation of the bidder.

For XYZ & Associates
Chartered Accountant
(FRN: ……)

Name of CA: ……..
Partner/Proprietor Membership No.: ……
Place: ……
Date: …….
UDIN: ……

Annexure-B

Letter Head of the Statutory Auditor
(Giving phone number, address and email address)

CERTIFICATE OF TURNOVER BY STATUTORY AUDITOR

1. This certificate is being issued on the request of ……..(Name of the Bidder and address) for participating in tender in respect of National Highways and Infrastructure Development Corporation of India Limited in accordance with the applicable auditing standards and guidance Note issued by the Institute of Chartered Accountant of India.
2. We M/s ……..(Name of the Statutory Auditor) are statutory auditors of ……..……..(Name of the Bidder) for the year ended 31st March 20XX (appropriate year may be filled in).

   Note 1: In case the certificate is issued by any firm other than statutory Auditors of a company, the form no. ADT 1.duly filed with the Registrar of Companies is attached.

   Note 2: In cases the Bidder does not have statutory auditor, the firm of chartered accountants that audited last financial statements/books of accounts shall be treated as Statutory Auditor while in case of a company, the statutory auditor shall have same meaning as 'Auditor' defined under the Companies Act, 2013.
3. We have obtained all relevant record and information that were necessary for providing this certificate.
4. We have read and understood the tender documents relating to financial and technical capacity (**e.g. 'Turnover' and 'Net worth**), verified the standalone audited financial statements of …… (Name of the Bidder), books of accounts and other relevant records and information as at 31st March 20XX produced before us by ……..……..(Name of the Bidder), and on basis of such verification, information and explanation given to us, we certify as under:

S.No.	Financial year	Turnover (₹ In lakh)
1	Year 1 (2019-2020)	
2	Year2 (2018-2019)	
3	Year 3 (2017-2018)	

In case financial statements of the latest financial year are not audited and therefore, the bidder cannot make it available, the bidder shall provide an undertaking to this effect and statutory auditor shall certify the same. In such case, the bidder shall provide the audited financial statements for five year immediately preceding the year for which the audited annual report is not being produced as per clause 2.2.2.8 of the RFP. In case, undertaking duly certified by statutory auditor is not submitted under such circumstances, the annual turnover for the year for which audited annual financial statements are not available shall be considered as 'Nil' for the purposes of arriving at the average annual turnover.

5. Annual Turnover updated to the price level of the year, based on factors indicated in table xxx of the tender documents, is given below:

Year	Year-1	Year-2	Year-3	Year-4	Year-5
Updation factor	**1.00**	**1.05**	**1.10**	**1.15**	**1.20**
Actual Turnover (₹ In lakh)					
Updated Turnover (₹ In lakh)					

Average Updated Turnover (to the price level of the year) = …… (₹ In lakh)

6. This is also certified that the Calculation of turnover is based on **standalone financial statements** of ……..……..(Name of the Bidder) prepared in conformity with applicable Accounting Standards and it does not include any component of indirect tax like GST.
7. This is also certified that the that turnover mentioned in para 5 is in individual capacity of ……..……..(Name of the Bidder) and its share in the Joint Venture where the work had been executed jointly with other party/parties and such a joint venture is not a separate legal entity. Further, the above turnover does not include any turnover related to joint venture or subsidiary having a separate legal entity.
8. This is also certified that turnover mentioned in para 5 is in respect of execution of construction/ civil /engineering activities and does not include any trading activity of ……..……..(Name of the Bidder).

For XYZ & Associates
Chartered Accountant
(FRN: ……)

Name of CA: ……..
Partner/Proprietor Membership No.: ……
Place: ……
Date: ……
UDIN: ……

SECTION-IV
FORMS OF BANK GUARANTEES, LOA & AGREEMENT
Form of Bank Guarantee
[Performance Security/Additional Performance Security]

To

_____[name of Authority]

_____ [address of Authority]

WHEREAS_____[name and address of Contractor] (hereafter called the "Contractor") has undertaken, in pursuance of Letter of Acceptance (LOA) No. Dated_ for construction of [name of the Project] (hereinafter called the"Contract")

AND WHEREAS the Contract requires the Contractor to furnish an {Performance Security/ Additional Performance Security} for due and faithful performance of its obligations, under and in accordance with the Contract, during the {Construction Period/ Defects Liability Period and Maintenance Period} in a sum of Rs….. cr. (Rupees ……..…….. crore) (the **"Guarantee Amount"**[1]).

AND WHEREAS we, …….. through our branch at .... (the **"Bank"**) have agreed to furnish this Bank Guarantee (hereinafter called the **"Guarantee"**) by way of Performance Security.

NOW, THEREFORE, the Bank hereby, unconditionally and irrevocably, guarantees and affirms as follows:

1. The Bank hereby unconditionally and irrevocably guarantees the due and faithful performance of the Contractor's obligations during the {Construction Period/ Defects Liability Period and Maintenance Period} under and in accordance with the Contract, and agrees and undertakes to pay to the Authority, upon its mere first written demand, and without any demur, reservation, recourse, contest or protest, and without any reference to the Contractor, such sum or sums up to an aggregate sum of the Guarantee Amount as the Authority shall claim, without the Authority being required to prove or to show grounds or reasons for its demand and/or for the sum specified therein.
2. A letter from the Authority, under the hand of an officer not below the rank of [General Manager of National Highways & Infrastructure Development Corporation Limited], that the Contractor has committed default in the due and faithful performance of all or any of its obligations under and in accordance with the Contract shall be conclusive, final and binding on the Bank. The Bank further agrees that the Authority shall be the sole judge as to whether the Contractor is in default in due and faithful performance of its obligations during and under the Contract and its decision that the Contractor is in default shall be final and binding on the Bank, notwithstanding any differences between the Authority and the Contractor, or any dispute between them pending before any court, tribunal, arbitrators or any other authority or body, or by the discharge of the Contractor for any reason whatsoever.
3. In order to give effect to this Guarantee, the Authority shall be entitled to act as if the Bank were the principal debtor and any change in the constitution of the Contractor and/or the Bank, whether by their absorption with any other body or corporation or otherwise, shall not in any way or manner affect the liability or obligation of the Bank under this Guarantee.

[1] Guarantee Amount for Performance Security and Additional Performance Security shall be calculated as per Contract.

4. It shall not be necessary, and the Bank hereby waives any necessity, for the Authority to proceed against the Contractor before presenting to the Bank its demand under this Guarantee.
5. The Authority shall have the liberty, without affecting in any manner the liability of the Bank under this Guarantee, to vary at any time, the terms and conditions of the Contract or to extend the time or period for the compliance with, fulfillment and/ or performance of all or any of the obligations of the Contractor contained in the Contract or to postpone for any time, and from time to time, any of the rights and powers exercisable by the Authority against the Contractor, and either to enforce or forbear from enforcing any of the terms and conditions contained in the Contract and/or the securities available to the Authority, and the Bank shall not be released from its liability and obligation under these presents by any exercise by the Authority of the liberty with reference to the matters aforesaid or by reason of time being given to the Contractor or any other forbearance, indulgence, act or omission on the part of the Authority or of any other matter or thing whatsoever which under any law relating to sureties and guarantors would but for this provision have the effect of releasing the Bank from its liability and obligation under this Guarantee and the Bank hereby waives all of its rights under any such law.
6. This Guarantee is in addition to and not in substitution of any other guarantee or security now or which may hereafter be held by the Authority in respect of or relating to the Contract or for the fulfillment, compliance and/or performance of all or any of the obligations of the Contractor under the Contract.
7. Notwithstanding anything contained hereinbefore, the liability of the Bank under this Guarantee is restricted to the Guarantee Amount and this Guarantee will remain in force for the period specified in paragraph 8 below and unless a demand or claim in writing is made by the Authority on the Bank under this Guarantee all rights of the Authority under this Guarantee shall be forfeited and the Bank shall be relieved from its liabilities hereunder.
8. The Guarantee shall cease to be in force and effect on ****. Unless a demand or claim under this Guarantee is made in writing before expiry of the Guarantee, the Bank shall be discharged from its liabilities hereunder.
9. The Bank undertakes not to revoke this Guarantee during its currency, except with the previous express consent of the Authority in writing, and declares and warrants that it has the power to issue this Guarantee and the undersigned has full powers to do so on behalf of the Bank.
   Any notice by way of request, demand or otherwise hereunder may be sent by post addressed to the Bank at its above referred branch, which shall be deemed to have been duly authorized to receive such notice and to effect payment thereof forthwith, and if sentby post it shall be deemed to have been given at the time when it ought to have been delivered in due course of post and in proving such notice, when given by post, it shall be sufficient to prove that the envelope containing the notice was posted and a certificate signed by an officer of the Authority that the envelope was so posted shall be conclusive.

10. This Guarantee shall come into force with immediate effect and shall remain in force and effect for up to the date specified in paragraph 8 above or until it is released earlier by the Authority pursuant to the provisions of the Contract.
11. This Guarantee is subject to the Uniform Rules for Demand Guarantees (URDG) 2010 Revision, ICC Publication No. 758, except that the supporting statement under Article 15(a) is hereby excluded.
12. This guarantee shall also be operatable at our…….Branch at New Delhi, from whom, confirmation regarding the issue of this guarantee or extension / renewal thereof shall be made available on demand. In the contingency of this guarantee being invoked and payment thereunder claimed, the said branch shall accept such invocation letter and make payment of amounts so demanded under the said invocation.

13. The guarantor/bank hereby confirms that it is on the SFMS (Structural Finance Messaging System) platform & shall invariably send an advice of this Bank Guarantee to the designated bank of [MoRT&H/NHAI/NHIDCL/State PWD/BRO], details of which is as under:

S.No.	Particulars	Details
1	Name of Beneficiary	National Highways & Infrastructure Development Corporation Limited
2	Beneficiary Bank Account No.	90621010002659
3	Beneficiary Bank Branch IFSC	IFSC SYNB0009062
4	Beneficiary Bank Branch Name	Transport Bhawan, New Delhi
5	Beneficiary Bank Address	Canara Bank (erstwhile Syndicate Bank) transport Bhawan, 1st Parliament Street, New Delhi-110001

Signed and sealed this ……. day of ……., 20…… at ……..

SIGNED, SEALED AND DELIVERED
For and on behalf of the Bank by:
(Signature)
(Name)
(Designation)
(Code Number)
(Address)

FORM OF LETTER OF APPLICATION

To,

General Manager (Tech.)
National Highways & Infrastructure Development Corporation Limited.
2nd Floor, PTI Building,
4, Parliament Street,
New Delhi - 110001

Name of Work: Construction of various RCC infrastructure works of Ladakh Police in the Union Territory of Ladakh

Dear Sir,

Having examined the Bid Document, Instruction to Bidders Qualification Information, Scope of works, etc. for the subject work. We, hereby submit our technical and financial bid for the subject work.

It is certified that the information furnished in this document is true and correct. The proposal is unconditional and unqualified. We undersigned accept that NHIDCL reserves the right to reject any or all application without assigning any reason.

Thanking you,

Yours faithfully,

(Authorized Signatory)
For and on behalf of M/s_____

FORM OF LETTER OF ACCEPTANCE

No. …… Dated ……..

To
M/s…….

Sub.: ……. Name of Work ……

Sir,

Based on your bid submitted on …….. in compliance of bidding document of NHIDCL for execution of the work of …… , it is hereby notified that your bid for a contract price of **Rs…… (Rupees in words……)** has been accepted by the Competent Authority.

You are hereby requested to furnish unconditional Performance Security in the form detailed in para 33.2 of ITB for an amount equivalent to **Rs…… (Rupees in words……)** within 15 days as per provisions of clause 33.1 of ITB of the bid document and failing which the actions as stipulated in clause- 33.3 of ITB shall be taken. You are also required to sign the contract agreement within 7 days from the receipt of the valid performance security.

Thanking you,

Yours faithfully,

(……..)
Authorized Signatory

FORM OF AGREEMENT

AGREEMENT

This agreement made the _____day of _____ 20…..._____ between the National Highways & Infrastructure Development Corporation Limited, New Delhi (hereinafter called "the Employer" of the one part and _____ (here in after called "the Contractor") of the other part.

AND WHEREAS the Employer invited bids from eligible bidders for the execution of certain works, viz ……

AND WHEREAS pursuant to the bid submitted by the Contractor, vide _____ (here in after referred to as the "BID" or "ÖFFER") for the execution of works, the Employer by his letter of acceptance dated _____ accepted the offer submitted by the Contractor for the execution and completion of such works and remedying of any defects thereon, on terms and conditions in accordance with the documents listed in para 2 below.

AND WHEREAS the Contractor by a deed of undertaking dated _____ has agreed to abide by all the terms of the bid, including but not limited to the amount quoted for the execution of Contract, as stated in the bid, and also to comply with such terms and conditions as may be required from time to time.

AND WHEREAS the contractor has agreed to undertake such works and has furnished a performance security pursuant to clause 33 of the instructions to bidders (Section-I).

NOW THIS AGREEMENT WITNESSETH as follows:

1. In this agreement words and expressions shall have the same meaning as are respectively assigned to them in the conditions of contract hereinafter referred to;

2. the following documents shall be deemed to form and be read and construed as part of this agreement viz.

    (a) Agreement,
    (b) Letter of Acceptance
    (c) Contractor's Bid including Financial Bid Form,
    (d) Contract Data,
    (e) Conditions of Contract
    (f) Scope of work & Technical specifications
    (g) List of Approved Makes of Materials
    (h) Drawings
    (i) Bill of Quantities, and
    (j) Any other document listed in the Contract Data.

3. The foregoing documents shall be construed as complementary and mutually explanatory one with another. Should any ambiguity or discrepancy be noted then the order of precedence of these documents shall be subject to the order as listed above and interpreted in the above order of priority.

4. In consideration of the payments to be made by the Employer to the Contractor as hereinafter mentioned, the Contractor hereby covenants with the Employer to

execute and complete the works and remedy any defects therein in conformity in all respects with the provisions of the contract.

5. the employer hereby covenants to pay the contractor in consideration of the execution and completion of the works and remedying of defects therein, the contract price or such other sum as may become payable under the provisions of the contract at the times and in the manner prescribed by the contract.

IN WITNESS WHEREOF the parties here to have caused this agreement to be executed the day and year above written. Signed, sealed and delivered by the said Employer through his Authorized Representative and the said Contractor through his Power of Attorney holder.

Binding Signature of Employer _____

For and on behalf of National Highways & Infrastructure development Corporation Limited, New Delhi

Binding Signature of Contractor _____

For and on behalf of M/s. _____

In the presence of
1. Name :
   Address:

2. Name :
   Address:

In the Presence of
1. Name:
   Address:

2. Name:
   Address:

FORMAT FOR POWER OF ATTORNEY FOR SIGNING OF BID

Know all men by these presents, We **(name of the firm and address of the registered office)** do hereby irrevocably constitute, nominate, appoint and authorize Mr./Ms (name), son/daughter/wife of **(Name)** and presently residing at **(Address)**, who is presently employed with us/ the Lead Member of our Joint Venture and holding the position of **(Designation),** as our true and lawful attorney (hereinafter referred to as the "Attorney") to do in our name and on our behalf, all such acts, deeds and things as are necessary or required in connection with or incidental to submission of our BID for the Project proposed or being developed by the National Highways & Infrastructure Development Corporation Ltd. (the "Authority") including but not limited to signing and submission of all applications, BIDs and other documents and writings, participate in Pre-BID and other conferences and providing information/ responses to the Authority, representing us in all matters before the Authority, signing and execution of all contracts including the agreement and undertakings consequent to acceptance of our BID, and generally dealing with the Authority in all matters in connection with or relating to or arising out of our BID for the said Project and/ or upon award thereof to us and/or until the entering into of the Contract with the Authority.

AND we hereby agree to ratify and confirm and do hereby ratify and confirm all acts, deeds and things done or caused to be done by our said Attorney pursuant to and in exercise of the powers conferred by this Power of Attorney and that all acts, deeds and things done by our said Attorney in exercise of the powers hereby conferred shall and shall always be deemed to have been done by us.

IN WITNESS WHEREOF WE,……., THE ABOVE NAMED PRINCIPAL HAVE EXECUTED THIS POWER OF ATTORNEY ON THIS …… DAY OF ……. 2…..

For ……..

(Signature, name, designation and address)
of person authorized by Board Resolution
(in case of Firm/ Company)/ partner in case of Partnership

Witnesses:
firm
1.
2.

Accepted

…… (Signature)
(Name, Title and Address of the Attorney)

(Notarised)
Person identified by me/ personally appeared before me/
Attested/ Authenticated*
(*Notary to specify as applicable)
(Signature Name and Address of the Notary)

Seal of the Notary
Registration No. of the Notary
Date:……

Notes:

- *The mode of execution of the Power of Attorney should be in accordance with the procedure, if any, laid down by the applicable law and the charter documents of the executant(s) and when it is so required, the same should be under common seal affixed in accordance with the required procedure.*
- *Wherever required, the Bidder should submit for verification the extract of the charter documents and documents such as a board or shareholders' resolution/ power of attorney in favour of the person executing this Power of Attorney for the delegation of power hereunder on behalf of the Bidder.*
- *For a Power of Attorney executed and issued overseas, the document will also have to be legalised by the Indian Embassy and notarised in the jurisdiction where the Power of Attorney is being issued. However, the Power of Attorney provided by Bidders from countries that have signed the Hague Legislation Convention 1961 are not required to be legalised by the Indian Embassy if it carries a conforming Appostille certificate.*

Bid Securing Declaration

(Refer Clause 16)

I hereby submit a declaration that the bid submitted by the undersigned, on behalf of the bidder, **[Name of the bidder],** either sole or in JV, shall not be withdrawn or modified during the period of validity i.e. not less than 180 (one hundred eighty) days from the bid due date.

I, on behalf of the bidder, **[Name of the bidder]**, also accept the fact that in case the bid is withdrawn or modified during the period of its validity or if we fail to sign the contract in case the work is awarded to us or we fail to submit a performance security before the deadline defined in clause 7 of the Request for Proposal (RFP), then **[Name of the bidder]** will be suspended for participation in the tendering process for the works of NHIDCL and works under other Centrally Sponsored Schemes, for a period of one year from the bid due date of this work.

(Signature of the Authorised Signatory)
(Official-Seal)

(SECTION –V)

CONDITIONS OF CONTRACT & CONTRACT DATA

Table of Clauses

Section V

Conditions of Contract

A. General

1. Definitions

1.1 Terms which are defined in the Contract Data are not defined in the Conditions of Contract but keep their defined meanings. Capital initials are used to identify defined terms.

Bill of Quantities means the priced and completed Bill of Quantities forming part of the Bid.

Compensation Events are those defined in Clause 41 hereunder.

The Completion Date is the date of completion of the Works as certified by the Engineer, in accordance with Clause 49.1.

The Contract is the Contract between the Employer and the Contractor to execute, complete, and maintain the Works. It consists of the documents listed in Clause 2.3.

The Contract Data defines the documents and other information, which comprise the Contract.

The Contractor is a person or corporate body whose Bid to carry out the Works has been accepted by the Employer.

The Contractor's Bid is the completed bidding document submitted by the Contractor to the Employer and includes technical and financial bids.

The Contract Price is the price stated in the Letter of Acceptance and thereafter as adjusted in accordance with the provisions of the Contract.

Days are calendar days; months are calendar months.

A **Defect** is any part of the Works not completed in accordance with the Contract.

The Defects Liability Certificate is the certificate issued by Engineer, after the Defect Liability Period has ended and upon correction of Defects by the Contractor.

The Defects Liability Period is the period named in contact data and calculated from the Completion Date.

Drawings include calculations and other information provided or approved by the Engineer for the execution of the Contract.

The Employer is the party as defined in the Contract Data, who employs the Contractor to carry out the Works. The Employer may delegate any or all of its functions to a person or body nominated by him for specified functions.

The Engineer is the person named in the Contract Data (or any other competent person appointed by the Employer and notified to the Contractor, to act in replacement of the Engineer) who is responsible for supervising the execution of the Works and administering the Contract.

Equipment is the Contractor's machinery and vehicles brought temporarily to the Site to construct the Works.

The Initial Contract Price is the Contract Price listed in the Employer's Letter of Acceptance.

The Intended Completion Date is the date on which it is intended that the Contractor shall complete the Works. The Intended Completion Date is specified in the Contract Data. The Intended Completion Date may be revised only by the Engineer by issuing an extension of time after the approval from Employer.

Materials are all supplies, including consumables, used by the Contractor for incorporation in the Works.

Plant is any integral part of the Works that shall have a mechanical, electrical, electronic, chemical, or biological function.

The **Site** is the area defined as such in the Contract Data.

Site Investigation Reports are those that were included in the bidding documents and are factual interpretative reports about the surface and subsurface conditions at the Site.

Specification means the Specification of the Works included in the Contract and any modification or addition made or approved by the Engineer.

The **Start Date** is given in the Contract Data. It is the date when the Contractor shall commence execution of the Works. It does not necessarily coincide with any of the Site Possession Dates.

A **Sub-Contractor** is a person or corporate body who has a Contract with the Contractor to carry out a part of the work in the Contract, which includes work on the Site.

Temporary Works are works designed, constructed, installed, and removed by the Contractor that are needed for construction or installation of the Works.

A **Variation** is an instruction given by the Engineer after the approval from NHIDCL, which varies the Works.

The **Works** are what the Contract requires the Contractor to construct, install, maintain, and handover to the Employer, as defined in the Contract Data.

2. Interpretation

2.1 In interpreting these Conditions of Contract, singular also means plural, male also means female or neuter, and the other way around. Headings have no significance. Words have their normal meaning under the language of the Contract unless specifically defined. The Engineer will provide instructions clarifying queries about these Conditions of Contract.

2.2 If sectional completion is specified in the Contract Data, references in the Conditions of Contract to the Works, the Completion Date, and the Intended Completion Date apply to any Section of the Works (other than references to the Completion Date and Intended Completion Date for the whole of the Works).

2.3 The documents forming the Contract shall be interpreted in the following order of priority.

(a) Agreement,

(b) Letter of Acceptance
(c) Contractor's Bid including Financial Bid Form,
(d) Contract Data,
(k) Conditions of Contract
(f) Scope of work & Technical specifications
(g) List of Approved Makes of Materials
(h) Drawings
(g) Bill of Quantities, and
(h) Any other document listed in the Contract Data.

3. Language and Law

3.1 The language of the Contract and the law governing the Contract are stated in the Contract Data.

4. Engineer's Decisions

4.1 Except where otherwise specifically stated, the Engineer will decide contractual matters between the Employer and the Contractor in the role representing the Employer.

5. Delegation

5.1 The Engineer, duly informing the Employer, may delegate any of his duties and responsibilities to other people except to the Adjudicator, after notifying the Contractor, and may cancel any delegation after notifying the Contractor.

6. Communications

6.1 Communications between parties that are referred to in the Conditions shall be effective only when in writing. A notice shall be effective only when it is delivered.

7. Subcontracting

7.1 The Contractor may subcontract any portion of work, up to a limit specified in Contract Data, with the prior approval of the Employer in writing. Subcontracting shall not alter the Contractor's obligations.

7.2 The Contractor shall not be required to obtain any consent from the Employer for:

a. the sub-contracting of any part of the Works for which the Sub-Contractor is named in the Contract;
b. the provision of labour or labour component.
c. the purchase of Materials which are in accordance with the standards specified in the Contract.

7.3 Beyond what has been stated in clauses 7.1 and 7.2, if the Contractor proposes sub-contracting of any part of the work during execution of the Works, because of some unforeseen circumstances to enable him to complete the Works as per terms of the Contract, the Employer will consider the following before according approval:

a) The Contractor shall not sub-contract the Works more than the limit specified in Contract Data.
b) The Contractor shall not sub-contract any part of the Work without prior consent of the Employer. Any such consent shall not relieve the Contractor from any liability or

obligation under the Contract and he shall be responsible for the acts, defaults and neglects of any of his sub-Contractor, his agents or workmen as fully as if they were the acts, defaults or neglects of the Contractor, his agents and workmen.

7.3 The Engineer should satisfy himself before recommending to the Employer whether

a) the circumstances warrant such sub-contracting; and
b) the sub-Contractor so proposed for the Work possess the experience, qualifications and equipment necessary for the job proposed to be entrusted to him in proportion to the quantum of Works to be sub-contracted.

8. Other Contractors

8.1 The Contractor shall cooperate and share the Site with other Contractors, public authorities, utilities, and the Employer between the dates given in the Schedule of Other Contractors, as referred to in the Contract Data. The Contractor shall also provide facilities and services for them as described in the Schedule. The Employer may modify the Schedule of Other Contractors, and shall notify the Contractor of any such modification.

8.2 The Contractor should take up the works in convenient reaches as decided by the Engineer to ensure there is least hindrance to the smooth flow of traffic including movement of vehicles and equipment of other Contractors till the completion of the Works.

9. Personnel

9.1 The Contractor shall employ the technical personnel named in the Contract Data. The ED, NHIDCL will approve any proposed replacement of technical personnel (except Project Manager) only if their relevant qualifications and experience are substantially equal to or better than those of the personnel stated in the Contract Data. If the personnel stated in the contract data are not deployed on site by the contractor, a penalty of Rs. 50,000/- per month in case of Project Manager and Rs. 25,000/- in case of other key personnel will be imposed upto a maximum period of 3 months. Thereafter, it will be treated as a breach of contract and action will be taken as per clause 53. The replacement of Project Manager will be approved by Engineer in Charge after the approval of Competent Authority.

9.2 If the Engineer asks the Contractor to remove a person who is a member of the Contractor's staff or work force, stating the reasons, the Contractor shall ensure that the person leaves the Site within seven days and has no further connection with the Works in the Contract.

10. Employer's and Contractor's Risks

10.1 The Employer carries the risks which this Contract states are Employer's risks, and the Contractor carries the risks which this Contract states are Contractor's risks.

11. Employer's Risks

11.1 The Employer is responsible for the excepted risks which are (a) in so far as they directly affect the execution of the Works in the Employer’s country, the risks of war, hostilities, invasion, act of foreign enemies, rebellion, revolution, insurrection or military or usurped power, civil war, riot commotion or disorder (unless restricted to the Contractor’s employees), natural calamities and contamination from any nuclear fuel or nuclear waste or radioactive toxic explosive, or (b) a cause due solely to the design of the Works, other than the Contractor’s design.

12. Contractor's Risks

12.1 All risks of loss of or damage to physical property and of personal injury and death, which arise during and in consequence of the performance of the Contract other than the excepted risks, are the responsibility of the Contractor.

13. Insurance

13.1 The Contractor at his cost shall provide, in the joint names of the Employer and the Contractor, insurance cover from the Start Date to the end of defect liability period for events (a) to (d), in the amounts and deductibles stated in the Contract Data for the following events which are due to the Contractor's risks:

a) loss of or damage to the Works, Plant and Materials;
b) loss of or damage to Equipment;
c) loss of or damage to property (except the Works, Plant, Materials, and Equipment) in connection with the Contract; and
d) Personal injury or death.

13.2 Insurance policies and certificates for insurance shall be delivered by the Contractor to the Engineer for the Engineer's approval before the Start Date. All such insurance shall provide for compensation to be payable in Indian Rupees to rectify the loss or damage incurred.

13.3 If the Contractor does not provide any of the policies and certificates required, the Employer may affect the insurance which the Contractor should have provided and recover the premiums the Employer has paid from payments otherwise due to the Contractor or, if no payment is due, the payment of the premiums shall be debt due.

13.4 Alterations to the terms of insurance shall not be made without the approval of the Engineer.

13.4 Both parties shall comply with any conditions of the insurance policies.

14. Site Investigation Reports

14.1 The Contractor, in preparing the Bid, may rely on any Site Investigation Reports referred to in the Contract Data, supplemented by any other information available to him, before submitting the bid. However, at the time of execution, the contractor may carry out necessary site investigation for design of the foundations in consultation with the engineer.

15. Queries about the Contract Data

15.1 The Executive Director will clarify queries on the Contract Data.

16. Contractor to Construct the Works & maintenance during defect liability.

16.1 The Contractor shall construct, install and maintain the Works during defect liability period in accordance with the documents forming part of the contract. No payment for maintenance during defect liability period is payable.

17. The Works to Be Completed by the Intended Completion Date

17.1 The Contractor may commence execution of the Works on the Start Date and shall carry out the Works in accordance with the Programme submitted by the Contractor, as updated with the approval of the Engineer, and complete them by the Intended Completion Date.

18. Approvals

18.1 The Contractor shall submit Specifications, Design and Drawings including quantities of each item showing the proposed Works to the Engineer within 15 days of signing of Contract Agreement, who shall approve them after proof checking within 7 days, if they comply with specifications and drawings.

18.2 The Contractor shall be responsible for detailed design and drawing of all the Works.

18.3 The Engineer's approval shall not alter the Contractor's responsibility for design of all Works.

18.4 The Contractor shall obtain approval of third parties to the design of all the Works, where required, as directed by the Engineer.

18.5 All Drawings prepared by the Contractor for the execution of the temporary or permanent Works, are subject to prior approval by the Engineer before their use.

18.6 The Contractor shall construct the structures as per contract specifications and as per the design approved by the Engineer. In case of any deficiencies, the same will be intimated to the contractor for rectification.

19. Safety

19.1 The Contractor shall be responsible for the safety of all activities on the Site.

20. Discoveries

20.1 Anything of historical or other interest or of significant value unexpectedly discovered on the Site shall be the property of the Employer. The Contractor shall notify the Engineer of such discoveries and carry out the Engineer's instructions for dealing with them.

21. Possession of the Site

21.1 The Employer shall give complete possession of the Site to the Contractor on the date of signing of agreement.

22. Access to the Site

22.1 The Contractor shall allow access to the Site and to any place where work in connection with the Contract is being carried out, or is intended to be carried out and to any place where material or plant are being manufactured /fabricated / assembled for the works to the engineer and any person/persons/agency authorized by:

a. The Engineer
b. The Employer

23. Instructions

23.1 The Contractor shall carry out all instructions of the Engineer, which comply with the applicable laws where the Site is located.

23.2 The Contractor shall permit the Employer to inspect the Contractor's accounts and records relating to the performance of the Contractor and to have them audited by Auditors appointed by the Employer if so required by the Employer.

24. Maintenance

24.1 The contractor shall maintain the buildings/structure during the defect liability period of 05 years. No separate payment will be made to the contractor for maintenance during the defect liability period.

25. Dispute and Arbitration

25.1 Dispute Resolution

(i) Any dispute, difference or controversy of whatever nature howsoever arising under or out of or in relation to this Agreement (including its interpretation) between the Parties, and so notified in writing by either Party to the other Party (the "Dispute") shall, in the first instance, be attempted to be resolved amicably in accordance with the conciliation procedure set forth in Clause 25.2.

(ii) The Parties agree to use their best efforts for resolving all Disputes arising under or in respect of this Agreement promptly, equitably and in good faith, and further agree to provide each other with reasonable access during normal business hours to all non- privileged records, information and data pertaining to any Dispute.

25.2 Conciliation

In the event of any Dispute between the Parties, either Party may call upon the Authority's Engineer, or such other person as the Parties may mutually agree upon (the "Conciliator") to mediate and assist the Parties in arriving at an amicable settlement thereof. Failing mediation by the Conciliator or without the intervention of the Conciliator, either Party may require such Dispute to be referred to the Chairman of the Authority and the Chairman of the Board of Directors of the Contractor for amicable settlement, and upon such reference, the said persons shall meet no later than 7 (seven) business days from the date of reference to discuss and attempt to amicably resolve the Dispute. If such meeting does not take place within the 30 (thirty) business day period or the Dispute is not amicably settled within 30 (thirty) days of the meeting or the Dispute is not resolved as evidenced by the signing of written terms of settlement within 30 (thirty) days of the notice in writing referred to in Clause 25.1. or such longer period as may be mutually agreed by the Parties, either Party may refer the Dispute to arbitration in accordance with the provisions of Clause 25.3 but before resorting to such arbitration, the parties agree to explore conciliation by the Conciliation Committees of Independent Experts set up by the Authority in accordance with the procedure decided by the panel of such experts and notified by the Authority on its website including its subsequent amendments. In the event of the conciliation proceedings being successful, the parties to the dispute would sign the written settlement agreement and the conciliators would authenticate the same. Such settlement agreement would then be binding on the parties in terms of Section 73 of the Arbitration Act. In case of failure of the conciliation process even at the level of the Conciliation Committee, either party may refer the Dispute to arbitration in accordance with the provisions of Clause 25.3.

25.3 Arbitration

(i) Any dispute which remains unresolved between the parties through the mechanisms available/ prescribed in the Agreement, irrespective of any claim value, which has notbeen agreed upon/ reached settlement by the parties, will be referred to the Arbitral Tribunal as per the Arbitration and Conciliation Act.

(ii) Deleted

(iii) The Arbitral Tribunal shall make a reasoned award (the "Award"). Any Award made in any arbitration held pursuant to this Clause 25 shall be final and binding on the Parties as from the date it is made, and the Contractor and the Authority agree and undertake to carry out such Award without delay.

(iv) The Contractor and the Authority agree that an Award may be enforced against the Contractor and/or the Authority, as the case may be, and their respective assets wherever situated.

(v) This Agreement and the rights and obligations of the Parties shall remain in full force and effect, pending the Award in any arbitration proceedings hereunder. Further, the parties unconditionally acknowledge and agree that notwithstanding any dispute between them, each Party shall proceed with the performance of its respective obligations, pending resolution of Dispute in accordance with this Article.

(vi) In the event the Party against whom the Award has been granted challenges the Award for any reason in a court of law, it shall make an interim payment to the other Party for an amount equal to 75% (seventy five per cent) of the Award, pending final settlement of the Dispute. The aforesaid amount shall be paid forthwith upon furnishing an irrevocable Bank Guarantee for a sum equal to 120 % (one hundred and twenty per cent) of the aforesaid amount. Upon final settlement of the Dispute, the aforesaid interim payment shall be adjusted and any balance amount due to be paid or returned, as the case may be, shall be paid or returned with interest calculated at the rate of 10% (ten per cent) per annum from the date of interim payment to the date of final settlement of such balance.

25.4 Adjudication by Regulatory Authority, Tribunal or Commission

In the event of constitution of a statutory regulatory authority, tribunal or commission, as the case may be, with powers to adjudicate upon disputes between the Contractor and the Authority, all Disputes arising after such constitution shall, instead of reference to arbitration under Clause 25.3, be adjudicated upon by such regulatory authority, tribunal or commission in accordance with the Applicable Law and all references to Dispute Resolution Procedure shall be construed accordingly. For the avoidance of doubt, the Parties hereto agree that the adjudication hereunder shall not be final and binding until an appeal against such adjudication has been decided by an appellate tribunal or court of competent jurisdiction, as the case may be, or no such appeal has been preferred within the time specified in the Applicable Law.

26 Deleted

B. Time Control

27. Programme

27.1 The Engineer shall issue a Notice to Proceed for all the site locations to the contractor immediately after signing of agreement. The Contractor shall submit to the Engineer for approval a programme within **7 days from the signing of the Contract Agreement for each site separately,** showing the general methods, arrangements, order, and timing for all the activities in the Works, along with monthly cash flow forecasts.

27.2 An update of the Programme shall be a programme showing the actual progress achieved on each activity and the effect of the progress achieved on the timing of the remaining Works, including any changes to the sequence of the activities.

27.3 The Contractor shall submit to the Engineer for approval an updated Programme at intervals. If the Contractor does not submit an updated Programme within this period, the Engineer may withhold the amount stated in the Contract Data from the next payment certificate and continue to withhold this amount until the next payment after the date on which the overdue Programme has been submitted.

27.4 The Engineer's approval of the Programme shall not alter the Contractor's obligations. The Contractor may revise the Programme and submit it to the Engineer again at any time. A revised Programme shall show the effect of Variations and Compensation Events.

28. Extension of the Intended Completion Date

28.1 The Engineer shall extend the Intended Completion Date only after the approval of NHIDCL if a Compensation Event occurs or a Variation is issued which makes it impossible for Completion to be achieved by the Intended Completion Date without the Contractor taking steps to accelerate the remaining Works, which would cause the Contractor to incur additional cost.

28.2 The Engineer shall decide whether and by how much time to extend the Intended Completion Date within 21 days of the Contractor asking the Engineer for a decision upon the effect of a Compensation Event or Variation and submitting full supporting information. If the Contractor has failed to cooperate in dealing with a delay, the delay by this failure shall not be considered in assessing the new intended Completion Date.

29. Delays Ordered by the Engineer

29.1 The Engineer may instruct the Contractor to delay the start or progress of any activity within the Works.

30. Management Meetings

30.1 **Either the Engineer or the Contractor may require the other** to attend a management meeting. The business of a management meeting shall be to review the plans for the remaining Works and to deal with matters raised in accordance with the early warning procedure.

30.2 The Engineer shall record the business of management meetings and provide copies of the record to those attending the meeting. The responsibility of the parties for actions to be taken shall be decided by the Engineer either at the management meeting or after the management meeting and stated in writing to all those who attended the meeting.

C. Quality Control

31. Identifying Defects

31.1 The Engineer shall check the Contractor's work and notify the Contractor of any Defects that are noticed. Such checking shall not absolve the contractor from its obligations and its responsibilities. The Engineer may instruct the Contractor to search for a Defect and

to uncover and test any work (existing work/work executed by the contractor) that the Engineer considers may have a Defect.

32. Tests

32.1 The contractor shall be solely responsible for:

a. Carrying out the mandatory tests prescribed in the technical specifications forming part of contract.
b. For the correctness of the test results, whether preformed in his laboratory or elsewhere.
c. The Authority may engage third party for testing of executed items. The payment for the same would be made by the Authority.

32.2 If the Engineer instructs the Contractor to carry out a test not specified in the Specification to check whether any work (executed by the contractor) has a Defect and the test shows that it does, the Contractor shall pay for the test and any samples. If there is no defect, the cost of such tests shall be borne by the Authority otherwise by the Contractor.

33. Correction of Defects noticed during the Defect Liability Period.

33.1 The Engineer shall give notice to the Contractor of any Defects before the end of the Defects Liability Period, which begins at Completion and is defined in the Contract Data. The Defects Liability Period shall be extended for as long as Defects remain to be corrected.

33.2 Every time notice of a Defect is given, the Contractor shall correct the notified Defect within the reasonable time specified by the Engineer's notice as per good industry practice. If any defect including shrinkage cracks, other faults appears in the work within defect liability period, the Engineer shall give Notice to the Contractor of such defects before end of defect liability period and shall extend the defect liability period as long as defects remain to be corrected.

34. Uncorrected Defects/ Incomplete Works

34.1 If the Contractor has not corrected the Defect, to the satisfaction of the Engineer, within the time specified in the Engineer's notice/indent, the Engineer will assess the cost of having the Defect corrected and get the defects rectified through some other agency and the Contractor will pay 1.2 times of this amount.

34.2 If the Contractor has not completed the work to the satisfaction of the Engineer, within the time specified in the Engineer's notice/indent, in no case exceeding one month, the Engineer will assess the cost of having the work completed and get the work completed through some other agency and the Contractor will pay this amount in addition to the damages specified as per clause 45.

D. Cost Control

35. Bill of Quantities

35.1 The Bill of Quantities shall contain a lump sum cost for the construction, installation, testing, and commissioning and maintaining works to be done by the Contractor.

