



BEML LIMITED

TENDER DOCUMENT

For

MECHANICAL, ELECTRICAL & PLUMBING WORKS FOR HMV

OVERHAULING HANGAR

AT BEML LIMITED, PALAKKAD COMPLEX, KERALA

**TENDER CONDITIONS
SCOPE OF WORK
&
BILL OF QUANTITY (BOQ)**

Bid No: 6300038764

LAST DATE FOR SUBMISSION ONLINE: 22/03/2024 – 17.00 Hrs

ISSUED BY

**The General Manager,
Material Management
BEML Limited
Palakkad Complex**

Bid invitation No: 6300038764**Closing Date: 22/03/2024**

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BEML LIMITED

(A Government of India Mini Ratna Company under Ministry of Defence)
 Kinfra Wise Park, Kanjikode, Palakkad – 678621, Telephone: 0491-2568178

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02. Qualification Criteria

A. Tender Description	As indicated in TENDER NOTICE
B. Contract period	SEVEN (07) Months from Date of commencement
C. Tender No.	6300038764
D. Tender closing date / time	22/03/2024 – 17.00 Hrs
E. Security Deposit	10% of P.O value to be submitted
F. Labour License under contract labour (R & A) ACT 1970 and Central Rules made there under	Successful bidder has to submit a valid Labour licence / Proof of applying for the same within a period of one month from the date of awarding work order.
G. PF / ESI	Firm should have PF/ESI Code Nos OR on award of contract the successful bidder (Firm) shall apply for PF/ESI codes to the respective authorities. In case the firms have registration in other states (other than Kerala) they have to agree to obtain separate sub code for the local area.

The scanned copies of following qualifying documents are to be uploaded along with the Technical bid.

Sl. no	Description	Requirement		Remarks
		Detail	Value Rs. in Lakhs	
1	Tender Document	To be uploaded in SRM		Signed & sealed Tender document to be uploaded in SRM along with other Technical documents.
2	NIT Acceptance Letter	NIT Acceptance letter to be uploaded in SRM		Signed & sealed NIT Acceptance letter to be uploaded in SRM along with other Technical documents.
3	Corrigendum if any	All pages of corrigendum need to be signed & sealed.		Corrigendum to be submitted along with other technical documents.
4	Average Minimum Annual Financial Turn over in last 3 years ending 31 st March 2023	Certified by practicing CA	59.40	CA certificate to be submitted along with other technical documents.
5	Experience in executing	3 Similar works	79.20	(a) The experience certificate shall

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	similar type of works/ civil works completed during last 7 years ending Febuary 2024 value greater than or equal to the said requirement. Note: Similar works means Mechanical, Electrical installation & Plumbing in public sector/Private organizations & Govt. organizations.	each of Minimum value		be considered only for the works completed in full & complete. (b) Select any applicable one and upload scanned copy of similar work completion certificates issued by client. (c) If the works /contracts were carried out in other than Government or PSUs, the bidders have to submit TDS Certificates along with experience Certificate.
		2 Similar works each of Minimum value	99.00	
		1 Similar work of Minimum value	158.40	
6	Earnest Money Deposit (EMD)	To be remitted before tender closing date	3.96	Proof of remittance to be submitted in SRM (RTGS / DD / Cheque)
7	Integrity Pact	Enclose Copy		To be submitted with seal and signature on SRM
8	PF & ESI Registration Certificate	Enclose copy		Copy to be submitted
9	PAN No. & GST No	Enclose copy		Copy to be submitted
10	Latest 3 Financial Years IT returns Filing	Enclose copy		Copy to be submitted
11	Statutory Electrical license	Enclose copy		The Contractor should possess a valid Electrical license for carrying out subject work. Copy to be submitted
12	Labour License under contract labour (R & A) ACT 1970 and Central Rules made there under	Enclose copy		If labour license already available copy to be scanned uploaded.