35.2 **Lump sum cost quoted by the contractor will be the Contract Price.** The Contractor is paid as per clause 40.2 for **work done in accordance with the percentage weighatge of each item as per Payment Schedule mentioned below:**

Payment Schedule

1.1 The Contract Price for this Agreement is **Rs. ……Crore.**

1.2 Proportions of the Contract Price for different stages of Construction of the each structure/building shall be as specified below:

Item	Weightage in percentage to the Contract Price	Stage for Payment	Percentage weightage to Particular item (col.2)
1	2	3	4
One building block having six units of Type-II residential quarters at Baroo Kargil	6.61%	**(1) Civil Works**	**52.15%**
		a) Earth Work	0.87%
		b) Plain Cement Concrete Work	7.77%
		c) Reinforcement Cement Concrete Work	22.77%
		d) Reinforcement Steel Work	42.85%
		e) Masonry Work	21.33%
		f) Water Proofing Work	4.41%
		(2) Architectural Works	**35.85%**
		a) Plaster	14.74%
		b) Flooring, Skirting, Dado	7.08%
		c) Painting	2.86%
		d) Doors, Windows, Glazing, Cladding, Façade, Polishing	49.56%
		e) Insulated sandwich panels PEB skeleton	25.76%
		(3) PHE Works	**7.84%**
		(4) Electrical Works	**4.02%**
		(5) Fire Fighting Works	**0.14%**
One building block having six units of Type-III residential quarters at Baroo Kargil	7.20%	**(1) Civil Works**	**51.93%**
		a) Earth Work	0.86%
		b) Plain Cement Concrete Work	7.59%
		c) Reinforcement Cement Concrete Work	23.37%
		d) Reinforcement Steel Work	41.65%
		e) Masonry Work	22.20%
		f) Water Proofing Work	4.33%
		(2) Architectural Works	**34.38%**
		a) Plaster	12.13%
		b) Flooring, Skirting, Dado	8.44%
		c) Painting	2.16%

Item	Weightage in percentage to the Contract Price	Stage for Payment	Percentage weightage to Particular item (col.2)
1	2	3	4
		d) Doors, Windows, Glazing, Cladding, Façade, Polishing	51.27%
		e) Insulated sandwich panels PEB skeleton	26.00%
		(3) PHE Works	**9.71%**
		(4) Electrical Works	**3.92%**
		(5) Fire Fighting Works	**0.06%**
Police Conference and Passport Verification Cell at District Police Office Kargil	11.62%	**(1) Civil Works**	**60.94%**
		a) Earth Work	0.90%
		b) Plain Cement Concrete Work	5.95%
		c) Reinforcement Cement Concrete Work	22.15%
		d) Reinforcement Steel Work	56.56%
		e) Masonry Work	11.37%
		f) Water Proofing Work	3.07%
		(2) Architectural Works	**30.04%**
		a) Plaster	15.35%
		b) Flooring, Skirting, Dado	10.40%
		c) Painting	2.57%
		d) Doors, Windows, Glazing, Cladding, Façade, Polishing	35.36%
		e) Insulated sandwich panels PEB skeleton	31.64%
		f) Wood Work	4.68%
		(3) PHE Works	**4.27%**
		(4) Electrical Works	**3.40%**
		(5) Fire Fighting Works	**1.35%**
District Police Office Building at Kargilby dismantling existing building	12.65%	**(1) Civil Works**	**53.46%**
		a) Plain Cement Concrete Work	7.51%
		b) Reinforcement Cement Concrete Work	24.89%
		c) Reinforcement Steel Work	48.32%
		d) Masonry Work	17.52%
		e) Water Proofing Work	1.76%
		(2) Architectural Works	**35.34%**
		a) Plaster	16.66%

Item	Weightage in percentage to the Contract Price	Stage for Payment	Percentage weightage to Particular item (col.2)
1	2	3	4
		b) Flooring, Skirting, Dado	11.52%
		c) Painting	2.68%
		d) Doors, Windows, Glazing, Cladding, Façade, Polishing	32.72%
		e) Insulated sandwich panels PEB skeleton	32.76%
		f) Wood Work	3.66%
		(3) PHE Works	**3.90%**
		(4) Electrical Works	**2.89%**
		(5) Fire Fighting Works	**4.41%**
Police Station Building at Baroo Kargil by by dismantling existing building	9.42%	**(1) Civil Works**	**60.14%**
		a) Earth Work	1.23%
		b) Plain Cement Concrete Work	5.12%
		c) Reinforcement Cement Concrete Work	13.10%
		d) Reinforcement Steel Work	67.06%
		e) Masonry Work	8.90%
		f) Landscape Work	4.59%
		(2) Architectural Works	**33.71%**
		a) Plaster	29.14%
		b) Flooring, Skirting, Dado	17.19%
		c) Painting	3.91%
		d) Doors, Windows, Glazing, Cladding, Façade, Polishing	39.61%
		e) Insulated sandwich panels PEB skeleton	7.93%
		f) Wood Work	2.22%
		(3) PHE Works	**3.87%**
		(4) Electrical Works	**1.72%**
		(5) Fire Fighting Works	**0.56%**
Anti-Human Trafficking/Children/ Woman Police Station at Kargil	9.50%	**(1) Civil Works**	**57.78%**
		a) Plain Cement Concrete Work	5.90%
		b) Reinforcement Cement Concrete Work	23.16%
		c) Reinforcement Steel Work	49.07%
		d) Masonry Work	19.28%

Item	Weightage in percentage to the Contract Price	Stage for Payment	Percentage weightage to Particular item (col.2)
1	2	3	4
		e) Water Proofing Work	2.59%
		(2) Architectural Works	**36.21%**
		a) Plaster	7.19%
		b) Flooring, Skirting, Dado	17.96%
		c) Painting	0.54%
		d) Doors, Windows, Glazing, Cladding, Façade, Polishing	52.53%
		e) Insulated sandwich panels PEB skeleton	17.68%
		f) Wood Work	4.10%
		(3) PHE Works	**3.83%**
		(4) Electrical Works	**1.63%**
		(5) Fire Fighting Works	**0.55%**
Barrack at Police Station Kargil	8.24%	**(1) Civil Works**	**54.05%**
		a) Earth Work	0.78%
		b) Plain Cement Concrete Work	6.19%
		c) Reinforcement Cement Concrete Work	20.05%
		d) Reinforcement Steel Work	53.37%
		e) Masonry Work	16.44%
		f) Water Proofing Work	3.17%
		(2) Architectural Works	**35.68%**
		a) Plaster	17.24%
		b) Flooring, Skirting, Dado	14.94%
		c) Painting	3.03%
		d) Doors, Windows, Glazing, Cladding, Façade, Polishing	47.62%
		e) Insulated sandwich panels PEB skeleton	17.17%
		(3) PHE Works	**6.99%**
		(4) Electrical Works	**3.08%**
		(5) Fire Fighting Works	**0.20%**
Multipurpose Hall at District Police Lines Kargil	11.42%	**(1) Civil Works**	**61.26%**
		a) Earth Work	1.51%
		b) Plain Cement Concrete Work	10.04%

Item	Weightage in percentage to the Contract Price	Stage for Payment	Percentage weightage to Particular item (col.2)
1	2	3	4
		c) Reinforcement Cement Concrete Work	23.16%
		d) Reinforcement Steel Work	53.63%
		e) Masonry Work	9.70%
		f) Water Proofing Work	1.96%
		(2) Architectural Works	**32.38%**
		a) Plaster	10.85%
		b) Flooring, Skirting, Dado	5.74%
		c) Painting	1.79%
		d) Doors, Windows, Glazing, Cladding, Façade, Polishing	36.82%
		e) Insulated sandwich panels PEB skeleton	28.47%
		f) Wood Work	16.33%
		(3) PHE Works	**4.29%**
		(4) Electrical Works	**1.11%**
		(5) Fire Fighting Works	**0.96%**
VIP Mess cum Assembly Hall at District Police Lines Kargil	9.48%	**(1) Civil Works**	**58.00%**
		a) Plain Cement Concrete Work	1.78%
		b) Reinforcement Cement Concrete Work	26.16%
		c) Reinforcement Steel Work	65.41%
		d) Masonry Work	4.16%
		e) Water Proofing Work	2.49%
		(2) Architectural Works	**33.96%**
		a) Plaster	10.01%
		b) Flooring, Skirting, Dado	6.46%
		c) Painting	2.09%
		d) Doors, Windows, Glazing, Cladding, Façade, Polishing	45.15%
		e) Insulated sandwich panels PEB skeleton	17.52%
		f) Wood Work	18.77%
		(3) PHE Works	**4.98%**
		(4) Electrical Works	**1.21%**
		(5) Fire Fighting Works	**1.85%**

Item	Weightage in percentage to the Contract Price	Stage for Payment	Percentage weightage to Particular item (col.2)
1	2	3	4
Jawan Recreation and Dining Hall at District Police Lines Kargil	4.90%	**(1) Civil Works**	**57.68%**
		a) Earth Work	3.01%
		b) Plain Cement Concrete Work	8.92%
		c) Reinforcement Cement Concrete Work	31.77%
		d) Reinforcement Steel Work	38.05%
		e) Masonry Work	18.25%
		(2) Architectural Works	**30.64%**
		a) Plaster	13.47%
		b) Flooring, Skirting, Dado	12.49%
		c) Painting	2.12%
		d) Doors, Windows, Glazing, Cladding, Façade, Polishing	42.07%
		e) Insulated sandwich panels PEB skeleton	29.85%
		(3) PHE Works	**7.36%**
		(4) Electrical Works	**2.73%**
		(5) Fire Fighting Works	**1.59%**
Jawan Barrack at District Police Lines Kargil	8.96%	**(1) Civil Works**	**70.56%**
		a) Plain Cement Concrete Work	2.52%
		b) Reinforcement Cement Concrete Work	25.55%
		c) Reinforcement Steel Work	63.60%
		d) Masonry Work	5.87%
		e) Water Proofing Work	2.46%
		(2) Architectural Works	**23.68%**
		a) Plaster	12.46%
		b) Flooring, Skirting, Dado	13.47%
		c) Painting	1.99%
		d) Doors, Windows, Glazing, Cladding, Façade, Polishing	43.50%
		e) Insulated sandwich panels PEB skeleton	28.58%
		(3) PHE Works	**4.01%**
		(4) Electrical Works	**1.66%**
		(5) Fire Fighting Works	**0.09%**

36. Variations

36.1 Change in quantities either w.r.t. the Cost Estimate or the quantities submitted by the contractor as per design & drawings and approved by the Engineer shall not constitute variation or Change of Scope (COS). However, for any new items to be executed by the contractor as per the directions and approval of the Engineer will be considered as variation or change in scope for which Engineer will issue a notice to the contractor.

36.2 In case of change in design of the building by the Employer or by the Engineer due to which the floor area increases or new building is asked to construct, the cost of new building/structure in such cases shall be dealt on the basis of quoted rates/cost of the nearest building.

37. Payments for Variations

The Contractor shall, within 14 days of the issue of order of Variation work, inform the Engineer the rate which he proposes to claim, supported by analysis of the rates. The Engineer shall assess the quotation and determine the rate based on prevailing market rates within 15 days of the submission of the claim by the Contractor and approval from NHIDCL will be taken. As far as possible, the rate analysis shall be based on the standard data book and the current schedule of rates of the district public works division.

38. Cash Flow Forecasts

38.1 When the Programme is updated, the Contractor shall provide the Engineer with an updated cash flow forecast.

39. Payment Certificates

39.1 The Contractor shall submit to the Engineer in accordance of clause 40.2 the value of the work executed with supporting documents.

39.2 The Engineer shall check the Contractor's statement within 7 days and certify the amount to be paid to the Contractor after taking into account any credit or debit for the month in question.

39.3 The value of work executed shall be determined, based on measurements certified by the Engineer.

39.4 The value of work executed shall comprise the value of the quantities of the items executed in accordance with the payment schedule.

39.5 The value of work executed shall also include the valuation of Variations and Compensation Events.

39.6 The Engineer may exclude any item certified in a previous certificate or reduce the proportion of any item previously certified in any certificate in the light of later information to rectify the mistakes with detail justification acceptable to Employer.

39.7 The final bill shall be submitted by the contractor within one month of the actual date of completion of the work; otherwise the Engineers certificate of the measurement and of the total amount payable for work accordingly shall be final and payment made accordingly within a period of sixty days.

40. Payments

40.1 Payments shall be adjusted for deductions for advance payments, security deposit, other recoveries in terms of the Contract and taxes at source, as applicable under the law. The Employer shall pay the Contractor the amounts Engineer had certified within 14 days of the date of each certificate.

40.2 The contractor shall submit to the Engineer bill in three copies and the Authorized Representative of the Employer shall make the payment certified by the Engineer.

40.3 The Contractor shall submit to the Engineer a bill prepared in accordance with the approved quantities and as per the Payment Schedule attached as Annexure-IV for the work executed for each building/structure. The minimum value of work of all the executed items for each building should be 1% of the Total Cost (Civil, Architectural, Electrical, PHE & Fire Fighting) of that building/structure for the purpose of claim of bill.

41. Compensation Events

41.1 The following shall be Compensation Events unless they are caused by the Contractor:

a) The Engineer orders a delay or does not issue/approve drawings, specifications or instructions required for execution of works in reasonable time.
b) The Engineer gives an instruction for dealing with an unforeseen condition, caused by the Employer, or additional work required for safety or other reasons.
c) Other contractors, public authorities, utilities or the Employer does not work within the dates and other constraints stated in the Contract, and they cause delay or extra cost to the Contractor.

41.2 If a Compensation Event would prevent the Works being completed before the Intended Completion Date, the Intended Completion Date shall be extended. The Engineer shall decide whether and by how much the Intended Completion Date shall be extended after the approval of the employer.

41.3 The contractor shall not be entitled to compensation to the extent that the Employer's interests are adversely affected by the Contractor not having given early warning or not having cooperated with the Engineer/Employer.

42. Currencies for payments

All payments will be made in Indian Rupees.

43. Deleted

44. Security Deposit / Retention Money

44.1 The Employer shall retain security deposit of five percent of the amount from each payment due to the Contractor until Completion of the whole of the Works.

44.2 The security deposit/retention money and the performance security will be released to the Contractor when the Defect Liability period is over, and the Engineer has certified that the Defects, if any, notified by the Engineer to the Contractor before the end of this period have been corrected.

44.3 If the contractor so desires then the Security Deposit/retention money can be released on submission of unconditional Bank Guarantee at the following two stages:-

(a) At a point after the progress of work in financial term (gross value of work done) has reached 50% of the contract amount

(b) After the retention money has been deducted to the full value (5% of the Contract Amount).

45. Liquidated Damages

45.1 The Contractor shall pay liquidated damages to the Employer at the rate or part thereof stated in the Contract Data for each day that the Completion Date is later than the Intended Completion Date. The total amount of liquidated damages shall not exceed the amount defined in the Contract Data. The Employer may deduct liquidated damages from payments due to the Contractor and/ or Performance Bank Guarantee. Payment of liquidated damages shall not affect the Contractor's other liabilities.

45.2 If the Intended Completion Date is extended after liquidated damages have been paid, the Engineer shall correct any overpayment of liquidated damages by the Contractor by adjusting in the next payment certificate. The contractor shall not be paid interest on the over payment of liquidated damages.

46. Advance Payment

Deleted

47. Securities

47.1 Subject to further condition in contract data, the Performance Security equal to three percent of the contract price shall be provided to the Employer no later than the date specified in the Letter of Acceptance and shall be issued in the form given in the Contract Data and by a prescribed bank. The Performance Security shall be valid until a date 28 days after the expiry of Defect Liability Period The validity shall account for additional 45 days time to account for BG verification, signing of contract and start date

48 Cost of Repairs

48.1 Loss or damage to the Works or Materials to be incorporated in the Works between the Start Date and the end of the Defects Liability Period shall be remedied/ rectified by the Contractor at their cost if the loss or damage arises from the Contractor's acts or omissions.

E. Finishing the Contract

49. Completion

49.1 When the whole of the works has been completed as per the provision of the Contract, the Contractor shall request the Engineer to issue a certificate of Completion of the Works. The Engineer shall, within 14 days of the date of receipt of such request, either issue to the Contractor, with a copy to the Employer, a completion certificate, stating the date on which, the works were completed in accordance with the contract, or give instructions in writing to the contractor specifying all the work which, in the Engineer's opinion, is required to be done by the Contractor before the issue of such certificate.

50. Taking Over

50.1 The Employer shall take over the Site and the Works within fifteen days of the Engineer's issuing a certificate of Completion.

51. Final Account

The Contractor shall supply to the Engineer with a detailed account of the total amount that the Contractor considers payable under the Contract before the end of the Defects Liability Period. The Engineer shall issue a Defects Liability Certificate and certify any final payment that is due to the Contractor within 56 days of receiving the Contractor's account if it is correct and complete. If it is not, the Engineer shall issue within 56 days a schedule that states the scope of the corrections or additions that are necessary. If the Final Account is still unsatisfactory after it has been resubmitted, the Engineer shall decide on the amount payable to the Contractor and issue a payment certificate within 56 days of receiving the Contractor's revised account.

52. "As built" Drawings

The Contractor is required to submit 'As Built Drawing' for the work executed before release of final payment. If the Contractor does not supply the Drawings and/or manuals by the stipulated date or they do not receive the Engineer's approval, the Engineer shall withhold the amount equal to Rs. 5 lakhs from payments due to the Contractor.

53. Termination/Foreclosure

53.1 The Employer may terminate the Contract if the Contractor causes a fundamental breach of the Contract.

53.2 Fundamental breaches of Contract include, but shall not be limited to, the following:

a) the Contractor stops work for 28 days when no stoppage of work is shown on the current Programme and the stoppage has not been authorized by the Engineer;
b) the Contractor is declared as bankrupt or goes into liquidation other than for approved reconstitution or amalgamation;
c) the Engineer/Employer gives Notice that failure to correct a particular Defect is a fundamental breach of Contract and the Contractor fails to correct it within a reasonable period of time determined by the Engineer;
d) the Contractor does not maintain a Security, which is required;
e) the Contractor has delayed the completion of the Works by the number of days for which the maximum amount of liquidated damages can be paid, as defined in clause 45;
f) the Contractor fails to provide insurance cover as required under clause 13;
g) if the Contractor, in the judgement of the Employer, has engaged in the corrupt or fraudulent practice in competing for or in executing the Contract. For the purpose of this paragraph, **" Corrupt practice"** means (i) the offering, giving, receiving, or soliciting, directly or indirectly, of anything of value to influence the actions of any person connected with the Bidding Process (For avoidance of doubt, offering of employment to, or employing, or engaging in any manner whatsoever, directly or indirectly, any official of the Authority who is or has been associated in any manner, directly or indirectly, with Bidding Process, at any time prior to the expiry of one year from the date such official resigns or retires from or otherwise ceases to be in the service of the Authority, shall be deemed to constitute influencing the actions of a person connected with the Bidding Process);

h) **"Fraudulent practice"** means a misrepresentation or omission of facts or suppression of facts or disclosure of incomplete facts, in order to influence the Bidding Process; if the Contractor has not completed at least thirty percent of the value of Work required to be completed after half of the completion period has elapsed;
i) if the Contractor fails to set up a field laboratory with the prescribed equipment, within the period specified; and
j) any other fundamental breach as specified in the Contract Data.

53.3 Without prejudice to any other right or remedies which the Employer may have under this contract, upon occurrence of a Contractor's fundamental breach of contract, the Employer shall be entitled to terminate this contract by issuing a Termination Notice to the Contractor ; provided that before issuing the Termination Notice, the Employer shall by a Notice inform the Contractor of its intention to issue such Termination Notice and grant 15 days to the Contractor to make a representation, and may after the expiry of such 15 days, whether or not it is in receipt of such representation, issue the Termination Notice.

53.4 Notwithstanding the above, the Employer may terminate the Contract for convenience.

53.5 If the Contract is terminated, the Contractor shall stop work immediately, make the Site safe and secure, and leave the Site as soon as reasonably possible but in no case later than 7 days.

53.6 Foreclosure- NHIDCL may foreclose the contract before the expiry of the scheduled contract period due to administrative decision by giving one month Notice.

54. Payment upon Termination / Foreclosure

If the Contract is terminated because of a fundamental breach of Contract by the Contractor, the Engineer shall issue a certificate for the value of the work done less advance payments received up to the date of the issue of the certificate and less the percentage to apply to the value of the work not completed, as indicated in the Contract Data. Additional Liquidated Damages shall not apply. If the total amount due to the Employer exceeds any payment due to the Contractor, the difference shall be a debt payable to the Employer and Employer may recover the same from Performance Bank Guarantee.

55. Property

All Materials on the Site, Plant, Equipment, Temporary Works, and Works shall be deemed to be the property of the Employer for use for completing balance work if the Contract is terminated because of the Contractor's fundamental breach of contract.

56. Release from Performance

If the Contract is frustrated by the outbreak of war or by any other event entirely outside the control of the Employer or the Contractor, the Engineer shall certify that the Contract has been frustrated. The Contractor shall make the Site safe and stop work as quickly as possible after receiving this certificate and shall be paid for all work carried out before receiving it and for any work carried out afterwards to which a commitment was made.

F. Other Conditions of Contract

57. Labour

57.1 The Contractor shall, make arrangements of his own cost and expenses for the engagement of all staff and labour, local or others; for their payment, housing, feeding and transport; and for compliance with various labour laws/ regulations.

57.2 The Contractor shall, as asked by the Engineer, deliver to the Engineer a return in detail, in such form and at such intervals as the Engineer may prescribe, showing the staff and the numbers of the several classes of labour from time to time employed by the Contractor on the Site and such other information as the Engineer may require.

58. COMPLIANCE WITH LABOUR REGULATIONS

58.1 During the currency of the Contract, the Contractor and his sub Contractors shall abide at all times by all existing labour enactments and rules made thereunder, regulations, notifications and bye laws of the State or Central Government or local authority and any other labour law (including rules), regulations, bye laws that may be notified already or that may be notified under any labour law in future either by the State or the Central Government or the local authority. Salient features of some of the major labour laws that are applicable to construction industry are given below. The Contractor shall keep the Employer indemnified in case any action is taken against the Employer by the competent authority on account of contravention of any of the provisions of any Act or rules made thereunder, regulations or notifications including amendments. If the Employer is caused to pay or reimburse, such amounts as may be necessary to cause or observe, or for non-observance of the provisions stipulated in the notifications/bye laws/Acts/Rules/regulations including amendments, if any, on the part of the Contractor, the Engineer/Employer shall have the right to deduct any money due to the Contractor including from his performance security/ retention money. The Employer/Engineer shall also have right to recover from the Contractor any sum required or estimated to be required for making good the loss or damage suffered by the Employer. The employees of the Contractor and the Sub-Contractor in no case shall be treated as the employees of the Employer at any point of time.

58.2 SALIENT FEATURES OF SOME MAJOR LABOUR LAWS APPLICABLE TO ESTABLISHMENTS ENGAGED IN BUILDING AND OTHER CONSTRUCTION WORK.

a) **Workmen Compensation Act 1923**: - The Act provides for compensation in case of injury by accident arising out of and during the course of employment.

b) **Payment of Gratuity Act 1972**: - Gratuity is payable to an employee under the Act on satisfaction of certain conditions on separation if an employee has completed the prescribed minimum years (say, five years) of service or more or on death the rate of prescribed minimum days' (say, 15 days) wages for every completed year of service. The Act is applicable to all establishments employing the prescribed minimum number (say, 10) or more employees.

c) **Employees P.F. and Miscellaneous Provision Act 1952**: The Act Provides for monthly contributions by the Employer plus workers at the rate prescribed (say, 10% or 8.33%). The benefits payable under the Act are:

i. Pension or family pension on retirement or death as the case may be.
ii. Deposit linked insurance on the death in harness of the worker.
iii. Payment of P.F. accumulation on retirement/death etc.

d) **Maternity Benefit Act 1951**: - The Act provides for leave and some other benefits to women employees in case of confinement or miscarriage etc.

e) **Contract Labour (Regulation & Abolition) Act 1970**: - The Act provides for certain welfare measures to be provided by the Contractor to contract labour and in case the Contractor fails to provide, the same are required to be provided, by the Principal Employer by Law. The principal Employer is required to take Certificate of Registration and the Contractor is required to take license from the designated Officer. The Act is applicable to the establishments or Contractor of Principal Employer if they employ prescribed minimum (say 20) or more contract labour.

f) **Minimum Wages Act 1948**: - The Employer is to pay not less than the Minimum Wages fixed by appropriate Government as per provisions of the Act if the employment is a scheduled employment. Construction of buildings, roads,runways are scheduled employment.

g) **Payment of Wages Act 1936:** - It lays down as to by what date the wages are to be paid, when it will be paid and what deductions can be made from the wages of the workers.

h) **Equal Remuneration Act 1979**: - The Act provides for payment of equal wages for work of equal nature to male and female workers and for not making discrimination against female employees in the matters of transfers, training and promotions etc.

i) **Payment of Bonus Act 1965**: - The Act is applicable to all establishments employing prescribed minimum (say, 20) or more workmen. The Act provides for payments of annual bonus within the prescribed range of percentage of wages to employees drawing up to the prescribed amount of wages, calculated in the prescribed manner. The Act does not apply to certain establishments. The newly set-up establishments are exempted for five years in certain circumstances. States may have different number of employment size.

j) **Industrial Disputes Act 1947**: - The Act lays down the machinery and procedure for resolution of industrial disputes, in what situations a strike or lock-out becomes illegal and what are the requirements for laying off or retrenching the employees or closing down the establishment.

k) **Industrial Employment (Standing Orders) Act 1946**: - It is applicable to all establishments employing prescribed minimum (say, 100, or 50). The Act provides for laying down rules governing the conditions of employment by the Employer on matters provided in the Act and get these certified by the designated Authority.

l) **Trade Unions Act 1926**: - The Act lays down the procedure for registration of trade unions of workmen and Employers. The Trade Unions registered under the Act have been given certain immunities from civil and criminal liabilities.

m) **Child Labour (Prohibition & Regulation) Act 1986**: - The Act prohibits employment of children below 14 years of age in certain occupations and processes and provides for regulations of employment of children in all other occupations and processes. Employment of child labour is prohibited in building and construction industry.

n) **Inter-State Migrant Workmen's (Regulation of Employment & Conditions of Service) Act 1979**: - The Act is applicable to an establishment which employs prescribed minimum (say, five) or more inter-state migrant workmen through an intermediary (who has recruited workmen in one state for employment in the establishment situated in another state). The Inter-State migrant workmen, in an establishment to which this Act becomes applicable, are

required to be provided certain facilities such as Housing, Medical-Aid, Travelling expenses from home up to the establishment and back etc.

o) **The Building and Other Construction workers (Regulation of Employment and Conditions of Service) Act 1996** and **the Cess Act of 1996**: - All the establishments who carry on any building or other construction work and employs the prescribed minimum (say, 10) or more workers are covered under this Act. All such establishments are required to pay cess at the rate not exceeding 2% of the cost of construction as may be modified by the Government. The Employer of the establishment is required to provide safety measures at the building or construction work and other welfare measures, such as canteens, first-aid facilities, ambulance, housing accommodations for workers near the work place etc. The Employer to whom the Act applies has to obtain a registration certificate from the Registering Officer appointed by the Government.

p) **Factories Act 1948:** - The Act lays down the procedure for approval of plans before setting up a factory, health and safety provisions, welfare provisions, working hours, annual earned leave and rendering information regarding accidents or dangerous occurrences to designated authorities. It is applicable to premises employing the prescribed minimum (say, 10) persons or more with aid of power or another prescribed minimum (say, 20) or more persons without the aid of power engaged in manufacturing process.

59. Drawings and Photographs of the Works

59.1 The contractor shall do photography/videography of the site firstly before the start of the work, secondly mid-way in the execution of different stages of work and lastly after the completion of the work. No separate payment will be made to the contractor for this.

59.2 The Contractor shall not disclose details of Drawings furnished to him and works on which he is engaged without the prior approval of the Engineer in writing. No photograph of the works or any part thereof or plant employed thereon, shall be taken or permitted to be taken by the Contractor or by any of his employees or any employees of his sub-Contractors without the prior approval of the Employer in writing. No photographs/ Videography shall be published or otherwise circulated without the approval of the Employer in writing.

Contract Data

Clause Reference

Items marked "N/A" do not apply in this Contract.

1. **The Employer is** [Cl.1.1]

   Ladakh Police,
   Police Head Quarters, Leh,
   Government of UT of Ladakh,

   Through Executing Agency

   NHIDCL
   Address: 2nd Floor, PTI Building, 4- Parliament Street, NHIDCL, New Delhi
   Name of authorized Representative: General Manager (Tech), NHIDCL HQ

2. **The Engineer is:**

   Designation: General Manager (P)/Dy. General Manager (P)

   Address: NHIDCL, PMU-Leh [Cl.1.1]

3. The Intended Completion Date for the whole of the Works is **12 months** from start date. [Cl.1.1, 17&28]

4. Site is located **in the Union Territory of Ladakh.** [Cl.1.1]

5. The Start Date shall be within 7 days after the date of issue of the Notice to Proceed with the work. [Cl.1.1]

6. (a) The name and identification number of the Contract **"Construction of various RCC infrastructure works for Ladakh Police in the Union Territory of Ladakh".** [Cl.1.1]

   (b) The Work consists of **"Construction of various RCC infrastructure works for Ladakh Police in the Union Territory of Ladakh" as mentioned in clause 7.2 of section II (ITB).** [Cl.1.1]

3.1 (a) The law which applies to the Contract is the **law of Union of India**. [Cl.3.1]

(b) The language of the Contract documents is **English**. [Cl.3.1]

7.1 The limit of subcontracting is **49%.** [Cl.7.1]

8.1 Schedule of Other Contractor – **NIL** [Cl.8.1]

13.1. Amount for insurance are: [Cl.13.1]

a) Rupees equivalent to Contract price.
b) Rupees equivalent to 5% of Contract price.
c) Rupees equivalent to 5% of contract price
d) Rupees 20 lakhs for multiple incidents
And deductible as per premium rate.

14.1 Site Investigation Report – NIL [Cl 14.1]

27.3 Amount to be withheld for delays in submission of updated programme: Rs. 10,000 per day up to a maximum limit of Rs. 5,00,000/-.

33 The Defects Liability Period for all items under the work is **05 years** from the date of completion of the works.

45.1	(a) Amount of liquidated damages for delay in completion of works	0.05 percent of the Contract price, rounded off to the nearest thousand, per day with the minimum of Rs. 100000/- per day
	(b) Maximum limit of liquidated damages for delay in completion of work.	5 per cent of the Initial Contract Price rounded off to the nearest thousand

[Cl.45.1]

47.1. The standard form of Performance Security acceptable to the Employer shall be an unconditional Bank Guarantee of the type as specified in the Bidding Documents.

[Cl. 47.1]

54.1. The percentage to apply to the value of work not completed representing the Employer's additional cost for completing the work shall be 20%.

[Cl.54.1]

SECTION - VI

Scope of Work & Technical Specifications

1. Scope of Work

The work includes construction of following buildings/structures:

a) Construction of Police Housing Unit (Residential Quarters, Type -2) in District Police Lines Kargil.
b) Construction of Police Housing Unit (Residential Quarters, Type -3) in District Police Lines Kargil.
c) Construction of Police Jawan Barrack at Baroo in District Kargil for 40 Pax
d) Construction of Multi storey police Jawan Barrack at Baroo in District Police Lines Kargil for approx. 200 Pax capacity
e) Construction of Multipurpose Hall for approx. 200 Pax capacity in District Police Lines Kargil.
f) Construction of Police station at Baroo in District Kargil.
g) Construction of SP Office building at Baroo in District Kargil

¬ Contractor has to construct above various Multi storeyed Office and residential Buildings for police department UT Ladakh (upto Ground+3 Storey,) at two Site locations i.e. police station area and district police line Kargil, as per drawings, technical specifications, scope of work & other conditions and Terms of contract as per Green Building details specified in the drawings.

¬ All items of work, part of work or work itself shown on the drawings or mentioned in the tender document are to be executed by the contractor. Non appearance of any of the items either in the drawings or in the tender shall not vitiate the purpose for which the building shall be constructed. Any extra items shall be dealt appropriately in terms of provision of the contract/GTC.

The brief scope of work includes the below items:-

1) Demolishing of existing buildings and Clearing of Site
2) Barricading the site area by using GI sheets supported suitably by MS Structures up to 6mt Height
3) Name Boards for safety and site development display
4) Excavation and Top soil preservation
5) RCC isolated/combined Foundation
6) PCC and soiling
7) Backfilling and Compaction
8) RCC Substructure and Superstructure including staircase

9) Plinth beam and plinth area construction
10) Masonry in compressed mud Blocks and PCC blocks
11) Internal and External plaster
12) Water supply including water meters, sewage disposal system, plumbing fittings and sanitary fixtures
13) Waterproofing of toilets, terrace, chajjas, balconies, refuge area, and other sunk areas etc.
14) Flooring, Bathroom and kitchen tiling
15) Wooden Doors, Anodised Aluminium windows, ventilators including locks and associated accessories
16) Strom water drainage
17) Internal and external painting,
18) Electrical Conduiting, Wiring, switchboards, Electrical Fittings & fixtures
19) Fire fighting wet riser, sprinkler, smoke detection system, Fire extinguishers, exit signage, Sand Buckets etc. as per Fire department NOC
20) HVAC system and Ducting etc
21) Lifts with Machine room as per local municipality (NMC) norms 38
22) Roof top grid connected solar panel system. Developing and maintaining automatic dust cleaning system (like wiper or water sprinkler or automatic cleaning system along with sensors) on the inclined roof solar roof panel.
23) Underground and overhead tanks including fire water tanks with associated plumbing works
24) Telephone, DTH Cabling and data cabling works
25) Fire Pumps, Water Supply pumps, panels and pump room
26) Meter room, feeder pillar, main cabling, Earth pits, and Lightning arrester etc.
27) Stilt lighting, External lighting and electrical works
30) Site office, site laboratory, temporary store room, Construction Machineries, First aid box, safety material, sanitary facilities for labour, temporary lighting for site area while executing works, water supply arrangements.
31) Associated works related to Green building features
32) Obtaining all statutory NOC/approvals as applicable in UT Ladakh.

Above items are only indicative and for guidance & brief description of jobs, but should not be considered limited to this list. Tenderer should refer to the detailed tender documents, technical specifications and drawings for detailed items and scope of work included in this project. Any discrepancy in the above shall be brought to the notice of NHIDCL in the pre-bid meeting.

GENERAL SCOPE/COMPLAINCE FOR GREEN BUILDING

Introduction:

NHIDCL has engaged consultant for providing Comprehensive services for Architectural, Green building Consultancy services best suiting the local climate, herein further referred as Architect-Consultant. The contractor has to follow the instruction given by Architect-consultant.

Proposed project is comprehensively designed in association with the Architect Consultant and their structural and MEP Building Consultants by suitably incorporating green building requirements to achieve desired Green Building features. However, if there are certain items which are not detailed out or mentioned in the tender shall also be required to be executed as per the instructions of NHIDCL's Architect Consultant in order to make it functional Green Building well responding to the local climate.

NHIDCL along with Architect-Consultant and their consultants has incorporated possible green building feature in the design, specification, BOQ and scope of work. However, the achievement of green building functions is possible only upon contractor's commitment and compliance of relevant green building criteria.

Contractor to submit a narrative, supported with Invoices and certificate from manufacturer and test certificate and Photographs for the same for showing the compliance of green building Conditions.

Commitment, Compliance & Appraisal of green building Criteria:

The contractor shall commit and comply with the green building guidelines, advice and instructions of NHIDCL, Architect-Consultant and their structure and MEP Consultants. Photos to be taken daily and especially to support the following conditions and submitted along with narratives. Failure to do so will be considered as non-compliance to tender agreement and result in charging of penalty. Some of the important GRIHA Criteria's along with their requirements have been briefly indicated hereunder:-

a) Preserve and protect landscape during construction/compensatory depository forestation:

1. Construction activities to been planned in a way that excavation & construction work, up to plinth level is not coinciding with rainy season and the site disruption is restricted to pre-designated areas.
2. Construction work and erosion control applications to be scheduled and sequenced during dry weather periods when the potential for erosion is the lowest.

3. Measures such as collecting runoff from construction areas and material storage sites; diverting water flow away from such polluted areas, so that pollutants do not mix with storm water runoff undisturbed areas.
4. Temporary drainage channels, perimeter dike/swale, etc. shall be constructed to carry the pollutant-laden water directly to treatment device or facility. The plan shall indicate how the above is accomplished on site, well in advance of the commencing of the construction activity.
5. Topsoil removal and preservation to be compulsorily done. Topsoil shall be stripped to a depth of 200 mm from areas proposed to be occupied by buildings, roads, paved areas and external services. Topsoil is rich in organic content and is essential to establish new vegetation. It shall be stockpiled to a height of 400 mm in designated areas and shall be reapplied to site during plantation of the proposed vegetation. Topsoil shall be separated from sub-soil debris and stones larger than 50 mm diameter. The stored top soil may be used as finished grade for planting areas. If the topsoil is not stored on site, it can be alternatively given to the nursery or for gardening purposes. Documentation of topsoil preservation has to be maintained at site as per the requirement of Architect Consultant/NHIDCL.
6. Spill prevention and control plans to be made and submitted, clearly stating measures to stop the source of the spill, to contain the spill, to dispose the contaminated material and hazardous wastes, and stating designation of personnel trained to prevent and control spills. Hazardous wastes include pesticides, paints, cleaners, petroleum products, fertilizers and solvents.
7. Protect & Preserve existing trees, if any, as per directions of Engineer-in-charge.
8. Slope construction techniques to control erosion to be used when construction during wet season is unavoidable. Sedimentation collection systems, drainage systems and run off diversion systems shall be installed before construction activity. The Architect-Consultant/ Engineer-in-charge shall monitor the site conditions and progress of work and schedule appropriate timing and sequencing of construction.
9. Soil erosion to be avoided by maintaining a protective cover on the soil, and creating a barrier to the erosive agent (i.e., wind and water).
10. Stabilize bare soils on the site: by using erosion control mats, seeding / planting.
11. Remove sediment from runoff before it leaves the site: use stabilized construction entrances/exits, silt fences, sediment traps, check dams etc.
12. Plan soil disturbance activities for the dry season.
13. Making Silt fences to hold water, allowing sediment to settle out as an effective sediment control measure.

b) Provide minimum level of sanitation/safety facilities for construction workers:
1. Ensure the health and safety of workers during construction, with effective provisions for the basic facilities such as sanitation and drinking water, and safety PPEs/equipment's for workers, first aid box, etc. at site.
2. Ensure cleanliness of workplace with regard to the disposal of waste and effluent; provide clean drinking water and latrines and urinals as per applicable standard.

c) Reduce Air and Noise pollution during construction:

1. Cover skips and trucks loaded with construction materials and continually damp down with low levels of water.
2. Segregate, tightly cover and monitor toxic substances to prevent spills and possible site contamination.
3. Cover up and protect all drains on site.
4. Collect any wastewater generated from site activities in settlement tanks, screen, discharge the clean water, and dispose of remaining sludge according to environmental regulations.
5. Use low-sulphur diesel oil in all vehicle and equipment engines, and incorporate the latest specifications of particulate filters and catalytic converters. PUC of vehicles to be submitted.
6. No burning of materials on site.
7. Noise pollution to be reduced through careful handling of materials; modern, quiet power tools, equipment and generators; low impact technologies; and wall structures as sound shields.

d) Efficient water use during construction:-

1. The use of potable water during construction to be minimized.
2. Materials such as pre-mixed concrete for preventing loss during mixing or use recycled treated water and control the waste of curing water to be used.
3. Gunny bags to be used for column, plinth beams concrete curing and slabs to be cured by water ponding.

e) Utilization of locally available mud in the building structure:

1. Use of low-embodied energy locally available mud as the construction material. Use of locally available mud , brickwork, plaster, block-work, etc. in the building.

f) Reduce volume, weight, and time of construction by adopting an efficient technology:

1. Use pre-cast systems, ready-mix concrete, etc.
2. Replace a part of the energy-intensive materials with less energy-intensive materials and/or utilize regionally available materials, which use low energy/energy-efficient technologies.

g) Use low-energy material in the interiors:

1. Out of the total quantity of all interior finishes and products used in each of the categories mentioned below, a minimum of 70% should be low-energy finishes/ materials/ products, which minimize wood as a natural resource or utilize industrial waste by using products in any category as listed.

1.1 Sub-assembly/internal partitions/false ceiling/in-built furniture
1.2 Flooring
1.3 Doors/windows and frames

2. Before ordering materials contractor to ask Green Building Certificate from manufacturer or dealer and submit the same to Architect-Consultant and NHIDCL for approval or While ordering materials following should be considered:-

2.1 Purchasing materials that have a recycled content
2.2 Ordering paints with low odour and VOC emissions
2.3 Minimize packaging
2.4 Ordering in standard sizes to minimize on site cutting and wastage
2.5 Provide adequate storage that is weatherproof and secure
2.6 Follow suppliers' storage instructions
2.7 Keep harmful chemicals in secure areas
2.8 Protect lightweight materials from wind
2.9 Store liquids and sand away from drains and water courses

h) Water recycle and reuse (including rainwater):

1. Rainwater storage and recharge system to be implemented at site including ground water recharge where potable municipal water is normally used, to reduce the load on municipal supplies and to improve the groundwater level.

i) Reduction in waste during construction:

1. Ensure maximum resource recovery and safe disposal of wastes generated during construction and reduce the burden on landfill.
2. Keep record of the waste generated and take pictures.
3. Designate separate areas for storage of recyclables
4. Submit records tabulating the total waste material generated and the quantities which were diverted from landfills.
5. A minimum of 4% of the total site area should be allocated for storage of the waste. This storage area should be covered and the pollutants from the waste should not affect the surrounding.

j) Efficient waste segregation:

1. Different types of waste to be segregated in different categories of waste sections /areas during construction to promote the segregation of waste.

k) Use of low-VOC (volatile organic compounds) paints/ adhesives / sealants:

1. VOC Limits for Materials

Please follow the type of material & their VOC Limit as mentioned below:-

Paints:-

Non-flat paints - 150 g/L
Flat (Mat) paints - 50 g/L
Anti-corrosive/ anti-rust paints - 250 g/L
Varnish - 350 g/L

Adhesives:

Tile adhesives - 65 g/L
Wood - 30 g/L

l) Reduce the water use by the building:

1. Flow rates of Water Fixtures:-

Select water fixtures whose average flow rates / capacities should not exceed the values mentioned below. Baseline Flow Rates / Capacity for Water Fixtures in a Typical Household are:-

1. Flush fixtures - LPF 6/3
2. Flow fixtures - LPM 12

At a flowing water pressure of 3 bar

2. Flow fixtures include faucets, basin mixer, taps, showers, shower mixers. The baseline flows can be demonstrated at flowing water pressure of 3 bar. Flowing water pressure of 3bar does not mean that the water supply in the building is at 3 bar.