SIGNATURE OF CONTRACTOR (S) WITH SEAL

Bid invitation No: 6300038764**Closing Date: 22/03/2024****03. NOTICE INVITING TENDER (NIT)****Subject: Tender for Mechanical, Electrical & Plumbing Works for Overhauling Hangar at BEML Limited, Palakkad complex, Kanjikode, Palakkad, Kerala**

INTRODUCTION:

BEML intends to Construct HMV overhauling hangar with connected office building with allied building at BEML Limited, Palakkad complex, Kanjikode, Palakkad, Kerala.

The Scope of work is for carrying out Mechanical, Electrical & Plumbing Works for Overhauling Hangar at BEML Limited, Palakkad complex, Kanjikode, Palakkad, Kerala as per detailed specification, Drawings and Bill of quantities (BOQ) mentioned in this tender.

Further to the above cited tender notice we would like to appraise the bidders with the following details: BEML Limited is a Government of India undertaking, under the Ministry of Defence Production, having manufacturing units at KGF, Bengaluru, Mysore, & Palakkad. Tenders in prescribed form is invited for the subject work, interested bidders can down load the tender document released along with this notification and quote in two bid system as mentioned below:

BEML LIMITED invites tender in two bid system (Submission of EMD and Technical Bid & Commercial Bid through SRM from eligible reputed firms / contractors for subject tender.

Please submit your Quotations through e-mode on BEML SRM platform, as per tender for the subject works at Palakkad complex, BEML LIMITED, Palakkad, as stated in the scope of work.

This Tender consisting of two parts:

Part A – Submission of EMD and Technical Bid i.e. Submission of Technical Bid (Through SRM)

Part B – Commercial Bid i.e. Submission of Price Bid (Through SRM)

Instructions for submission of the bids:

Both Technical Bid (incl of payment of EMD / EMD Exemption certificates) and Commercial bid are to be submitted through electronic mode only in the SRM system.

Part A: Technical Bid: (Online mode)

- a) Please upload all the technical bid documents in the SRM system and ensure that no price details are mentioned in any of the documents uploaded as part of the Technical Bid.
- b) Corrigendum regarding the tender if any will be published in SRM website only before the tender closing date. Bidders to make note of the above and check the website before tender closing date / time to have the latest communication / update. The same to be

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signed with company seal and scanned copy to be uploaded with the technical bid documents.

- c) Documents as indicated in the Mandatory qualifications of the contractor for eligibility are to be uploaded on SRM Platform. (Commercial bids of the bidder will be opened only if all the technical requirements are fulfilled and qualified through technical evaluation. Hence the bidders are advised to upload all the required documents carefully.)
- d) The tender documents will be considered at the sole discretion of M/s BEML Ltd, whose decision in the matter will be Final & Binding. Failure to do so will result in rejection of the bid.

Part B: Submission of Commercial Bid: (e-mode)

- a) Price bid to be submitted in SRM system only against the respective line items provided therein before tender closing date and time specified.
- b) In case Bidder is not quoting for all the activities in price bid, then their offer will be rejected.
- c) Quotations sent by Fax / Email / Quotations on letter heads will not be entertained. The offers should be only on SRM platform.
- d) Bidders must quote lumpsum amount, calculated as total for all the activities and quantities indicated in the BOQ; for the tender in SRM. L1 will be arrived based on lumpsum quote.

Technical Bid will be opened first on the specified date and time. Commercial Bid (Bill of quantities) will be opened only, if the firm qualifies in the Technical Bid. Incomplete details of the Technical Bid will be rejected summarily. BEML have its right to reject any bid without assigning any reason what so ever.

Incomplete / Invalid Tenders and tenderers submitting without payment of EMD / uploading EMD Exemption (as per SRM) will be rejected and no correspondence will be entertained in case of rejection.

General Instructions with regard to EMD:

- a) Quotation submitted online without submission of EMD/EMD Exemption Certificate in-time will not be considered.
- b) EMD submitted in any other form will not be accepted and the offer is liable to be rejected.
- c) EMD lesser than **Rs.3,96,000/-** (Rupees Three Lakh Ninety-Six Thousand Only) will not be accepted and the quotation is liable to be rejected.
- d) EMD of technical disqualified bidders will be returned.
- e) EMD does not carry any interest on return.
- f) Pre-qualification and technical bids shall be opened **on closing date i.e. 22/03/2024 – 17.30 Hrs**

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- g) No responsibility will be taken for postal delay or non-delivery/non-receipt of EMD/firms claiming EMD exemption.

Offers without EMD or EMD in the form other than the one specified or EMD with lesser amount shall not be considered and tenders will be rejected. No Interest would be paid on the Earnest Money Deposit.

Completion Period: The period allowed for execution of the work is till completion of project in all respects and details (Scope, time and payment schedule) of Terms and Conditions from the date to be mentioned in the work order to be placed on the successful bidder.

Communication: Any queries/clarification / information / details regarding tender enquiry to be communicated only through email Id: dhinesh.a@bemltd.in and narasimhaprasadtk@bemltd.in and queries/clarification/ information/details will be accepted up to two days prior to the closing date of the tender.

Other Terms related to Tender:

- 1) The company does not bind itself to accept the lowest or any other tender.
- 2) The tender shall remain open for acceptance for a period of **90 days** from the date of opening of tenders.
- 3) The intended bidders may visit the site and acquaint themselves with the conditions of the site prior to submission of tenders and no claims will be entertained later on the grounds of ignorance.
- 4) The successful bidder is required to sign the work order prepared based on the quoted rates placed on him by the Accepting Officer.
- 5) The Accepting Officer reserves the right to place order as a whole or part of any item only as deemed fit.
- 6) In case, the Successful consultant/firm after quoting withdraw from the tender or refuse / delay in commencing the work or stop the work abruptly, their EMD will be forfeited.
- 7) Bidders exempted from Earnest Money Deposit (EMD) shall submit exemption certificate from Competent Authority.

Conditional tenders are liable to be rejected.

Thanking you

Yours faithfully,

for BEML Limited

-Sd/-

The General Manager,
Material Management
BEML Limited
Palakkad Complex

Bid invitation No: 6300038764**Closing Date: 22/03/2024****04. GENERAL CONDITIONS:**

(UNDER WHICH THE WORKS HEREINAFTER DESCRIBED ARE TO BE PERFORMED)

1. INTERPRETATION CLAUSE:

In these General Conditions and the Specifications attached, the word 'COMPANY' shall be held to mean 'BEML LIMITED', the work 'CONTRACTOR' shall be held to mean one or more contractor or contractors jointly or generally engaged in the works to which these General Conditions and the specifications relate, and shall include his/their heirs, executors and administrators. The word 'ENGINEER-IN-CHARGE, shall be held to mean a Member of the staff of the BEML to supervise the work. The expression 'SITE OF WORKS, shall be held to mean the extent of land which the Company places at the disposal of the Contractor from time to time for the purpose of executing the contract works. The word 'DRAWINGS' shall be held to mean 'THE PLANS, SECTIONS, ELEVATIONS AND DETAILS OF WORKS' annexed to the contract and such further drawings, as the Engineer in charge may issue from time to time during the progress of the works and shall be held to include tracings and photographic prints. The word SPECIFICATIONS shall be held to include the tender General Conditions, Specifications, Schedule of Prices and Bill of Quantities.

2. SUFFICIENCY OF PRICED BILL OF QUANTITIES AND TENDER:

On the acceptance of this tender, the contractor shall forthwith satisfy himself as to the correctness and sufficiency of his tender for the works as well as all prices stated in the Bill of Quantities and the schedule of Prices and within SEVEN DAYS of the acceptance of his tender, he shall sign the contract which shall be construed and taken as an acknowledgement on his part of his complete satisfaction and acquiescence in the sufficiency of the prices. The amount of the tender shall be the sum at which the contractor engages to execute whole of the works set-forth in the Bill of Quantities, the contractor shall submit to the company, with his tender both Schedule of Prices and Bill of Quantities upon which the tender has been based fully and completely priced. Items left unpriced in the bill of Quantities shall be held to be included in the prices for other items of the work.

3. CONTRACTOR TO EXECUTE CONTRACT WITH THE COMPANY:

The successful contractor shall within SEVEN DAYS of the acceptance of his tender enter into and execute a formal indenture of contract to be prepared by the Company's Solicitor. The contractor shall not be entitled to make any charges for perusal of the contract.