3. The building fixtures can operate at lower pressures but to show compliance under this credit, the design flow rates are to be submitted at 3 bar. The average flow rate is a simple arithmetic average of all the respective flush / flow fixtures

m) Minimize ozone - depleting substances:

1. Halon-free fire suppression and fire extinguishing systems to be used to eliminate or control the release of ozone-depleting substances into the atmosphere wherever applicable.

n) Ensure water quality:

1. Ensure groundwater and municipal water meet the water quality norms as prescribed in the Indian Standards for various applications (Indian Standards for drinking [IS 10500-1991], irrigation applications [IS 11624-1986]. In case the water quality cannot be ensured, provide necessary treatment to raw water for achieving the desired concentration for various applications.

2. Technical Specifications

A. TECHNICAL SPECIFICATION OF CIVIL WORKS:

1.0 GENERAL:

1.1 The work shall in general conform to the **Latest CPWD Specifications** (corrected up to the last date of submission/uploading of bid). Work under this Contract shall consist of furnishing all labour, materials, equipment, tools & plants and appliances necessary and required.

1.2 The Contractor shall conduct his work, so as not to interfere with or hinder the progress or completion of the work being performed by other Contractor(s) or by the

Engineer-in-Charge and shall as far as possible arrange his work and shall place and dispose of the materials being used or removed, so as not to interfere with the operations of other Contractor simultaneously working or he shall arrange his work with that of the others in an acceptable and coordinated manner and shall perform it in proper sequence to the complete satisfaction of others.

1.3 Regarding testing of civil & electrical & other materials, the testing of materials shall be conducted in Govt. Laboratory/ Govt. Engineering Colleges/ IITs/ NITs or from the laboratory approved by Engineer-in-charge. The charges of testing of materials in approved laboratory shall be borne by the Contractor.

1.4 No payment shall be made for any damage caused by rain, snowfall, flood or any other natural calamity, whatsoever during the execution of the work. The Contractor shall be fully responsible for any damage to the govt. property and work for which the payment has been advanced to him under the contract and he shall make good the same at his risk and cost. The Contractor shall be fully responsible for safety and security of his material, T&P, Machinery brought to the site by him.

1.5 The Contractor shall comply with the safety procedures, norms and guidelines (as applicable) as outlined in the document Part 7 Constructional practices and safety- 2016, National Building code of India, Bureau of Indian Standards. A copy of all pertinent regulations and notices concerning accidents, injury and first-aid shall be prominently exhibited at the work site. Depending upon the scope & nature of work, a person qualified in first-aid shall be available at work site to render and direct first-aid to causalities. A telephone may be provided to first-aid assistant with telephone numbers of the hospitals displayed. Complete reports of all accidents and action taken thereon shall be forwarded to the competent authorities.

1.6 Contractor should spray curing water on concrete structure and shall not allow free flow of water. Concrete structures should be kept covered with thick cloth/gunny bags and water should be sprayed on them. Contractor shall do water ponding on all sunken slabs using cement and sand mortar.

1.7 **Approved Makes**:
Specification/brands names of materials to be used as per the scope of work are listed in the bid documents. The efforts should be made by the Contractor to use indigenous products. The Contractor should also consider the availability of spares parts/ components for maintenance purposes while proposing any brand/ manufacturer. The materials of any other brand/manufacturer may be proposed for use by the Contractor in case the brands specified below are not available in the market and/or Contractor intends to use some other brand better than the brands mentioned in this list. The alternate brand can be used only after the approval of Engineer-in-Charge. The list of approved makes is appended to this document.

1.8 **Method Statement:**

The Contractor shall submit a 'Methods statement' for each important activity for the approval of the Engineer-in-charge soon after the award of work to him. The 'Methods statement' is a statement by which the construction procedures for any activity of construction is formulated and stated in chronological order. The 'Methods statement', should have a description of the item with elaborate procedures in steps to implement the same, the specifications of the materials involved, their testing and acceptance criteria, equipment to be used, Precautions to be taken, etc.

1.9 The work shall be carried out in accordance with the Design Basis Report, Architectural drawings and structural drawings (proof checked/vetted by the Contractor) and approved by the Engineer-in-Charge. The Technical Specifications are to be read with and in general conforming to the Latest CPWD Specifications.

1.10 The Contractor shall procure the required materials in advance so that there is sufficient time to testing of the materials and clearance of the same before use in the work. The Contractor shall provide at his own cost suitable weighing and measuring arrangements at site for checking the weight / dimensions as may be necessary for execution of work.

2.0 **For Detailed Specification of DSR items of Civil works (Based on DSR 2019) mentioned in BOQ shall be as per latest CPWD specification VOLUME I AND VOLUME II** (corrected up to the last date of submission/uploading of bid)

3.0 GLASS REINFORCEMENT CONCRETE (GRC) WALL CLADDING TILES.

3.1 MATERIAL:

3.1.1 GRC Wall cladding tiles is a highly refined architectural precast concrete building stone made by a special process to simulate natural stone. Because of its versatility of form, color and texture, GRC Wall cladding tiles offers a superior, yet cost effective, ornamentation medium.
3.1.2 The thickness of the tiles should range between 12 to 18 mm (depending on the texture of the tile), allowing variance of ±2 mm in accordance with IS: 1237-1980.
3.1.3 The composition of tiles should be '43' Grade White Portland cement, reinforced with Alkali Resistant Glass Fiber and the pigmentation should be done with exterior grade synthetic inorganic iron oxide pigments manufactured by 'BAYFERROX (Germany)' or equivalent.
3.1.4 The pigmentation should be homogeneous and in accordance with British Standards BS EN 12878:1999. The other additives should be fine washed graded quartz, super plasticizers and integrated water proofing agents and others.
3.1.5 The tiles should be produced with high vibration technology and should have compressive strength equivalent to M-40 Grade@ 28 days. The top surface of the tiles should be sealed with acrylic lacquer resulting in surface water absorption of tiles, less than 1% and water absorption by 24 hrs. immersion method, less than 8%.
3.1.6 Stone shall be of the type as specified in the item. It shall be hard, sound durable and tough free from cracks, decay and weathering and defects like cavities cracks, flaws, holes, veins, patches of soft or loose materials etc. Thickness of stone shall be as specified.

3.1.7 Before starting with the installation procedure, Contractor first need to calculate the area where he wants to clad. Contractor can instruct to the labour to calculate by simply measuring its length and breadth and then multiplying it. This would help him get an estimated amount of material for the cladding.

3.2 SUBMITTAL :

3.2.1 Product Data: Manufacturer's (as per approved make) standard specifications, and descriptive literature for main products and any accessory items, including:

1. Spec-Data product information sheets. (GRC Wall cladding tiles GRC Wall Cladding Tiles, Pattern: Unibrick country Brick, Size: 7.5" x 2.25) or as per Project Architect.
2. Color charts - Copper Red, or approved by Project Architect.
3. Building code evaluation reports.
4. Blank warranty forms.

3.2.2 Samples: Color boards prepared with actual stone veneer style specified or selected for this Project; show joints, color variations, and textures expected in finished installation.

3.3 SCAFFOLDING

As specified in 7.4.11. of **CPWD Specification Volume I** (corrected up to the last date of submission/uploading of bid).

3.4 SURFACE PREPARATION:

This is the most crucial part the whole procedure as it would ensure the bonding that the adhesive/ mortar will have the wall because if the bond between the adhesive/ mortar and wall is not intact than the cladding can plunge off the wall. So, the procedure for surface preparation is as follows-

3.4.1 Plastered wall to be rough finished for mechanical ponding, wet cladding can be initiated directly on wall.

3.4.2 If your wall is painted remove the layer using grinders than cut grooves into wall using an angle grinder, horizontally as well as vertically to create keys, for mechanical bonding.

3.5 INSTRUCTION

3.5.1 Ensure that the surface is not friable and that all laitance, dust is removed. Do not wet the surface before cladding commences.

3.5.2 Mortar mix must be applied to the surface to a minimum bed thickness of 10mm or as per manufacturer instruction.

3.5.3 Spread only enough mortar/adhesive for each individual piece. Should a thin film (skin) appear on the surface of the adhesive, re-agitate with trowel before bedded.

3.5.4 Press the dry Natural stone cladding firmly into wet mortar with a twisting action. Product must be bedded with the aid of a Rubber mallet.

3.5.5 Lift and replace random cladding to ensure that 100% contact is being achieved between the cladding and mortar (no voids behind cladding).

3.5.6 Back buttering of Natural stone cladding is recommended where the back of the cladding product surface is irregular or when cladding in awkward locations.

3.6 INSTALLATION PROCEDURE

The tiles should be applied on a rough plaster of cement mortar 1:3 (1 cement: 3 coarse sand) and the fixing of tiles should be done by 'GRC Wall cladding tiles' tile adhesive or equivalent as per manufacturer's laying instruction.

4.0 UPVC WINDOWS AND VENTILATORS:

4.1 GENERAL:
All type of UPVC Door and Window are as per SOQ. Detailed specification of UPVC Door and Window for size and material can be as per manufacturer (in approved make) approved by Engineer -in-charge /Project Architect.

4.2 MATERIAL: As specified in 9.18.0 of **CPWD Specification 2009 Volume I** (corrected up to the last date of submission/uploading of bid).

4.3 TEST: As specified in 9.19.4 of **CPWD Specification 2009 Volume I** (corrected up to the last date of submission/uploading of bid).

4.4 SPECIFICATION FOR TYPES AND SIZES OF UPVC WINDOWS AND VENTILATORS TO BE INSTALLED AS PER SOQ ITEM:

4.4.1 UPVC (un-plasticized polyvinyl chloride) sliding windows size 2400w x 2070h (53.48 sq. Ft.) 41201-03000, Slider Screen-: Track + Screen, Super Screen Sash type, White Handle Colour, Grooved SL Alumi Rail, Patio sliding Handle, SS 430 (CS) Espag. Type, White Bead Colour all complete as per drawing.

4.4.2 UPVC (un-plasticized polyvinyl chloride) sliding windows size 1200w x 2070h (26.74 sq. ft) complete in all respect with specification of SY05 Combination System, Combination System, 6.0mm+12mm air gap +6mm thick toughened glass, White colour,I-60 Slider Series Coupling 180 - 40107-01400, Full Reinforcement, Channel Reinf of type, 1.5mm Rein thick frame , 2.0mm Reinf thick Sash, White Frame colour , Window O/F: 41101-11000,Slider O/F : 41201-01000, White Sash Colour, Slider Sash : 41201-03000, Slider Screen-: Track + Screen, Super Screen Sas type, White Handle Colour,: Grooved SL Alumi Rail, Patio sliding Handle,SS430 (CS) Espag. Type, White Bead Colour all complete as per drawing.

4.4.3 UPVC (un-plasticized polyvinyl chloride) sliding windows size 600w x 2070h (13.37 sq. ft) complete in all respect with specification of SY05 Combination System, Combination System, 6.0mm+12mm air gap +6mm thick toughened glass, White colour,I-60 Slider Series Coupling 180 - 40107-01400, Full Reinforcement, Channel Reinf of type, 1.5mm Rein thick frame , 1.5mm Reinf thick Sash, White Frame colour , Window O/F: 41101-11000, White Sash Colour, Cement T- Sash : 41101-13000, ,White Handle Colour,

Casement Handle - Espag, SH Friction hinge type, SS Friction Hinge,SS430 (CS) Espag. Type, White Bead Colour all complete as per drawing.

4.4.4 UPVC (un-plasticized polyvinyl chloride) sliding windows size 900w x 2070h (20.05 sq. ft) complete in all respect with specification of SY05 Combination System, Combination System, 6.0mm+12mm air gap +6mm thick toughened glass, White colour, Coupling 180 - 40107-01400, Full Reinforcement, Channel Reinf of type, 1.5mm Rein thick frame , 1.5mm Reinf thick Sash, White Frame colour , Window O/F: 41101-11000, White Sash Colour, Cement T- Sash : 41101-13000, ,White Handle Colour, Casement Handle - Espag, SH Friction hinge type, SS Friction Hinge,SS430 (CS) Espag. Type, White Bead Colour all complete as per drawing.

4.4.5 UPVC (un-plasticized polyvinyl chloride) sliding windows size 750w x 2070h (16.71sqft) complete in all respect with specification of SY05 Combination System, Combination System, 6.0mm+12mm air gap +6mm thick toughened glass, White colour, I-60 Slider Series ,Coupling 180 - 40107-01400, Full Reinforcement, Channel Reinf of type, 1.5mm Rein thick frame , 2.0mm Reinf thick Sash, White Frame colour , Window O/F: 41101-11000, Slider O/F -41201-01000,White Sash Colour, Slide Sash : 41201-03000, Slider Track + Screen, Super Screen Sas Type, White Handle Colour, Grooved shape SL Alumi rail, Patio Sliding handle,SS430 (CS) Espag. Type, White Bead Colour all complete as per drawing.

4.4.6 Providing and fixing UPVC (un-plasticized polyvinyl chloride) ventilator size 900w x 900h (8.72sqft) complete in all respect with specification of SY01 Combination System, Combination System, 6.0mm+12mm air gap +6mm thick toughened glass, White colour, I-60 Int. Glz. Sys, Tilt/Turn F, White colour, Full Reinforcement, Channel Reinf of type, 1.5mm Rein thick frame, White frame colour, Window O/F -41101-11000, White Bead Colour all complete as per drawing.

4.4.7 UPVC (un-plasticized polyvinyl chloride) ventilator size 600w x 600h (3.88sqft) complete in all respect with specification of SY01 Combination System, Combination System, 6.0mm+12mm air gap +6mm thick toughened glass, White colour, I-60 Int. Glz. Sys, Tilt/Turn F, White colour, Full Reinforcement, Channel Reinf of type, 1.5mm Rein thick frame, White frame colour, Window O/F -41101-11000, White Bead Colour all complete as per drawing.

4.5 FIXING:

Fixing of window and ventilators shall be done as per manufacturer's fixing instruction. All corner joints shall be homogeneously fusion heat welded in accordance with the instructions of the profile Systems supplier. The resulting joints shall be finished by the grooving/knifing method. Solvent welded joints shall not be allowed.

4.6 MEASUREMENT:

The Measurement shall be done by simply counting the number of UPVC window and ventilators as per Manufacturer criteria or contract.

4.7 RATE:

The rate includes the cost of the materials and labour involved in all the operations described above. The cost of anchor bolts or screws for joining the frame is included in the rate. Any other hardware, which may be required, shall be inclusive.

4.6 GLAZING:

All glazing shall be internally beaded. The windows shall be constructed in such a manner that the glazing or deglazing can take place without the removal of the sash or frame.

5.0 FULLY AUTOMATIC SLIDING DOOR

5.1 GENERAL:
Automatic Sliding glass door operator 4150 mm, compliant with future European standards and produced according to the guidelines for power-operated windows, doors and gates, BGR 232, the UVV and the VDE regulations.

5.2 TESTING:
TÜV design tested, tested according to the low voltage guidelines, fulfils DIN 18650 standards, for framed glass door application with 12mm toughed glass for 2 Nos sliding door panels and 2 Nos fixed panels, both sliding Operator & Frame Finish should be Silver Anodized E6/C0, with operator dimensions (H x D) : 100 x 180 mm and of length as required to suit the opening size given below.

5.3 SPECIFICATION/FEATURES:
The track profile should be separate from the main profile for enabling reduction in vibration insulation. Microprocessor-controlled control unit, Self-learning, with adjustable parameters for opening and closing speed, hold-open time and opening and closing force, reversing when obstruction is encountered, Class of protection IP 20. Activators- 6 Safe Combinations Radars with Motion & Presence Detection (02 Nos), Light barrier comprising of receiver and transmitter - 01 Pair, with Electro-mechanical locking, Program Switch with Key. Max Panel Weight Carrying Capacity of 2 X 100 Kgs. tem shall have constant power supply 230V+ 5%, 50Hz, AC. The requirement in total is as mentioned, wall connecting profiles be used on top of over panel and on all sides to fixed panels only. The above work should complete in all respect as per approved drawings and to the satisfaction of Architect /Engineer-in-Charge.

5.4 INSTALLATION:
The installation for automatic sliding door opener has a lot of procedures, and each process should be carefully done under the supervision of Engineer-in-charge, Company which deal with this type of work or Project Architect. For electrical supply he may contact to Contractor as it is under Contractor scope.

5.5 PRECAUTION:

After the installation is completed, close the door, check the door moving leaf active area without obstructions, sensor area without active person. Then switch the power. When the first time the power on, the door will slowly movement to record the door route.

5.4 MEASUREMENT AND RATE:
The rate includes the cost of the materials and labour involved in all the operations described above. The cost of anchor bolts or screws for joining the frame is included in the rate. Any other hardware, which may be required, shall be inclusive.

6.0 GLASS DOOR

6.1 GENERAL:
6.1.1 Glass Door (Single Leaf) size of 2100 mm x 1050mm of 10mm toughened glass with Slim line 45mm frames clip in profiles all around the door with complete assembly.
6.1.2 DP45 Door Profile frame of size 45X50mm with seals with Junior Office Hinges (3nos) & Studio Gala Locks (1no) & Studio Gala lever handles in aluminum silver (EV1) finish , Euro profile cylinder and TS 89 Door closer with slide channel (as per EN 1154) and saddle plate for fixing on the Glass door and necessary seals to be provided all around the door frames.
6.1.3 The slim line profiles shall be suitable for Glass thickness of 10mm.
6.1.4 The Profile shall be matt natural anodized, the Profile Manufacturer to supply all the necessary clips, seals and fixing accessories for the system. All Profiles to be with 2 mm Gauge thickness Excluding 20 Micron of Anodizing.

6.2 PRECAUTION BEFORE INSTALLATION:
6.2.1 All installation materials used have been checked for compatibility.
6.2.2 Correct orientation of system has been identified. Inswing or Outswing.
6.2.3 Sill condition is understood and necessary weep system is in place where standard Doors sill is not being applied.
6.2.4 Frame has been sealed and joined at all points indicated in instructions
6.2.5 Opening checked for correct dimensions.
6.2.6 Frame is installed at correct depth within the opening
6.2.7 Frame has been installed square, level and plumb
6.2.8 Plastic shims were utilized under sill when required
6.2.9 Jambs were shimmed to prevent rolling
6.2.10 Shims were applied between head track and header. Only as recommended in instructions
6.2.11 Installation holes prepared correctly
6.2.12 Sealant was applied to sill installation holes prior to inserting screws & top of screw heads once applied
6.2.13 Correct fastener placement has been followed as directed by manufacturer
6.2.14 Proper operation and adjustment has been achieved

Frame has been checked for level, square and plumb. All horizontal and vertical adjustments have been made so that proper reveals are present and product is operating as designed. Weep holes have been checked and free of obstruction and debris. All trash

has been discarded. All hardware has been installed correctly and checked for proper operation. Product has been closed and locked and recommended to not be used as thoroughfare by other trades. Product is protected from damage. Final inspection of weather proofing and operation has been performed. Job has been turned over to contractor or Site engineer with approval.

6.3 INSTALLATION: Product was installed as directed by the Manufacturer approved by the Engineer-in-charge.

7.0 FULL HEIGHT GLASS PARTITION/ FULL HEIGHT PARTITION/ LOW HEIGHT PARTITION

7.1 GENERAL:

Furnish and install glass partitions. Provide all labor, materials, tools, equipment, and services for glass partitions in accordance with provisions of contract documents.

7.1 FULL HEIGHT GLASS PARTITON:

Glass partition of 10 mm Toughened Glass using slim line System-45 Frames clip in profile to a height of maximum 3m or as per drawing. The Fixed glass to be fixed using BP45 Profiles at Top & Bottom & fixed frame cleat. The profile size to be 45x25MM to be fixed on to the floor/ ceiling as per the architect design. H Junction profile to be used at all Glass to Glass vertical joints, 90 Deg L Junction Profiles and T Junction profiles necessary as per design. In case of Glass overall panel MP45 & BP45 Over panel Profile to be used. The clip in profiles shall be suitable for Glass thickness of 10 mm. The Profile shall be matt natural anodized, the Profile Manufacturer to supply all the necessary clips, seals and fixing accessories for the system.

All Profiles to be with 2 mm Gauge thickness Excluding 20 Micron of Anodizing.

7.2 FULL HEIGHT PARTITION

7.2.1 GENERAL:

69 mm thick of approved make drywall partition system/approved equivalent, which include "Approved make Steel" G.I framework (180GSM Galvanizing; 345 Mpa Yield Strength), comprising of 51mm Floor and Ceiling track profile, 0.5 mm thick, having two equal flanges of 32mm, fixed to the floor and ceiling, in plumb with each other, with sleeves and screws at 610 mm; Vertical G.I studs of size 51mm, 0.5mm thick, having one flange of 42mm and another flange of 44mm and two equal lips of 5mm insert fixed into the track profiles at 610 mm centers.

9 mm Heavy Duty Fibre Cement board (Confirming to IS 14862; Type - B) are screw fixed to the either side of the framework with 25mm drywall screws, respectively, at 300 mm centers. Rate shall be inclusive of Glass wool of 48kg/m3 density and 50mm thickness that has to be placed in between the cavity of frame.

7.2.2 JOINTING AND FINISHING:

Finally edges of the board are to be jointed and finished so as to have a flush look which includes filling and finishing with Everest compound of standard. make with Self-adhesive Fiber glass mesh tape. The rate shall be inclusive of providing & finishing 2 coats of top paint and labour for cutouts for light fixtures grills, diffusers etc.

7.3 LOW HEIGHT PARTITION

7.3.1 GENERAL:
69 mm thick X1350 mm height , approved make drywall partition system/ approved equivalent, which include "Approved make Steel" G.I framework (180GSM Galvanizing; 345 Mpa Yield Strength), comprising of 51 mm Floor and Ceiling track profile, 0.5mm thick, having two equal flanges of 32 mm, fixed to the floor and ceiling, in plumb with each other, with sleeves and screws at 610 mm; Vertical G.I studs of size 51 mm, 0.5 mm thick, having one flange of 42mm and another flange of 44mm and two equal lips of 5mm insert fixed into the track profiles at 610 mm centers.

9 mm approved make Heavy Duty Fibre Cement board (Confirming to IS 14862; Type - B) are screw fixed to the either side of the framework with 25mm drywall screws, respectively, at 300 mm centers. Rate shall be inclusive of Glass wool of 48kg/m3 density and 50mm thickness that has to be placed in between the cavity of frame.

7.3.2 JOINTING AND FINISHING:
Finally edges of the board are to be jointed and finished so as to have a flush look which includes filling and finishing with Everest compound of std. make with Self-adhesive Fiber glass mesh tape. The rate shall be inclusive of 2 coats of top paint and labour for cutouts for electrical, telephone, computer conduits etc.

7.4 INSTRUCTION:

7.4.1 Product was tested, installed as directed by the Manufacturer approved by the Engineer-in-charge.

7.4.2 The product shall be gone through quality assurance. Glass shall be clear tempered per ASTM C1048-97b.

7.4.3 Proper storage of partitions before installation and continued protection during and after installation will be the responsibility of the Contractor.

7.4.4 The submitting manufacturer guarantees the proposed substituted product complies with the product specified and as detailed on the drawings.

7.4.5 The complete installation of the glass wall system shall be by an authorized factory-trained installer and be in strict accordance with the approved drawings and manufacturer's standard printed specifications, instructions, and recommendations.

7.4.6 Cleaning: All track and panel surfaces shall be wiped clean and free of handprints, grease, and soil.

7.4.7 Warranty: Track, carriers, and horizontal rails shall be guaranteed for one year against defects in material and workmanship. The glass is not included in this warranty.

7.4.8 Cartoning and other installation debris shall be removed to on-site waste collection area, provided by others.

7.4.9 Tolerance: ±10 mm in height and width.

7.4.10 Specification of partition, installation process all depends on manufacturer's as per approved make.

8.0 LAMINATE WALL PANEL

8.1 GENERAL

8.1.1 Pre-manufactured panel system including mounting hardware and specified accessories.
8.1.2 Submittal of Product Data: Manufacturer's Safety Data Sheets (MSDS) on each product to be used, including:

a) Preparation instructions and recommendations.
b) Storage and handling requirements and recommendations.
c) Installation methods.

8.1.3 Manufacturer's Drawings: Manufacturer's drawings in sufficient detail to show fabrication, installation, anchorage, and interface of the work of this Section with adjacent work.
8.1.4 Selection Samples: For each finish product specified, one complete set of color samples representing manufacturer's standard range of available colors and patterns.
8.1.5 Quality assurance: Firm experienced in successful production of wall systems similar to that indicated for the Project, with sufficient production capacity to produce required units without causing delay in the work.
8.1.6 Installer Qualifications: Demonstrate successful experience in installing architectural woodwork similar in type and quality to those required for this project.
8.1.7 Provide prefinished decorative laminates where shown on the drawings, as specified herein, and as needed for a complete and proper installation.

8.2 PREPARATION

8.2.1 Panels must be acclimated to ambient temperature and humidity conditions in accordance with manufacturer's specifications prior to installation.
8.2.2 Clean surfaces thoroughly prior to installation.
8.2.3 Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

8.3 MATERIAL

8.3.1 1MM THK LAMINATE FINISH (selected as per approved make):

1 mm thk selected laminate of approved colour & approved make, glued with approved phenol formaldehyde based adhesive or approved equivalent overlaying on substrate without any gap/air bubbles pressed uniformly to line level and plumb, item complete with all edge lipping with water based PU TW lipping mounted flush to surface as per detailed drawings and Architects recommendations: all accessories, fixing implements , men material and lift upto 6 Mtr. Finished complete with all necessary masking with avg. min 10mm wide masking tape before applying polish to edge lipping and getting mock up approved by Engineer in charge/ Architect. Item to include protecting finished item by avg. 20 microns thk polythene sheet till handover of facility complete.

8.3.2 UNICOLOUR LAMINATE (selected as per approved make):
unicolor decorative laminate with homogeneous same color of decorative surface and core layers as per 438:3 -2005, FSC & Green Guard. Item to be completed in all respects as per drawings and instructions from Project in charge.

8.3.3 1-(B)) MR+ (MAR RESISTANT) TUFF GLOSS LAMINATES (selected as per approved make):
(Mar Resistant) Tuff Gloss Laminates 1mm thickness, conforming to IS 2046:1995, 3to 4 times more resistant than normal Gloss Laminate, gloss meter reading is over 110 at 60-degree angle reading as per ASTM D6037-96. Item to be completed in all respects as per drawings and instructions from Project in charge.

8.4 INSTALLATION

8.4.1 Install in accordance with manufacturer's instructions.

8.4.2 The laminate sheet shall be fixed using approved quality adhesive recommended by the manufacturer and applied strictly in accordance to their instruction/specifications.

8.4.3 The adhesive shall be applied in a thin layer and while still tacky, it shall be spread evenly with steel in both directions to Project.

8.4.4 Assume full contact with the adhesive / Fevicol / SR. A constant and even pressure is applied for not less than 24 hours to ensure good bonding of the surface to the board. The laminate surface shall be cleaned as recommended by the manufacturer of all stains/ adhesive marks etc.

8.5 PROTECTION

1. Protect installed products until completion of project.
2. Touch-up, repair or replace damaged products before Substantial Completion.

9.0 MDF EXTERIOR GRADE PLAIN PARTICLE BOARD

9.1 GENERAL:

MDF is the short term for medium density fibre board. Alum, wax, resin or other additive introduced to the agglomerate for MDF prior to forming, primarily to increase water

resistance. Any suitable type of synthetic resin adhesive may be used for the purpose of bonding to comply with physical and mechanical requirements.

9.2 TESTING OF SAMPLES

9.2.1 Preparation and Conditioning of Test Specimens: All the test specimens shall be prepared and conditioned before testing in accordance with the procedure given in IS 2380 (Part 1).

9.3 QUALITY ASSURANCE

MDF shall conform to the requirement of quality and performance as specified in standard of manufacturer.

9.4 MATERIAL:

MDF Exterior grade plain particle board of approved makes: Plain Exterior Grade MDF Boards of 9.75mm thickness, Exterior grade wood base (Grade-I), Melamine Bonded, Stamped IS 12406. All accessories, screws, fixing implements, labors, material and all lifts. Item to be completed in all respects as per drawings and instructions from Engineer in charge.

10.0 PLYWOOD

10.1 MATERIAL:

Partition skinning with avg 12 mm thk BWP Grade Plyboard IS 710 BWP grade on over Al. skeletal frame/wooden frame , as approved by Architect. Plywood shall be 12mm thick, non-decorative, factory made as per IS:710 and should be ISI marked and be made of non-coniferous timber red hard wood with moisture contents not more than 12% and dimension as given in IS code. The panel comprising of plywood should be 9 ply construction and cross bend and panel core shall be glued by hot pressed with Quadra process, while the thickness of face veneer (Okume/Gurjan) shall not be less than 0.5mm. all core shall fully confirm to the requirement specified in the IS code. All timber used should be well seasoned and chemically treated. Adhesive used shall be phenol formaldehyde synthetic resin BWP type specified in IS:848-1974. All dimensions shall be finished dimension and manufacturers test certificate for test specified in IS:710 shall be rendered." Item shall be complete in all respect.

11.0 FALSE CEILING

11.1 GI METAL LAY IN BLACK GROOVE CEILING :

Providing & Fixing of GI Metal Suspended Ceiling System - Approved make In Perf. With fleece 600x600x0.5mm (MICROLOOK) EDGE TILES in global white colour to be laid on Black Groove 15mm wide T - section flanges color white having rotary stitching on the Main Runner, 1200 mm & 600 mm Cross Tees with web height of 38mm. The tiles should have Humidity Resistance (RH) of 100%, with Light Reflection of 62%, NRC 0.7.

INSTALLATION: To comprise main runner spaced at 1200mm centers securely fixed to

the structural soffit at 1200mm maximum center. The First/Last suspension system at the end of each main runner should not be greater than 450mm from the adjacent wall. Flush fitting 1200mm long cross tees to be interlocked between main runners at 600mm center to form 1200 x 600 mm module. Cut cross tees longer than 600mm require independent support. 600 x 600mm module to be formed by fitting 600mm long flush fitting cross tees centrally between the 1200 mm cross tees. Perimeter trim to be wall angles of size 3000x19x19mm, secured to walls at 450 mm maximum centers.

SUSPENSION SYSTEM accessories supplied by Hilti consisting of HLC Sleeve Anchor Fasteners of thread size 6.5mm x 25/5 with Soffit Cleat made of Galvanized steel of size 27 x 37 x 25 x 1.6mm and Level Clip in dimensions of 85x30x0.8mm with 4.00 mm GI wire.

11.2 BAFFLE CLOSED

Providing & fixing Vertical Linear Baffle Ceiling made out of Aluminum Extrusion in Aluminum alloy grade 6063. The baffle blade shall be in size of 100x 25 x 3600mm in Wood grain finish – Pradoo & Cabrueava. The baffle blade shall be suspended using Slotted U-profile at on-center spacing in multiples of 25mm. Longer lengths of Baffle to be connected by Baffle Joiner and the ends to be fixed with End caps.

INSTALLATION OF U-GRID :
The U profile to be suspended at every 1200mm on-center using 6mm threaded rod from the structural soffit using U-profile hanger. U-profile splice to be used to join more than one U profiles of length 3.75M. 1st U-Grid Channel must be no more than 400mm from the perimeter.

INSTALLATION OF BAFFLES :

Locate the slot for Baffle Hangers in slot of Baffle section at 1200mm centers. Hangers are inserted into the slot, then rotated 90° and fixed into position by tightening the grub screw. Baffle to be lifted into position and hangers engage over lip of U-Grid Channel. Each Hanger to be secured into position by inserting the Locking Clip.

Baffles blades to be connected at ends with Baffle Joiner, which are inserted into the top and bottom slots of the Baffle closed profile for alignment only. The bottom Joiner to be located first and fastened on one side only. The top Joiner to be fitted then and secured with grub screws on one side. Then the two Baffle sections shall be joined and the top Joiner is screw fastened on the 2nd Baffle profile.

End Caps to be located by pushing the End Cap tongues into Baffle slots.

11.3 CELLIO OPEN CELL 100MM X 100MM 'LAY-IN' ALUMINIUM CEILING WITH 15mm GRID

Providing and fixing in true horizontal level Cello Open cell Aluminum lay-in ceiling tiles with border panels forming flush-tegular edge of size 600mmx600mmx38mm having Fire Performance CLASS 0/Class 1 (BS 476). The tile of 'Global white' color with cell size

100mm X 100mm shall be laid on white painted Suprafine XL15mm profile grid system comprising Main runners (3000mm), 1200mm and 600mm cross tees with 15mm white flanges and 38mm web height.

The grid should be of "Approved" make with 15mm wide T - section flanges color white having rotary stitching on all T sections i.e. the Main Runner with C3 coupling, 1200 mm & 600 mm Cross Tees with Hardened XL2 Clip having a web height of 38 mm and a load carrying capacity of 14 Kgs/M. The T Sections have a Galvanizing of 90 grams per M2 with pull out strength of 100 Kgs. Suspension system is to be of Approved make.

INSTALLATION: To comprise main runner spaced at 1200mm centers securely fixed to the structural soffit by approved hangers at 1200mm maximum centre & not more than 150mm from spliced joints. The last hanger at the end of each main runner should not be greater than 600mm from the adjacent wall. 1200mm long cross tees to be interlocked between main runners at 600mm centre to form 1200 x 600 mm module. Cut cross tees longer than 600mm require independent support. 600 x 600mm module to be formed by fitting 600mm long cross tees centrally between the 1200 mm cross tees. Installation to be carried out by Trained Installation team & Installation should be carried out as per recommended procedure. Perimeter trim to be wall angles, secured to walls at 450 mm maximum centers.

SUSPENSION SYSTEM accessories manufactured and supplied by Industries consisting of M6 Anchor Fasteners with Vertical Hangers made of Galvanized steel of size 26 x 26 x 25 x 1.2mm with a Galvanized Thickness of 80gsm, A pre Straightened Hanger wire of dia – 2.65 mm of 1.8 m length., thickness of 80gsm and a tensile strength of 344- 413 MPa, along with Adjustable hook clips of 0.8mm thick, galvanized spring steel for 2.68 mm. The adjustable clip also consists of a 3.5 mm aquiline wire to be used with the main runner.

11.4 SOUNDSCAPE BLADE 400X1200X40MM

Providing and Fixing Approved SoundScapes – Blades which are 40 mm thick, pre-formed fiberglass blades with sizes of 200X1200mm, 200mmX1600mm, 400X1200mm, 400X1600mm,400X1800mm, 500mm X 1200mm and 500X1600mm with Dura brite finish on all sides and edges, Acoustical performance of 0.65 NRC in standard White color with Light reflectance 87%, or in the color specified by the Architect (Light Ivory, Pale Green, Pastel blue, Traffic Grey, Pale Brown) and Fire Performance Class B – s1, d0 as per En 13501-1.

INSTALLATION WITH U-PROFILE HANGER:
The U-profile of size 20mmX30mmX3750mm to be suspended based on the on-centre distance between the factory fitted spiral hooks on the blades. The on-centre distance between the factory fitted spiral anchors is length of the blade – 600mm. U profile to be suspended using 6mm threaded rod from the structural soffit no further than 450mm from each wall. U- Profile splice to be used to join longer lengths more than 3.75M.

U- Profile hanger kit comprising of Blade hanger and snap hooks to be used to suspend the Blades to the U –profile. Blade hanger to be locked on the U-profile using the Locking

clips on the square slots with on center spacing in multiples of 50mm. Snap hooks to be fixed on the blade hanger. Soundscapes Blades to be installed on the snap hook by inserting the factory fitted spiral hooks into the snap hooks on both sides.

Blade connector kit comprising of bottom connector and top connector to be used to join two blades side by side.

Installation to be according to the instructions provided by manufacturer.

11.5 SOUNDSCAPE SHAPES - ACOUSTICAL CLOUDS (INDIVIDUAL SUSPENSION)

Providing and Fixing Approved Soundscape - Acoustical clouds which are 30 mm thick, flat glass fibre panels with Humidity Resistance RH 90% & Recycled Content of minimum 30%, come in various shape options like Square and in standard Traffic White colour with LR 90% or in the color specified by the Architect / Engineer in charge (Ivory / Pale Green / Pastel Blue / Traffic Grey / Pale Brown). or in the color specified by the Architect / Engineer in charge (Ivory / Pale Green / Pastel Blue / Traffic Grey / Pale Brown) . The size and sound absorption details are as below: Square 1200x1200mm 2.48. The back of each panel to have embedded square frame bracket system of 610x610mm in which provisions are already made for integration of installation system for suspension of individual or grouped panels.

INSTALLATION:
The panels to be suspended individually using the Soundscape Deck hanging kit. Each kit to consist of gripper structure anchors, aircraft cables and bottom end cable adjusters. Each panel to be suspended using the aircraft cables which are suspended from the soffit using the gripper structure anchors and its other end passing through the bottom end cable adjuster which are screwed in the 4 corners of the frame bracket system. The height & level of the panels can be adjusted using the bottom end cable adjusters.

11.6 G. I LAY-IN PLAIN

Providing & Fixing of GI Metal Suspended Ceiling System GI Lay In Plain Fleece 600x600x0.5mm (regular) EDGE TILES in global white colour to be laid on 24mm normal Grid 24 mm wide T - section flanges color white having rotary stitching on the Main Runner, 1200 mm & 600 mm Cross Tees with web height of 32mm. The tiles should have Humidity Resistance (RH) of 100%, with Light Reflection of 62%.

INSTALLATION: To comprise main runner spaced at 1200 mm centers securely fixed to the structural soffit at 1200mm maximum center. The First/Last suspension system at the end of each main runner should not be greater than 450 mm from the adjacent wall. Flush fitting 1200mm long cross tees to be interlocked between main runners at 600mm center to form 1200 x 600 mm module. Cut cross tees longer than 600 mm require independent support. 600 x 600mm module to be formed by fitting 600mm long flush fitting cross tees centrally between the 1200 mm cross tees. Perimeter trim to be wall angles of size

3000x19x19mm, secured to walls at 450 mm maximum centers.

SUSPENSION SYSTEM accessories supplied by Approved make consisting of HLC Sleeve Anchor Fasteners of thread size 6.5mm x 25/5 with Soffit Cleat made of Galvanized steel of size 27 x 37 x 25 x 1.6mm and Level Clip in dimensions of 85x30x0.8mm with 4.00 mm GI wire.

11.7 WOODWORKS GRILLE WITH DOWEL MADE OF NATURAL BAMBOO WITH 24 MM PRELUDE 43 BLACK SYSTEM

Providing & fixing of woodworks grille with dowel made of natural bamboo with 24mm prelude 43 black exposed grid. The Woodworks (WW) Grille panel of nominal size 57x300x2400mm comprising 6 blades of 57x16x2376mm with on center spacing of 50mm fixed thru dowel of dia-12mm x 300mm with on center spacing of 300mm and additional end dowels at 150mm from both the edges. Ledger of 6.5x24x2400mm to be used for covering face of wall angle. WW Grille should comply with ASTM-E84: Class A and have Relative Humidity of RH70. The panels are UV coated to Natural or Carbonized shades. Optional: Open edges may be covered using "Edge Caps" of 66x19x2400mm and "Blade Junction" of 66x38x2400mm to be used along the connection of two WW Grille Panels.
The grid should be of "Approved" make Prelude 43 with 24mm wide T - section flanges Black powder coating having rotary stitching on all T sections i.e. the Main Runner, 1200 mm & 600 mm Cross Tees with a web height of 43mm for the main runner & the Cross Tees and with a load carrying capacity of 20 Kgs/M2. Black dowel clips of spring steel to be used for fixing panel to suspension system.

INSTALLATION: To comprise main runner spaced at 1200 mm centers securely fixed to the structural soffit using Approved suspension system (specifications below) at 1200mm maximum center. The First/Last suspension system at the end of each main runner should not be greater than 450mm from the adjacent wall. Flush fitting 1200 mm long cross tees to be interlocked between main runners at 600mm center to form 1200 x 600 mm module. Cut cross tees longer than 600 mm require independent support. 600 x 600mm module to be formed by fitting 600 mm long flush fitting cross tees centrally between
the 1200 mm cross tees. Perimeter trim to be wall angles of size 19x19x3000mm, secured to walls at 450 mm maximum centers.

11.8 PORTLAND MAPLE CEILING APPROVED EQUIVALENT WOODWORKS 600X600X18MM MICROLOOK EDGE TILES IN RG3003 (RG3) PERFORATION WITH 15mm SUPRAFINE 43 EXPOSED GRID" SYSTEM:

Providing & Fixing of Wooden finished Suspended Ceiling System with Woodworks Microlook edge tiles with 15mm Suprafine 43 exposed grid. The Tile in RG3003 (RG3) perforations having hole diameter as 3mm and open area as 3% with approved laminate finish with 0.7mm matching PVC edge banding and having an NRC of 0.42, Humidity Resistance (RH) of 70% in module size of 600mm x 600mm x 18mm and density of 725 Kgs/M3. The tile shall be laid on Superfine 43 with 15 mm wide T - section flanges colour white having rotary stitching on all T sections i.e. the Main Runner, 1200 mm & 600 mm

Cross Tees with a web height of 38mm and a load carrying capacity of 15.5 Kgs/M2 & pull out strength of minimum 100 Kgs. The T Sections have a Galvanizing of 90 grams per M2 and need to be installed with Suspension system of Approved make.