4. CONTRACT NOT TO BE ASSIGNED OR UNDERLET AND CONSEQUENCE OF GRATUITIES BEING GIVEN:

The contractor shall not assign or make over the contract to any other person, or underlet it, or make a sub-contract with any workmen or workman for the execution of any part of work(s), but shall employ his own workmen for the labour thereof, who shall be paid by him in wages by the day. And in case the Contractor assigns or makes over the contract, or

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underlet or make sub-contract, contrary to this clause or either himself or his agents give any gratuity to any employee of the Company, the company shall be at liberty to terminate the contract.

5. TENDER OR AGREED RATE:

The contractor shall agree not to petition for revision of rates tendered for by him under any circumstances at any stage of the work, either during execution or when the final claims are settled.

6. In the event of anything evidently necessary to the due and complete performance of the works being omitted to be shown on the drawings or described in the specification or being omitted from the Bill of Quantities through oversight or error, the contractor shall, notwithstanding, execute (in the most perfect manner) all such works the same as if they had been severally shown, described and included without being entitled to make any extra claim or charge.

7. The contractor shall satisfy himself or shall be deemed to have satisfied himself as to the nature of the sub-soil, the three dimensions, levels, character and nature of all roads, existing drains, sewers, water, gas or other mains, electric cables and other things as regards any connection they may have with the works the subject of the contract, and he shall also inspect the site of the works and surroundings, the means of access there to and egress therefrom and shall generally obtain his own information on all matters and things which can in any manner influence his tender, No claims for extra works otherwise will be allowed in consequence of any misunderstandings, error or incorrect information on these points, or of any other in-accuracies in reference thereto, which may appear on the drawings, or in the specification, nor shall the contract be nullified in consequence of any such misunderstanding, error incorrect information or in-accuracies.

8. ENGINEER IN CHARGE'S ORDERS TO COMMENCE WORKS AND AS TO NON-DELIVERY OF SITE:

The Contractor having signed the contract, the Chief Engineer will forthwith give him notice to commence the works and the contractor shall upon receipt of such notice, commence the works and carry them on at such point and points and in such portions as the Engineer in charge may direct.

The Company shall, with the Engineer in charge written order to commence the works, give to the contractor, the use of so much of the site of works, as may in the opinion of the Chief Engineer be required in order to enable the contractor to commence and continue the construction of the works, and shall from time to time as works proceed give the contractor the use of such further portions of such site as the Engineer in charge may from time to time consider proper in that behalf, but the non-delivery in manner aforesaid of the use of such site or any portion thereof shall not vitiate or affect the contract, nor any provision contained in the specification nor entitle the contractor to any increased allowance in respect of money.

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The Contractor shall set out the whole of the works and be responsible for the correctness of the position, levels and dimensions of the several works, according to the drawings and written instructions of the Engineer in charge. If at any time during the progress of the works any error shall appear or arise in the position, levels or dimensions of the several works, the contractors on being required to do so by the Engineer in charge, shall at his own expense remove and amend the works to the satisfaction of the Engineer in charge, notwithstanding that he may have been assisted by Engineer-In-Charge in setting out the same. The contractor shall observe, perform and comply with the requirements of all statutes and byelaws and shall also serve notice on the authorities having control of the road surfaces before the same are broken up and he shall likewise serve notices on the owners of the sewers, drains, water, gas or other mains, electric cables and other things which may be in any way affected by the execution of the contract work.

10. TIME OF WORKING (APPLIES ONLY FOR FACTORY AREA):

As the entry and exit of the workmen into the factory area is controlled by the Security Authorities of the Factory, the contractor should strictly adhere to the timings of entry and exit, laid down by the authorities and the rates quoted are deemed to include for this provision.

11. NIGHT WORKS:

The works shall be carried on day and night continuously without extra charge. If bad or treacherous ground be met with or if there be any other causes whatsoever, which in the judgment of the Engineer-In-Charge, requires, it, but no work shall be carried on in the night without the knowledge and sanction of the Engineer-in-charge.

12. WATCHMEN, LIGHTS, ETC., TO BE PROVIDED BY THE CONTRACTOR:

The Contractor, shall at his own cost provide night watchmen to all parts of the work where necessary required by the Engineer-in-Charge, He shall also keep all open trenches, excavation or other dangerous places properly and sufficiently lighted between sunset and sunrise, and shall provide and fix proper fencings and boarding and temporary bridges to protect and assist the public traffic. The contractor shall also at his own cost erect temporary fences on the site of works where required by the Engineer-in-charge.

13. TEST MATERIALS:

All the materials to be used in and on every part of the works shall be subjected from time to time to such tests as the Consultant and Engineer in charge may direct. Such tests shall be performed at the expense of the contractor but the Company shall refund to the Contractor the actual cost of testing any of the materials which are proved to conform with the conditions of the specifications but the samples shall be, in all cases, selected by the

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Engineer in charge, and supplied by the contractor as part of the contract. If, at any time, any materials so tested is not equal to the test for such materials, hereinafter specified, the same shall be removed from the site of works, and other materials substituted therefor, but in the absence of any specified test, the decision of the Engineer in charge, shall be final as to whether the said material or materials shall be used in the works, or forthwith removed and other materials substituted.

14. MATERIALS, TOOLS ETC., BROUGHT ON TO WORKS TO BECOME PROPERTY OF COMPANY DURING CONTINUANCE OF CONTRACT:

All materials, tools, implements and other things brought by the Contractor upon Company's works shall there upon become and shall continue to be the absolute property of the Company and be considered in its possession, the Contractor having only the right of using the same for the purpose of the contract. After the works have been completed and all obligations under the contract duly fulfilled, the Company shall return to the Contractor the tools, implements and surplus or waste materials then remaining upon the Company's works to be removed by him forth-with and cleared away. Nevertheless, the Company shall not at any time be liable for the loss of any of the said materials, tools, implements or other things but the whole of this liability shall fall upon the Contractor, the same as if they had remained in his possession.

15. POWER TO VARY WORKS:

The Company shall have full power and authority from time to time, and at all times, to order works additional to the contract, and to make and issue such further drawings and to give such further instructions and direction as may appear necessary or proper for the guidance of the contractor and the good and sufficient execution of the contract, and the contractor shall receive, execute, obey and be bound by the said further drawings, instruction and directions, according to the true intent and meaning thereof and as fully and effectively as though they had accompanied, or had been mentioned or referred to in the original drawings and specifications. The company shall also have power to vary or alter the levels or position of any of the works, the subject of this contract, or may order any of the works contemplated thereby to be omitted with or without the substitution, of any other works in lieu thereof, or may order any work, or any portion of work executed or partly executed, to be removed, changed or altered, and if needed that other work shall be substituted in lieu thereof and the difference of expense occasioned by any such increase, diminution or alterations so ordered and directed shall be added to or deducted from the amount of the contract agreeable to the prices for similar works set forth in the Bill of Quantities, or failing which the Schedule of Prices attached hereto, and in the absence of any such similar work being scheduled, the Engineer in charge shall determine the amount to be paid for such additions or deductions. The company will in no case become liable to the payment of any charge in respect of any such conditions, alteration or deviations, unless the instructions for the performance of the same shall have been given in writing and signed by the Engineer in charge, nor unless such instructions distinctly states that the matter thereof is to be subject of an extra or varied charge, in the form of an order hereinafter set forth nor

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unless the claim thereof shall be made in writing, signed by the Contractor and in the form of claim herein as set forth and properly filled up nor unless such claim be made within the week in which the work is executed and materials used, and before the same shall have been placed out of view, or beyond check of measurement, nor unless the value of any altered or varied works, or any further works shall wherever practicable have been determined and settled before such altered, varied or further works shall have been commenced. Such value in case of dispute shall be ascertained by the Engineer in charge, who shall determine in all cases whether such previous determination and settlements were practicable or not, and in all the cases where he shall consider the same to have been practicable, the contractor shall not be entitled to make any claim in respect of such altered, or varied or further works if it shall, in the opinion of the Engineer in charge, if any special instance become necessary to execute any additional or substituted work, either wholly or in part by the day the claim therefor, shall not be recognized unless the contractor shall have delivered to the Engineer-in-charge, within one working day, and so on from day to day a true and exact list of the name, occupations, time and wages of the several workmen engaged during the previous day on any and every such works in respect of when a charge 'BY THE DAY' is intended to be made in the next succeeding weekly claim of contractor, Nevertheless, no charge 'BY THE DAY' shall be made unless, in the opinion of the Engineer in charge, it is impracticable or unreasonable to determine the value of the amount of work in manner otherwise provided for in these general conditions. All such instruction given by the Engineer in charge, shall be in the following form or as near there to as may be:

ORDER No:

CONTRACT No.