INSTALLATION: To comprise main runner spaced at 1200mm centers securely fixed to the structural soffit using suspension system (specifications below) at 1200mm maximum center. The First/Last suspension system at the end of each main runner should not be greater than 450mm from the adjacent wall. Flush fitting 1200mm long cross tees to be interlocked between main runners at 600mm centre to form 1200 x 600 mm module. Cut cross tees longer than 600mm require independent support. 600 x 600mm module to be formed by fitting 600mm long flush fitting cross tees centrally between the 1200 mm cross tees. Perimeter trim to be approved brand wall angles of size 3000x19x19mm, secured to walls at 450 mm maximum centers. approved brand SUSPENSION SYSTEM accessories manufactured and supplied by approved brand World Industries consisting of M6 Anchor Fasteners with hanger hole, pre-Straightened Hanger wire of dia – 2.5 mm of 1.80 m length having a tensile strength of 344-413 MPa and a minimum pull strength of 110 kgs. (Adjustable hook clips of 0.7mm thick, galvanized spring steel can also be used for installation purpose as an additional accessory. The adjustable clip also consists of a 4 mm aquiline wire to be used with the main runner).

11.9 PLAIN PORTLAND MAPLE CEILING APPROVED EQUIVALENT CAT NO. RG 10077 WOODWORKS 600X600X18MM MICROLOOK EDGE TILES IN PLAIN WITH 15MM SUPRAFINE 43 EXPOSED GRID SYSTEM:

Providing & Fixing of Wooden finished Suspended Ceiling System with
Woodworks Micro look edge tiles with 15mm Suprafine 43 exposed grid. The Tile in Plain with approved laminate finish with 0.7mm matching PVC edge banding, would have Humidity Resistance (RH) of 70% in module size of 600x600x18mm and density of 725 Kgs/M3. The tile shall be laid on approved brand Suprafine 43 with 15 mm wide T - section flanges colour white having rotary stitching on all T sections i.e. the Main Runner, 1200 mm & 600 mm Cross Tees with a web height of 38mm and a load carrying capacity of 15.5 Kgs/M2 & pull out strength of minimum 100 Kgs.. The T Sections have a Galvanizing of 90 grams per M2 and need to be installed with Suspension system of Approved make.

INSTALLATION: To comprise main runner spaced at 1200mm centers securely fixed to the structural soffit using suspension system (specifications below) at 1200mm maximum center. The First/Last suspension system at the end of each main runner should not be greater than 450mm from the adjacent wall. Flush fitting 1200mm long cross tees to be interlocked between main runners at 600mm center to form 1200 x 600 mm module. Cut cross tees longer than 600mm require independent support. 600 x 600mm module to be formed by fitting 600mm long flush fitting cross tees centrally between the 1200 mm cross tees. Perimeter trim to be wall angles of size 3000x19x19mm, secured to walls at 450 mm maximum centers.

SUSPENSION SYSTEM accessories manufactured and supplied by Industries consisting of M6 Anchor Fasteners with hanger hole, pre-Straightened Hanger wire of dia – 2.5 mm of

1.80 m length having a tensile strength of 344-413 MPa and a minimum pull strength of 110 kgs. (Adjustable hook clips of 0.7mm thick, galvanized spring steel can also be used for installation purpose as an additional accessory. The adjustable clip also consists of a 4 mm aquiline wire to be used with the main runner).

12.0 ARTIFICIAL GREEN WALL (VERTICAL WALL GARDEN)

12.1 GENERAL:

Providing testing and commissioning of Artificial boxwood matt is a matt prepared with synthetic PVC leaves made to look like actual plant for vertical applications both in indoors & outdoors. The main reason for usage of this matt is maintenance-Artificial matt stands up to heavy use and requires no irrigation and trimming and no sunlight but only requires periodic cleaning if used in interiors.

Since major cities across globe are turning into concrete jungles with very less space for greenery, so artificial green matt in different leave patterns which almost look real is best solution to create a soothing green effect without any maintenance.
For exterior applications UV matt are recommended for long life
Application is done using rubber adhesive or by simply hanging matt on walls with screws giving a long-lasting installation.

Further artificial flowers or bushes to be added in matt to give more natural look as per requirement. TechArtz Global is major importer of this material from Germany & China to India. The Rate shall be inclusive of providing and fixing SS Fastener of 10mmdia. and 100mm Long (IS code) duly Fixed the ply to Wall.

13.0 FLOORING

13.1 TEXTURE LAMINATE WOODEN FLOORING:
Providing and laying of 8mm thick AC5 grade textured laminated wooden flooring (as/ EN 13329), including 100mm high skirting with 0.2mm thick direct laminate on top of specially developed substrate core of planks size 1288mm x196mm having smart lock tongue and grove construction with edges dully impregnated to secure long lasting joints secure together confirm to EN 13329. the approved décor planks to be placed on a 0.2 mm thick alkali resistant polyethylene foam (density 3920-935kg/m3) with a 1.5mm thick extruded polyethylene foam (density 30-32 kg/m3) on top to secure the floating floor to resist any moisture movement from the sub floor on top to secure the floating installation. the skirting is to be secured with the help of matching wall based ,60mm high, with t-profile &reducer/ beading. the installation at site has to be done by company trained and approved installers. all complete as per instructions from engineer-in-charge. (the item includes skirting &all necessary profiles, beading etc. complete in all respect).

13.2 VINYL FLOORING
Sports flooring of Vinyl flooring Polaris consists of following specifications for Badminton court, General performance sports flooring, shock absorption, vertical deformation, vertical ball behavior, resistance of rolling load, resistance to wear ,specular gloss having overall thickness 6.5mm weight 4200 g/sqm sheet size 1.5m width & 10m length shall all

be conforming to BS EN 14904.

14.0 PAINTING/FINISHING WORK

14.1 LUSTRE PAINT

Providing and applying on all exposed surfaces of beams, ceiling & walls etc. 3 coats of Lustre paint of approved make and shade as per manufacturer specification with a brush or roller after levelling the surface to a smooth finish with the help of putties etc. & having base coats of approved primer before applying three coats of paint. Rate to include additional coat of paints in any required to get smooth and uniform finish. Rate to include scrapping & sand papering for wall, beam & ceiling surfaces. Rate quoted by the contractor shall include necessary cleaning, preparation of surface, centering, scaffolding, cleaning of paint stains, curing etc. complete. Rate Shall include application at all heights, wastage and provision of suitable platform with railing all around the scaffolding. Only pipe scaffolding is permitted. Scaffolding is mandatory for any height above 1.2 m from floor level. (included in structural glazing item) actual area shall be measured.

14.2 SPECIAL EFFECT PAINT(TEXTURE)

Providing & Applying smooth stone wall finishing system manufactured by spectrum/ UltraTech, comprises of a 2 component system 25kg dry material and 5ltr binder made up of pure / specially selected quartz, mineral aggregates inorganic pigment, the material contain pure acrylic co polymer in emulsion including anti cracking, ant rusting, antifoaming, bactericides, U.V resistant and broad spectrum fungicides, to be sprayed to the surface by mean of customized spray gun of 3 HP, with the applied thickness of coating being between 1.5mm to 2.0 mm , as per applied on a cured ,dry , smooth, level plaster without keying as per the shades/ combination approved, by the approved applicator, of manufacturer , all complete inclusive of primer on the base.

14.3 CONCRETE PROTECTIVE PAINT (TILE GUARD CLEAR)

Providing and application of concrete protective paint, including initial coat of priming coat by spray or brush by diluting with water in ratio as specified by manufacturer, followed by two neat coats of finishing without any dilution. Application shall be as recommended by Manufacturer. Dry Film thickness of one priming coat and two finishing coats shall be 225-250 microns. The datasheet of the concrete protective paint shall be submitted and approved by architect beginning of work. Concrete protective paint of approved make on all ceilings/ RCC extension of approved shade including supply of all materials tools as per direction of engineer in charge. Rate quoted by the contractor shall include necessary centering, provision of suitable platform with railing all around the scaffolding, cleaning of paint stains, curing etc. complete. Flash point IS101/1987 Part 1, Sec 6: NA. Drying time: Surface dry time 30 minutes.

14.4 WALLPAPER

Providing and applying select approved Wall paper of approved make and shade on all

surfaces & at all heights including scaffolding, preparing the surface by brushing and brooming down, etc. complete. The dry/wet cleaning of floors etc. after wall paper is to be carried out. Item to include getting mock-up for approved by Architect/Engineer in charge, all approved gluing as per detailed specifications and approval, all accessories, men material and all lifts, protecting finished surface with min. 20 microns thk polythene sheet till facility handover, finished cleaned complete. Item to be completed in all respects as per drawings & instructions from Project- in-charge.

14.5 ARTWORKS ON WALLS

Providing & installation work in special area panel size 6.0 x 2.4 m made out of modular acrylic sheet panel of 1.2x 2.4 each of 12mm thick of approved color and make to shape as per approved design pattern with computerized numerically controlled (CNC)-router cutting machine upto the min size of 10-25 mm width. Basic price of acrylic sheet with cutting of 600 /sq. ft. Item inclusive of single unit sample & all softcopies of artworks approval by architect all installation. & cleaning men & material & all fixing implements complete with all lift up to 20 mts including protecting exhibits from damage till handover with all necessary approved protective aids. The art work will be sourced from reputed professionals depending upon the quality of the work within the basic rate as per approval from EIC/Architect.

15.0 ROLLER BLINDS:

15.1 Providing & fixing of Roller Blinds Approved make Non-Blackout, Blind Shade, Color Decided as per site Color matching to be decided by site engineer-in-charge.

16.0 SHELTER GUARD

16.1 Providing and applying two coats of WPM 310, single component tough UV stable acrylic based highly elastomeric waterproof facade membrane, ensure that the coating is applied evenly at the recommended coverage rates. (3.2 Sqm per ltr per coat). apply the first coat of WPM310 over dried coat of primer and allow it to dry. apply the second coat of WPM310 in opposite direction to the first coat. Time gap of minimum 4 hours between the first and second coat should be maintained strictly. including grinding all sharp edges of the substrate to make them flush with the surface, cleaning the substrate to make them free from all contaminants, treating the cracks and construction joints, etc. and complete as per manufacturer's specification. Membrane must confirm specific gravity: approx. 1.3 g/cm3; characteristics of cured membrane- water vapour transmission (ASTM E96) at 1.0 mm: 21.9 g/sqm/24hrs; tensile strength: AS 1145 - after 28 days dry: 2.1 Mpa, after 14 days UV exposure: 3.0 Mpa, after 2500 Hrs QVA: 5.9 Mpa; Elongation at break AS 1145 - after 28 days dry: 460%, after 14 days UV exposure: 315%, after 2500 Hrs QUV: 180%. Application temperature: 10 Deg C to 35 Deg C; Service temperature: 0 to 60 Deg C; VOC content: 100g/L.

B. TECHNICAL SPECIFICATION OF PUBLIC HEALTH WORKS:

1.0 For Detailed Specification of DSR items of Public health works (Based on DSR 2018) mentioned in SOQ shall be as per CPWD specification 2009 VOLUME I AND VOLUME II (corrected up to the last date of submission/uploading of bid) i.e. in Sub-head No. 17, 18, 19, 23.

2.0 For Nonscheduled item mentioned in SOQ shall be installed as per manufacturer's direction approved by the Engineer-in-charge.

3.0 Specification/brands names of fixtures to be used as per the scope of work are listed in the bid documents. The efforts should be made by the Contractor to use indigenous products. The Contractor should also consider the availability of spares parts/ components for maintenance purposes while proposing any brand/ manufacturer. The materials of any other brand/manufacturer may be proposed for use by the Contractor in case the brands specified below are not available in the market and/or Contractor intends to use some other brand better than the brands mentioned in this list. The alternate brand can be used only after the approval of Engineer-in-Charge. The list of approved makes is appended to this document.

C. TECHNICAL SPECIFICATION OF ELECTRICAL WORKS:

1.0 INTERNAL ELECTRICAL WORKS INSTALLATION & ALLIED WORKS

For Detailed Specification of DSR items of Internal Electrical works (Based on DSR 2018) mentioned in SOQ shall be as per CPWD General specification for electrical works Part 1 (Internal) 2013 (corrected up to the last date of submission/uploading of bid).

1.0 GENERAL

The electrical Installation work shall be carried out in accordance with Indian Standard Code of Practice. It shall also be in conformity with the current Indian Electricity rules and regulations of local Electricity Rules. Fire Insurance Rules, I.S. Codes and Indian Electricity Rules.

General Specifications for Electrical Works.

- Part -I - Internal Work - 2005.
- Part -II - External Work - 2007.
- Part -IV - Substation Work - 2007.

Wherever this specifications calls for a higher standard of material and or workmanship than those required by any of the above mentions regulations and specification then the specification here under shall take precedence over the said regulations and standards.

The details of scope of work subhead wise are given in the subsequent paras. The quantities worked out in schedule of quantities are based on particular equipment considered at design stage. The contractor is required to recheck the quantities based on equipment offered by him to achieve required parameters.

TECHNICAL SPECIFICATION FOR L.T CABELS

1.0 GENERAL

L.T. Cables shall be supplied, inspected, laid tested and commissioned in accordance with drawings, specifications, relevant Indian Standards specifications and cable manufacturer's instructions. The cable shall be delivered at site in original drums with manufacturer's name clearly written on the drums. The recommendations of the cable manufacturer with regard to jointing and sealing shall be strictly followed.

1.2 MATERIALS

The L.T. Power cables shall be XLPE insulated PVC sheathed type aluminium conductor armoured cable conforming to IS : 7098 : 1988 (Part-I) with upto date ammendments where as control cable shall be XLPE insulated and PVC sheathed copper conductor armoured/ unarmoured cable conforming to IS:7098 (Part-I) 1988.

1.3 INSTALLATION OF CABLES

Cables shall be laid directly in ground, pipes, masonry ducts, on cable tray, surface of wall/ceiling etc. as indicated on drawings and/or as per the direction of Engineer-In-Charge. Cable laying shall be carried out as per CPWD specifications.

1.4 INSPECTION

All cables shall be inspected at site and checked for any damage during transit.

1.5 JOINTS IN CABLES

The Contractor shall take care to see that the cables received at site are apportioned to various locations in such a manner as to ensure maximum utilization and avoiding of cable joints. This apportioning shall be got approved from Engineer-In-Charge before the cables are cut to lengths.

1.6 LAYING CABLES IN GROUND

Cables shall be laid by skilled experienced workmen using adequate rollers to minimize stretching of the cables. The cable drums shall be placed on jacks before unwinding the cable. With great care it shall be unrolled on over wooden rollers placed in trenches at intervals not exceeding 2 metres. Cables shall be laid at depth of 0.75 metres below ground level. A cushion of sand total of 250mm shall be provided both above and below the cable, joint boxes and other accessories**.** Cable shall not be laid in the same trench or along side a water main**.**

The cable shall be laid in excavated trench over 80mm layer of sand cushion. The relative position of the cables, laid in the same trench shall preserved. At all changes in direction in horizontal and vertical planes, the cables shall be bent smooth with a radius of bent not less than 12 times the diameter of cables. Minimum 3 metre long loop shall be provided at both end of cable.

Distinguishing marks may be made on the cable ends for identifications of phases**.** Insulation tapes of appropriate voltage and in red, yellow and blue colours shall be wrapped just below the sockets for phase identifications.

1.7 PROTECTION OF CABLES

The cables shall be protected by bricks laid on the top layer of the sand for the full length of underground cable. Where more than one cables is laid in the same trench, the bricks shall cover all the cables and shall project a minimum of approximately 80mm on either side of the cables. Cable under road crossings and any other places subject to heavy traffic, shall be protected by running them through Hume Pipes of suitable size.

1.8 EXCAVATION & BACK FILL

All excavation and back fill required for the installation of the cables shall be carried out by the Contractor in accordance with the drawings and requirements laid down elsewhere. Trenches shall be dug true to line and grades. Back fill for trenches shall be filled in layer not exceeding 150mm. Each layer shall be properly rammed and consolidated before laying the next layer.

The Contractor shall restore all surface, roadways, side walks, kerbs wall or the works cut by excavation to their original condition to the satisfaction of the Engineer-In-Charge.

1.9 LAYING OF CABLES ON CABLE TRAY/SURFACE OF WALL/CEILING

Cable shall be laid on perforated M.S. Cable tray. Cables shall be properly dressed before cable ties/clamps are fixed. Wherever cable tray is not proposed, cables shall be fixed on surface of wall or ceiling slab by suitable MS clamps/ saddles**.** Care shall be taken to avoid crossing of cable.

1.10 CABLES ON HANGERS OR RACKS

The Contractor shall provide and install all iron hangers racks or racks with die cast cleats with all fixings, rag bolts or girder clamps or other specialist fixing as required.

Where hangers or racks are to be fixed to wall sides, ceiling and other concrete structures, the Contractor shall be responsible for cutting away, fixing and grouting in rag bolts and making good.

The hangers or racks shall be designed to leave at least 25mm clearance between the cables and the face to which it is fixed. Multiple hangers shall have two or more fixing holes. All cables shall be saddled at not more than 150mm centres. These shall be designed to keep provision of some spare capacity for future development.

1.11 CABLES TAGS

Cable tags shall be made out of 2mm thick aluminium sheets, each tag 1-1/2 inch in dia with one hole of 2.5mm dia, 6mm below the periphery. Cable designations are to be punched with letter/number punches and the tags are to be tied inside the panels beyond the glanding as well as below the glands at cable entries. Trays tags are to be tied at all bends. On straight lengths, tags shall be provided at every 5 metres / at both ends only.

1.12 TESTING OF CABLES

Prior to installation, burying of cables, following tests shall be carried out. Insulation test between phases, phase & neutral, phase & earth for each length of cable.

a. Before laying.
b. After laying.

c. After jointing.

On completion of cable laying work, the following tests shall be conducted in the presence of the Engineer-In-Charge.

a. Insulation Resistance Test (Sectional and overall).

b. Continuity Resistance Test.

c. Earth Test.

All tests shall be carried out in accordance with relevant Indian Standard code of practice and Indian Electricity Rules**.** The Contractor shall provide necessary instruments, equipments and labour for conducting the above tests & shall bear all expenses of conducting such tests.

TECHNICAL SPECIFICATION FOR CABLE TRAY

1.0 CABLE TRAY

The cable tray shall be fabricated out of slotted/perforated MS sheets as channel, sections, single or double bended**.** The channel sections shall be supplied in convenient lengths and assembled at site to the desired lengths. These may be galvanized or painted to the desired lengths. Alternatively, where specified, the cable tray may be fabricated by two angle irons of 50mm x 50mm x 6mm as two longitudinal members, with crosses bracings between them by 50mm x 5mm flats welded/bolted to the angles at 1 m spacing. 2mm thick MS perforated sheet shall be suitably welded/bolted to the base as well as on the two sides.

Typically, the dimensions, fabrication details etc. are shown in CPWD General Specification for Electrical Works - Part II -External, 1994**.**

The jointing between the sections shall be made with coupler plates of the same material and thickness as the channel section. Two coupler plates, each of minimum 200mm length, shall be bolted on each of the two sides of the channel section with 8mm dia round headed bolts, nuts and washers. In order to maintain proper earth continuity bond, the paint on the contact surfaces between the coupler plates and cable tray shall be scraped and removed before the installation**.**

The maximum permissible uniformly distributed load for various sizes of cables trays and for different supported span are as per CPWD General Specification of Electrical Work Part II -1994. The sizes shall be specified considering the same.

The width of the cable tray shall be chosen so as to accommodate all the cable in one tier, plus 30 to 50% additional width for future expansion. This additional width shall be minimum 100mm. The overall width of one cable tray shall be limited to 800mm.

Factory fabricated bends, reducers, tee/cross junctions, etc. shall be provided as per good engineering practice. Details are typically shown in figure 3 of CPWD General

Specification of Electrical Work Part-II -1994. The radius of bends, junctions etc. shall not be less than the minimum permissible radius of bending of the largest size of cable to be carried by the cable tray.

The cable tray shall be suspended from the ceiling slab with the help of 10mm dia MS rounds or 25mm x 5mm flats at specified spacing as per of CPWD General Specification of Electrical Work Part II -1994. Flat type suspenders may be used for channels upto 450mm width bolted to cable trays. Round suspenders shall be threaded and bolted to the cable trays or to independent support angles 50mm x 50mm x 5mm at the bottom end as specified. These shall be grouted to the ceiling slab at the other end through an effective means, as approved by the Engineer-In-Charge, to take the weight of the cable tray with the cables.

The entire tray (except in the case of galvanized type) and the suspenders shall be painted with two coats of red oxide primer paint after removing the dirt and rust, and finished with two coats of spray paint of approved make synthetic enamel paint.

The cable tray shall be bonded to the earth terminal of the switch boards at both ends.

The cable trays shall be measured on unit length basis, along the center line of the cable tray, including bends, reducers, tees, cross joints, etc, and paid for accordingly.

Cable laid on cable tray shall be clamped on the tray at suitable intervals as per CPWD specifications.

TECHNICAL SPECIFICATION OF POINT WIRING

1.0 SCOPE

This section covers the general technical requirements and measurement of the various component in Internal Electrical Installation Works.

1.1 TERMINOLOGY

The definition of terms shall be accordance with IS 732: 1989 (Indian Standard Code of Practice for Electrical Wiring), except for the definitions of point, circuit and submain wiring, which are defined in Clause 1.2, 1.3 and 1.3.2 hereunder.

1.2 POINT WIRING

1.2.1 Definition :

A point (other than socket outlet point) shall include all works necessary in complete wiring to the following outlets from the controlling switch or MCB. The scope of wiring for a point shall, however, includes the wiring work necessary in tapping from another point in the same distribution circuit: -

a) Ceiling rose or connector (in the case of points for ceiling/ exhaust fan points, pre-wired light fittings and call bells)

b) Ceiling rose (in case of pendants except stiff pendants)

c) Back plate (in the case of stiff pendants)

d) Lamp holder (in the case of gooseneck type wall brackets, batten holders and fittings which are not pre-wired.

1.2.2 In the case of call bell points, the words “from the controlling switch or MCB” shall be read as “from the ceiling rose meant for connection to bell push”.

1.2.3 Scope

i) Following shall be deemed to be included in point wiring :

a) Conduit, accessories for the conduit and wiring cables between the switch box and point outlet, loop protective earthing of each fan/ light fixture.

b) All fixing accessories such as clips, nails, screws, Phil plug, rawl plug etc. as required.

c) Metal switch boxes for control switches, regulators, sockets etc. recessed or surface type and phenolic laminated sheet covers in case of piano type switches and outer & inner cover plates in case of modular type switches.

d) Outlet boxes, junction boxes, pull-through boxes etc. but excluding metal boxes if any, provided with switchboards for loose wires/ conduit terminations.

e) Control switch or MCB as specified.

f) Ceiling rose or connector as required.
g) Connections to ceiling rose, connector, lamp holder, switch etc.

h) Interconnection wiring between points on the same circuit, in the same switch box or from another.

i) Protective (loop earthing) conductor from one metallic switch box to another in the distribution circuits, and for socket outlets. (The length of protective conductor run alongwith the circuits/ submains is excluded form the scope of points)

j) Based conduit or porcelain tubing where wiring cables pass through wall etc.

ii) Following shall be deemed to be included in group control point wiring :

Conduit, accessories for the conduit and wiring cables between the Switchboard/ MCBDB to the first point or wiring cable between points forming a group including loop protective earthing of each fan/ light fixture. (Providing MCB/Switch is not included in this scope and will be measured separately].

All fixing accessories such as clips, nails, screws, Phil plug, raw plug etc. as required.

Junction boxes, pull-through boxes etc. but excluding metal boxes if any, provided with Switchboard/ MCBDB for loose wires/ conduit terminations.

Ceiling rose or connector as required.

Connections to ceiling rose, connector & Switch/ MCB etc.

Bushed conduit or porcelain tubing where wiring cables pass through wall etc.

1.3 MEASUREMENT

1.3.1 POINT WIRING (OTHER THAN SOCKET OUTLET POINT)

Unless and otherwise specified, there shall be no linear measurement for point wiring for light points, fan points, exhaust fan points and call bell points. These shall be measured on unit basis by counting.

No separate measurement will made for interconnections between points in the same distribution circuit and for the circuit protective (loop earthing) conductors between metallic switch boxes.

1.3.2 POINT WIRING FOR SOCKET OUTLET POINTS

i) The light plug (5 / 6 Amp) point and power(15 / 16 Amp) point wiring shall be measured on linear basis, from the respective tapping point of live cable, namely, switchbox, another socket outlet point, or the Sub distribution board as the case may be, upto the socket outlet.

ii) The metal box with covers, switch/ MCB, socket outlet and other accessories shall be measured and paid as separate item.

iii) The power point may be 15/5 Amp or 16/6 Amp 6 pin socket outlet, where so specified in the Tender documents. (2 pin or 5 pin socket outlet shall not be permitted.)

1.3.3 SWITCH CONTROL GROUP POINT WIRING

i) In the case of points with more than one point controlled by one switch, such points shall be measured in part i.e. from switch to the first point outlet as one point and (from switch to first point of group controlled point). Subsequent looping points i.e one point to another point in the same group will be measured under group controlled point (from one point to another point).

ii) No recovery shall be made for non provision of more than one switch in such cases.

1.3.4 MCB CONTROL GROUP POINT WIRING

i) In the case of points with more than one point controlled by one MCB, such points shall be measured in part i.e. from MCB to the first point outlet as one point and will be measured under group controlled point (from MCB to first point of group controlled point). Subsequent looping points i.e one point to another point in the same group will be measured under group controlled point (from one point to another point).

ii) Providing MCB is not covered in this scope and will be measured separately and shall be separately paid for.

1.3.5 TWIN CONTROL LIGHT POINTS WIRING

i) A light point controlled by two numbers of two way switches shall be measured as two points from the fitting to the switches on either side.

ii) No recovery shall be made for non-provision of more than one ceiling rose or connector in such cases.

1.4 CIRCUIT AND SUBMAIN WIRING

1.4.1 Circuit Wiring

Circuit wiring shall mean the wiring from the distribution board upto the tapping point for the nearest first point of that distribution circuit, viz. upto the nearest first switch box.

1.4.2 Submain Wiring

Submain wiring shall mean the wiring from one Main/Distribution switchboard to another. Measurement of circuit and submain wiring.

i) Circuit and submain shall be measured on linear basis along the run of the wiring. The measurement shall include all lengths from end to end of conduit exclusive of interconnections inside the switchboard etc. The increase on account of diversion or slackness shall not be included in the measurement

ii) The length of circuit wiring with two wires shall be measured from the distribution board to the first nearest switch box in the circuit irrespective of whether the neutral conductor is take to switch box or not.

iii) When wires of different circuit are grouped in as single conduit the same shall be measured on linear basis depending on the actual numbers and sizes of wires run.

iv) When circuit wires and wires of point wiring are run in the same conduit, circuit wiring shall be measured on linear basis depending on the actual number and sizes of wires run in the existing conduit. As far as, practicable circuit wiring and point wiring shall be drawn in different conduit.

v) Circuit wiring and submain shall not be run in the same conduit.

vi) Protective (loop earthing) conductors, which are run along the circuit wiring and the submain wiring, shall be measured on linear basis and paid for separately.

1.5 OTHER WIRING WORKS

i) Except as specified above for point wiring, circuit wiring and submain wiring, other types of wiring shall be measured separately on linear basis alongwith the run of wiring depending on the actual number and sizes of wires run.

1.6 SYSTEM OF DISTRIBUTION AND WIRING

The main distribution board and branch distribution board shall be controlled or provided with linked switch fuse unit or miniature circuit breaker (MCB) of specified rating on the phase or live conductor or combined phase and neutral control gear for incoming and outgoing as indicated in the BOQ.

Distribution of submain and circuits.

As per final approved single line diagram.

1.6.1 Balancing of Circuits

i) The balancing of circuits in three wire or poly phase installations shall be arranged before handling to the satisfaction of the Engineer-In-Charge.

1.6.2 Wiring System

i) Unless and otherwise specified in the tender documents, wiring shall be done only by the "Looping System". Phase of live conductors shall be looped at the switch boxes and neutral conductors at the point outlets.

ii) Lights, fans and call bell shall be wired in the 'lighting' circuits. 15/ 16 Amp socket outlets and other power outlets shall be wired in the 'Power' circuits. 5/ 6Amp socket outlets shall be wired in the 'lighting circuits'.

iii) The wiring throughout the installation shall be such that there is no break in the neutral wire except in the form of linked switchgear

1.6.3 Run of Wiring

The type of wiring shall be as specified in tender document, i.e. conduit.

Surface wiring shall run, as far as possible, along the walls and ceiling so as to be easily accessible for inspection.

In no case, the open wiring shall be run above the false ceiling without the approval of Engineer-In-Charge.

In all types of wiring, due consideration shall be given for neatness, good appearance and safety.

1.6.4 Passing through walls or floors

When wiring cables are to pass through a wall, these shall be taken through a protection (Steel/PVC) pipe or porcelain tube of suitable size such that they pass through in a straight line without twist or cross in them on either end of such holes. The ends of metallic pipe shall be neatly bushed with porcelain, PVC or other approved material.

Where a wall pipe passes outside a building so as to be exposed to weather, the outer end shall be bell mouthed and turned downwards and properly bushed on the open end.

All floor openings for carrying any wiring shall be suitably sealed after installation.

1.6.5 Joints in Wiring

i) No bare conductor in phase and/or neutral or twisted joints in phase, neutral, and/or protective conductors in wiring shall be permitted.

ii) There shall be no joints in the through runs of cables. If the length of final circuit or submain is more than the length of a standard coil, thus necessitating a through joint, such joints shall be made by means of approved mechanical connectors in suitable junction boxes.

iii) Termination of multi-stranded conductors shall be done using suitable crimping type thimbles.

1.7 CONFORMITY TO IE ACT, IE RULES AND STANDARDS

i) All electrical works shall be carried out in accordance with the provisions of Indian Electricity Act, 1910 and Indian Electricity Rules, 1956, amended up to date and a certificate to this effect shall be submitted by the contractor to the Owners.

ii) The works shall also conform to relevant Indian Standard Codes of Practice shall be followed.

1.8 GENERAL REQUIREMENTS OF COMPONENTS

1.8.1 Quality of Materials

All material and equipments supplied by the Contractor shall be new. They shall be of such design, size and materials as to satisfactorily function under the rated conditions of operation and to withstand the environmental conditions at site.

1.8.2 Conformity of Standards

a) All components shall conform to relevant Indian Standard Specification, wherever existing. However, for conduits, wiring cables, piano switches and socket outlets, ISI marked materials shall only be permitted.

b) The Indian Standards, including amendments or revisions thereof upto the date of tender acceptance, shall be applicable.

1.8.3 Interchangeability

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

1.9 CABLES

1.9.1 Wiring Cables

Conductors of wiring cables (other than flexible cables) shall be of aluminium or copper, as specified.

Stranded aluminium conductor shall not be used in wiring cables upto and including 6 Sq.mm. size.

Unless and otherwise specified, copper conductor of size 1.5 Sq.mm. and above used for wiring shall be stranded.

1.9.2 Flexible Cables

i) Conductor of flexible cables shall be of copper. The minimum cross sectional area of conductor for flexible cable shall be 0.0006 Sq. inch (14/.0076" or 14/0.193 mm).

ii) Only 3 core flexible cables shall be used for connecting single-phase appliances.

iii) Unless armour, or tough rubber, or PVC sheath mechanically protects the flexible cables, these shall not be used in workshops and other places where they are liable to mechanical damage.

iv) Flexible cable connection to bell push from ceiling rose shall be taken through steel conduit/ metallic casing and capping.

1.10 WIRING ACCESSORIES

1.10.1 Control Switches For Points

i) Combined switch cum socket shall not be permitted.

ii) Control switch shall be placed only in the live conductor of the circuit. No single pole switch or fuse shall be inserted in the protective (earth) conductor, or earthed neutral conductor of the circuit.

1.10.2 Socket Outlets

i) 5/ 6Amp and 15/ 16Amp 6 Pin socket outlets shall be installed at the following positions, unless otherwise specified.

a) Kitchen/ Pantry 23 cm above working platform and away from the likely positions of stove and sink.

b) Toilets in non-residential building – 1.25 mt. Above floor level.

c) At all other places – 23 cm above floor level.

1.10.3 Switch box covers

Phenolic laminated sheet of 3 mm thick of approved shade shall be used for switch box covers in case of piano type switches. For modular type switches/sockets suitable outer and inner cover plates as specified shall be provided over the standard box as recommended by the manufacturers of modular type switch/ sockets and no separate sheet cover is required to be provided.

1.10.4 Ceiling Rose

i) A ceiling rose shall not be used on circuit the voltage of which normally exceeds 250 Volts.

ii) Only one flexible cord shall be connected to ceiling rose. Specially designed ceiling roses shall be used for multiple pendants.

iii) A ceiling rose shall not embody fuse terminal as an integral part of it.

1.11 FITTINGS

The type of fittings shall be as specified in BOQ of tender documents.

1.11.1 Indoor Type Fittings

i) The contractors shall supply the specified model and make of the fittings. The standard constructional features of specified make and model as given in the tender document are acceptable.

ii) Where conductors are required to be drawn through tube or channel leading to the fitting, the tube or channel must be free from sharp angles or projection edge, and

of such size as will enable them to be wired with the conductors used for the final circuit without removing the braiding or sheathing. A far as possible all such tubes or channels should be of sufficient size to permit looping back.

iii) Pendants in verandahs and similar situations exposed to wind shall be of fixed rod type.

iv) Fittings using discharge lamps shall be complete with power factor correction capacitors, either integrally or externally. An earth terminal with suitable marking shall be provided for each fitting for discharge lamps.

v) Fittings shall be installed such that the lamp is at a height specified in approved drawings or as directed by the Engineer-In-Charge.

1.12 ATTACHMENT OF FITTINGS AND ACCESSORIES

1.12.1 Conduiting Wiring System

i) All accessories like switches, socket outlets, call bell pushed and regulators shall be fixed in flush pattern inside the switch/ regulator boxes. Accessories like ceiling roses, brackets, batten holders, stiff pendants etc. shall be fixed on metal outlet boxes.

ii) Brass screws shall be used to fix the accessories to their bases.

iii) The switch box/ regulator box shall normally be mounted with their bottom 1.25 m from floor level, unless otherwise directed by the Engineer-In-Charge.

1.12.2 Fixing of Walls and Ceiling

i) PVC sleeves/ dash fasteners should normally be used for fixing to walls or ceiling.

ii) Plugging of walls or ceiling can be done in a better way where neatness is the first consideration. In all such cases, an approved type of asbestos or fiber fixing plug (rawl or Phil plug) with correct size of tools shall be used and done in a workmanlike manner.

1.12.3 FANS, REGULATORS AND CLAMPS

1.12.3.1 Ceiling Fans

i) Ceiling fans including their suspension shall conform to relevant Indian Standards.

ii) Any additional hardware items required for installation of ceiling fans including fan hooks/ clamps as specified below, shall be provided as specified in BOQ as a separate item.

iii) All ceiling fans shall be wired to ceiling roses or to special connector boxes, and suspended from hooks or shackles, with insulators between hooks and suspension rods. There shall be no joint in the suspension rod.

iv) For wooden or steel joists and beams, the suspension shall consist of MS flat of size not less than 40mm x 6mm, secured on the sides of the joists or beams by means of two coach screws of size not less than 5 cm for each flat. Where there is space above the beam, a through bolt of size not less than 1.5cm dia shall be placed above the beam from which the flats are suspended. In the latter case, the

flats shall be secured from movements by means of another bolt and nut at the bottom of the beam. A hook consisting of MS rod of size not less than 1.5 cm dia shall be inserted between the MS flat through oval holes on their sides. Alternatively, the flats may be bent inwards to hold tightly between them by means of a bolt and nut, a hook of 'S' form.

v) In the case of 'I' beams, flats shall be shaped suitably to catch the flanges and shall be held together by means of a long bolt and nut.

vi) For concrete roofs, a 12mm dia. MS rod in the shape of 'U' with their vertical legs bent horizontally at the top at least 19cm on either side and bound to the top reinforcement of the roof shall be used.

vii) In buildings with concrete roofs having a low ceiling height, where the fan clamp mentioned under sub clause (vi) above cannot be used, or wherever specified, recessed type fan clamp inside a metallic box shall be used. The metallic box shall suitably be covered with 3mm thick phenolic laminated sheet.

viii) Canopies on top of suspension rod shall effectively hide the suspension.

ix) The leading in wire shall be of copper and nominal cross sectional area not less than 1.5 Sq.mm. and shall be protected from abrasion.

x) All ceiling fans shall be hung at a height as directed by the Engineer-In-Charge.

xi) In the case of measurement of extra down rod for ceiling fan including wiring, the same shall be measured in units of 10 cm. Any length less than 5cm shall be ignored.

xii) The wiring of extra down rod shall be paid as supplying and drawing cable in existing conduit.

1.12.3.2 Exhaust Fans

i) Exhaust fans shall conform to relevant Indian Standards.

ii) Exhaust fans shall be erected at the places indicated by the Engineer-In-Charge additional hardware items required for installation of ceiling fans including fan hooks/ clamps as specified below, shall be provided as specified in BOQ as a separate item.

1.12.3.3 Regulators

The metallic body of regulators of ceiling fans / exhaust fans shall be connected to earth by protective conductor.

1.12.3.4 Workmanship

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

The work shall be carried out under the direct supervision of an engineer, employed by the contractor, who shall rectify then and there the defects pointed out by the Engineer-In-Charge during the progress of work. The qualification of engineer or supervisor for

over all supervision and to take instructions from the Engineer-In-Charge shall be as specified in the special conditions.

1.13 TESTING OF INSTALLATION

All the completed installations shall be tested as per specification for "Testing of Installation".

1.13.1 Drawings

i) The work shall be carried out in accordance with the drawings enclosed with the tender documents and also in accordance with modification thereto from time to time as approved by the Engineer-In-Charge or as per the drawing prepared by the contractor based on inventory and approved by Engineer-In-Charge.

ii) All wiring diagrams shall be deemed to be 'Drawings' within the meaning of the term as used in the Conditions of Contract. They shall indicate the main switchboard, the distribution boards (with circuit numbers controlled by them), the runs of various mains and submains and the position of all points with their controls.

iii) All circuits shall be indicated and numbered in the wiring diagram and all points shall be given the same number as the, circuit to which they are electrically connected.

1.14 COMMISSIONING OF COMPLETION

1.14.1 Before the workman leaves the work finally, he must make sure that the installation is commissioned, after due testing.

1.14.2 Completion Plan and Completion Certificate

i) For all work completion certificate after completion of work as required by Owner shall be submitted to the Engineer-In-Charge.

ii) Completion plan drawn to a suitable scale in tracing sheet with three blue print copies of the same shall also be submitted.

a) General Layout of the building.

b) Locations of main switchboard and distribution boards.

c) Position of all points and their controls indicating the circuit numbers controlled by them.

d) Types of fittings, viz. C.F.L., L.E.D. bracket fans, Exhaust fans etc.

e) Name of work, job number, accepted tender reference, actual date of completion, names of Division/Sub-Division, and name of the firm who executed the work with their signature.

NON-METALLIC CONDUIT WIRING SYSTEM

1.0 SCOPE

This section covers the detailed requirements for wiring work in non metallic conduits. This section covers both surface and recessed types of works.

1.1 APPLICATIONS

Conduit system used shall be Rigid.

Flexible conduits may only be permitted for interconnections between switchgear & DBs and conduit terminations in wall.

1.2 MATERIALS

1.2.1 Conduits :

i) All rigid conduit pipes shall be of Heavy grade F.R.L.S. PVC. The wall thickness shall be 1.6mm (16 SWG) for conduits upto 32mm dia. and 2mm (14 SWG) for conduits above 32mm dia and as per IS. These shall be solid drawn or reamed by welding, and finished with galvanized or stove enameled surface.

ii) The maximum number of PVC insulated cables conforming to IS: 694-1990 that can be drawn in one conduit is given size wise in Table I., and the number of cables per conduit shall not be exceeded. Conduit sizes shall be selected accordingly in each run.

iii) No conduits less than 20mm in diameter shall be used.

1.2.2 Conduits Accessories :

i) The conduit wiring system shall be complete in all respects, including their accessories.

ii) All conduit accessories shall be of slip joint type, and under no circumstances pin grip type or clamp grip accessories shall be used.

iii) Bends, couplers etc. shall be solid type in recessed type of works and may be solid or inspection type as required, in surface type of works.

iv) a) Saddles for surface conduit work on wall shall not be less than 0.55mm (24 gauge) for conduits upto 25mm dia and not less than 0.9mm (20 gauge) for larger diameter. The corresponding widths shall be 19mm and 25mm.

b) The minimum width and the thickness of girder clips used for fixing conduits to steel joints, and clamps shall be as per Table-II.

1.2.3 Outlets :

i) The switch box regulator box shall be made of metal on all sides, except on the front. In case of welded mild steel sheet boxes the wall thickness shall not be less than 1.2mm (18 gauge) for boxes upto a size of 20 cm x 30 cm and above this size 1.6mm (16 gauge) thick MS boxes shall be used. The metallic boxes shall be duly painted with anticorrosive paint before erection as per painting specification.

ii) a) Outlet boxes for light/ power sockets shall be of standard size of manufacturer to accommodate required number of modular switches, socket outlet.

b) Where a large number of control switches and/ or fan regulators are required to be installed at one place, these shall be installed in more than one outlet box adjacent to each other for ease of maintenance.

iii) An earth terminal with stud and metal washers shall be provided in each DB/MS box for termination of protective conductor and for connection to socket outlet/ metallic body of fan regulator etc.

iv) A metal strip shall be welded/ screwed, to the metal box as support if fan regulators are to be fixed herein.

v) Clear depth of the box shall not be less than 50mm, and this shall be increased suitably to accommodate mounting of fan regulators in flush pattern.

vi) The fan regulators can also be mounted on the switch box covers, if so directed by the Engineer-In-Charge.

vii) The size of the switchbox in case of piano type switches shall be as below

a) Without any fan regulator/ Dimmer on the Switch box:- The size of the switch box shall be minimum 75mm x 75mm x 60mm deep to accommodate the number of switches meeting spacing requirements mentioned below.

b) With electronic/ resistance type fan regulator on the Switch box:- The size of the switch box shall be minimum 75mm x 75mm x 60mm to accommodate the number of switches and fan regulators meeting spacing requirements mentioned below.

Spacing Requirements

The spacing between any edge of live terminal of Switch/ socket and the body shall not be less than 26mm at any point.

viii) The size of the switch box in case of modular type switches shall be as per manufacturer's standard.

1.3 INSTALLATION

1.3.1 Common aspects for recessed and surface conduit works.

i) Conduit Joints

a) The conduit work in each circuit or section shall be completed before the cables are drawn in.

b) Conduit pipes shall be joined by means of slip joints and using proper adhesive

c) Cut ends of conduit pipes shall have no sharp edges, nor any burrs left to avoid damage to the insulation of the conductors while pulling them through such pipes.

d) The Engineer-In-Charge, with a view to ensuring that the above provision has been carried out, may require that the separate lengths of conduit etc. after they have been prepared shall be submitted for inspection before being fixed.

ii) Bends in Conduit

a) All necessary bends in the system, including diversion, shall be done either by neatly bending the pipes without cracking with bending radius of not less than 7.5 cm., or alternatively, by inserting suitable solid or inspection type normal bends, elbows or similar fittings, or by fixing cast iron inspection boxes, whichever is most suitable.

b) No length of conduit shall have more than the equivalent of four quarter bends from outlet to outlet.

c) Conduit fittings shall be avoided as far as possible on conduit system exposed to weather. Where necessary, solid type fittings shall be used.

iii) Outlets

a) All outlets such as switches, wall sockets etc. may be either flush mounting type, or of surface mounting type, as specified in the additional specifications if any or as directed by the Engineer-In-Charge.

b) All piano type switches and accessories shall be fixed on the phenolic laminated sheet covers in flush pattern.

iv) Fixing Conduit On Surface

Conduit pipes shall be fixed by saddles, secured to suitable approved plugs with screws in an approved manner at an interval of not more than one metre, but on either side of the couplers or bends or similar fittings, saddles shall be fixed at a distance of 30 cm from the centre of such fittings.

Where conduit pipes are to be laid along the trusses, steel joists etc. the same shall be secured by means of saddles or girder clips or clamps as required by the Engineer-In-Charge.

In long distance straight run of conduit, inspected type couplers at reasonable intervals shall be provided, or running threads with couplers and jam nuts shall be provided.

v) Fixing Outlet Boxes

Only a portion of the switch box shall be sunk in the wall, the other portion being projected out for suitable entry of conduit pipes into the box.

1.3.3 Additional requirements for recessed conduit works

i) Making Chase

a) The chase in the wall shall be neatly made, and of ample dimensions to permit the conduit to be fixed in the manner desired.

b) In the case of building under construction, the conduits shall be buried in the wall before plastering, and shall be finished neatly after erection of conduit.

c) In chase of exposed brick/ rubber masonry work, special care shall be taken to fix the conduit and accessories in position along with the building work.

ii) Fixing Conduits in Chase

a) The conduit pipe shall be fixed by means of staples, J-hooks, or by means of saddles, not more than 60 cm apart, or by any other approved means of fixing.

b) All threaded joints of conduit pipes shall be treated with some approved preservative compound to secure protection against trust.

iii) Fixing Conduits in RCC work

a) The conduit pipes shall be laid in position and fixed to the steel reinforcement bars by steel binding wires before the concreting is done. The conduit pipes shall be fixed firmly to the steel reinforcement bars to avoid their dislocation during pouring of cement concrete and subsequent tamping of the same.

a) Fixing of standard bends or elbows shall be avoided as far as practicable, and all curves shall be maintained by bending the conduit pipe itself with all long radius, which all permit easy drawing in of conductors.

iv) Fixing Inspection Boxes

Suitable inspection boxes to the minimum requirement shall be provided to permit inspection, and to facilitate replacement of wires, if necessary. The distance between inspection/ junction boxes shall not exceed 12.5 mts in straight run.

Location of inspection/ junction boxes in RCC work should be identified by suitable means to avoid unnecessary chipping of the RCC slab subsequently to locate these boxes.

These shall be mounted flush with the wall or ceiling concrete. Minimum 65mm depth junction boxes shall be used in roof slabs and the depth of the boxes in other places shall be as per IS : 2667-1977.

Suitable phenolic laminated sheet cover shall be provided on the inspection box.

Suitable ventilating holes shall be provided in the inspection box covers.

v) Fixing Switch Boxes and Accessories

Switch boxes shall be mounted flush with the wall. All outlets such as switches, socket outlets etc. shall be flush mounting type, unless otherwise specified.

vi) Fish wire

To facilitate subsequent drawing of wires in the conduit, GI fish wire of 1.6mm / 1.2mm (16/ 18 SWG) shall be provided alongwith the laying of the recessed conduit.

vii) Bunching of Cables

a) Cables carrying direct current may, if desired, be bunched whatever their polarity, but cables carrying alternating current, if installed in metal conduit shall always be bunched so that the outgoing and return cables are drawn into the same conduit.

b) Where the distribution is for single phase loads only, conductors for these phases shall be drawn in one conduit.

c) In case of three phase loads, separate conduits shall be run from the distribution boards to the load points or outlets as the case may be.

1.3.4 Earthing Requirements

i) The entire system including the outlet boxes and other metallic accessories, shall be mechanically and electrically continuous by proper screwed joints, or by double check nuts at termination. The conduit shall be continuous when passing through wall or floors.

ii) Protective (loop earthing) conductor (s) shall be laid along the runs of the conduit between the metallic switch boxes and the distribution boards/ switchboards, terminated thereto. The conductors shall be of such size and material as specified. Depending upon their size and material, the protective earth conductors shall be either drawn inside the conduits alongwith the cables, or shall be laid drawn in outside the conduits. When laid external to the conduits, this shall be properly clamped with the conduit at regular intervals.

iii) The protective conductors shall be terminated properly using earth studs, earth terminal block etc. as the case may be.

iv) Gas or water pipe shall not be used as protective conductor (earth medium).

TABLE - I

Maximum number of PVC insulated 1100 V grade aluminium/copper conductor cable conforming to IS : 694 - 1990

Nominal Cross-Sectional area of conductor in sq.mm	20mm		25mm		32mm		38mm		51mm		64mm	
	S	B	S	B	S	B	S	B	S	B	S	B
1	2	3	4	5	6	7	8	9	10	11	12	13
1.50	5	4	10	8	18	12	-	-	-	-	-	-
2.50	5	3	8	6	12	10	-	-	-	-	-	-
4	3	2	6	5	10	8	-	-	-	-	-	-
6	2	-	5	4	8	7	-	-	-	-	-	-
10	2	-	4	3	6	5	8	6	-	-	-	-
16	-	-	2	2	3	3	6	5	10	7	12	8
25	-	-	-	-	3	2	5	3	8	6	9	7
35	-	-	-	-	-	-	3	2	6	5	8	6
50	-	-	-	-	-	-	-	-	5	3	6	5
70	-	-	-	-	-	-	-	-	4	3	5	4

NOTE :

1. The above table shows the maximum capacity of conduits for a simultaneous drawing in of cables.

2. The columns headed 'S' apply to runs of conduits which have distance not exceeding 4.25m between draw in boxes and which do not deflect from the straight by an angle of more than 15 degrees. The columns headed 'B' apply to runs of conduit which deflect from the straight by an angle of more than 15 degrees.

3. Conduit sizes are the nominal external diameters.

TABLE - II

Girder clips or clamps

Size of Conduit		Width	Thickness
i)	20 mm - - - -	19 mm	0.9mm (20 SWG)
ii)	25 mm - - - -	19 mm	0.9mm (20 SWG)
iii)	32 mm & above - - - -	25 mm	1.2mm (18 SWG)

1.4 SPECIFICATION FOR PAINTING

1.4.1 SCOPE

This section covers the requirements of painting work in internal electrical installations, carried out manually by brush. This does not cover spray painting work of factory made items.

1.4.2 PAIINTING WORK IN GENERAL

1.4.2.1 PAINTS

Paints, oils, vanishes etc. of approved make, in original tin to the satisfaction of the Engineer-In-Charge shall only be use.

1.4.2.2 PREPRATION OF THE SURFACE

The surface shall be thoroughly cleaned and made free from dust or foreign matter before painting is started. The proposed surface may be inspected by the Engineer-In-Charge before the paint is applied.

1.4.2.3 APPLICATION :

i) Paint shall be applied with brush. The paint shall be spread as smooth and even as possible. Particular care shall be paid to rivets, nuts, bolts and over-lapping. Before drawing out in small containers, it shall be continuously stirred with a smooth stick, while painting work is taken up.

ii) Primary coat of anti-corrosive paint shall be given in the case of steel work, after preparation the surface. In all cases of painting work, finishing shall be with 2 coats of paint in approved shade.

iii) Each coat shall be allowed to dry out sufficiently before a subsequent coat is applied.

1.4.2.4 PRECAUTIONS

All furniture, fixture, glazing, floors etc. shall be protected by suitable covering. Al stains, smears splashing, dropping etc. shall be removed. While painting of wiring etc. it shall be ensured that the painting of wall and ceiling etc. is not spoiled in any way.

TESTING OF INSTALLATION

1.0 **SCOPE**

This section describes the details of test to be conducted in the completed internal electrical installation, before commissioning.

1.1 **GENERAL**:

1.1.1 TESTS

On completion of installation, the following tests shall be carried out :-

i) Insulation resistance test.
ii) Polarity test of switch.
iii) Earth continuity test.
iv) Earth electrode resistance test.

1.1.2 WITNESSING OF TESTS

Testing shall be carried out for the completed installations, in the presence of and to the satisfaction of the Engineer-In-Charge by the Contractor. All test results shall be recorded and submitted to the Department.

2.0 **INSULATION RESISTANCE**

The tests described below shall be made before the installation is permanently connected to the supply. For these tests large installations may be divided into groups of outlets, each containing not less than 50 outlets. For the purposes of this code the term 'outlet' includes every point and every switch except that a socket outlet, appliance or luminaire incorporating a switch is regarded as one outlet. The test voltage for insulation resistance measurement shall be 1000 V.

When measured with all fuse links in place, all switches (including, if practicable, the main switch) closed and, all poles or phases of the wiring electrically connected together, the insulation resistance to earth shall be not less than 1 mega ohm.

When measured between all the conductors connected to any one phase or pole of the supply and, in turn, all conductors connected to each other phase or pole the insulation resistance shall be not less than 1 mega ohm. Wherever practicable, so that all parts of the wiring may be tested, all lamps shall be removed and all current-using equipment shall be disconnected and all local switches controlling such lamps or other equipment shall be closed. Where the removal of lamps and/or the disconnection of current-using equipment is impracticable, the local switches controlling such lamps and/or equipment shall be open. Particular attention shall be given to the presence of electronic devices connected in the installation and such devices shall be isolated so that the test voltage does not damage them.

Where equipment is disconnected for the tests prescribed above, and the equipment has exposed conductive parts required by these clauses to be connected to protective conductors, the insulation resistance between the exposed conductive parts and all live parts of the equipment shall be measured separately and shall comply with requirements of the appropriate Indian Standard and the insulation resistance shall not less than 0.5 mega ohm.

3.0 POLARITY TEST OF SWITCH

In a two wire installation, a test shall be made to verify that all the switches in every circuit have been fitted in the same conductor, throughout, and such conductor, shall be labeled or marked for connection to the phase conductor, or to the non-earthed conductors of the supply.

In a three wire or a four wire installation, a test shall be made to verify that every non-linked single pole switch is fitted in a conductor which is labeled, or marked for connection to one of the phase conductors of the supply.

The installation shall be connected to the supply for testing. The terminals of all switches shall be tested by a test lamp, one lead of which is connected to earth. Glowing of test lamp to its full brilliance, when the switch is in 'ON' position irrespective of appliance in position or not, shall indicate that the switch is connected to the right polarity.

4.0 TESTING OF EARTH CONTINUITY PATH

The earth continuity conductor, including metal conduits and metallic envelops of cables in all cases, shall be tested for electric continuity. The electrical resistance of the same alongwith the earthing lead, but excluding any added resistance, or earth leakage circuit breaker, measured from the connection with the earth electrode to any point in the earth continuity conductor in the completed installation shall not exceed one ohm.

5.0 MEASUREMENT OF EARTH ELECTRODE RESISTANCE

5.1 Two auxiliary earth electrodes, besides the test electrode, are placed at suitable distance from the test electrode. A measured current is passed between the electrode 'A' to be tested and an auxiliary current electrode 'C' and the potential difference between the electrode 'A' and auxiliary potential 'B' is measured. The resistance of the test electrode 'a' is then given by

$$R = V/I$$

Where,

R- Resistance of the test electrode in ohms

V- Reading of the voltmeter in volts

I- Reading of the ammeter in amps

5.1.1 i) Stray currents flowing in the soil may produce serious errors in the measurement of earth resistance. To eliminate this, hand driven generator is used.

ii) If the frequency of the supply of hand driven generator coincides with the frequency of stray current, there will be wandering of instrument pointer. An increase or decrease of generator speed will cause this to disappear.

5.1.2 At the time of test, the test electrode shall be separated from the earthing system.

5.1.3 The auxiliary electrodes shall be of 13mm diameter mild steel rod driven upto 1 m into the ground.

5.1.4 All the three electrodes shall be so placed that they are independent of the resistance area of each other. If the test electrode is in the form of a rod, pipe or plate, the auxiliary current electrode C shall be placed at least 30 m away from it and the auxiliary potential electrode 'B' shall be placed mid-way between them.

5.1.5 Unless three consecutive readings of test electrode resistance agree, the test shall be repeated by increasing the distance between electrodes A and C upto 50 m, and each time placing the electrode B mid-way between them.

5.1.6 On these principles, "Megger Earth Tester" containing a direct reading ohm-meter, a hand driven generator and auxiliary electrodes are manufactured for direct reading of earth resistance of electrodes.

6.0 **TEST CERTIFICATE**

On completion of an electrical installation or an extension to an installation, a certificate shall be furnished by the Contractor, countersigned by the competent Engineer PMC Rep.

FORM OF COMPLETION CERTIFICATE

I/We certify that the installation detailed below has been installed by me/us and tested and that best of my/ our knowledge and belief it complies with Indian Electricity Rules 1956, as well as the Contract Specifications.

Electrical Installation at _____

Voltage and system of supply _____

2.0 EXTERNAL ELECTRICAL WORKS

For Detailed Specification of D.G. Set of Electrical works (Based on DSR 2018) mentioned in SOQ shall be as per CPWD General specification for electrical works Part VII (D.G SET) 2013. (corrected up to the last date of submission/uploading of bid).

For Detailed Specification of Substation of Electrical works (Based on DSR 2018) mentioned in SOQ shall be as per CPWD General specification for electrical works Part IV (SUBSTATION) 2013. (corrected up to the last date of submission/uploading of bid).

2.1 DG SET (SOUND PROOF DG SETS OF 125 KVA)

"Supply ,installation ,testing and commissioning of 125 KVA water cooled silent DG set comprising of water cooled Diesel Engine developing 156 BHP @ 1500 RPM & 125 KVA

alternator rated at three Phase , 415 Volts , 50 Hz: 0.8 P.F. @ 1500 RPM Both mounted , and aligned on a common MS base Frame Complete with MS Fuel tank , Standard AMF Control Panel , Residential Exhaust Silencer , AVM Pads fitted on base frame , 1 nos. 12 Volts DC Battery ,Battery Leads , 1st fill of lube oil all housed in sound proof Acoustic Enclosure as per specification attached as per satisfaction of engineer in-charge.
Note: The Agency Will provide first filling of full tank Diesel with supply of DG set"

2.2 DG AMF PANEL

Supply, installation, testing and commissioning of DG, cubical type, totally enclosed, free standing type, dust, damp and vermin proof made up of 14/16 SWG CRCA sheet, complete with busbars, M.V. Danger notice plate, inter connections with suitable capacities aluminum leads / solid aluminum strips / rods ,power coats painted and having incoming and outgoing switchgear as mentioned below and complete as required.
1. All relays to operate at 240 V single phase, 50HZ, AC supply through UPS
2. Panel should be suitable for manual and automatic operation (AMF) and shall be complete as required.
One no.250 A auto change over switch for changeover state electricity board power and DG set power including by pass facility as approved by the engineer – in-charge.
1 no. MCCB as per following details specifications
250 AMP. 415 V, 4 pole MCCB with Microprocessor realest and variable current settings 0.8 to 1.0) with earth fault release
"ON" LED indicating Lamp and 2A control SP MCB
Extended rotary operating mechanism
Digital energy meter with one set of suitable CTs, CT sorting link
Digital Ampere Meter of suitable range with suitable set of CTs and ASS
Digital Volt meter with VSS and HRC fuse
Digital multi-function meter to show, KWH, KVAH, P.P and frequency meter one set of suitable CTs, CT shorting links.

2.3 PROTECTION AND AMF COMPONENTS FOR ABOVE MENTION DG SET

Over voltage relay
Under voltage relay
Battery charger (with trickle and boost charging).
Digital voltmeter and ammeter.
8 window Alarm annuciator with separate hooter , accept ,reset and push button
Hooter
Engine cranking relay
Main supply voltage monitor, alternator voltmeter monitor and engine starting relays
Auxiliary relays, Timer, Push button and control fuse
Phase sequence relays

2.4 ENCLOSURE:

Fabrication, PVC sleeving, Control/power wiring and necessary electrical / mechanical interlocking etc. any other item required for proper functioning of the system complete as required

Providing and fixing oil tank of suitable capacity complete with suitable M.S Fabricated ,M.S stand oil level indicator gauge tank and stand duly painted complete with float switches etc. including its connections to the fuel tank of the DG set complete as required
The silencer should be minimum 20'-0" long nothing extra shall be paid
125KVA DG set with AMF panel mentioned as above Model No: 6BTAA5.9G13

2.5 EARTHING OF DG SET:

Earthing with G.I. earth plate 600 mm X 600 mm X 6 mm thick including accessories, and providing masonry enclosure with cover plate having locking arrangement and watering pipe of 2.7 meter long etc. with charcoal/ coke and salt as required.(2No for DG body earthing)
Earthing with copper earth plate 600 mm X 600 mm X 3 mm thick including accessories, and providing masonry enclosure with cover plate having locking arrangement and watering pipe of 2.7 meter long etc. with charcoal/ coke and salt as required.(2No. For DG Neutral earthing)
Providing and fixing 25 mm X 5 mm copper strip on surface or in recess for connections etc. as required.
Providing and fixing 25 mm X 5 mm G.I. strip on surface or in recess for connections etc. as required.
Providing and fixing 6 SWG dia G.I. wire on surface or in recess for loop earthing as required.
Providing & laying in position cement concrete 1:3:6 (1Cement:2Coarse sand: 6 graded stone aggregate 20mm nominal size) in foundation of DG sets etc including form work etc as required. (1No DG set+1No CSS 2X6x5X.6Mtr)

2.6 400KVA, 11KV SUB-STN

Providing and fixing of FIRE EXTINGUISHER ABC Powder type (stored pressure)as per is :15683 complete with all accessories as per manufactures specification.ISI Mark complete in all respect. 4 kg capacity.
Providing and fixing of FIRE EXTINGUISHER CO2 type as per is: 15683 complete with all accessories as per manufactures specification.ISI Mark complete in all respect. 4.5 kg capacity

2.7 PCC POLES

Supply and erection of pre-stressed cement concrete pole of suitable length with a given planting depth confirming to IS1678-1978 below ground level in excavated pit of suitable dimensions complete in all respect as per satisfaction of engineer in charge.
PCC pole overall length 11metre planting depth 1.83 meter, top dimensions 152.4mmx 203.2mm bottom dimensions 152.4mmx368.3mm load capacity 363Kg and wt 1146Kg.
ACSR- Supply and sagging of al conductor steel reinforced (ACSR) on pole including binding with insulators.

2.8 GO SWITCH 200A & POLE ACCESSORIES

Supply & erection of 11KV 400-800A GO switch confirming to ISI specifications. The item includes supply and erection of operating pipe and handle arrangement of MS flat 50mmX6mm and channels 75mmx40mm sheet. The GO switch is to be fitted with locking

arrangement so as it locks upward on “ON" position and locks downward in "OFF" position. The entire GO switch assembly/unit should be properly earthed and the job is to be completed as approved by engineer-in-charge.
ACSR DOG conductor (100sq mm) Size (6/4.5Al+1/4.5GI)
Supply and Erection of MS angle iron size 50mm x 50mmx 6mm thick with cutting, bending and necessary holes as desired by Engineer-in-charge at site.
Supply and erection of MS channel iron size 100mmx50mmx6mm thick with cutting, bending and necessary holes as desired by engineer in charge
Supply and erection of MS flat size 50mmx5mm thick with cutting, bending and necessary holes as desired by engineer in charge

2.9 XLPE INSULATED HT ARMOURED CABLES
Supply & laying of Circular Aluminum conductor, conductor screened with extruded semiconducting compound, XLPE insulated, insulation screened with extruded semiconducting combination in combination with copper tape (0.3KA for 1sec.) cores laid up, FRLS PVC inner sheathed, galvanized steel strip armored and overall FRLS PVC sheathed cable confirming to IS:7098/II/85 working voltage 11KV(UE) grade to be laid 1 m below ground level including excavation, sand cushioning, covering with sand & bricks and back filling the trench etc., of the required size:-
Circular Aluminum conductor, conductor screened with extruded semiconducting compound, XLPE insulated, insulation screened with extruded semiconducting combination in combination with copper tape (0.3KA for 1sec.) cores laid up, FRLS PVC inner sheathed, galvanized steel strip armored and overall FRLS PVC sheathed cable confirming to IS:7098/II/85 working voltage 11KV(UE) grade 70sq.mm (Three Core)

2.10 EARTHING OF SUB- STATION.
Earthing with G.I. earth plate 600 mm X 600 mm X 6 mm thick including accessories, and providing masonry enclosure with cover plate having locking arrangement and watering pipe of 2.7 meter long etc. with charcoal/ coke and salt as required.(2No for Transformer body earthing)
Earthing with copper earth plate 600 mm X 600 mm X 3 mm thick including accessories, and providing masonry enclosure with cover plate having locking arrangement and watering pipe of 2.7 meter long etc. with charcoal/ coke and salt as required.(Neutral Earthing)
Providing and fixing 25 mm X 5 mm copper strip on surface or in recess for connections etc. as required.
Providing and fixing 25 mm X 5 mm G.I. strip on surface or in recess for connections etc. as required.
Providing and fixing 6 SWG dia G.I. wire on surface or in recess for loop earthing as required.
Supply and making outdoor cable termination with heat shrinkable jointing kit complete with all accessories including lugs suitable for 3X70Sq mm XLPE A conductor cable of 11 KV grade as required.
Supply & Erection of galvanized D iron clamps complete with shakle insulator (100mmx110mm) GI bolts, Nuts and washers, coach screws etc as required.

Supply & erection of shackle insulators (Medium). The item includes supply and erection of nuts and bolts and other accessories whatsoever required at site for fixing it to the structure pole. .The job is to be completed as approved by engineer in charge.
Supply & erection of galvanized stay sets for 11KV over head lines complete with 19/20mm dia 1.8mtr long GI stay rod, anchor plate of size 45cmx45cmx7.7mm thick, thimbles, stay clamps, turn buckle) 20mmx600mm), 7/4,00 mm dia GI Stay wire and 11 KV strain insulator etc in cement concrete 1:3:6 (1 cement: 3 Coarse sand : 6 graded stone aggregate 40mm nominal size) foundation including excavation and backfilling as required.
Supply & erection of 11KV pin insulators with GI pin confirming to ISI specifications. The item includes supply and erection of nuts and bolts and other accessories whatsoever required at site for fixing it to the structure pole. .The job is to be completed as approved by engineer in charge.
Supply & erection of 11KV Disc insulators with GI pin confirming to ISI specifications. The item includes supply and erection of nuts and bolts and other accessories whatsoever required at site for fixing it to the structure pole. .The job is to be completed as approved by engineer in charge.
Supply & erection of 11KV Lightning Arrestors suitable for 3 wire, 11KV overhead lines with rated voltage 9KV(rms) with nominal discharge current rating 5KA and complete with galvanized clamping arrangement G.I. bolts nuts washers etc etc as required confirming to ISI specifications. .A separate earth to be provided to lightning arrestor complete as approved by engineer in charge.

2.11 500 KVA Package Sub-Station

2.11.1 HT Switchgear

HT 11kV Compact switchgear (Type DV) consisting of One No. direct cable compartment and one No. fixed manual vacuum Circuit Breaker in SF6 stainless steel enclosure with series trip, self powered microprocessor based Over current & Earth Fault (IDMTL + Inst.) relay protection .Interconnection between HT and Transformer shall be using 1C x 3 x 95.sq.mm Al. unarmored XLPE (E) Cable.

2.11.2 Transformer

400/500 KVA,11KV/433V,DYn11, ONAN OIL/DRY TYPE, hermetically sealed transformer with corrugated wall design & top bushings for HT & LT with off load tap switch of rating+5 to -5% @2.5% on HT side of transformer.(Make:

2.11.3 LT PANEL

LT Indoor panel 433V with Aluminum Busbars, Fabrication using 1.5/2 MM CRCA sheet steel , Ingress protection IP4X , complete with internal wiring.

2.11.4 INCOMER cum OUTGOING

400A, 250A & 200A (1No. Each) 433V, 4P, 50Hz, 36KA,Fixed Manual MCCB with thermal base release as incomer cum outgoing.

2.11.5 Outdoor Enclosure

Outdoor type enclosure having modular construction of Galvanized Sheet Steel. The Enclosure shall have IP54 degree of protection for HT & LT switchgear compartment & IP23 degree of protection for Transformer compartment. The enclosure exterior shall be painted with polyurethane paint (color Light Gray & D.A.Gray). Each compartment will

be provided with the door and pad locking arrangement. The Compartment illumination lamp with door operated switch shall be provided for each compartment

2.11.6 Interconnection & Earthing

Interconnection between HT switchgear & Transformer using 1Cx3x95Sq.mm XLPE Single core cable & Interconnection between Transformer & LT switchgear using Busbars. Internal earthing connections by GI strips.

2.11.7 HT Panel/Transformer/LT Panel must be of same make.

Package Sub-Station is outdoor plinth mounted type. Civil work for package substation is not in our scope. The Foundation details will be furnished.

Package Sub-station will be complete with the internal interconnections & earthing. Accessories required for the external connections of HT & LT cables like termination kits, lugs, glands etc & extending of earth bar to earth pits is not included in our scope.

D. TECHNICAL SPECIFICATION OF FIRE FIGHTING WORKS:

1.0 SPECIFICATIONS FOR FIRE HYDRANT & SPRINKLER SYSTEM.

1. General.

1.1. Work under this subhead is time-bound and has t be completed within the time limit set in the tender. Work shall be executed in accordance with an agreed schedule which shall be submitted by the tenderers along with offer and agreed to by owners.

1.2 Scope of work.

The scope of work in this subhead shall consist of furnishing all labour, materials, equipment and appliances necessary and required to completely do all work relating to the supply, installation, testing & commissioning of Fire Fighting System as described herein after and shown on the drawings. The scope of work in general shall include the following.

i) Fire Fighting Pumps & Accessories and related electrical works.
ii) External & Internal Fire Hydrant System.
iii) Sprinkler system in entire building.
iv) Hand Appliances.

Without restricting to the generality of the foregoing, the work shall include the following: A Hydrant System covering the entire complex and consisting of the following:

(v) Three number of Pump – One number Main electric end suction pump of 2280 LPM at 60 M head, one number a Diesel Standby split casing Pump for Hydrant System of 2280 LPM at 60 M head and Jockey Pump for

System pressurization of 180 LPM at 60 M. head.

(vi) Other piping system ancillaries such as Suction and Delivery Headers, Air Vessel, Pressure Gauges, Pressure Switches, Pump Panel etc. as required.

(vii) External Hydrant Ring Main of 150mm dia with single headed Yard Hydrants, RRL Hoses, Branch Pipes etc. all housed in a Hose Box.

(viii) Internal Hydrant system where required with single headed landing valves on each floor accompanied by 1 number swinging type Hose Reel, 2 numbers RRL Hoses, 1 number of Branch Pipe etc. all housed in the niche. Bidder shall provide front frame with shutter for niche.

(ix) Sprinkler system for entire building.

(x) Hand appliance as per Bill of Quantities.

(xi) To obtain the approval of the relevant drawings before actual installation at site and to get the complete installation inspected and passed by the concerned authorities, as may be necessary as per local bye-laws. (any fee payable to the local bodies.

1.3 Contractor's Experience.

1.3.1 Contractors shall engaged specialist agency only for this work of Fire Fighting systems.

1.3.2 The selected specialist agency must have sufficient experience in the execution of turnkey projects as specified.

1.3.3 Contractor must submit with the tender a list of similar jobs carried out by him as required along with the name of works, name and address of clients, year of execution, capacity of plant and value of work.

1.4 Technical Information.

1.4.1 Contractor shall submit along with the tender copies of detailed specifications, cuts, leaflets and other technical literature of equipment and accessories offered by him.

1.4.2. Contractor's attention is specially invited to the special conditions and other clauses in the agreement which required the contractor to: -

a. Submit detailed shop drawings.
b. Use material of specific makes and brands
c. Obtain all approvals from Fire Fighting authorities.

d. Execute the entire work on a turn-key basis so as to provide a totally operating plant.

1.5 Exclusions.

1.5.1. Work under the contract does not include the following work.

1.5.2 Electrical cable up to incoming motor control centre.

1.6. Site Accessibility.

1.6.1 The equipments are to be located in pump house located within the Service block.

1.6.2 The equipment must be carried from the goods receiving station to the site in an extremely careful manner to prevent damage to the equipment building or existing services.

1.6.3 Contractor must visit the site and familiarize himself with above problems to ensure that the equipment offered by him are of dimensions that they can be carried and planed in position without any difficulty.

1.7 Approvals.

The contractor shall prepare all submission drawings and obtain all approvals of fire fighting works from fire fighting authorizes.

1.8 System Description.

1.8.1 The Hydrant System shall comprise of AC motor driven pump set, standby diesel pump set, jockey pump set for pressurization and fire booster pump with all required accessories including valves, special fittings, instrumentation, control panels and any other components required to complete the system in all respects.

1.8.2 The Hydrant System shall be semi automatic in action and shall be laid covering the entire area externally and all the floors internally with independent piping system for Sprinkler System, a separate piping system shall be installed.

1.8.3 The Hydrant System shall be kept pressurized at all times. The proposed Hockey Pump shall take care of the leakages the system, pipe lines and valve glands.

1.8.4 The pressure in the hydrant pipe work shall be kept constant at 6 Kg/cm^2. In the event of fire when any of the hydrant valve in the network is opened, the resultant fall in header pressure shall start the AC motor driven fire pump through pressure switches automatically. There shall be one Diesel Engine

Driven pump as standby for both hydrant system. In case of failure of electricity or failure of Electric Pump to start on demand, the standby Diesel Pump shall automatically take over.

1.8.5 However, shutting down of the pump set shall be manual except for the Jockey Pump which shall start and stop automatically through pressure switches. In addition to auto start arrangements, the main pump shall also have an over-riding manual starting facility by push bottom arrangement.

1.8.6 The ping for the hydrant system in the yard shall be laid in soil 1 Metre deep or in rectangular trench. The pipe laid in soil shall be protected as specified.

1.8.7 The yard hydrants shall be placed at a regular spacing of 45m centre to centre. The following accessories are proposed near each yard hydrant.

i) One no. gunmetal single headed hydrant vales.
ii) Two nos. RRL Hoses of size 63mm dia x15m long.
iii) One nos. gunmetal Branch pipe.

Gun metal hydrant valve, RRL hose and gunmetal branch pipe will be accommodated in a aluminium hose box mounted on brick pedestals.

1.8.8. The Internal Hydrant System (Wet Risers) shall be provided at points as indicated on the drawing on each floor.

1.8.9. The hydrant point shall be directly tapped from the Riser pipes, and shall be furnished with required accessories such as –

i) One no. gunmetal single headed hydrant valves.
ii) Two nos. RRL Hoses of size 63mm dia x 15m long.
iii) One no. first aid Dunlop hose reel full swinging type 20mm dia x 30m long.
iv) One nos, gunmetal Branch pipe.

The hydrant risers shall be terminated with air release vale at the highest points to release the trapped air in the pipe work. At each tapping from the Riser a Orifice Plate shall be located in the lower floors to reduce the pressure.

An overhead tank 20000 litres capacity will be connected to the fire hydrant system.

1.8.10 Sprinkler system shall be distributed entire building so as to cover 12-12 sq.m area with one sprinkler

Sprinkler risers shall be provided with instantaneous control valve with alarm gang.

An overhead tank of 20000 litres capacity with makeup line will be connected to sprinkler riser at basement (overhead tank is excluded from scope of work)

A suitable drainage arrangement with bye-ass valve shall be provided to facilitate maintenance f sprinkler pipe work.

1.8.11 To compensate for slight losses of pressure in the system and to provide an air cushion for counteracting pressure surges/water hammer in the underground pipe work Air Vessels shall be furnished in the pump room ear fire pumps. The air vessel shall be normally partly full of water and the remaining being filled with air which shall be under compression when the system is in normal operation.

1.8.12 The entire Wet Riser and external Hydrant Ring Main System shall be fed from the water supply (Static Water Tank) and pump room to be provided by the others.

1.9 GENERAL SPECIFICATIONS.

1.9.1 **Pipes and Fittings**.

Pipes for Wet Riser system shall be of GI pipe (Heavy Duty).Pipes upto 150mm dia shall be GI and conform to IS-1239. Pipes with dia 200mm and above (6mm thick) shall be MS and form to IS-3589. All pipes shall be I.S.I. marked. Fittings for black steel pipes shall be malleable iron suitable for welding or approved type cast iron fittings with tapered screwed threads.

1.9.2 Jointing

Joint for black steel pipes and fittings shall e metal-to-metal tapered thread or welded joints. A small amount of red lead may be used for lubrication and rust prevention in threaded joints.

Joints between C.I. or black steel pipes, valves and other apparatus, pumps etc. shall be made with C.I. or M.S. flanges with appropriate number of bolts. Flanged joints shall be made with 3mm thick insertion rubber gasket.

Note : Joints for pipes and fittings upto 50mm diameter shall be threaded joints using Teflon Tape or equivalent bonding tape on the threads. Joints for pipe and fittings above 50mm diameter shall be welded joints.

1.9.3 Pipe Protection.

a) All pipes in underground masonry trenches/service tunnels, above ground and in exposed locations shall be painted with one coat of red oxide primer and two or more coats of synthetic enamel paint of approved shade.

b) Pipes in wall chases shall be protected from corrosion by 2 coats of bituminous paints.

c) Protection of Underground pipes.

The underground steel pipes shall be protected by coating and wrapping. The coating and wrapping shall be done, in general as per IS:10221-1982.

It specified in Bill of Quantities, the proprietary pipe production system shall be provided as per the Manufacturers recommendation. The proprietary system shall be of approved make.

1.9.4 Installation of Pipes.

All pipes shall be adequately supported from ceiling or walls by structural clamps fabricated from M.S. structural e.g. rods, channels, angles and flats. All clamps shall be painted with one coat of primer and two coats of black enamel paint. The contractor shall provide inserts at the time of slab casting or provide suitable anchor fasteners.
The pipe supports or hangers shall be designed to withstand combined weight of pipe, pipes fittings, fluid in pipe and insulation. Pipe supports shall be of steel and coated with rust preventing paint and finished with two coats enamel paint. The maximum spacing for pipes supports shall be as below :

Pipe (MM)	*Spacing (MTR)*	*Size of support*
Up to 25	2.0	6 mm
32 to 65	2.4	8 mm

75 to 125	2.7	10 mm
150 & above	3.0	12 mm

Pipes supports shall be spaced at maximum interval of 1.5 mtrs. on either side of heavy fittings and valves. Wherever piping passes through walls, pipes sleeves of diameter larger than that of piping shall be provided. Pipe sleeves shall be of steel or cast iron pipe.

The underground piping shall be supported with cement concrete blocks of suitable size and strength provided at an interval of 2.5 metres. The pipes shall be laid at 1 metre Depth (top of the pipe) and trench excavated for sufficient width. The rate of pipes shall include the scope of excavation / refilling the trench. 1:2:4 concrete thrust blocks are also to be provided at turning of pipe. The cost of installation includes concrete pedestals etc. as required and to be included in the item rate.

1.9.5 *Orifice Flanges.*

Contractor shall provide orifice flanges fabricated from 6mm thick stainless steel plates on the branch lines feeding different zones/floors so as to allow required flor of water at a pressure of 3.5 kg/sq.cm. for each hydrants and 2 bar at 1800 LPM at installation valve for sprinkler system. The contractor shall design the orifices to ensure the required pressure.

1.9.6 Air Vessel and Air Release Valve.

Air vessel on top of wet riser piping shall be fabricated of at least 8mm thick steel to withstand the pressure, with dished ends and supporting legs. This shall be of 250mm dia and 1m high. This shall be complete with necessary flange connection to the wet riser piping and air release valve with necessary piping to meet the functional requirement of the system. The air vessel shall be of continuous welded construction and galvanized to be IS:4736 – 1968. This shall be tested for twice the working pressure.

1.9.7 *Valves & Other Accessories.*

1.9.7.1 General

Each valve body shall be marked with cast or stamped lettering giving the following information's:

a) The manufacturer's name or trade mark.
b) The size of the valve
c) The guaranteed working pressure.

Isolating valves on the water supply lines shall be full bore ball valve type for pipe diameters upto 50mm. For 65mm dia and above these shall be butterfly valves.

1.9.8. **Full Way Ball Valve**.

The valves shall be of full bore type and of quality approved by the Project Architect / EIC. The body and ball shall be of copper alloy and stem seat shall be of Teflon.

1.9.9 Butterfly Valves.

Butterfly valves shall be of centric disc construction with single piece body of Cast Iron with disc of aluminium bronze with nitrile seat. Shaft shall be stainless steel with Teflon bearing butterfly valve shall conform to PN 1.6 rating and shall be provided with suitable matching flanges compatible with PIN 1.6 rating of valves.

1.9.10 Non-Return Valves.

Non-return valves are to be IS:778-1984 manufactured from gun-metal or dezincification resistant brass.

1.9.11 Drain Valve.

Drain Valves are to be provided at all low points in the system for draining the water. These shall be 40mm dia full way ball valve fixed on 40mm dia black steel pipe.

1.9.12 Pressure Switches.

Pressure switches shall be differential type for operation of all pumps and for the various duties and settings required. Pressure switches shall be for heavy duty operation and of approved make. All pressure switches shall be factory calibrated.

1.10 External Fire Hydrants.

Yard Hydrant valves shall be single headed as per IS:5290. The valve shall be complete with hand wheel, quick coupling connection spring loaded type and gun metal blank cap. The Yard Hydrant shall be laid on 150mm dia Hydrant Ring Main, branched off to 80mm dia and Stand Post of 80mm dia.

1.11 Internal Landing Valves.

The internal landing valves shall be double-headed made of gun metal and conforming to IS:5290. It shall be complete with hand-wheel, quick coupling connection spring loaded type and blank cap.

1.12 Hose pipes, Branch Pipes and Nozzles.

Hose Pipe : Hose pipe shall be rubber lines woven jacketed and 63mm in diameter. They shall conform to type-2 (Reinforced rubber lined) of IS:639-1979. The hose shall be sufficiently flexible and capable of being rolled.

Each run of hose pipe shall be complete with necessary coupling at the ends to match with the landing valve or with another run hose pipe or with Branch pipe. The couplings shall be of instantaneous spring lock type.