In pursuance of Clause-15 of the General Conditions of contract and subject as there in mentioned, we request you to perform the under mentioned at the under mentioned price, namely:

SUCH WORK ADDITIONAL TO WORK INCLUDED BEING IN SUBSTITUTION FOR IN THE tender, and we request you to omit the under mentioned work at the under mentioned prices, viz.

DATE:

SIGNATURE OF THE
ENGINEER-IN-CHARGE.

AND every claim shall be made in the following form:

CLAIM No: _____ CONTRACT No. _____

Contractors claim under and subject to Clause-18 of the General Conditions of Contract for the week ended Saturday the _____ day of _____ in respect of other than contract work.

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Work Claimed For		Number Of Engineer's Order	Price of Similar Work in Bill of Quantity of Schedule.		Where no Similar Work in Bill of Quantity of Schedule.	Amount claimed Rs.
Qty in Mtrs.	Des-cription.		Number/ Number of items	Value of Item.	Schedule Price of Labour.	

 DATE:

SIGNATURE OF THE CONTRACTOR 'S

The claim shall be delivered to the Engineer-in-charge , for his examination before being transmitted by him to the Chief Engineer and shall be subject in all respect to the consideration, ratification and correction of the Chief Engineer who shall be at liberty to decide whether any such claim entitle the Contractor to any, and if so, what extra charges, according to the true meaning and intention of the specifications, and whether any and what allowance shall be made to the company in respect of any work or obligation to be performed under the contract and from the performance of which the contractor may be or become directly or consequently relived by reasons of any such additional or substituted works.

16. SUSPENSION OF WORK:

The Contractor(s) shall suspend the execution of work or any part or parts thereof whenever called upon in writing by the Chief Engineer to do so and shall not resume work thereon until so directed in writing by the Chief Engineer. The Contractor will be allowed by the Chief Engineer an Extension of time (not less than the period of suspension) for completion of the item or group of items of work for which a separate period of completion is given in the contract and of which the suspended work forms part but not other claims in this respect for completion or otherwise, however, shall be admitted. The contractors shall have no claim to any payment of compensation or otherwise, whatsoever on account of suspension of work.

17. WORKS TO BE EXECUTED IN APPROVED MANNER:

The works, the subject of the contract, specified and provided for or that they may be necessary to be done to form and complete any part thereof, shall be executed and completed in the best substantial manner, with materials of the best and most approved quality of their respective kinds agreeable to the particulars contained in or implied by the specification or as referred to and represented by the drawings and memoranda thereon or as referred to by any of the said further drawings and memoranda thereon or as referred to by any of the said further drawings, instructions and directions and shall be to the full satisfaction of the Engineer in charge ,. The Engineer in charge, shall have full liberty at all reasonable time to inspect and examine the works, materials and workmanship, and may

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every such time reject any or all of such works, materials and workmanship which to him/them or either of them may appear defective, unfit or improper for the several purposes to which they are applied, or intended to be applied, or as not in accordance with the specification or the said drawings, memoranda, instruction or directions respectively.

18. WORK TO BE CARRIED ON WITH EXPEDITION FAILING WHICH THE COMPANY MAY EMPLOY OTHER CONTRACTOR WITHOUT VITIATING THE CONTRACT:

The Contractor shall commence to carry on the works with due diligence, and as such expedition as the Engineer in charge, may reasonably expect, having regard to the specified time of completion of the whole of the works. In case the contractor fails to do so, or neglect to provide proper and sufficient materials, or to employ a sufficient number of workmen to execute the work, then the company shall have full power, without vitiating the contract, to take the works wholly or in part out the hands of the contractor to engage or employ any other person or workmen to procure all requisite materials and implements for the due execution and completion of the said works, and the cost and charges incurred by the company in so doing shall be ascertained by the Chief Engineer and be paid for or allowed to the company by the contractor and it shall be competent for the Company to deduct the amount of such costs and charges along with overheads out of any sum or sums due or to become due from the company to the contractor under this or any other contract.

19. INFERIOR MATERIALS OR WORKMANSHIP TO BE AMENDED:

The materials as well as the workmanship and finish of the whole of the contract works shall be best of their kind and should any materials be brought upon the site of works or on any land or property of the company or on the places where the operations are being carried out in connection with the works, which in the judgment of the Engineer in charge, is of an inferior description and improper to be used in works, the said materials shall be removed. All inferior workmanship or finish shall be amended by and at the cost of the contractor forthwith, or within such period or periods as the Engineer in charge, may direct, and the contractor shall pull down, amend and reconstruct any work he may have erected upon an insecure or insufficient foundation or that he may have insufficiently secured and protected against immediate and future injuries, whether arising or likely to arise in future from weight, pressure action of water or otherwise, on being required to do so by the Engineer in charge. In case the contractor neglects or refuses to remove such materials or comply with such directions it shall be lawful for the Chief Engineer, on behalf of the company and by its agents, servants and workmen to remove the materials and amend the workmanship and finish, so objected, to, or any part thereof, and to replace the same with such other materials, workmanship and finish as shall be satisfactory to the company and on the certificate of the Chief Engineer to deduct the expense thereby incurred, or to which the company may be put or be liable or which may be incidental thereto, from the amount of any sum or sums due to or become due to contractor, or to recover the same by action at law or otherwise from the contractor as the company may determine.

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When it is apparent to the Chief Engineer that defects exist in the work, or that damage or accident has occurred to the works, or that the works are not upheld or maintained in good sound and water tight conditions, or repair or in working order, but the cause thereof is not apparent, a general requisition in writing by the Chief Engineer to the contractor to amend, make good or maintain the works in sound, perfect and water tight conditions shall be under no obligation to specify the work or repair, but such requisition shall be conclusive evidence against the contractor that he is not performing his obligations under the contract.

20. EMERGENCY POWERS:

In the event of any accident or failure occurring in or on the works, which, in the opinion of the Chief Engineer requires immediate attention either during construction or during the period of maintenance the company may by their own or other workmen make necessary repairs at the expenses of the contractor.

21. OPENING TO BE MADE FOR EXAMINATION OF WORKS:

Should Engineer-in-charge require it for their more perfect satisfaction, the contractor shall at any period during the continuance of the contract, pull down any part of the work and make such openings, as to such extent through any part of the said work as the Engineer-in-charge, may direct and the contractor shall make such works good again to his or their satisfaction. Should the work be found faulty in any respect, the whole of the expenses thereby incurred shall be defrayed by the contractor but if otherwise by the company.

22. PRECAUTIONS AGAINST INJURY TO PROPERTY ADJACENT TO THE WORK IN PROGRESS:

The contractor shall take special care, by the erection of temporary fences and by every other means which circumstances may render necessary, to prevent all injury and damage to or trespass upon the lands, roads, fences or property adjacent to the site of works and shall confine the passage of his workmen to existing public roads, foot paths. He shall likewise pay and satisfy all claims whatsoever and from whomsoever, for temporary occupation, way-leaves, damages, the trespass or otherwise, in reference to the said lands, roads, fences and property adjacent and bear the company harmless from any and all such claims. If any greater extent of land than the site of work be required by the contractor for his operations, he shall obtain and occupy the same at his own cost and charge.