Branch Pipe : Branch pipe shall be of gunmetal 63mm dia and be complete with male instantaneous spring lock type coupling for connection to the hose pipe. The branch pipe shall be externally threaded to receive the nozzle.

Nozzle : The nozzle shall be of copper or gunmetal, 20mm in internal diameter. The screw threads at the inlet connection shall match with the threading on the branch pipe, the inlet end shall have a hexagonal head to facilitate screwing of the nozzle on to the branch pipe with nozzle spanner.

End couplings, branch pipes, and nozzles shall conform to IS:903-1985, two hoses of 15 mtr. Lengths with couplings shall be provided with each external (yard) hydrant. One nozzle and one branch pipe with coupling shall be provided with each yard hydrant.

1.13 External Fire Hose Cabinet.

The external fire hose cabinet to accommodate the hose pipes, branch pipe nozzle and the hydrant outlets shall be fabricated from 1.5m sheet steel. This shall be lockable and provided with centre opening glazed doors.

The support for hose cabinet shall be of brick work up to a height of 0.5m above ground level. The depth of footing for this support shall be minimum 50cm below ground level, resting on levelling course of minimum 10cm of PCC (1:5:6). The brick work shall be plastered in cement mortar (1:6). The hose cabinet shall be painted red and stove enamelled.

1.14 Internal Fire Hose Cabinet.

Each internal fire hydrant valve shall be housed in a nitch of size indicated on drawings. Each internal fire hose Cabinet shall hold double headed hydrant,4 Hoses and 2 Branch pipes and 1 no. Dunlop hose reel mounted on a drum.

A) The cabinet shutters & frames shall be fabricated from boxed

steel sections and MS pate 2mm thick.

B) The front glass of shutters shall be 5.0mm thick clear glass and shall be held by means of rubber. Locking arrangement shall also be made with one number of mortice lock of approved make. A separate Key Box of 16mm thick MS sheet with glass facing shall be provided.

C) The Shutter shall be given a powder coat finish in post office red colour.

1.15 Hose Reel.

The hose reel shall be directly tapped from the riser through a 25mm dia pipe, the drum and the reel being firmly held against the wall by use of dash fasteners. The Hose Reel shall be swinging type (180 degrees) and the entire Drum, Reel etc. shall be as per IS:884. The rubber tubing shall be of approved quality and the nozzle shall be 6mm dia shut off type.

1.16 Brigade inlet Connections.

One set of 4 ways collecting head Fire Brigade connection shall be provided at the location indicated in the drawing.

The inlet to the riser shall be with 150mm dia sluice valve and non-return valve. The scope shall include providing necessary reducers, tees bends and special fittings as required. Necessary enclosure mad of 2mm thick sheet metal with support shall be provided, as in the case of hose cabinets.

1.17 AUXILIARY PUMPING EQUIPMENT.

1.17.1 Scope.

This section covers the details or requirements of the auxiliary equipment necessary for the operation of the fire pumps and the wet-riser system.

1.17.2 Drive

The pump shall be directly driven from the electric motor. Flexible coupling and coupling guard shall be provided.

1.17.3 ***Capacity.***

The discharge and head of the jockey pump shall be as mentioned in Bill of Quantities.

Jockey pump shall be Horizontal /Vertical mono-block / coupled type. The pump casing shall be of cast iron and parts like impeller, sleeve, wearing ring etc. shall be of non- corrosive metal like bronze, brass or gunmetal. The shaft shall be of stainless steel.

Bearing of the pump shall be effectively sealed to prevent loss of lubricant or entry of the dust or water. The pump casing shall be designed to withstand 1.5 time the working pressure.

1.17.4 Motor.

The motor shall be squirrel cage A.C. induction type suitable for operation on 415 volts 3 phase 50 Hz, system. The motor shall be totally enclosed fan cooled type confirming to protection clause IP 21 of IS 4691. The class of insulation shall be B, synchronous speed shall be 3000 RPM/1500 RPM. The motor shall conform IS 325-1978 and rated for continuous duty.

1.17.5 Motor Starter.

The motor starter shall be automatic star delta type with overload trip, but without under voltage / no volt trip. Starter shall conform to IS 1822-1967**.**

1.18 MAIN ELECTRIC FIRE PUMP.

1.18.1 Scope

This section covers the details of requirements of the motor, starter and pump for the electrically operated firm pump.

1.18.2 General.

The electric fire pump shall be suitable for automatic operation complete with necessary electric motor and automatic starting gear, suitable for operation on 415 volts, 3 phase, 50 Hz A/C system,. Both the motor and the pump shall be assembled on a common base plate of fabricated MS channel type or cast iron type.

1.18.3 Drive

The pump shall be only direct driven by means of a flexible coupling. Coupling guard shall also be provided.

1.18.4 Fire Pump (Electrical)

The fire pump shall be horizontal end suction centrifugal type. It shall have a capacity to deliver 2280 LPM as specified, developing adequate head so as to ensure a minimum pressure of 3 kg. per sq.cm at the highest and the farthest outlet. The delivery pressure at pump outlet shall be not less than 6 kg. per sq.cm. in any case.

The pump shall be capable of giving a discharge of not less that 150 percent of the rated discharge, at a head of not less than 65 percent of the rated head. The shut off head shall be within 120 percent of rate head.

The pump casing shall be of cast iron to grade FG 200 to IS:210 and parts like impeller, shaft sleeve, wearing ring etc. shall be of non-corrosive metal like bronze / brass / gunmetal. This shaft shall be of stainless steel.

Bearing of the pump shall be effectively sealed to prevent loss of lubricant or entry of dust or water.

The pump shall be provided with a plat indicating the suction lift delivery head, discharge speed and number of stages. The pump casing shall be designed to withstand 1.5 times the working pressure.

1.18.5 Motor

The motor shall be squirrel cage A/C induction type suitable for operation on 415 volts 3 phase 50 Hz system. The motor shall be totally enclosed fan cooled type conforming to protection clause IP 21 vide IS-4691.The class of insulation shall be B. The motor shall be rated to continuous duty as per relevant IS and shall have a horsepower rating necessary to drive the pump at 150 percent of its rated discharge.

1.18.6 Motor Starter.

The motor starter shall be automatic star Delta type conforming to IS:1822-1967. The starter shall not incorporate under voltage or overload trip or single-phase preventor. The starter assembly shall be suitably integrated in the power control panel for the wet riser system.

Each pump shall be provided with vibration isolating pads of appropriate size.

1.19 DIESEL FIRE PUMP.

1.19.1 Scope

This section covers the details or requirements of the stand by fire pump operated by a diesel engine.

1.19.2 General

The diesel pump set shall be suitable for automatic operation complete with necessary automatic starting gear, for starting on wet battery system and shall be

complete with all accessories. Both engine and pump shall be assembled on a common bed place, fabricated with mild steel channel.

1.19.3 Drive

The pump shall be only direct driven by means of a flexible coupling. Coupling guard shall also be provided. The speed shall be 1500/1800 RPM.

1.19.4 Fire Pump (Diesel)

The fire pump shall be horizontal split casing centrifugal type. It shall have the capacity to deliver 2280 LPM as specified. Developing adequate head so as to ensure a minimum pressure of 3 kg. per sq.cm. at the highest and the farthest outlet. The delivery pressure at the pump outlet shall be not less than 7 kg per sq.cm. in any case. The pump shall be capable of giving a discharge of not less than 150% of the rated discharge at a head of not less than 65% of the rated head. The shut off head shall be within 120% of the rated head. The shaft shall be of stainless steel. The pump shall be provided with mechanical seal. The pump casing shall be designed to withstand 1.5 times the working pressure.

Bearing of pump shall be effectively sealed to prevent loss of lubricant or entry of dust or water.

1.19.5 Diesel Engine

Engine Rating :-

The engine shall be cold starting type without the necessity of preliminary heating of the engine cylinders or combustion chamber (for example, by wicks, cartridge, heater plugs etc.) The engine shall be multi cylinder /vertical, 4-stroke cycle, water-cooled, diesel engine, developing suitable HP at the operating speed specified to drive the fire pump, Continuous capacity available for the load shall be exclusive of the power requirement of auxiliaries of the diesel engine, and after correction for altitude, ambient, temperature and humidity for the specified environmental conditions. This shall be at least 20% greater than the maximum UP required to drive the pump at its duty point. It shall also be capable of

driving the pump at 150% of the rated discharge at 65% of the rated head. The engine shall be capable for continuous non-stop operation for 8 hours. The engine shall have 10% overload capacity for one hour in any period of 12 hours continuous run.

The engine shall accept full load within 15 seconds from the receipt of signal to start. The diesel engine shall conform ton B.S. 649/IS 160/IS 10002, all amended up to date.

1.19.6 Cooling System.

The engine cooling system shall be radiator water cooled system. The radiator assembly shall be mounted on the common base plate. The radiator fan shall be driven by the engine as its auxiliary with a multiple fan belt. When half the belt brake remaining belts must be capable of driving the fan. Cooling water shall be circulated by means of an auxiliary pump of suitable capacity driven by the engine in a closed circuit.

1.19.7 Fuel System.

The fuel shall be gravity fed from the engine fuel tank to the engine driven pump. The engine fuel tank shall be mounted either over or adjacent to the engine itself suitably wall mounted on brackets. The fuel filter shall be suitably located to permit easy servicing.

The engine fuel tank shall be welded steel construction (3mm thick) and of capacity sufficient to make the engine to run on full load for at least 8 hours. The tank shall be complete with necessary supports, level indicator (protected against mechanical injury), inlet, outlet, over flow connections drain plug and piping to the engine fuel tank. The outlet should be so located as to avoid entry of any sediment into the fuel line of the engine. A semi rotary hand pump filling the engine fuel tank together with hose pipe 5 mtr. Long with a foot-valve etc. shall also form part of the scope of work.

1.19.8 Lubricating Oil System.

Forced feed Lubricating Oil system shall be employed for positive lubrication. Necessary Lubricating Oil filters shall be provided and located suitably for convenient servicing.

1.19.9 Starting System.

The starting system shall comprise of necessary battery / batteries, starter motor of adequate capacity and axle type gear to match with the toothed ring fly wheel. Suitable metallic relay to protect starting motor from excessively long cranking runs shall be included within the scope of the work. The metallic relay protection shall be integrated with engine protection system.

The capacity of the battery shall be suitable for meeting the needs of the starting system but not less than 180 AH.

The battery capacity shall be adequate for 10 consecutive starts without recharging with cold engine under full compression.

The scope shall cover all cabling, terminals, initial charging etc.

1.19.10 Exhaust System.

The exhaust system shall be complete with silencer suitable for indoor installation, and silencer piping including bends and accessories needed. The exhaust pipe shall protrude outside the pump room. The total backpressure shall not exceed the engine manufacturer's recommendations. The exhaust piping shall be suitably supported and the pipe used shall be of medium class MS pipe.

1.19.11 Engine Shut Down Mechanism.

This shall be manually operated and shall return automatically to the starting position after use.

1.19.12 Governing System.

The engine shall be provided with an adjustable governor to control the engine speed with 5% of its rated under all conditions of load up to full load. The governor shall be set to maintain rated pump speed at maximum pump load.

1.19.13 Engine Instrumentation.

Engine instrumentation shall include the following :

a) Lubricating Oil Pressure Gauge.
b) Lubricating Oil temperature gauge
c) Water temperature gauge.
d) Water pressure gauge
e) Tachometer
f) Hour meter
g) Starting key

The instrument panel shall be suitably mounted on the engine.

1.19.14 Pipe Work :

The piping for exhaust outlet as well as fuel piping between fuel tank and the engine shall be with Medium class M.S.

1.19.15 Anti Vibration Mounting.

Suitable vibration mounting duly approved by engineer-in-charge shall be employed for mounting the unit so as to minimize transmission of vibration to the structure. The isolation efficiency achievable shall be clearly indicated in the report, which will be submitted to engineer-in-charge before installation.

1.19.16 Battery Charger.

Necessary float and boost charger shall be incorporated in the control section of the power and control panel to keep the battery under trickle condition. Ammeter to indicate the state of charge of the batteries shall be provided.

1.20 POWER AND CONTROL PANEL AND OTHER CONTROL COMPENENTS.

1.20.1 Scope

This section covers the detailed requirements of the power and the control panel for the wet riser system, and also for the various control components in the system.

1.20.2 Power and Control Panel.

1.20.2.1 Constructional Requirements General Features.

The power and control panel shall be totally enclosed, free standing floor mounted cubic type, fabricated out of sheet steel not less than 2mm thick. Where necessary, additional stiffening shall be provided by angle iron frame work. General construction shall be of compartmentalization and sectionalisation such as mains incomes, electric fire pump, diesel fire pump, pressurization pump, and control, so that there is no mix up of power and control wiring and connections in the same sections as far as possible. The panel shall also have the space for cable allays. The space for cable alleys shall be at least 200m wide to the entire depth of panel. The panel shall be front operated type with all connections accessible from the front. Front doors shall be hinged type. Back doors shall be hinged type or removable type for inspection. The door hinges shall be of concealed type. The doors for bus bar chamber shall be of removable type with the help of bolts. The doors shall be provided with quick fixing doors knobs with indication. The general arrangement of the panel shall be got approved before fabrication the cubicle construction shall be to IP 21 as per IS:2147.

1.20.2.2 Cable entries and gland plates.

All cable entries shall be through gland plates which are removable and sectionalized. Where heavy cable are brought in and terminated, suitable

clamps shall be incorporated to relieve the stress on the glands due to the weight of the cable. Cable entries may be from top or bottom depending on the equipment layout and cable scheme as approved.

1.20.2.3 Bus bar and Connections.

The Bus bar shall be air insulated, and of aluminium of high conductivity electrolytic quality (grade E 91 E to IS:5082) and a adequate cross section. Current density shall not exceed 1.3 amps. Per sq.cm. All connections to individual circuits from the bus bars shall preferably be with solid connections. The bus bars and the connections shall be suitable covered with PVC sleeves or in an approved manner. Bus bar shall be suitably supported using non-hygroscopic insulated supports. High tensile bolts and spring washers shall be provided at bus bar joints.

1.20.2.4 Earthing Arrangement.

CI strip 24mm x 5mm shall be run at the rate of the board 2 nos., earth terminals shall be provided at the ends of the GI strip for connection to earth system.

1.20.2.5 Terminal Blocks and Small Wiring.

Terminal blocks shall be heavy duty type and generally not less than 15 amps 250V grade up to 100V, and 600V grade for the rest of the functions. They shall be easily accessible for maintenance. All control wiring inside the panel shall be with PVC insulated copper conductor of 2.5 sq.mm size and 600V grade conforming to IS:694- 1977. Suitable colour-coding may be adopted. Wiring harness shall be nearly formed and run preferably function wise, and as far as possible segregated voltage wise, Identification ferrules shall be used at both ends of the wires.

1.20.2.6 Instruments and Lamps.

All indication lamps and instruments shall be flush mounted type in front of the panel. The voltmeter and ammeter shall of size 100mm nominal (dial size) conforming to clause 1.5 of IS 1248 for accuracy.

Current transformers shall be provided with ammeters.

Indicating lamps to indicate the availability of electric supply shall be provided at the incoming section. Necessary indicating lamps for alarm indication and battery charging shall be provided in the respective sections.

All indicating lamps and meter shall be protected with HRC cartridge type fuses.

1.20.2.7 Labels

All internal components shall be provided with suitable identification labels. Suitably engraved labels shall be fixed at the panel for all switches, instrument push bottons, indicating lamps etc.

1.20.2.8 Painting.

The entire panel shall be given a primer coat of red lead after degreasing and phosphating treatment and two coat of final paint or approved shade before assembly of various items.

1.20.3 Equipment Requirements.

1.20.3.1 General

The power and control panel shall comprises individual section for the various equipment's of the system and controls, in a combined cubicle type design. All switches MCCB. MCBS and fuse/fuses switch unit shall be conforming to relevant IS.

1.20.3.2 ***Incomer Section & Outgoing Section.***

(A) **Incomer section** :

1 no. 300 amps TPMCCB unit complete. One set of 96 mm square Ammeter (0- 400 Amps) complete with selector switch and CTS. One set of 96mm square Voltmeter (0-500 V) complete with control fuses and selector switch. One set of phase indicating lights with control fuses. One set of 4 strips of 300 Amps aluminium busbars.

(B) ***Outgoing Feeder.***

(i) One number of 250 A,ps TP MCCB unit complete, SP Preventer, ML 4 type contractor forstar delta starting, start an stop push bottons, auto-manual switch, Ammeter with CTS, A S S , phase indicating lights. Auxillary Contractors for interlocking / sequence of operation, control terminals complete in all respect with interconnections for Hydrant Pump and sprinkler pump.

(ii) Two numbers of 63 Amps rated TP MCCB unit complete, ML 1.5 type contractor D O L starting with overload relay, start and stop button. Ammeter, CTS and selector switch, hase indicating lights, Auxiliary contacts for interlocking / sequence of operation, control terminals complete in all respect for Jockey Pump & fire booster pump.

(C) Control wiring from pressure switches of different settings in Hydrant and Jockey Pumps, for sequence of operation shall be included to complete the system.

(D) Colour code with ferrule marking shall also be make.

(E) The wiring shall be PVC insulated and PVC armoured aluminium conductor cable of 650 /100 volts grade conforming to IS 1554 as required from Fire Pump Board to motor and cable of suitable size.

1.20.3.3 ***Electric Fire Pump Section.***

This section shall incorporate the following facilities.

a) MCCB
b) Control system components ad equipment such as relays, contractors, timers etc. for automatic operation.
c) Starter Unit , Current Transformer and ammeter.
d) Indication lamps, their fuses, terminal block, push bottons, control and selector switches etc. are as required.
e) Pump look out devices due to faults or abnormalities as specified in operating sequence.
f) Visual/audio alarms, indications and communications facility as specified in operating sequence.
g) Necessary inter-connection and control wiring etc.

1.20.3.4 Engine Section.

The engine section shall incorporate the following facilities**:-**

i) Control system components and equipment such as relays, contractors, timers etc. for automatic operation.

ii) Instruments, indicator lamps, fuses terminal blocks, push buttons, control and selector switches etc. as are required.

iii) Engine shut down and block out devices due to faults or abnormalities as specified.

iv) Visual/audio alarms and indications as specified.

v) Inter-connection and control wiring etc.

1.20.3.5 Auxiliary Pump Section.

The auxiliary pump section for Jockey pump shall incorporate the following:

a) TP&N MCBS

b) Control system components such as relays, times, contractors etc. as are necessary for functional requirements.

c) Starter unit, current transformer and ammeter.

d) Indication lamps, fuses, terminal blocks, push buttons selector, switch etc. as required.

e) Inter-connections and control wirings etc.

1.20.3.6 ***Control Section.***

This section shall incorporate the following –

a) Control components integrating the various sections, so as to satisfy the functional requirements.

b) Battery charger unit with boost / float chare facility with voltmeter, capable of independently charging 2 sets of batteries at a time.

c) Visual / audio alarms, not covered in individual sections.

d) Lamps healthy test facility.

e) Instruments, indicating lamps, pushbuttons, fuse terminal blocks etc. as are required.

f) Test facility to simulate operation of hydrants.

1.20.4 Other Control Components

1.20.4.1 **Pressure Switches**.

Pressure switches shall be provided for switching on and off the pressurization pump at present pressures and also for switching off the fire pump at present pressure. Being the main component for initiating the signal for the operation of the pumps, the pressure settings shall be totally reliable, sturdy in construction and of long life. The pressure settings shall be adjustable.

1.20.4.2 Power Supply for Controls.

In order to ensure that the control systems remains co-operational at all times the control system shall be designed for 24 VDC operation fed from the battery. This shall be independent of the starting battery for the engine i.e. battery shall remain trickle charged at all times from the separate battery charger at the control system.

1.21 Electrical Work and Earthing.

Scope.

This section covers the detailed requirements of electrical works including earthing, for the materials installation.

Electric power supply shall be terminated in the incoking switch gear of the power and control panel by the Department. All further connections to the various components of the system shall be the responsibility of the contractor, for a complete and working system, satisfying all the functional requirements.

The scope shall particularly include the following :

Power and Control Panel(s) as given in relevant section.

All inter-connections with multi-core armoured copper cables of size suitable between various control units and control panel(s)

All power cable connections with multi-core armoured aluminium cables of size as specified in BOQ, between panels, motors etc.

Necessary earthing with 2 Nos. G.I. plate electrodes and loop earthing.

The work shall be carried out conforming to CPWD General Specifications for Electrical works Part-I (Internal) amended up to date and Part-II (External) amended upto date.

1.22 Sprinkler System.

1.22.1 **Sprinkler Heads**.

Sprinkler heads shall be of quartzoid bulb type with bulb, valve assembly yoke and the deflector. The sprinklers shall be approved make and type.

1.22.2 Types

1.22.2.1 Conventional Pattern.

The sprinklers shall be designed to produce a spherical type of discharge with a portion of water being thrown upwards to the ceiling side of wall extra. The sprinklers shall suitable for erection in upright position or pendant position.

A. Side Wall Sprinklers.

These shall be designed for installation along with the walls of room close to the ceiling. The discharge pattern shall be similar to one quarter of sphere with a small proportion discharging on the wall behind the sprinklers.

1.22.2.2 Construction

i) **Bulb –** Bulb shall be made of corrosion-free material strong enough to with stand any water pressure likely to occur in the system. The bulb shall shatter when the temperature of the surrounding air reaches a predetermined level.

ii) **Valve assembly –** Water passage of the sprinkler shall be controlling assembly of flexible construction. The valve assembly shall be held in position by the quartzoid bulb. The assembly be stable and shall withstand pressure surges or external vibration without displacement.

iii) **Yoke :** The yoke shall be made of high quality gunmetal. The arms of yoke shall be so designed as to avoid interference with discharge of water from the deflector. The sprinkler body shall be coated with an approved anti corrosive treatment if the same is to used in corrosive conditions.

iv) **Deflector :** The deflector shall be suitable for either upright or pendent erection. The deflector shall be designed to give an even distribution of water over the area protected by each sprinkler.

a. ***Colour Code.***

The following colour code shall be adopted for classification of sprinkler according to nomination temperature ratings.

b. ***Sprinkler Temperature Rating.***

c. Size of Sprinklers Orifices.

The sprinklers shall be of 15mm nominal bore size.

1.22.2.3. **Pipes and Fittings**

Pipes for sprinkler system shall be of black steel conforming to I.S. 1239 (Heavy class).

Fittings for black steel pipes shall be malleable iron suitable for welding or approved type cast iron fittings with tapered screwed threads.

1.22.2.4 Jointing.

Joint for black steel pipes and fittings shall be metal to metal tapered thread or welded joints. A small amount of red lead may be used for lubrication and rust prevention in threaded joints.

Joints between G.I. or black steel pipes, valves and other apparatus, pumps etc. shall be made with G.I. or M.S. flanges with appropriate number of bolts. Flanged joint shall be made with 3mm thick insertion rubber gasket.

1.22.2.5 Pipes Protection.

All pipes above ground and in exposed locations shall be painted with one coat of red oxide primer and two or more coats of synthetic enamel paint of approved shade.

Pipes in chase or buried underground shall be painted with two coats of hot bitumen.

1.22.2.6 Pipe Supports

All pipes shall be adequately supported from ceiling or walls from structural clamps fabricated from M.S. structural e.g. rods, channels, angles and flats. All clamps shall be painted with one coat of primer and two coats of black enamel paint. The contractor shall provide inserts at the time f slab casting or anchor fastener later.

1.22.2.7 Valves

Sluice vales of sizes 80mm and above shall be double flanged cast iron conforming to I.S.780. Check valve shall be of cast iron double flanged conforming to I.S.5312.

Valves on pipes 65mm and below shall be heavy pattern gunmetal valves with cast iron wheel seat tested to 20 kg/sq.cm. Pressure. Valves shall conform to I.S. 778.

A. ***Air Valves***

25mm dia screwed inlet cast iron single acting air valves on all high points in the system or as shown on drawings.

B. ***Drain Valves***

50mm dia black steel pipe conforming to I.S.1239 medium class with 50mm gunmetal full way valve for draining and water in the system in low pockets.

1.22.2.8 Installation Control valve.

Installation control valves shall comprise of the following :

a) One-man stop valve of full way pattern with gunmetal pointer to indicate where open/shut.

b) One automatic alarm valve fitted with handle & cover.

c) One hydraulic alarm motor and going for sounding a continuous alarm upon out-break of fire. One combined waste and testing valve including 5 mtr. Of tubing and fittings.

d) Alarm stops valve.

e) Strainer

f) Drain plug.

g) Padlock and strap

h) Wall box for installation of valve.

1.22.2.9 ***Pressure Gauges.***

Burden type pressure gauges conforming to IS/BS specifications shall be provided at the following locations.

a) Just above alarm valve.

b) Just below alarm valve, on the installation stop valve.

c) One pressure gauge on delivery side of each pump.

d) Required number of pressure gauges on pressure tank.

Piping shall be so installed that the system can be thoroughly drained. All the pipes shall be arranged to drain to the installation drain valve. In case of basement and other areas where the pipe work is below the installation drain valve / auxiliary valves of the following sizes shall be provided.

a) 20 mm dia valve for pipes up to 50mm dia.

b) 25 mm dia valves for 65mm dia pipe.

c) 32 mm dia valves for pipes larger than 65mm dia.

Piping shall be screwed type upto 50mm diameter, Welding of joints will be allowed for pipes of above 50mm dia.

1.22.2.10 The entire piping shall be pressure tested by hydrostatic method upto a pressure of 1.5 times the working pressure. The piping shall be slowly charged with water so that all the air is expelled from the piping by providing a 25mm inlet with a stop cock. The piping shall be allowed to

stand full of water for a period of 2 hours and then the piping shall be put under pressure by means of manually operated test pump or by a power driven test pump. The pressure gauges used for testing shall be accurate and shall preferably the calibrated before the testing shall be rectified to the entire satisfaction of the Engineer-in-charge. The system may be tested in sections/parts as the work of erection of piping proceeds. The piping shall with stand 1.5 times the working pressure for at least 2 hours.

1.23 Operating Sequence for the Fire Fighting System.

1.23.1 The operating pressure in the mains is to be maintained at 6.0 kg/cm^2.

1.23.2 The jockey pup shall start automatically the moment pressure drops to 5.5 kg/cm^2 because any leakage or minor draw-off from the system and stop when the pressure reaches 5.5 kg/cm^2 again.

1.23.3 In case, after the start of Jockey pump, the pressure still keeps on falling, the main fire pump shall start at 5.0 kg/cm^2 by triggering of the pressure switch. Jockey pump shall stop when main pump starts.

1.23.4 In the event of electrical or mechanical failure of main fire pump (hydrant) to start, the diesel engine driven pump shall cut in when the pressure in the mains fall down to 4.5 kg/cm^2. The main electric pump shall then be locked out.

1.23.5 In the event of failure of wet rise system, three will be further drop in pressure and when the pressure reaches to 4.0 kg /cm^2 fire booster pump near overhead tank will start automatically .

1.23.6 If within a preset period the standby pump fails to start or fails to develop adequate pressure, the control system shall shut down the standby pump and lock it out and given an audiovisual indication to that effect at the control panel.

1.23.7 Jockey pump shall be shut down automatically when the fire pump electric or diesel, is operating. Necessary integration or pipe work and controls shall be provided for the purpose. A timer may be employed where necessary to distinguish between slow fall of pressure due to system leaks

and sudden fall of pressure due to fire duty by opening of valves and thus prevent parallel start up of both pressurization and fire pumps.

1.23.8 The control panel shall status selection for each of the pumps for :automatic" as well as "manual" operation.

1.23.9 Pumps when under 'manual" status shall be operated manually through relevant push buttons.

1.23.10 The fire pumps once started shall not be stopped automatically.

1.23.11 The fire pumps shall be locked out for operation both for "manual" and "automatic" operations, once the low water controls operates and furnish an audio and visual alarm on the panel the audio alarm can be silenced by accepting the alarm. The visual alarm shall be individual for each equipment. It shall be flashing type and on acceptance remain steady. A reset button shall be provided for each pump for returning the pump for fire duty.

1.23.12 Over load or under voltage/mo volt trip device for electric fire pump shall not be provided in the starter. LED type indication lamps to indicate the availability of power shall be provided.

1.23.13 Once tripped the electric fire pump shall remain locked out for operation irrespective of the positive of its operational status selection switch. Look out indication shall be available on the panel.

1.23.14 Rerun to normal operational availability shall be feasible only by manual re-set of locked out units by operation of appropriate push buttons.

1.23.15 When fire pumps are brought into operation an audible tone from turbine type alarm operated by water flow in the mains shall be provided in indicate the healthiness of the system. The healthy running alarm shall not be silenced till the fire pump is shut down, but the tone may be mellowed by the operation, if required.

1.23.16 Alarm for failure and lock out of any pump shall distinct from "healthy" alarm. Failure alarms shall be loud and can be silenced on acceptance.

1.23.17 Repeat indication of various audio and visual indications on a slave remote panel in fire control room in terminal building shall be available. The slave remote panel shall have indication lamps to show the status of :

a) Power healthy in fire pump room
b) Jockey pump 'ON'
c) Main pump "ON"
d) Fire booster pump "ON"

The slave Remote panel shall also have a hooter, which shall sound in case, any pump is "ON". The slave Remote panel shall have a provision to reset the hooter with the help of a push button.

1.24 ***Testing.***

1.24.1 Testing on Completion of Installation.

The entire system shall be tested after completion of installation as per the operating sequence specified.

Standard and Codes.

1.	IS-1648-1961 (general)	Code of Practice for fire safety of building Fire fighting equipment and maintenance.
2.	IS-3844-1966	Code of practice for installation of internal fire hydrant in multi-storied building.
3.	IS-2217-1963	Recommendation for providing first aid and fire fighting arrangement in public buildings.
4.	IS-2190-971	Code of practice for selection, Installation and maintenance of portable first fire appliance.
5	IS-3589	Electrically Welded Steel pipes (Medium

		class)
6.	IS-1239	Mild steel tubes, Tubular and other wrought steel fittings (Medium class)
7.	IS-780	C.I. Double flanges sluice valve.
8.	IS-778	Gun Metal Valve.
9.	IS-909-1965	External fire hydrant (underground)
10.	IS-5290-1969	Internal Landing Valve.
11.	IS-884-1969	First and hose reel.
12.	IS-934-1976	Specification for portable chemical fire Extinguisher soda acid type.
13.	IS-2873-1969	Specification for fire extinguisher for carbon dioxide.
14.	IS-2189 & 2109	Automatic fire alarm system or BSS-3116
15.		National Building Code.

2.0 For Detailed Specification of Fire Detection and Alarm System (Based on DSR 2019) mentioned in SOQ shall be as per CPWD General Specification for electrical works Part VI (FIRE DETECTION AND ALARM SYSTEM) 2018. (corrected up to the last date of submission/uploading of bid).

3.0 CCTV & PA SYSTEM:

DESIGN CONCEPT & SCOPE OF WORK:

3.1 IP CCTV SURVEILLANCE SYSTEM

3.1.1 DESIGN CONCEPT:

- ✓ The entire IP surveillance system is designed to control and monitor the different blocks of the CDRI campus. All the corridors shall have IP Fixed dome camera to monitor the connecting corridors
- ✓ There are three types of cameras shall be installed to monitor the movement of the people as follows:
  - IP fixed dome camera indoor type
  - IP PTZ camera outdoor type
  - IP fixed box camera outdoor type
- ✓ IP fixed dome camera shall be installed at the entrances and connecting corridors of the main buildings like laboratories, administration block,

computer hub, special equipment and lab engineering services, library, auditorium, chemical storage and animal house.

- ✓ IP PTZ camera shall be mounted on the pole at different locations for outside surveillance purpose.
- ✓ IP fixed box camera shall be mounted on the pole at all boom-barrier and turnstile locations to monitor the vehicles and pedestrians passing by there.
- ✓ All cameras shall be true IP camera.
- ✓ All outdoor cameras shall be in IP-66 housing.
- ✓ All outdoor items for cameras like JBs, power supply, media convertor etc. shall be in water poof and dust proof housing.
- ✓ Purchaser's LAN network being laid by third party would be utilized to extend the IP CCTV connectivity to central server
- ✓ All CCTV cameras shall have connectivity to non- PoE port of purchaser's networking switches on LAN.
- ✓ UPS Power supply for each camera.
- ✓ Tentative locations of cameras are indicated in the IP CCTV, ACS, Boom Barriers and Turnstiles layout drawing enclosed with this tender

3.1.2 SCOPE OF WORK:

- ✓ Supply, installation, testing and commissioning high quality fast-acting IP CCTV surveillance system along with power supply, power distribution and required accessories in different blocks of CDRI campus as indicated in BOQ.
- ✓ The entire system shall be as per BOQ, drawings and technical specifications enclosed with tender documents.
- ✓ The price coated by the vendor should include all the expenses incurred in commissioning of all cameras with power supply, accessories and other devices complete with software.
- ✓ The CCTV surveillance system should consist of IP Fixed dome cameras (indoor type), PTZ & fixed box cameras (outdoor type), software, server, power supply and cables.
- ✓ Video management software shall offer both video stream management and video stream storage management. Recording frame rate and resolution in respect of individual channel shall be programmable.
- ✓ The system is presently designed for 45 cameras whereas not limited to the same and scalable upto unlimited cameras if required in the future.
- ✓ Provide supervisory specialists and technicians at the job to assist in all phases of system installation, start up and commissioning.
- ✓ Cat 6cable/fiber cable connectivity with all required hardware upto purchaser's networking switches of LAN, locations of networking switches in CDRI campus are indicated in the list. Enclosed with this tender document.
- ✓ 230 volts AC Power supply distribution from UPS to each location of cameras along with DBs, JBs, cabling work etc. with required accessories.
- ✓ Power supply unit as required for cameras.
- ✓ Integrated testing and commissioning of CCTV system on LAN being provided by the third party in CDRI campus.
- ✓ Training & handing over of all materials, equipment and appliances.

- ✓ ***Any other items/accessories required for installation, testing and commissioning of CCTV system.***
- ✓ No extra cost shall be paid for miscellaneous items if required to complete the work as per the design concept.

3.1.3 SUBMITTALS: (IP CCTV)

Drawings: The system supplier shall submit all shop drawings, and bill of materials for approval /reference.

a) Drawings shall be submitted in standard sizes as indicated
b) Four complete sets (copies) of submittal drawings shall be provided.
c) Drawings shall be available on CD-ROM.
d) CCTV layout drawing (A1 size)
e) Installation drawing for each item (A3 size)
f) Bill of Materials (A4 size)
g) Cable connectivity drawings and cable schedule. (A3 Size)
h) Power distribution scheme (A3 size)
i) Specifications and data sheet for each item (A4 size)
j) List of software and software licenses, (A4 size).
k) Test certificates, Internal test reports etc.

(i) System Documentation

- ✓ System configuration diagrams in simplified block format.
- ✓ Manufacturer's instructions and drawings for installation, maintenance, and operation of all purchased items.
- ✓ Overall system operation and maintenance instructions—including preventive maintenance and troubleshooting instructions.
- ✓ A list of all functions available and a sample of function block programming that shall be part of delivered system.
- ✓ Shop drawings of card reader stand, canopy/shed as approved by Project Architect.
- ✓ Test certificates and internal test reports for each item
- ✓ Quality Assurance Plan
- ✓ Operation and maintenance manuals.

(ii) Project Management

- ✓ The supplier shall provide a detailed project design and installation schedule with time markings and details for hardware items and software development phases.
- ✓ Schedule shall show all the target dates for transmission of project information and documents and shall indicate timing and dates for system installation, debugging, and commissioning.

(5) QUALITY ASSURANCE:

- ✓ The entire system shall be installed and commissioned from a single vendor to assure reliability and continued service.
- ✓ The vendor shall be required to train and instruct client's personnel in the correct use, operation and supervision of the system, preferably prior to the handing over of the project.
- ✓ The supplier shall be responsible for inspection and Quality Assurance (QA) for all materials and workmanship furnished.

(6) TESTING:

- ✓ **Component Testing**: Maximum reliability shall be achieved through extensive use of high-quality, pre-tested components. Each and every component shall be individually tested by the manufacturer prior to shipment.
- ✓ **Tools, Testing and Calibration Equipment**: The supplier shall provide all tools, testing, and calibration equipment necessary to ensure reliability and accuracy of the system.

(7) POWER SUPPLY:

230 V $\pm$ 10 %, 50 Hz $\pm$ 5% shall be made available for UPS input. Bidder's scope shall include complete power distribution for IP CCTV system, Access Control system, Boom Barriers and Turnstiles, including complete cabling work, DBs and required electrical accessories with suitable protection devices from UPS (in bidder's scope) and UPS output to IP CCTV cameras , Access control devices, Boom Barriers and Turnstiles.

E. TECHNICAL SPECIFICATION OF HVAC WORK:

1.0 GENERAL:

Intent of these specifications is to define the requirements for design, supply, installation, testing and commissioning of air conditioning system. The contractor's liability shall not be limited to the scope of work mentioned, but shall also extend to achievement of the desired conditioned as per the BASIS OF DESIGN, complete, safe and satisfactorily operating System as approved by the Project Architect / EIC. Any alternations / additions, apparatus, material and labour required in order to achieve the completeness of the A/C system as above shall be deemed to be included in contractor's scope without any extra charge whether the same have been covered or not in the specifications and drawings. However, any changes required in design and installation shall be brought to the notice of the Architect/EIC; and due approval shall be obtained therefore.

The entire work shall be performed in accordance with the terms and conditions and generally as per the scope drawings set forth in the documents and shall comply with the relevant Bureau of Indian Standards Specifications and Good Engineering Practices.
The contractor shall employ a qualified Erection/Project Engineer at site and he shall be assisted by adequate number of skilled supervisors and experienced staff.
Any material supplied by the contractor, if damaged in any way during cartage or execution of work or otherwise shall be made good by the contractor at his own cost.

1.1 SUBMISSION BY THE CONTRACTOR:
The contractor shall submit three complete sets of drawings to the Engineer-in-charge after completion of the work. These drawings must give following information.
Installation drawing of air conditioning plant room.
Refrigerant distribution system layout drawing.
Schematic diagram of various controls used in air conditioning System.
Schematic diagram of electrical installation for air conditioning System, and ferrule drawings.
Detailed maintenance schedule for smooth running of the air conditioning system.
List of spare-parts required for two years satisfactory performance of the system.

1.2 GUARANTEE:
The contractor shall guarantee the installation for a period of 12 months from the date of erection / take-over certificate respective of the date of supply / erection of any equipment. Guarantee shall cover all components of the A/C System, irrespective of the nature of item, any consumable items like refrigerant gas, oil, etc. if the loss of the same is due to reasons attributed to contractor. Any damage or defect that may arise or lie discovered or in any way be connected with the equipment or fittings supplied by him or in the workmanship shall deemed necessary by the Engineer-in-charge. The achievement and maintaining of prescribed conditions throughout the Guarantee period shall be the responsibility of the contractor.
Contractor shall also provide routine preventive maintenance to the system/plant for the trouble-free operation of the system, and remove any faults that may arise during the guarantee period without any cost.

1.3 SCOPE AND STIPULATIONS:
This section relates to describe in general scope of work within this contract and stipulations.

Scope:
The scope of work includes design, supply, installation, testing and commissioning of the Air Conditioning system installation for the application mentioned herein above.
The scope of work for the air conditioning system shall be as per the schedule of quantities and scope drawings.

Drawings: The tender drawings which are enclosed herewith shall serve as scope drawings. They indicate the general scheme of the air conditioning system requirement. However, actual location, distance, levels will be governed by actual field conditions,

contractor shall check architectural, structural, water supply, drainage, false ceiling, lightning and other services plans to avoid possible installation conflicts. Should drastic changes from original plan be necessary to resolve such conflicts, the contractor shall notify the Architect and secure written approval before the installation is started. Contractor must submit the coordinated shop floor drawings prior to execution of HVAC Works and get the approval of Engineer in charge/Project architect/Project architect
Discrepancies in different plans or between plans and actual promptly be brought to attention of the Engineer in charge/Project architect/Project architect for a decision.
Shop / Working Drawings: The contractor shall submit to the consultant detailed shop/working drawings covering all items of equipment and installation.
Shop / working drawings shall show detailed dimensions of all equipment's, space requirements for access, repair and maintenance for equipment's, frame details, support details, foundation drawings etc. The shop/working drawings shall also contain details that require for A/C equipment's installation, cutouts, openings, framework, and foundations etc. that require for the A/C system.
No fabrication and installation should be put into execution until these drawings are approved by the Project architect.
The contractor shall initially submit in triplicate the drawings prepared by him for checking and verification by the Project architect/EIC. The contractor shall submit adequate copies of final drawings as required by Project architect/EIC on approval.

Codes and Regulations:
The installation shall be in conformity with bye-laws and regulations of local authorities concerned in so far as these become applicable to the installation. The installation shall be in conformity with the relevant Indian Standard Codes and Practices of which reference is made in the particular section of these specifications. Wherever a reference of Indian Standard Specification is made in the particular section of these specifications, wherever a reference of Indian Standard Specification is made in this document, it should imply to the latest revision of that standard, including such revisions / amendments as may be issued by the Bureau, during the course of the work contract.
Compliance with all the applicable laws/rules pertaining to materials and workers/personnel shall be the liability of contractor.
In case if the drawings and/or specifications require something, which violates the bye-laws and the regulations shall govern the requirement of this installation and the fact shall be brought to the notice of the Project architect/EIC.
Materials & Workmanship: The materials used by the contractor shall be new, free from defects and of the best quality and workmanship and shall be in conformity with the latest and best engineering practice.

Testing/Quality Assurance programme:
(i) All equipment's and space conditions shall be tested to establish equipment ratings and indoor space conditions. The test results shall be furnished to the Engineer in charge/Project architect/Project architect as per the tender. Instruments required for testing shall be furnished by the contractor, all instruments for measuring performance parameter needs to be calibrated and calibration certificates for those instruments to be produced when necessary. Contractor to submit the material test reports to Engineer in

charge/Project architect/Project architect. Contractor must submit a hardcopy of Quality assurance programme for material/AC System, with necessary test templates for getting approval from Engineer in charge/Project architect/Project architect. Once approved the same to be used throughout the phase of project. Any material without approval shall not be brought to site.

(ii) After testing and commissioning, all equipment's shall be labelled in an approved manner.

(iii) All equipment shall be guaranteed for the specified ratings with + / - 3% tolerance.

(iv) After all the tests and adjustments have been made, the plant to be put to running test for a period of daily from 9.00 AM to 5.30 PM or 3-7 days continuously. The temperature readings to be taken on hourly basis and the same test to be witnessed by Engineer in charge/Project architect.

(v) Factory test if required by Engineer in charge/Project architect, then the contractor to organize the same, travel/boarding will be borne by Client.

Training :

The contractor shall provide free training at site in operation and maintenance of the system supplied by them to the client. The duration of training shall be minimum ten-fifteen days or till the time client is completely conversant with the operation and maintenance of the System.

Supervision:

The work shall have to be carried in best workman like manner and supervised by competent erection engineers having adequate experience in the similar kind of work.

Clean Up At the Work Site:

It is contractor's responsibility to keep site clean during the execution, installation, and after the execution of work, from debris, rubbish and wastage of any material used by him.

1.4 SCHEDULE OF QUANTITIES:

The quantities of piping, cabling, etc. mentioned in the tender documents are tentative and are given for tenderer's guidance and to have uniform basis for tendering.

The accompanied tender drawings show the route of refrigerant piping, and equipment layout. Should there be any ambiguity in plans and specifications or obstructions, the same should be brought to the notice of the Project architect/EIC while submitting the tender documents.

The contractor should carry out detailed calculations for estimating the quantities of variable quantity items on approval of drawings. Any increase or reduction in the quantities of variable items shall be payable or deducted at the unit rate for that particular item. Any extra item not covered under the schedule of quantities but needed for the completion of the work shall be first approved by the Project architect/EIC. In case, the estimated quantity exceeds the quantity mentioned in Schedule of Quantities by over 5% written approval from the owner and the Project architect/EIC should be obtained before delivering the item/s, failing which, no claim for increase in final Contract Value may be entertained on this account.

1.5 APPROVAL OF DRAWINGS:

While it will be attempted to accord the technical approval of the contractor's shop/working drawings on an expeditious basis, it will be the responsibility of the contractor to secure from the other related agencies like the Architect, Interior Designer etc. their approval for the scheme of installation as far as the building and interior layouts, aesthetics etc. are concerned.

The approval of the drawing by the Project architect/EIC shall in no way relieve the contractor from the responsibility of providing a complete and satisfactory installation and achieving and maintaining the stipulated design conditions. Any errors, omissions and shortfalls shall be rectified, and made good free of cost to the owner regardless of the fact that the installation may in the first place have been carried out as per the approved drawings.

1.6 MODE OF MEASUREMENT:

Piping (bare / insulated), cabling, earthling etc. physical measurements and geometrically worked out quantities shall be considered without any additions for bends, reducers, fittings, valves, strainers etc.

1.7 STIPULATED COMPLETION PERIOD:

The entire work including design, manufacture, supply, installation, testing and commissioning is to be completed within the completion period mentioned in the GCC of this Tender Enquiry.

1.8 The Tender Drawings are meant for the purpose of defining the scope and the broad scheme of installation. The Contractor shall, on award of the work, prepare working Drawings based on the Tender Drawings and the final Civil and Interior Drawings; incorporating the actual equipment dimensions, duct sizes, etc.

1.9 The Bidders must check and confirm the adequacy of the installation space for A/C machines vis-à-vis their actual equipment dimensions, piping installation space, etc. shown on the Drawings. Any changes required must be clearly brought to the notice of Project architect/EIC at Tendering stage. No changes shall be possible later. Additional trapdoors if required to be taken approval from Architect.

1.10 Notwithstanding anything indicated in this Document, all the components of the A/C system should be selected, designed and installed in such a manner as to prevent objectionable noise or vibrations being transmitted to the A/C areas.

1.11 On award of the work and from time to time thereafter, area wise priorities and sequence shall be informed to the Contractor, based on which the Contractor should submit break-up of the overall completion time; and strictly adhere to the same.

1.12 The indicated configuration of air conditioners is based on the estimated A/C load to achieve the stipulated inside temperature during peak load conditions (i.e. on a summer afternoon with full occupancy).

Notwithstanding anything stated/specified in this Document / Drawings, it is to be clearly understood that it is the responsibility of the contractor to achieve and maintain the stipulated inside temperature and uniformity of conditions in all the air-conditioned areas.

2.0 HEAT LOAD

2.1 The tenderer should work out heat load and air quantity independently and confirm the same in the tenderer's confirmation.

(a) Description of the work to be carried out:

The estimated peak air conditioning requirement of the various areas with occupancy and all other internal loads as listed in the table.

(i) Each floor is having centralized Variable Refrigerant flow Air-conditioning System as per the attached BOQ.

(ii) Each indoor unit (FCU)/Cassettes should have individual Temperature controller and each floor should have one central station to control the FCU/Cassettes 's of entire block.

(iii) Necessary power with Panels and DBs will be provided by Electrical agency at site. However, contractor has to arrange for own construction power.

(iv) It is also proposed to install BMS system as specified in the tender elsewhere. VRV to be compatible with BMS System.

(v) It is proposed to install the air cooled VRV condensers at Terrace. Copper piping interconnecting between indoor and condenser will be through the identified shaft.

2.1 BASIC DESIGN AND DESCRIPTION OF PROPOSED A/C SYSTEM

2.1.1 Basic consideration for estimation

Site : Guwahati.
Latitude : 26.1445° North
Longitude : 91.7362° East
Mean sea level : 49 - 55 meters above Sea level
Area to be air-conditioned
Office areas as detailed in data sheet
Occupancy : As per DBR
Lighting load : As per DBR.
Equipment load : As per DBR.
Fresh air quantity : 10-15 cfm per person or 1.0 air change per hour whichever is higher.

Note: The complete design of air conditioning shall be as per latest codes and specification.

3.0 VARIABLE REFRIGERANT FLOW SYSTEM

3.1 VARIABLE REFRIGERANT FLOW TYPE SYSTEM:

The system shall be Variable Refrigerant Flow type multi-unit air-conditioning system complete with indoor and outdoor units with individual controller for cooling & heating type operations. System shall be BMS compatible; contractor shall be shall be responsible for coordination between BMS and Airconditioning. Supply/ Installation of Modular type

VRF Outdoor System, equipped with Efficient Scroll 100% Inverter compressor, Hot & Cold both option, special acrylic precoated heat exchanger, low noise condenser fan, auto check function for connection error, auto address setting of following capacity. Outdoor shall be capable to operate in Ambient conditions (Cooling / Heating) from -20 Deg C to +25 Deg C and from -15 Deg C to 24 Deg C. VRF / VRV must be equipped with Variable Energy Efficiency Regulation device feature which shall be enabling the ODU to perform in #3 Modes (Basic Mode / Turbo Mode and High Efficiency Mode) with varied EER in all three modes.

F. TECHNICAL SPECIFICATION OF LIFT WORK:

1.0 SCOPE OF WORK

These specifications cover the details of 2(Two) nos. 15 persons/1020 kgs. capacity Passenger lifts including suitable Brake release tools to be designed supplied, inspection as may be necessary before dispatch, delivery at site, installation, testing, commissioning and handing over to CDRI and the defects liability for a period of 1 year after completion of all works & handing over to client. Scope of work shall also include AMC (Annual maintenance contract) for 3 years after one year of defect liability period after handing over to client.

These specifications shall be read in conjunction with the General Conditions of Contract, Additional Conditions of Contract.

2.0 GENERAL

The equipment and installation covered by these specifications shall conform to codes of practice in force and highest standards of workmanship and materials. This work shall be done in accordance with the provisions of the Local Lifts Authority rules and shall also conform to requirements of local municipal by laws, and subsequent provisions, as also any state or local Act in force and latest Indian Standard 14665 and all latest applicable BIS, NBC code and 'CPWD General Specifications for Electrical Works (Part III, Lifts & Escalators) 2003'.

The Entire electrical installation shall be done in accordance with the Indian Electricity Act 2003, Indian Electricity Rules 1956 as amended to-date. The Electrical wiring shall strictly comply with IS:732 and latest applicable BIS and NBC code. The electrical works shall also conform to CPWD General Specification for Electrical Work Part-I (Internal) 1994 and Part-II (External) 1994 as amended up to date.

The Contractor shall follow all Statutory Requirements as well as best trade practices in the manufacture & installation of lifts. The Contractor shall arrange to obtain the statutory approval of the Inspectorate of Lifts as may be required for commissioning of the lifts and handover for operation after satisfactory tests.

3.0 DRAWINGS

Before commencing work, the Contractor shall prepare and submit all drawings for individual lifts in required nos. necessary to show the general arrangement and details of lift installation, electrical etc. These drawings must be approved by the EPI/CDRI before installation and shall become part of the contract.

The Contractor shall, within 3(three) weeks of receipt of a Letter of award of contract, submit 4(four) copies of all working drawings showing pit, hoistway and machine room layouts clearly indicating and specifying all connected structural, electrical and architectural works including imposed structural static / dynamic loads (including breaking load on guides, reaction of buffers on lift pits, reaction on support points in machine room, lift well etc.) and electrical ratings including calculations for selection of kW rating of motor. Within 10 days of receipt of letter of award of contract, the Contractor shall obtain from the EPI/CDRI all the information he needs to prepare his drawings and shall have any interaction with the EPI/CDRI to finalise all parameters and data for design. The Contractor will be responsible for any discrepancies, errors and omissions in the drawings or particulars submitted by him even if these have been approved by the EPI/CDRI. On approval of these drawings (within 2 weeks of submission of full documentation), the Contractor shall submit 8(eight) copies of approved working drawings incorporating corrections / comments, if any, and shall immediately commence work.

On completion of work, the contractor shall supply four sets of CD's and 8 (eight) copies of the detailed wiring diagram, 'As built' drawings and equipment operation & maintenance manuals and original certificates from 'Inspector of Lifts' for all the lifts. Further, a copy of such detailed diagram and a set of instructions for evacuation of passengers in case of breakdown of the lifts shall be framed and installed in the respective machine room by the Contractor.

The Contractor shall carry out all the work strictly in accordance with drawings, details and instructions of EPI/CDRI.

4.0 WORKS TO BE ARRANGED BY EPI/CDRI

The following items shall be provided to the Lift Contractor under instructions of the Department to suit the requirements of the lift Contractor.

i. Hoist-ways, machine rooms and pits of specified dimensions (within normal building tolerances).

ii. Floor, wall and ceiling finishes in hoist-ways, pits and machine rooms; including painting (except painting of equipment and materials supplied by lift Contractor) and waterproofing, as well as doors and windows in machine room.

iii. Cables from main L.T. Panel Board through the hoist-ways terminating in and including individual Main Switches of required rating for 3 phase and single phase supply in Machine Rooms including necessary earthing.

iv. Free 3 phase power supply for group testing and commissioning of lifts after erection is completed.

v. Lighting installation within machine rooms as required by the lift Contractor including 1-phase main switch with ELCB at machine room.

vi The equipment shall be suitable to operate on 415 Volts 3 phase, 4 wires, 50 Hz. A.C. supply with a variation of ±10% in Volts and +5% in frequency respectively. The supply for illumination and single-phase equipment shall be 230 Volts A.C.

vii Lighting installation within hoistways and pits as required by the lift Contractor including 1-phase main switch at machine room.

viii. Ventilation system of machine rooms with minimum 18" heavy duty exhaust fan in each machine room as per the requirement of NBC / BIS codes.

ix. Providing of hoisting beam in the machine room for hoisting of equipment during erection and to facilitate maintenance in future.

5.0 LIFTS CONTRACTOR'S RESPONSIBILITIES : ANCILLARY WORKS

i. All cabling , wiring and earthing from 3 - phase main DB in machine room to Lift Contractor's equipment.

ii. All steel items i.e. machine beam/bases, pedestals/ bearing plate in the machine room, separators wherever required and buffer support channels, vertical iron ladder in lift and structural steel supports and brackets for the installation in etc., to suit the sizes of the hoistways.

iii. Sill tracks including sill supports, supporting protection at all landings.

iv. Screen guards, facia plates and other protection for installation.

v. To carry out minor civil work, such as chipping & making openings in slabs , grouting of foundation bolts in shaft, pit and machine room, modification and making rail bracket, hall buttons indicators and laying of sills in positions. Or any other work required for smooth operation/ commissioning of lifts. All chiseling and cutting of pockets and making good. (All cutting shall be as approved by EPI/CDRI).

vi. Ensuring safety against accidents including barricading all openings and caution signs.

vii. Scaffolding and other Tools & Tackles required for installation in the hoist-way required for erection of lifts.

viii. All other items necessary for satisfactory execution & completion of works, whether specified or not.

ix. Power shall be provided at incoming of main DB for lifts. Main DB in the machine room shall be provided by the lift contractor. From main DB to lifts, cables shall be in the scope of lift contractor. However, lighting for machine room shall be done by others.

x. Trap doors, floor gratings, steps / ladders and openings in machine rooms and ladders for pits as required by the lifts Contractor. Contractor shall furnish the details of these items in the layout drawing for lifts to submitted after award of the job.

xi. Temporary power supply connection(s) for erection work shall be arranged by the lift Contractor.

6.0 SOUND REDUCTION

The Contractor shall provide necessary sound reduction materials, such as rubber pads/ anti vibration pads of proper density to effectively isolate the machine from the machine beams and/or flooring.

Noise level inside cars and in the machine, room shall be maintained at minimum levels as laid down in the relevant codes and in any case not more than specified under PERFORMANCE PARAMETERS.

7.0 TRACTION MACHINE

The machine shall be worm geared traction type with motor (steel worm, bronze gears, steel sheave shaft & Ferro molybdenum sheave), electro-mechanical type of brake and driving sheave mounted in proper alignment on a single heavy cast iron base or steel bedplate.

The worm shaft shall be fitted with roller bearings to take end thrust. The sheave shaft shall also be fitted with roller bearings to ensure proper alignment. All shafts shall be provided with well-designed keys.

Rotating parts shall be statically and dynamically balanced.

The drive sheave shall be designed with machined V-grooves to ensure adequate traction with minimum wear on rope. All sheaves including deflector sheaves, where used, shall conform to I. S. 14665 (Part 4 section 3)

Adequate and dust – proof lubrication shall be provided for all bearings and worm gears.

The brake shall be suitably curved and provided with fire proof friction lining. The operation of brake shall be smooth, gradual and with minimum noise. The brake shall be designed to be of adequate size and strength to stop and hold the car at rest with rated load. The brake shall be capable of operation automatically by various safety devices, current failure and by the normal stopping of the car. The brake shall be released electrically. It shall also be possible to release the brake manually so as to move the lift car in short stops. Suitable Brake release tools (total 3 nos.) shall be supplied and stored in the machine rooms.

For manual operation of lifts, up & down direction of the movement of the car shall be clearly marked on the motor or traction machine. A warning plate in bold signal red colour to switch off the mains supply before releasing the brake and operating the wheel shall be prominently displayed.

8.0 HOIST MOTOR

The motor shall be suitable for 415 Volts +10% to –20%, 50 Hz. + 5%, 3 Phase A.C. Supply. The motor must be designed for arduous lift duty, rapid reversals and constantly repeated starts & stops as defined in the relevant codes of practice. All windings must be heavily insulated, adequately impregnated for tropical climate and mechanically strengthened and must be specifically designed to have a high starting torque and low starting current characteristics within the limits acceptable to electricity supply co. requirements and I.E. Rules. The motor shall be designed in such a way as to withstand occasional overloading above its rated capacity and

shall have overload protection. The motor shall have good speed regulation under different conditions of load and shall be designed to give a noiseless and vibration-free operation. Insulation shall be class F.

9.0 MOTOR CONTROL AND DRIVE

The lift motor shall be controlled by a variable voltage variable frequency (V.V.V.F.) micro-processor control system which shall control and monitor every aspect of lift operation at all stages of the car motion cycle on real time basis.

The A.C. V.V.V.F. drive system shall control A.C. voltage and frequency concurrently with the hoist motor to regulate the lift's actual performance to match closely the ideal speed pattern, obtain maximum efficiency of operation and provide a very smooth ride.

Frequency shall range fully between zero and rated value.

The Controller shall be provided with a self diagnostic programme to keep downtime to a minimum possible.

The controller shall intelligently adjust door times in response to car calls, hall calls and "Door Open" button operation.

An Inspector's changeover test switch and set of test buttons shall be provided in the controller. Operation of the Inspector's changeover switch shall make both the car and landing buttons inoperative and permit the lift to be operated in either direction from machine room for test purposes by pressing corresponding test buttons in the controller. It shall not, however, interfere with the emergency stop switches inside the car or on the top of the car.

10.0 GUIDES AND FASTENINGS

i. Guide-rails for car and counterweight shall consist of machined mild steel Tee sections, erected plumb, and securely fastened to the lift well framing by heavy steel brackets, suitably spaced, to limit deflection of guide rails to 3 mm under normal working conditions.

ii. The guide-rails shall be of suitable section with ends tongued and grooved, forming matched joint and shall be connected with steel fish plates.

iii. Guide-rails shall cover the full height of the hoistway and pit , such that It shall be not be possible for any of the car or counter weights shoes to run off the guides.

iv. Guides shall be designed to withstand the action of safety gear when stopping a counter weight or fully loaded car.

v. The max. deviation from true plumb and alignment of guide rails shall be 2 mm.

vi. All support framing shall be rigid and shall be designed to restrict displacement of the point of support of brackets to 3 mm under normal working conditions.

vii. The whole guide rail installation, including expansion joints, shall be designed for a smooth ride.

viii. The guide-rails shall be protected during storage and installation with a rust inhibiting coating which shall be cleaned off on completion of installation.

ix. Guide-shoes shall be adjustable type & mounted so as to provide continuous contact with guide rails under all conditions.

Guide shoes shall be provided at top and bottom of each side of car and counterweight and shall be designed for quiet operation.

Additional guide shoes shall be provided on each side of buffer frame in case of oil buffers.

Each lift shall be equipped with roller guides for up and down travel. There shall not be any metal-to-metal contact between Car and rail. Roller shall be mounted on ball bearings to provide quiet operation and excellent ride quality. (It is not required in case the design varies however the ride quality shall not be compromised for any other design).

11.0 SAFETY

In addition to other specifications, the lift shall be provided with safety devices as follows :-

i. Against overload

ii. Safety gear on car so that in the event of rope breaking or loosening, the car will be brought to rest immediately by means of grips on the guides.

The overspeeding car shall be automatically brought to a gradual stop on guide rails and power supply to the hoist motor shall be switched off.

iii. Overspeed centrifugal governor operating the safety gear in case of over-speeding of car in the down direction.

iv. Car gate lock so that in the event of car gate being opened when passengers are in the car, the lift will be brought to rest.

v. Overtravel limit switches at top and bottom limits of travel to disconnect the power supply and apply brakes to stop the car within a defined safe distance in case of overtravel in either direction

vi. Ultimate terminal switches to stop the car automatically within top & bottom clearances independently of normal overtravel limit switches but with buffers operative.

vii. Protective guards to counterweights in pit, rope sheaves and wherever required.

viii. Toe guard apron to the car platform.

12.0 CAR

a. Cabin Size

The internal clear dimensions of the cabin shall not be less than those specified in IS 14665-Part I, NBC & CPWD General specifications for electric work (Lifts) . The car shall be so mounted on the frame that vibration and noise transmitted to the passengers inside is minimised.

b. Frame and Safety Device

The car frame shall consist of mild steel channel/structural steel top and bottom securely riveted or bolted and substantially reinforced and braced so as to relieve the car enclosure of all strains when the safety device comes into action due to overspeed or when the capacity loaded car is run on the buffer springs at normal speed.

The safety device mounted on the bottom members of the frame operated by a centrifugal speed governor shall be arranged to bring the car to a gradual stop on the guide rails in the event of excessive descending speed; and provision shall be made to shut off the power supply to the motor.

c. Buffers

Substantial spring buffers (2 Nos.) shall be furnished and installed in the pit under the car and counterweight. These buffers shall be mounted on RCC Pedestals in the pit. The car buffer spring must be of correct design to sustain the car with capacity load without damage should the car terminal limits become inoperative. The car buffers must be located symmetricaly with reference to centre of car.

The Contractor may alternatively offer oil type buffers. The plunger shall be mild steel, designed for a very high factor of safety and accurately machined. A toughened rubber bumper shall be fitted to the plunger top to cushion the impact of steel buffer plates attached under the car and the counterweight. An oil gauge shall be provided to check the oil level.

d. Counterweight

The lift shall be suitably counter-balanced for smooth and economical operation. Cast iron weights shall be contained in a structural steel frame properly guided with suitable guide shoes (minimum 4 Nos). It shall be equal to the total weight of lift plus approx. 50% of the contract load.

Substantial expanded metal counter-weight screen guard shall be furnished and installed at the bottom of hoist way, as required by Lift Inspector.

e. Hoisting and Governor Ropes

Bright steel wire ropes with fibre cores suitable for Lift duty as per BIS Code shall be used for hoisting ropes.

Not less than 3 independent suspension ropes shall be provided and designed to share load equally by means of adjustable shackle rods with equalizer springs at each end of hoisting ropes.

Each rope shall have adequate section to provide a minimum factor of safety of 4 based on the max. force on the rope.

Governor ropes shall be similar to hoisting ropes. Their ends shall be securely attached to the car and to the safety gear. The governor ropes shall be tensioned by a weight loaded device in the pit.

The contractor shall submit the technical details and source of supply of ropes to the EPI as well as a certificate of performance of ropes from an approved test laboratory or Authority.

Compensation for travel shall be provided for all lifts having a travel of more than 30m.

f. Enclosure

The car enclosure shall be as specified in technical data sheet. The cabin floor, roof and walls shall be free of distortion and undue deflection as per IS 14665 – Part 4, Section 3.

g. Brakes

D.C. brakes will be spring-applied and electrically released. They shall be designed to provide smooth stops under variable loads.

h. Doors

Provision shall be made for vertical and horizontal fine adjustment of doors as per the specifications given in technical data sheet.

i. Door Operators

The door operators shall be VVVF inverter controlled heavy duty A. C. motor, allowing variable opening and closing speeds, and full synchronization of car and landing doors.

j. Travelling Cables

The traveling cables shall be multi-core with high conductivity stranded conductors specifically designed for lift duty. The cables shall be provided with retaining straps and individual cable clamps.

k. Emergency Lighting

A self-contained, non-maintained emergency light with a trickle boost charger shall be provided.

l. Intercom

An Intercom system shall be provided between the car, main landing, machine room and Fire Console room linked to EPABX located at Admn. Bldg.

m. Manual Cranking Facility

Manual cranking facility shall be provided in the machine room to facilitate evacuation of passengers in case of power failure. The manual mode shall be in addition to automatic car failure operation specified elsewhere

n. Emergency Stop Switch

A stop switch in the machine room / top of car shall be provided for use by maintenance crew to cancel all car and landing calls for a particular lift.

o. Maintenance Switch

On operation of the maintenance switch located on top of the car by the maintenance crew, the car shall travel at slow speed not exceeding 0.85 m / sec by continuous operation of a button

p. Landing Door Interlocks

Electrical interlocks shall be provided to ensure that the car does not operate unless all doors are closed and unless the car reaches a landing zone.

q. Overload Indicator (Only in Passenger elevator)

An overload indicator with buzzer shall be provided in the cabin to indicate to the passengers that the car will not start as it is overloaded.

r. Other Features

All features specified in the BIS/NBC/CPWD and in the enclosed technical specifications shall be provided.

s. Lift for Disabled

All the Passengers lifts shall be suitable for use by disabled persons. The following additional facilities shall be provided in this lift:

i. Full length handrails shall be provided on the rear and side wall panels.
ii. The door closing time shall be set for min. 5 seconds and the door closing speed shall not exceed 0.25 m/sec.
iii. The "door open" and "door closed" announcements shall be audibly made in the car.
iv. Braile signs / buttons.

t. Operating Panels, Buttons & Switches

Main and secondary car operating panels, buttons and switches shall be located on one of the two front wall panels next to the car door and as specified in the Schedule of lifts & as per approved G.A. drawings.

All buttons and switches shall be clearly legible with fade-proof text and figures, and shall be easily accessible, (especially for disabled persons in the lift designated for them).

13.0 ELECTRIC WIRING

Necessary insulated wiring to connect all parts of the equipment shall be furnished and installed. Insulated wiring shall be flame retardant and moisture resistant and shall be run in G.S. conduits. All cables shall be flame – retardant with copper conductors.

Trailing cables shall be PVC sheathed copper conductor multi-core ribbon type designed for lift service and shall be flame retardant and moisture resistant. They shall be flexible and shall be suitably suspended to relieve strains on individual conductors. All copper conductors shall be of appropriate gauge copper to avoid excessive voltage drop. All wires, cables, conduits, metal boxes, fittings and earthing shall comply with statutory requirements and BIS specifications.

The controller unit comprising of the MCCB, 25KA, adjustable overload and phase reversal and phase failure protection, all the circuit elements, transformer, rectifier for D.C. control supply, inverter power pack, terminal blocks etc. shall be enclosed

in an insect vermin proof, sheet steel floor or wall mounted cabinet with hinged doors at front or at both front and rear. Proper warning boards and danger plates shall be provided on both sides of the controller casing. Sheet steel used for controller cabinet shall not be less than 14 gauge and shall be properly braced, where necessary. Suitable gland plate shall be provided for cable entry. The battery for the charger unit shall be suitably placed in the machine room. Degree of protection of Enclosure shall be IP54. Enclosure shall have provision of earthing studs.

All sheet steel work shall be painted with two coats of synthetic enamel paint of suitable shade both inside and outside over two coats of zinc primer.

Apart from lift controller enclosure, 7 distribution boards (3 Main DB + 4 DB) are required as per BOQ. Cables to incomer of these DB's shall be terminated by others, whereas outgoing cables for lift shall be in the scope of lift contractor. Contractor shall furnish the sizes of cables alongwith KW rating of motors.

14.0 PAINTING

All exposed metal work furnished in these specifications, except as otherwise specified, shall be given one shop coat of anti-corrosive primer after approved surface treatment of metal surfaces and two coats of approved enamel paint of approved shade. After installation of Lifts, a final Touch-up Coat of paint shall be applied.

15.0 WORKS TESTS

The following tests shall be carried out at Works. EPI shall be given notice of the time and procedure of the tests before they are carried out, and shall be given facilities for observing the tests at Works.

a. High voltage works tests of equipment which is not already tested in accordance with appropriate IS codes.

b. Buffer test.

16.0 TESTS ON COMPLETION

The following tests shall be carried out to the satisfaction of the EPI/CDRI.

i. Insulation resistance and earth test for all electrical apparatus.

ii. Continuous operation of the lift under full load conditions and simulated starts and stops (150 nos. per hour each) for one hour at the end of which time the service temperature of the motor and the operating coils shall be tested. This shall be as per B.I.S. specification.

iii. The car shall be loaded until the weight on the rope is twice the combined weight of the car and the specified load. The load must be carried on for about 30 minutes, without any sign of weakness, temporary set or permanent elongation of the suspension rope strands.

iv. The following items shall be tested :

   a. Levelling accuracy at each landing in conditions of fully loaded and empty car.
   b. No load current and voltage readings both on 'Up' and 'Down' Circuits.
   c. Full load current and voltage readings both on 'Up' and 'Down' Circuits.

d. One and quarter load current and voltage readings both on 'Up and 'Down' Circuits.
e. Stalling current and voltage and time taken to operate overload.
f. Overload protection.
g. Gate sequence relays, if provided and installed.
h. Car and landing door interlocks.
i. Collective control and priority sequences, if installed.
j. Safety gear mechanism for car and counterweight with fully loaded car and also with only 68 kg load.
k. Speeds on Up and Down travel with full load, half load and empty car.
l. Door contacts.
m. Final terminal stopping device.
n. Normal terminal stopping device.
o. Car and counterweight buffers with contract load and contract speed.
p. Operation of controllers.
q. Manual operation of lift at mid-way travel.
r. Emergency operation.

v. Tests on completion shall also be performed to the satisfaction of Inspector of Lifts and a certificate will be obtained from the 'Lift Inspector ' by the contractor.

17.0 STATUTORY APPROVALS

All statutory approvals from commencement to commissioning of lifts shall be obtained by the Contractor from the Inspector of Lifts and / or other authorities. However, the client will provide all necessary assistance for providing documents, drawings and certificates pertaining to other contractors, if required.
The contractor shall pay necessary fees in connection with the approval of installation of lifts.

18.0 FEATURES REQUIRED FOR VVVF LIFTS

(a) **Group / Independent / Attendant Operation**

It shall be possible to group specified cars in a group wherever required with dynamic disposition of cars as required by the traffic pattern. A smart car dispatching system with ring communication shall be provided for optimum passenger comfort and lift performance under all traffic conditions. Any defective car shall be automatically eliminated from the group.

Each car shall be provided with a keyswitch for independent operation housed in a service cabinet. In this mode, the lift shall respond only to car calls. Hall calls will not be registered.

It should be possible for an attendant to operate any car.

(b) **Fireman's Switch**

A fireman's toggle switch shall be provided in a break glass for the specified lift at ground floor to enable firemen to bring the lift non-stop to ground floor from any location and to cancel hall calls until the car is operated on attendant control.

(c) **Emergency Power Operation**

In case of power failure, standby power equipment shall enable lifts to reach a pre-determined floor, in a pre-determined sequence, and then permit operation of one or more lifts on emergency power.
A trickling battery shall be provided to supply power to light fixtures, fan, alarm and intercom.

(d) **Profile Generator**
A profile generator or similar device shall be provided to use the car at an optimum speed level and to improve levelling accuracy.

(e) **Predictive Car Selection**
Once a hall call is registered, a dynamic car algorithm shall transfer the call to an optimally selected car to provide the maximum traffic efficiency.

(f) **Home Landing Facility**
A car shall return to a pre-determined landing after the last call is answered.

(g) **Door Safety**
Multi-beam infrared / ultrasonic electronics curtains shall be provided to scan the doorway and reverse the door closing in case of any obstruction.

(h) **Double Door Operation**
If both up and down calls are registered at a hall which is the last registering hall in the direction of the car, the lift shall travel to that hall and open / close the doors. After this, the car shall reverse its travel and shall open / close the doors again unless no car calls are registered at that floor.

(i) **Nudging Door Operation**
When the doors remain open for more than a predetermined period, a buzzer shall sound and the door shall close automatically. The door sensing device shall be rendered inoperative but the Door Open button and the safety shoe shall remain operative

(j) **Selective floor Service**
Programming for selective floors services shall be software driven.

(k) **Manual Cranking & Slow speed Travel**
A manual cranking facility shall be provided.
Slow speed operation shall be possible from machine room and car top.

(l) **Auto Fan Off**
In case no calls are registered for a pre-set time, the cabin fan shall be automatically switched off.

(m) **Automatic Rescue Device**
In case of mains power failure and Lift control system failure, the Lift's own rechargeable and maintenance free battery power shall move the car to the nearest floor and the door shall open automatically for automatic rescue of passengers. A battery run-down indicator shall be provided.

19.0 PERFORMANCE PARAMETERS

The following parameters shall be achieved in the installation :

*	Levelling Accuracy	$\pm$ 3 mm for 1.5 m/s speed $\pm$ 4 mm for 0.75 m/s speed
*	Jerk level	0.9 – 1.5 m/s^3

*	Noise level in car	58 dB
*	Noise level at 1 M in machine room	60 dB
*	Acceleration rate	0.6 – 1.0 m/s^2 (adjustable)
*	Max. car vibration	20 milli gals.

20.0 SUBMITTALS 'ALONGWITH TENDER' AND 'POST AWARD'

(A) The following items are required to be submitted in duplicate **along with the Tender**.

i. Catalogues with offered items highlighted.
ii. List of imported components, if any.
iii. Compliance Statement for guaranteed performance parameters given in Specification 19.0 above.
iv. Confirmation that offer submitted meets the technical specifications & scope of work and there are no deviations and exclusions from NIT.
v. The contractor shall specify in his offer the full capability of his system in this regard.

(B) The successful contractor, **after award of the contract**, shall furnish following technical particulars of the equipment/devices for the approval by CDRI/EPI.

i) Single line/ schematic diagram of electronic control panel, lift & equipment etc.
ii) Layout of Hoist-way, Lift machine room, showing foundation details in the pit, machine room, electric control panel, Lift & equipment etc.
iii) Earthing layout.
iv) Inspection manual for equipment & accessories covered in the scope of supply (8 copies).
v) Technical literature of operation, control and maintenance etc. (8 copies) along-with CDS.
vi) Schedule of scope of maintenance service during defect liability period and AMC.

The technical parameters furnished by the tenderer would be examined in detail during design submission stage. All improvements considered necessary to meet the tender Technical Specifications would have to be incorporated without any additional cost to EPI/CDRI with objective of providing high performance and safety Lifts.

21.0. MAINTENANCE DURING DEFECTS LIABILITY PERIOD

Comprehensive maintenance during Defects Liability Period inclusive of periodic servicing, prompt attention to client (CDRI) complaint, prompt rectification of all malfunctions and equipment failures, replacement of defective equipment / parts, replacement of light fittings, lubrication including lubricants, maintaining correct alignment and levelling of cars and ensuring smooth running, starts and stops etc. all complete to EPI/CDRI's satisfaction shall be done by the contractor at own cost.

G. TECHNICAL SPECIFICATION OF LANDSCAPE WORK:

1.0 LANDSCAPE WORK:

Landscaping (Horticulture) operations shall be started on ground previously levelled

and dressed to required formation levels and slopes. In case where unsuitable soil is met with, it shall be either removed or, replaced or it shall be covered over to a thickness decided by the Engineer-in-charge with good earth. In the course of excavation or trenching during horticultural operations, any walls, foundations, etc. met with shall not be dismantled without pre-measurement and prior to the written permission of the Engineer-in-charge.

2.0 TRENCHING IN ORDINARY SOIL:

2.1 TRENCHING:

Trenching is done in order to loosen the soil, turn over the top layer containing weeds etc. and to bring up the lower layer of good earth to form a proper medium for grassing, re-grassing, hedging and shrubbery. Trenching shall be done to the depth ordered by the Engineer-in charge. The depth is generally 30 cm for grassing and 60 cm for re-grassing in good soil.

2.1.1 The trenched ground shall, after rough dress, be flooded with water by making small kiaries to enable the soil to settle down. Any local depression unevenness etc. shall be made good by dressing and/or filling with good soil.

2.1.2 Weeds or other vegetation which appear on the ground are then uprooted and removed and disposed off and paid.

2.1.3 Trenching shall consist of the following operations: 1. The whole plot shall be divided into narrow rectangular strips of about 1.5 m width or as directed by the Engineer-in-Charge. 2. These strips shall be sub-divided lengthwise into about 1 m long sections. Such sections shall be excavated serially and excavated soil deposited in the adjacent section preceding it. 3. In excavating and depositing care shall be taken that the top soil with all previous plant growth including roots, get buried in the bottom layer of trenched area, the dead plants so buried incidentally being formed into humus. 4. The excavated soil shall be straight away dumped into the adjoining sections so that double handling otherwise involved in dumping the excavated stuff outside and in back filling in the trenches with leads is practically eliminated.

2.1.4 Measurements Length and breadth of the plot shall be taken correct to 0.1 m and depths correct to cm. Cubical contents shall be calculated in cubic meters, correct to two places of decimal. No deduction shall be made nor extra paid for removing stones, brick bats and other foreign matter met with during excavation upto initial lead of 50 m and stacking the same.

2.1.5 Rate The rate shall include the cost of all labour and material involved in the operations described above, including cost of all precautionary measures to be taken for protections and supporting all services etc. Met with during trenching. It does not include the cost of mixing of earth, sludge/manure.

2.2 GOOD EARTH

2.2.1 The earth shall be stacked at site in stacks not less than 50 cm high and of volume not less than 3.0 cum.

2.2.2 Measurements: Length, breadth and height of stacks shall be measured correct to a cm. The volume of the stacks shall be reduced by 20% for voids before payment, unless otherwise described.

2.2.3 Rate: The rate shall include the cost of excavating the earth from areas lying at distance not exceeding one km. from the site, transporting the same at site breaking of clods and stacking at places indicated. The rate shall also include royalty if payable.

2.3 SUPPLY AND STACKING OF SLUDGE

2.3.1 It shall be transported to the site in lorries with efficient arrangement to prevent spilling en-route. It shall be stacked at site. Each stack shall not be less than 50 cm height and volume not less than 3 cum.

2.3.2 Measurements Length, breadth and depth of stacks shall be measured correct to a cm. The volume of the stack shall be reduced by 8% for looseness in stacking and to arrive at the net quantity for payment.

2.3.3 Rate The rate shall include the cost of labour and material involved in all operations described above, including carriage up to one km. The rate shall also include royalty if payable.

2.4 SUPPLY AND STACKING OF MANURE

2.4.1 Farmyard Manure: Same as 2.3.1.
2.4.2 Measurements: Same as 2.3.2.
2.4.3 Rate : Same as 2.3.3.

2.5 EXCAVATION AND TRENCHING FOR PREPARATION OF BEDS FOR HEDGE AND SHRUBBERY

2.5.1 Beds for hedges and shrubbery are generally prepared to width of 60 cm. to 125 cm. and 2 to 4 meters respectively.

2.5.2 Beds for hedges and shrubbery shall be prepared in the following manner. The beds shall first be excavated to a depth of 60 cm. and the excavated soil shall be stacked on the sides of the beds. The surface of the excavated bed shall then be trenched to a further depth of 30 cm, in order to loosen the soil, in the manner described in 2.1. No flooding will be done at this stage but the top surface shall be rough dressed and levelled. The excavated soil from the top 60 cm depth of the bed stacked at the site shall then be thoroughly mixed with sludge over manner in the proportion 8:1 by ratio or other proportion described in the item. The mixed earth and manure shall be refilled over the trenched bed, levelled neatly and profusely flooded so that the water reaches even the bottom most layers of the trenched depth of the bed. The surface after full subsidence shall again be refilled with the earth and manure mixture, watered and allowed to settle and finally fine dressed to the level of 50 mm to 75 mm below the

adjoining ground or as directed by the Engineer-in-Charge. Surplus earth if any, shall be disposed off as directed by the Engineer-in-charge. Any surplus earth if removed beyond initially lead shall be paid separately. Stones, bricks bats and other foreign matter if met with during excavation or trenching shall be removed and stacked within initially lead & lift, such material as is declared unserviceable by the Engineer-in-charge shall be disposed by spreading and levelling at places ordered by him. If disposed outside the initial lead & lift, then the transport for the extra leads will be paid for separately. If a large proportion of material unsuitable for the hedging and shrubbery operations is met with and earth from outsides is required to be brought in for mixing with manure and filling, the supply and stacking of such earth will be paid for separately.

2.5.3 Measurements

Length, breadth and depth of the pit excavated and trenched shall be measured correct to a cm. The cubical contents shall be calculated in cubic meter correct to two places of decimal.

2.5.4 Rate

The rate shall include the cost of all the labour and material involved in all the operations described above. The rate shall not include the cost of supply & stacking of the manure unless the same is specifically included in the description of the item.

2.6 DIGGING HOLES FOR PLANTING TREES

2.6.1 In ordinary soil, including refilling earth after mixing with oil cake, manure and watering.

2.6.1.1 Holes of circular shape in ordinary soil shall be excavated to the dimensions described in the items and excavate soil broken to clods of size not exceeding 75 mm in any direction, shall be stacked outside the hole, stones, brick bats, unsuitable earth and other rubbish, all roots and other undesirable growth met with during excavation shall be separated out and unserviceable material removed from the size as directed. Useful material, if any, shall be stacked properly and separately. Good earth in quantities as required to replace such discarded stuff shall be brought and stacked at site by the contractor which shall be paid for separately. The tree holes shall be manured with powdered Neam/castor oil cake at the specified rate along with farm yard manure over sludge shall be uniformly mixed with the excavated soil after the manure has been broken down to powder, (size of particle not be exceeded 6 mm in any direction) in the specified proportion, the mixture shall be filled in to the hole up to the level of adjoining ground and then profusely watered and enable the soil to subside the refilled soil shall then be dressed evenly with its surface about 50 to 75 mm below the adjoining ground level or as directed by the Engineer-in-charge.

2.6.1.2 Measurements:

Holes shall be enumerated.

2.6.1.3 Rate:

The rate shall include the cost of all the labour and material involved in all the

operations described above, excluding the cost of supply and stacking the requisite quantity of manure/ sludge and oil cake.

2.7 M.S. FLAT IRON TREE GUARD

2.7.1 M.S. Iron Riveted Tree Guard

2.7.1.1 The tree guard shall be 600 mm in diameter and 2-meter-high above ground level and 25 cm in below ground level.

2.7.1.2 The tree guard shall be framed of 4 nos. 25 x 6 m M.S. flat 2 meter long excluding displayed outward at lower and upto an extent 10 cm and 8 nos. 25 x 3 mm vertical M.S. Flat Rivetted to 3 Nos. 25 x 6 mm Flat iron rings in two halves, bolted together 8 mm dia and 30 mm long M.S. bolts and nuts. The entire tree guard shall be given two coats of synthetic enamel paint of approved brand and manufacturer of required shade over a priming coat of ready mixed steel primer of approved brand and manufacturer. The design of tree guards shall be shown in the drawing.

2.7.1.3 Measurement:
The tree guard shall be enumerated.

2.7.1.4 Rate:
The rate shall include the cost of all the labour and material involved in all the operations described above.

2.7.2 M.S. Flat Iron Welded Tree Guard

2.7.2.1 The tree guard shall be 600 mm in diameter and 2-meter-high above ground level and 25 cm in below ground level.

2.7.2.2 The tree guard shall be framed of 4 nos. 25 x 6 mm MS. Flat 2 meters long excluding displayed outward at lower and upto an extent 10 cm and 8 Nos. 25 x 3 mm vertical M.S. Flat Riveted to 3 nos. 25 x 6 mm flat iron rings in two halves, bolted together 8 mm dia and 30 mm long M.S. Bolts & nuts. The entire tree guard shall be given two coats of synthetic enamel paint of approved brand and manufacturer of required shade brand and manufacturer of required shade over a priming coat of ready mixed steel primer of approved brand and manufacturer. The design of tree guards shall be shown in the drawing.

2.7.2.3 Measurement:
The tree guard shall be enumerated.

2.7.2.4 Rate:
The rate shall include the cost of all the labour and material involved in all the operations described above.

2.8 FILLING MIXTURE OF EARTH & SLUDGE OVER MANURE

2.8.0 The separately specified earth and sludge shall be broken down to particles of size not exceeding 6 mm in any directions before mixing. Good earth shall be thoroughly mixed with sludge over manure in specified proportions as directed by Officer-in-Charge. During the process of preparing the mixture as above, trenches shall be flooded with water and levelled.

2.8.1 Measurements
Measurement shall be made in (Length, breadth and height of stacks) cubic meter. The cubical contents shall be worked out to the nearest two places of decimal in cubic meter.

2.8.2 Rate
The rate shall include the cost of all the labour and material involved in all the operations described above, but do not include the good earth, sludge or manure which will be paid separately.

3.0 SPECIFICATIONS OF PLANTS (Plants, Trees Shrubs taken in SOQ) :

3.1 The plants, Trees and shrubs included under SOQ should be as per following specification.

1 The plants should be full of fresh and healthy foliage.
2 The plants should be free from insect, pest and disease.
3 Plant should be healthy and vigorous growth
4 The height of the plants will be measured from top of the pots.
5 The plants should be well settled and should not be newly shifted.
6 The plants should be true to the variety and named Variety should be tagged.
7 Moss stick used should be made on plastic pipe.
8 Moss stick should be straight and properly fixed in the pot.
9 The rejected plants materials should be removed from the site immediately.
10 Moss stick should be covered with the plants in case of plants supplied with moss stick.
11 The Plant should be well stablished and good spread.
12. Good earth and manure used for filling the pot/poly bag free from any inert material and mixed to proper ratio.
13. Pot/ Poly bag used for filling the plants should be proper size good quality not damaged.
14. There should be proper drainage in pots for plants.
15 The flowering plants should also have proper flowering and should be true to the variety.
16 All plant should have the tendency of growth and should not be stunted type.
17. There should be no stagnation of water in the pots.

H. TECHNICAL SPECIFICATION OF STP WORK:

1.0 DESCRIPTION OF PROCESS SCHEME

In order to conserve water, the treatment plant will be designed to ensure that treated effluent (water) characteristics are well below the permissible limits. It is proposed to use Attached Growth system working on the principle of Fluidized Aerobic Bio-reactor process based on the FAB process.

Waste water will flow via gravity through a bar screen chamber & Oil & Grease Trap to an Equalization Tank. A bar screen will be provided at the inlet point in the bar screen chamber and the waste water will flow through this bar screen into the Tank. Bar screen will be so designed that it can be cleaned manually from outside the Tank. The oil & grease from the Oil & Grease Trap would have to be removed manually. Waste water from the equalization tank will be transferred by means of Pumps into the FAB tank where it will be mixed with living organisms also called MLSS (Mixed Liquor Suspended Solids) in presence of air & air will be introduced through submerged air diffusers (MLSS in aeration tank will be maintained 2500-3000 Mg/L). The FAB system will be designed in a way so as to achieve complete mixing of organisms with raw sewage. After achieving a complete mixing of organisms over a retention period of 10-12 hrs, the effluent would flow via gravity into the Tube Settler. In the tube settler, PVC Tube Media would be provided to enhance settling of the sludge with attached settling process. Through the use of baffles the liquid in the Tube Settler is maintained in quiescent condition which allows the solids to settle to the bottom for collection. The accumulating solids known as "Sludge" will be constantly pumped back into the FAB tank by sludge recycle pumps. This return sludge undergoes further digestion in the aeration tank and also provides the active organism needed to digest the incoming raw sewage.

The Tube Settler will be provided with adjustable overflow weir to collect the treated effluent and a scum baffle will keep any floating matter from passing out in the final treated water. Treated water from Tube Settler will over flow into a chlorine contact tank where hypochlorite solution will be added to disinfect the treated water.

Excess sludge from the bottom of the Tube Settler will be collected in an adjoining aerobic digester cum thickener tank. In this tank sludge will be aerated. The air will be shut off periodically and supernatant water shall flow into the collection tank. This way the sludge will be thickened and its volume will be reduced. The sludge digester cum thickener tank will be sized to hold excess sludge. The excess sludge will be further passed into a filter press where the sludge will be pressed between plates manually and the liquid concentration in the sludge will be further reduced. The sludge will then form into semi-solid cake which can be removed for disposal.
The treated sewage from STP will be used for irrigation system & flushing water with in the complex.

2.0 DOCUMENTS TO BE SUBMITTED WHILE SUBMITTING SCHEME TO ENGINEER FOR APPROVAL

i) Flow scheme with hydraulics
ii) Size of units
iii) Description of process

iv) List of mechanical and electrical equipment
v) Total Power requirement unit wise
vi) Guarantees

3.0 SUBMISSION OF DESIGN AND DRAWINGS

Selected tenderer shall submit detailed drawings for approval to the client.

4.0 SELECTION OF EQUIPMENT

Subject to the requirement of this specification and the design criteria the tenderer shall select the type of equipment and the form of construction and installation, subject to approval of the Project architect/EIC.

The tenderer shall be entirely responsible for the performance of the sewage treatment works in their totality with due regard to capacity, hydraulics, quality of final effluent, suitability of piping, mechanical and electrical equipment complete and shall give due guarantee for the same.

The tenderer shall submit to the Client / Owner GFC drawings together with sufficient details to give a clear indication of the work to be carried out for approval of the Engineer.

The approval of the Engineer shall in no way relieve the tenderer of his responsibilities for the satisfactory functioning of the works.

All construction materials and workmanship shall conform to the relevant section of the specification and to the approval of the Engineer.

5.0 ERECTION

The tenderer shall undertake the erection of the plant under the direct supervision of the plant manufacturer or their nominated agencies, as approved by the Engineer. The tenderer shall also supply and install all the mechanical and electrical equipment's required for functioning of the sewage treatment plant. The tenderer shall provide with all the facilities required by the Engineer for inspection of the installation.

6.0 PAINTING AND PROTECTIVE COATINGS

All surfaces exposed to the atmosphere shall be painted in accordance with relevant section of specification or as per manufacturer's instructions.

All M.S surfaces exposed to sewage treatment plant shall have protective coatings using epoxy-based paint. The tenderer shall submit full details of all the protective coatings proposed, for approval before any of the equipment, pipe work, etc. of the plant is supplied.

7.0 TESTING

The tenderer shall make all arrangements as required or necessary to prove that the completed works fulfil every aspect of the design requirements and specifications. The tenderer shall provide all labour, material and attendance necessary to the Engineer's satisfaction.

8.0 LUBRICATION

The tenderer shall ensure that all moving parts are lubricated in accordance with the equipment manufacturer's recommended procedures prior to commencement of operation of any plant and also during the operating period.

8.1 In general, STP shall comprises erecting, testing and commissioning of the following items of STP. The sewage treatment plant in general shall comprise following items of work.

(a) 1 No. manual bar screen suitable for 500m3/day flow rate.
(b) 3 Nos. Sewage lifting pumps from equalisation tank (one duty + one stand by) self-priming type capacity 10.0m3/hr at 10m head.
(c) 2 Nos. Drainage lifting pumps from drainage sump (one duty + one stand by) submersible type capacity 18.0m3/hr at 10m head.
(d) 1 Lot Air Grids for MBBR tanks for 500m3/day sewage flow.
(e) 3 Nos. Air blowers (two working and one standby) twin lobe rotary air blower each of capacity 400m3/hr at 6000 mm wg.
(f) 1 No. UV reactor of capacity 40.0m3/hr.
(g) 2 Nos. Filter feed pumps (one working + one standby) each of capacity 40.0m3/hr at 30m head.
(h) 2 Nos. Treated water pumps (one working + one standby) each of capacity 40.0m3/hr at 40m head.
(I) 1 Nos. M.S. pressure Dual Media filter with frontal pipe work capacity. Flow Rate 40.0m3/hr and 3.0kg/cm2 working Pressure.
(j) 1 No. M.S. activated carbon filter with frontal pipe work capacity. Flow Rate 40.0m3/hr and 3.0kg/cm2 working Pressure.
(k) 2 Nos. Sludge pumps (one duty + one stand by) self-priming type capacity 10.0m3/hr at 10m head.
(l) 1 No. Filter press feed screw pumps (one working + one standby) each of capacity 2.0m3/hr at 40 m head.
(m) 1 No. Ozonator of suitable for 500 KLD.
(n) All interconnecting piping and valves for above equipment.
(o) Operating platform alround STP.
(p) 1 Lot Electrical cabling, earthing, MCC and local push buttons station to cater phase-I requirements (Electrical Cabling, earthling including the incoming power supply etc shall be provided by the client. However, connections/terminations to the equipment's, testing and commissioning shall be carried out by the contractor).
(q) Operation & Maintenance contract of STP for a period of two years after commissioning. All spares and replacement of any defective part shall be included in the contract.

9.0 ELECTRICAL WORKS

9.1 Cables

a) Contractor shall provide all power and control cables from motor control centre to various motors, level controllers and other control devices.
b) Cables shall conform to IS:1554 and carry ISI mark.
c) Wiring cables shall conform to IS: 694.
d) All power cables shall be aluminum conductor PVC insulated/PVC sheathed FRLS armoured cables of 1100 volts grade.
e) All control and wiring cables shall be copper conductor PVC insulated armoured and PVC sheathed 600-volt grade.

f) All cables shall have stranded conductors. The cables shall be in drums as far as possible and bear manufacturer's name.

9.2 Motor Control Centers

Cubicles switch board of floor mounted and shall be fabricated from 16-gauge M.S. sheet with dust and vermin proof construction. It shall be painted with stove enameled paint of approved make and shade. It shall be fitted with suitable etched plastic identifications plates for each motor. The cubicles shall in general comprise of the following:

(A) Incoming and outgoing MCCB's of required capacity with rotary handle.

(B) PVC Colour coated TPN Aluminum bus-bar having current density 0.8Amp/sq.mm.

(C) Isolation switch fuse unit one for each motor.

(D) Fully automatic DOL/Star Delta starters appropriate for motor rating with ON/OFF

push buttons and on/off indicating neon lamps for individual motor.

(E) Single phase preventor of appropriate rating for each motor.

(F) Selector switch for pump operation.

(G) Panel type ampere meters of appropriate rating one for each motor.

(H) Panel type voltmeter on incoming main with rotary selector switch to read voltage between phase to neutral and phase to phase.

(I) Rotary switch for manual or auto operation for each pump.

(J) Space for liquid level controllers specified separately in this contract.

The panel shall be prewired with colour-coded wiring. All interconnecting wiring from incoming main to switch gear, meters and accessories within the switch board panel.

I. TECHNICAL SPECIFICATION OF SOLAR PANEL WORK:

Solar photo Voltaic Power Generation System

1) SOLAR PV MODULE:

A) The solar photovoltaic modules will be used Poly/Multi crystalline, Thin film PV technology modules.

B) The capacity of each Solar Modules should be equal to or greater than 300Wp. Solar Modules to be used have to be framed only. At locations where there is constraint of space, it should be considered higher efficiency modules only.

C) Module would be PID Free and of positive Tolerance only.

D) Modules would have an efficiency of not less than 16% and the fill factor should be above 75%.

E) Minimum dimension of the SPV module shall be preferred.

F) Each SPV Module would have IEC/BIS test certificate from any recognized IEC accredited or MNRE approved laboratory.

G) The SPV modules would confirm to the minimum technical specification laid down by MNRE that can be referred on the MNRE website.

H) The PV Modules shall be tested for Salt Mist Corrosion Test as per MNRE requirement.

PV modules used in solar power plants/ systems must be warranted for their output peak watt capacity, which should not be less than 90% at the end of 10 years and 80% at the end of 25 years.

2) INVERTER:
The Inverter/s used would be robust, intelligent **On-grid** inverters of reputed manufacturer/makes. The inverter/s must conform to the IEC 61683 and IEC 60068-

2, IEC 62116, IEC 61727. The typical specifications required are as under:
a) All inverters should be 3 phase, 415V, 50Hz AC output
b) The AC capacity of the Inverter can be minimum of 80% of the connected DC capacity to the inverter.
c) Minimum Start Voltage should be greater than 200V
d) MPPT Range: 200V-800V
e) Maximum Input Voltage: 1000V DC
f) Euro / CEC Efficiency above 97%
g) Frequency: 50Hz +/- 1.5%
h) Power Factor > 0.99
i) THD < 3%
j) Ambient Temperature range: -5 deg C to + 60 deg C
k) Warranty: 5 Years Comprehensive warranty. This warranty from the manufacturer shall be in addition to the scope covered under defects liability period.
l) Integrated Ground Fault Protection
m) Anti Islanding Feature
n) Transformer less
o) Over Voltage/ Under Voltage Protection
p) Auto Shut down in case or Over Heat/ Over Temperature

3) SOLAR MODULE MOUNTING STRUCTURE:
a) The structure shall be designed in accordance to the requirement of the site with minimum tilt angle of 15 degrees for RCC roof structure. The array mounting structure shall be designed to allow easy replacement of any module and shall be in line with site requirement. Structure shall be designed for simple mechanical and electrical installation. It shall support SPV modules at a given orientation, absorb and transfer the mechanical loads to the ground properly.

b) The module mounting structure shall be mounted on clear roof space availability with fixed tilt. Tilt angle to be decided by the party to maximize annual energy output as per the site geographical location. Recommended minimum angle of tilt for R.C.C Flat roof terrace for the location is 15 degrees.

The minimum thickness of galvanization for MS or MS extruded sections should be of 50 microns.
All fixing fasteners and nuts and bolts should be of Stainless Steel only.

c) The minimum clearance of the lowest part of the module and the RCC roof level shall not be less than 300 mm.
d) All structures are to be pre-fabricated for easy assembly at site.

4) EARTHING:
The array structure of the PV yard shall be grounded properly using adequate number of earthing pits. All metal casing or shielding of the solar power plants shall be thoroughly grounded to ensure safety of the solar power plants.

5) ARRAY JUNCTION BOX:
a) The array junction box would be dust, vermin & water proof as per IP65 rating and should be made of FRP/ABS plastic (Test certification is required for IP65 degree of protection).
b) Suitable Fuses/ MCB's should be provided for each string.
c) A DC Surge Protection Device Class II should be provided in the AJB for grounding the surges to protect the inverter.
d) The AJB should have suitable cable entry points fitted with cable glands of appropriate sizes for both incoming and outgoing cables.
e) Suitable markings to be provided on the bus bar for easy identification and cable ferrules shall be fitted at the cable termination points for identification.

SECTION VII

LIST OF APPROVED MAKES OF MATERIALS- CIVIL, INTERIOR, PLUMBING, HVAC, SOLAR PANEL, STP, ELECTRICAL AND FIRE FIGHTING

APPROVED MAKE LIST

SR. NO.	DETAILS OF EQUIPMENT/ MATERIAL	MAKES/ MANUFACTURER
A. CIVIL WORK		
1	Cement	ACC, Ultratech, Ambuja, Vikram, Birla cement,JK Cement, Shree cement & Jaypee Cement
2	Reinforcement Steel / Structural Steel	SAIL, Tata Steel, RINL, Jindal
3	ALUMINIUM Extrusion / SECTIONS	Jindal, Hindalco, Indalco
4	Aluminium Accessories and Hardware	Hardima, Everite, Sigma, Argent, Classic make
5	Aluminium Composite Panels	Alucobond, Reybond
6	Anchor Fastner/Dash Fastner	Hilti, Fisher, Canon
7	Ready Mix Concrete (RMC)	Ultratech, ACC, RMC India
8	Concrete Additive	Pidilite / Fosroc / Fairmate / MC Bauchemie/ Sika/ Cico
9	Door closer / Floor spring	Hardwyn, Godrej, Yale, Ozone
10	Door Locks	Ingerroll Rand, Dorma
11	Door Shutters- Flush	Kitlam, National, Swasthik, Corbett Kitply, CNC, Shivalik, Prima Jayna
12	Doors & Windows Fixtures / Fitting.	Everite / Classic/ Crown / Earl Bihari
13	UPVC DOORS/ WINDOWS/ VENTILATORS	WINSTA, WINPLAST, REHAU, DIMEX.

14	PAINTS (Plastic Emulsion Paint (exterior))	Asian (Apex Ultima)/ Berger (Weathercoat all Guard)/ ICI (Dulux weathershield max)
15	Paints - Other Paints / Primer	ICI Dulux/ Asian/ Berger/ Nerolac
16	Paints - Texture paint	Berger / Spectrum / Unilite Heritage /Asian
17	Paver blocks / Tiles (All Types)	KK / Uni Stone Products (India) Pvt. Ltd/ Hindustan Tiles/ NITCO
18	Epoxy Flooring	Fosroc/ Dr. Beck/ Flamaflor
19	False Ceiling - Calcium Silicate Boards & Tiles	India Gypsum/ Armstrong / Hilux / Saint Gobain (Gyproc)/Aerolite
20	False Ceiling - Metal	Armstrong / Hunter-Douglas / USG-Boral/ Saint Gobain/ Unimet
21	False Ceiling - Mineral fibre	Armstrong / Decosonic / USG-Boral/ AMF/ Saint Gobain (Gyproc)
22	Fire Rated Doors & Frames	Navair / Shakti-Hormann / Pacific/Promat
23	Fire Rated Glass	Asahi India Safety Glass Ltd./ Saint Gobain/ Pilington, Schott, Pyroguard, Glaverbel
24	Fire Retardant Paint	Viper FRS 881/ Nullifire/ Berger
25	Fire Seal	Sealz, Alstroflam/ Abacus
26	Fire: Door Closures, Mortice Dead locks	Becker Fire Solution/ Inersoll Rand/ Dorma/Godrej/ Geze/ Hafele
27	Fire: Panic Exit Devices	Becker Fire Solution/ Inersoll Rand LCN Series/ Dorma PHA Series/ D-line/Godrej
28	Glass : Float & Mirror	Modiguard / Atul / Saint Gobain/ Asahi India Safety Glass Ltd / Modi Glass
29	Glass for Aluminum Doors/ Windows/ Structural Glazing	Modiguard / Saint Gobain / Pilkington/ Asahi India Safety Glass Ltd./Modiglass

30	GRC Jali	Unistone/ Kuber Fibrostone/Everest Composites/ Birla white
31	GRC wall cladding	Unistone/ Kuber Fibrostone/Everest Composites/ Birla white
32	Grout: Non-Shrink	Fosroc / Sikka/Pidilite or equivalant
33	Laminates/ Veneers	Century/Archidply/Greenlam/Formica/Sunmica / Merino
34	Night Latch	Godrej / Dorma/ Ozone/Harrison/Link
35	Paints - Cement Based	Snowcem Plus/, Berger (Durocem Extra)/ Nerolac (Super Acrylic)/ TATA Cem, Asian
36	Plywood/Block board/Ply board	Duroply / Greenply/ Archidply/ Century/ Kitply/ National / Anchor/ Merino
37	Silicon sealants /Weather Sealant / Structural Glazing Sealant	GE- Silicon / Pidilite / Forsoc / Cico /Dow Corning / Sikka/ Wacker
38	Stainless Steel	Salem Steel/ Jindal or equivalent
39	Stainless Steel bolts, Screws, Nuts & Washers	Kundan / Puja / Atul
40	Stainless Steel Clamps	Hilti /Intellotech Koncept or equivalent
41	Stainless Steel Hinges	Hettich/ Godrej/ Dorma
42	Stone Adhesives	Fosroc / Sikka/Pidilite
43	Tiles: Ceramic Tiles	Kajaria / Somany/RAK or equivalent
44	Tiles: Glazed (Ceramic) tiles	Kajaria / Somany/RAK or equivalent
45	Tiles: Vitrified Tiles	Kajaria / Somany/RAK
46	Vinyl Flooring	Wonder floor/Responsive or equivalent make
47	Water Proofing Materials	BASF/ Fosroc / Sikka / CICO / STP/ Pidilite/CHRYSO
48	Wooden Laminated Flooring	NITCO /Euro / Pergo

49	Expansion Joints	Sanfield (India) Ltd., MIGUA, TRISTAR
50	Automatic sliding door	Dorma or equivalent make
51	False flooring	Arena, unitile, or equivalent make
52	Roller blinds	Hunter dougles/ Phifer or equivalent make
53	M.D.F	Nuwood(Grade -I AND GRADE II), Durotuff
54	wallpaper	Elemento/ marshall/ tatva/ baron/ tarket
B**. PUBLIC HELATH WORK**		
55	Ball valves with floats	Zoloto / Leader / Sant/ Audco/GPA
56	Brass - Stop & Bib Cock	Zoloto / Sant / Jaquar
57	C. I Pipes & Fittings	Electrosteel/ Kapilansh/ NECO/ RIF/ SKF/BIC
58	C.I. Manhole Covers	NECO/R.I.F./B.I.C./HEPCO/SKF/ KAJECO
59	C.P. Fittings: Mixer / Bib Cock/ Pillar taps/ Angle valve/ Valves Washers / Waste/ Urinal / Spreaders / Accessories etc.	Jaquar /Kohler/ Grohe/Marc
60	Geyser	Spherehot / Racold / Usha Lexus /Bajaj
61	Liquid Soap Dispenser	Euronics/Utec/Kopal
62	MS Saddle with G.I. Riser	Harvel/Alprene/Rain Bird, USA
63	Pipe Fittings: G.I.	R/Unik/Zoloto/K.S./Sun/Swastik
64	Pipe:- G.I.	Jindal / Tata / Prakash Surya/SAIL/ Swastik
65	Pipes & fitting: PVC for SWR Soil, Waste & Vent Pipes and fittings, Type B PVC Casing & Screen Pipes	Prince / Supreme / Finolex
66	Pipes & Fittings: CPVC	Flowguard/ Astral/ Ashrivad/ AKG/Supreme

67	Pipes & fittings: UPVC	Finolex / Prince / Supreme / AKG / Kasta / Vector / Astral
68	Pipes & Gully Trap: Stone ware	Perfect / S.K.F/ R.K/ Hind / Anand
69	Pipes: M.S.	Jindal / Prakash – Surya /TATA
70	Pipes: R.C.C	Indian Hume Pipe / Pragati Concrete Udyog Daya/ KK / JSP
71	SS Gratings/ Soap Dish/Towel Rail etc.	Camry/Glacier/Gem/ Jaquar/ Grohe
72	Stainless Steel Sink	Hindware / Neelkanth / Nirali / Jayna
73	Valve: Butterfly	Zolato/Audco /Sant/ KSB
74	Valve: Solenoid	Rain Bird, USA/Toro/Nelson,
75	Valve: Non Return	Sant/ Leader/ Zoloto / AIP / Kirloskar/ IVC/ Leader/ Audco
76	Vitreous China Sanitary wares	Hindware / Parryware / Cera / Kohler
77	Water supply pumps	KSB/ Grunfos/ Kirloskar/ Crompton/ Mather & Platt
78	Automatic Hand dryer	JAGUAR/ Kopal / Utech Systems / Euronics Automat
79	CI FLOOR TRAP	ROCA/ JAGUAR/ KOHLER/
80	UPVC MULTI INLET FLOOR TRAP WITH ACCESSORIES	FINOLEX/ SUPREME/ PRINCE/ KISSAN/ ASTRAL
C**. ELECTRICAL WORK**		
81	HT Panel with Vacuum Circuit Breaker (VCB)	L&T/ ABB / Schneider/ Siemens or their authorized Channel Partner
82	Batteries	Hitachi/Panasonic/ Yuasa/ SF/ Exide/ Amco/ Amaraja
83	Battery Charger	Amaraja/ Sabnife/ Statcon/ Voltstat/ HBL
84	Bus bar	Jindal/ Hindalco/ Indal
85	Bus trunking , rising mains, end feed unit, top-off box	L&T/ Schneider/ C&S/ Godrej /Legrand/ EAE

	(plug-in type)	
86	Ceiling /Exhaust/Wall fans	Crompton/ Usha/ Orient/ Bajaj/ Havells
87	Control fuse base with HRC fuse / HRC Fuse	L&T/ Siemens/ ABB/ Alstom/ Schnieder
88	Data/Telephone/TV Outlets	Systemax/ Belden/ Simone/ MK/ Legrand/ Havells/ Anchor
89	DG Set - Assembler	Jakson & Company / Jakson Ltd/ Sterling Generators / Sudhir Gensets/ C&S Himoinsa/ Powerica/ Kirloskar (KOEL authorized OEM) / TIPL
90	DG Set - Alternator	Stamford/ Leroy Somer/ Toyo Denki/ AVK-SEG/ Kirloskar (KOEL Green)
91	DG Set - Engine	Cummins/ Mitsubishi/ Perkins/ Volvo/ Caterpiller/ Kirloskar (KOEL Green)
92	Fire Extinguisher	Ceasefire/ Exflame/ Minimax/ Life Guard/ Safex
93	HT & LT Cables (Power & Control Cables, Solar Cables)	Gloster/ Havells/ Nicco/ Finolex/ KEI/Polycab
94	Insulators	Jaya Shree/ Modern/ IEC/ WSI
95	LED Light Fixtures and Lamps	Philips/ Wipro/ Trilux /Havells
96	Lighting for Facade	Philips/ Wipro/ Trilux /Allurays/RZB/BEGA
97	Lightening Arrestors	L&P ELECTRO/ LPI/ Indelec
98	LT Panels / Synchronizing Panels/ Capacitor Panels	L&T/ ABB / Schneider/ Siemens or their authorized Channel Partner
99	MCBs / RCCB/Isolaters / RCBO / Change over switch	Hager/ Havells/ Legrand/ L&T/ Schneider/ ABB/ Siemens
100	Modular Switches/ Socket outlets and wiring accessories with moulded cover plate	MK (wraparound plus) / Siemens (Delta)/ Legrand (mylinc)/ L&T (Entice)/ Havells (Crab tree-Athena)/ Anchor (Roma)/ Schnieder (Opale)/ Wipro (North-West)
101	MS Conduit	BEC/ AKG/ Steel Kraft
102	Street Light Poles & Light Fixtures – Solar & Conventional	Philips/ Wipro/ Havells/ Bajaj/ Keselac Schreder

103	Transformer (Oil Type / Dry Type)	ABB/ Siemens/ Kirloskar/ Voltamp/ Areva/ Schneider
104	UPS	Emerson (Vertiv)/ Schnieder (APC)/ Eaton/ Socomec
D. FIRE FIGHTING WORK		
105	Air Release Valve/Air Cushion Tank	Zoloto/Advance/Leader/Audco/Castle
106	Alarm valve & Hydraulic (Alarm motor with coupling)	HD fire protect/TYCO/VIKING/Newage
107	Ammeter/ Voltmeter/ PF/ kW/ Hz/ meter /Energy Meter/ Multimeter	As per respective electrical make list
108	Anchor Fastener	Fischer / Hilti or equivalent
109	Ball Valves	L&T/ Audco /Zoloto/ Advance/Emerald/ KSB
110	Battery	Exide/ AMCO /Amararaja/ Panasonic
111	Butterfly valves	L&T/ Audco/ Zoloto / Advance/ KSB
112	Cables	As per electrical make list
113	Check Valve/Foot Valve/Sluice Valve/	L&T/Audco / Zoloto Advance/KSB
114	Control / Potential / Current Transformer	As per respective electrical make list
115	Deluge valve/ Solenoid valve/ Spray nozzle	HD / Tyco/Viking
116	Diesel engine driven pump	Ashok Leyland/ Cummins/ Perkins/ WILO-Mather & Platt/ Kirloskar/Armstrong Fluid Technology
117	Fire Extinguisher	Minimax / Newage/ Eversafe/ Tyco – Johnsons Control
118	Fire Hydrant Valves/ Fire RRL Hose Pipes / Fire Hose Reels/ Fire Man's Axe/ Gun	Ceasefire / Newage /Minimax/HD/Tyco

	metal short branch pipe/ 2/ 3/4 FB inlet/ draw Out connection/Hose Box/ Hose reel drum /Nozzle/ blank Caps & Chains / Coupling	
119	Fire Pumps	Mather&Platt(WILO)/Grundfos/Kirloskar /Xylem –ITT/ Armstrong Fluid Technology
120	Electrical Motors	ABB/ Siemens/Kirloskar/C&G/BALDOR
121	Flow Meter	Scientific Equipments(p) Ltd./System Sensor or equivalent
122	GI clamps	Chilly/Hilti or equivalent
123	Gl / MS Pipes	Tata / Jindal- Hissar/ SAIL
124	Sprinkler Heads (Sidewall/ Upright/ Pendant)	Grinnel- Tyco / Viking / HD
125	Fire Suppression System/Gas Flooding Sytem	Tyco/Newage/Minimax/Viking
126	Clean Agent Fire Extinguisher	Kanex/Tyco/Newage/SVS Buildwell/Minimax/Lifeguard/Ceasefire
127	Intelligent Addressable Fire Alarm Panel/Detectors/ Hooters/ Manual Call Point UL Listed/ Talkback/ Control Module/ Monitor Module/ Control relay Module/ Short Ckt. Isolator/	Honeywell-Notifier/ Siemens/ Schneider/ Bosch/ GE Edwards/Tyco
128	Panic Button	Eureka Forbes/ Fire Pro / Tyco
129	Termination Control Cable	Dowell's/ Elemex/ Wago/ Phoenix
130	Door Controller, Card Reader, Biometric Reader, Access Control server Software, Smart card	
131	CCTV Camera/ NVR/ Central Monitoring Software / Other Items	Honeywell / Pelco /Cisco /Bosch/ GE/ Axis/ Sony

132	PA Speaker, Voice controller, paging station, Microphone	Bosch/ Honeywell/Bose
E. HVAC WORK		
133	2-Way Pressure Independent Balancing & Control Valve	Siemens/ Danfoss/Oventrop /Belimo
134	Adhesives for Insulation	Pidilite/Superlon / Armacell
135	Air cooled package units	Voltas/ Bluestar/HITACHI or equivalent
136	Air Handling Units with Coils etc.	Zeco/ Edgetech/VTS/ Waves/Flaktwood
137	Air Distribution (Ducting) - GI/GSS Sheets	SAIL / TATA Steel/ Jindal-Hissar
138	Aluminium Sheet for Ducts	Jindal/ Hindalco/ Indal
139	Cable Lugs/Thimbles/Glands	As per Approved Makes of Electrical Works
140	Cable Tray	As per Approved Makes of Electrical Works
141	CAV Box/VAV Box	Trox/ System Air / Ruskin Titus /Honeywell /Johnson's Control/Belimo
142	Centrifugal Fans/Fan section/Plug Fans	Kruger / Greenheck /Comefri/ Wolter/ Nicotra/Systemair
143	Electric Motor	ABB/ Siemens/ Crompton Greaves /BALDOR
144	Fasteners-Dash	HILTI / Fischer / Cannon / Wurth
145	Inline Fans	Kruger / Nicotra/ Greenheck/ Ostberg
146	Humidifier	KEPL / Rapid cool/ Emerald /Enmax
147	Split AC Units /Precision AC	Toshiba/Daikin/ Hitachi/ Carrier
148	VRV/ VRF Outdoor/ Indoor Units/ Refnet Joints/Remote Controllers	Mitsubishi Electric/ Daikin/ Toshiba/ Panasonic/Carrier
149	Chillers	Daikin-Mcquay/ Carrier / Trane / York/Dunhambush

150	Chilled Water Cassette Unit	Carrier/TRANE/Daikin/Johnson Control
F. LIFT WORK		
151	Lifts	OTIS/ Kone / Mitsubishi/ Schindler/ Johnson Lifts Pvt. Ltd.
H. SEWAGE TREATMENT PLANT		
152	Air Blowers	Beta/ Everest/ Kulkarni / TMVT
153	Air Diffusion System	Airfin/Usha Ruba/Rehau
154	Air Vent Valve	Oven trop (Germany) / CIM / Rapid Control
155	Anti-Corrosive Tape for Pipe protection	Pypcoat / Marphalt / Cotek/STP
156	Ball Valve	Zoloto/Honeywell/RB
157	Bar Screen	KSP/AWMS/PAMM
158	Blowers	Kay / airvac /Everest
159	Butterfly valves	Zoloto/Audco/Kirloskar/AIP/Advance
160	Centrifuge	Apollo/United/B.A Engineering

Note: Makes of Materials not mentioned in the above list may be used after obtaining prior approval of the Engineer in Charge.

SECTION VIII
Drawings

(Drawings are enclosed separately with the tender documents)

Volume - II

Bill of Quantities

Percentage BoQ

Tender Inviting Authority: National Highways & Infrastructure Development Corporation Limited

Name of Work: Construction of various RCC infrastructure works for Ladakh Police in the Union Territory of Ladakh.

Contract No: NHIDCL/Infra/Ladakh/Police/2020-21

Name of the Bidder/ Bidding Firm / Company :	

PRICE SCHEDULE

(This BOQ template must not be modified/replaced by the bidder and the same should be uploaded after filling the relevant columns, else the bidder is liable to be rejected for this tender. Bidders are allowed to enter the Bidder Name and Values only)

Sl. No.	Item Description	Quantity	Units	Estimated Rate excluding GST in Rs. P	TOTAL AMOUNT excluding GST in Rs. P	TOTAL AMOUNT excluding GST In Words
1	**Construction of One building block having six units of Type-II residential quarters at Baroo Kargil** including all type of Civil work, Architectural work, Electrical work, PHE works and Fire Fighting work etc. complete in all respect as per the quantities and rates mentioned in cost estimate and as per the approved design, drawings and specifications. All works shall be executed as per Indian codes and established best engineering practices.	1.000	Nos	22775766.45	**22775766.45**	INR Two Crore Twenty Seven Lakh Seventy Five Thousand Seven Hundred & Sixty Six and Paise Forty Five Only
2	**Construction of One building block having six units of Type-III residential quarters at Baroo Kargil** including all type of Civil work, Architectural work, Electrical work, PHE works and Fire Fighting work etc. complete in all respect as per the quantities and rates mentioned in cost estimate and as per the approved design, drawings and	1.000	Nos	24833643.50	**24833643.50**	INR Two Crore Forty Eight Lakh Thirty Three Thousand Six Hundred & Forty Three and Paise Fifty Only

	specifications. All works shall be executed as per Indian codes and established best engineering practices.					
3	**Construction of Police Conference and Passport Verification Cell at District Police Office Kargil** including all type of Civil work, Architectural work, Electrical work, PHE works and Fire Fighting work etc. complete in all respect as per the quantities and rates mentioned in cost estimate and as per the approved design, drawings and specifications. All works shall be executed as per Indian codes and established best engineering practices.	1.000	Nos	40049270.67	**40049270.67**	INR Four Crore Forty Nine Thousand Two Hundred & Seventy and Paise Sixty Seven Only
4	**Construction of District Police Office Building at Kargil by dismantling existing building** including all type of Civil work, Architectural work, Electrical work, PHE works and Fire Fighting work etc. complete in all respect as per the quantities and rates mentioned in cost estimate and as per the approved design, drawings and specifications. All works shall be executed as per Indian codes and established best engineering practices.	1.000	Nos	43591873.19	**43591873.19**	INR Four Crore Thirty Five Lakh Ninety One Thousand Eight Hundred & Seventy Three and Paise Nineteen Only
5	**Construction of Police Station Building at Baroo Kargil by by dismantling existing building** including all type of Civil work, Architectural work, Electrical work, PHE works and Fire Fighting work etc. complete in all respect as per the quantities and rates mentioned in cost estimate and as per the approved design, drawings and specifications. All works shall be executed as per Indian codes and established best engineering practices.	1.000	Nos	32474112.81	**32474112.81**	INR Three Crore Twenty Four Lakh Seventy Four Thousand One Hundred & Twelve and Paise Eighty One Only
6	**Construction of Anti-Human Trafficking/Children/Woman Police Station at Kargil** including all type of Civil work, Architectural work, Electrical work, PHE works and Fire Fighting work etc. complete in all respect as per the quantities and rates mentioned in cost estimate and	1.000	Nos	32758167.33	**32758167.33**	INR Three Crore Twenty Seven Lakh Fifty Eight Thousand One Hundred & Sixty Seven and Paise Thirty

	as per the approved design, drawings and specifications. All works shall be executed as per Indian codes and established best engineering practices.					Three Only
7	**Construction of Barrack at Police Station Kargil** including all type of Civil work, Architectural work, Electrical work, PHE works and Fire Fighting work etc. complete in all respect as per the quantities and rates mentioned in cost estimate and as per the approved design, drawings and specifications. All works shall be executed as per Indian codes and established best engineering practices.	1.000	Nos	28412911.53	**28412911.53**	INR Two Crore Eighty Four Lakh Twelve Thousand Nine Hundred & Eleven and Paise Fifty Three Only
8	**Construction of Multipurpose Hall at District Police Lines Kargil** including all type of Civil work, Architectural work, Electrical work, PHE works and Fire Fighting work etc. complete in all respect as per the quantities and rates mentioned in cost estimate and as per the approved design, drawings and specifications. All works shall be executed as per Indian codes and established best engineering practices.	1.000	Nos	39376733.37	**39376733.37**	INR Three Crore Ninety Three Lakh Seventy Six Thousand Seven Hundred & Thirty Three and Paise Thirty Seven Only
9	**Construction of VIP Mess cum Assembly Hall at District Police Lines Kargil** including all type of Civil work, Architectural work, Electrical work, PHE works and Fire Fighting work etc. complete in all respect as per the quantities and rates mentioned in cost estimate and as per the approved design, drawings and specifications. All works shall be executed as per Indian codes and established best engineering practices.	1.000	Nos	32673367.49	**32673367.49**	INR Three Crore Twenty Six Lakh Seventy Three Thousand Three Hundred & Sixty Seven and Paise Forty Nine Only
10	**Construction of Jawan Recreation and Dining Hall at District Police Lines Kargil** including all type of Civil work, Architectural work, Electrical work, PHE works and Fire Fighting work etc. complete in all respect as per the quantities and rates mentioned in cost estimate and as per the approved design, drawings and specifications. All works shall be executed as per Indian codes and	1.000	Nos	16899304.91	**16899304.91**	INR One Crore Sixty Eight Lakh Ninety Nine Thousand Three Hundred & Four and Paise Ninety One Only

	established best engineering practices.					
11	**Construction of Jawan Barrack at District Police Lines Kargil** including all type of Civil work, Architectural work, Electrical work, PHE works and Fire Fighting work etc. complete in all respect as per the quantities and rates mentioned in cost estimate and as per the approved design, drawings and specifications. All works shall be executed as per Indian codes and established best engineering practices.	1.000	Nos	30890680.80	**30890680.80**	INR Three Crore Eight Lakh Ninety Thousand Six Hundred & Eighty and Paise Eighty Only
Total in Figures					**344735832.05**	INR Thirty Four Crore Forty Seven Lakh Thirty Five Thousand Eight Hundred & Thirty Two and Paise Five Only
Quoted Rate in Figures			**Select**		**0.00**	INR Zero Only
Quoted Rate in Words		**INR Zero Only**				