23. PRECAUTIONS AGAINST ACCIDENTS OR INJURY:

The Contractor shall, at his own expense, shore, sling, protect, support, alter, restore make good and maintain as may be necessary, all buildings, water and gas pipes, sewers, drains, electric cables and other things which may be disturbed, exposed or injured during the execution of works or in consequence of the execution of the works and shall also provide any extra timbering which may be temporarily required and all labour in fixing and removing the same and shall, at his own expenses provide for the continuous use of all buildings, pipes, sewers, drains electric cable, water sources and other things, the use of which may be

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liable to interruption during the progress of the work. The Contractor shall at his own expense restore all such buildings, water and gas pipes, sewers, drains, electric cables and other things to the satisfaction of the owners thereof and he shall likewise, at his own expense, construct and maintain such works as may be necessary for the due permanent support of all such buildings, pipe, sewers, drains, electric cables and other things met with in the construction of works, and shall indemnify, save, harmless and keep indemnified, the Company and its officers from and against all action, suits, claims, penalties, liabilities, cost, expenses and demands whatsoever, by reasons or on account of damage to such buildings, pipes, sewers, drains, electric cables and other things whether caused by the execution of the contract works or in the insufficiency of the aforesaid permanent support. The Company may deduct the expenses thereby incurred or to which the Company or its Officers may thereby be put or be liable or which may be incidental thereto from, the amount of any sum or sums due or to become due to the contractor or may recover the same by action at law or otherwise from the contractor and the Company may compromise any such action suits or other proceedings, or such terms as it shall see fit and contractor shall thereupon forthwith pay the Company the sum or sums paid by the Company upon the occasion thereof, and shall in every case pay such sum or sums as shall fully indemnify the Company according to the present stipulation.

24. COVERING OF CONSTRUCTION SITE:

The Contractor shall, at his own expense, make arrangements to cover/wrap the construction site in mesh material of green color to prevent the dust from the escaping into the adjoining Properties or premises and atmosphere and also to prevent accidental fall of debris onto the people. The contractor at his own expense should make arrangements to remove the cover after completion of the work.

25. ROYALTIES:

The Contractor shall be liable to pay all royalties chargeable on Government or Company materials required for the work.

26. REJECTED MATERIALS:

All rejected materials will at once be removed from site by the contractor to such distance as may be desired, failing which the company after giving three days' notice in writing may do so and recover the cost of removal from the contractor.

27. COMPANY'S PLANT:

No Company's plant, materials or Labour will ordinarily be lent or hired to the contractor. Exceptional cases must have the approval of the company in writing.

28. SCOPE OF COMPLETION:

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Completion includes completion of all work in accordance with the plans and specifications, removal of all yard mess accumulated during construction, levelling and cleaning up the site and generally cleaning the whole building or works.

29. FINAL MEASUREMENTS TIME:

The final measurement must invariably be preceded by a thorough remeasurement of the whole of the work, performed which will be made by the company's authorized representative and at which the contractor or his accredited agent must be present. For this purpose, a written notice will be sent to him at least THREE DAYS before the date fixed for the measurements, appointing the day, hour and place of meeting. Should he not attend to this the measurements will proceed without him, and he will be precluded from making any protest.

30. If a dispute arises between the company and contractor as to the quantity or quality of work, performed, involving sum larger than Rs.500.00, the contractor may appeal in writing to the company for remeasurement or reappraisal, as the case may be. If the company considers that Contractors claim is valid, they may appoint an officer, other than the Officer who made the final measurement and inspection vide Paragraph-28 above, and his report shall be considered as final and binding on the contractor. The Contractor shall have a representative present when the remeasurement or the appraisal is being made.

31. ATTENTION:

- a) Time will be the essence of the contract and the contractor is to complete the whole of the work in the time stated in the tender, subject to the schedule of conditions.
- b) The contractor is to provide at all times during the progress of work and the maintenance period proper means of access, with ladders, gangways, etc., and the necessary attendance to move and adopt as directed for the inspection of their representative (no separate rate will be allowed).
- c) The Contractor is to keep all persons under his control and within the boundaries of the site and he will be held responsible for the care of the works generally until their completion including all works executed and materials deposited in the sites by himself or suppliers, together with all risks arising from weather, carelessness of operatives, damages or loss by thefts or by any other cause, and is to allow for all necessary watching and protective lighting.

32. LABOUR ACTS:

- a) The Contractors shall employ labour in sufficient number to achieve the required rates of progress and quality to ensure best workmanship of the degree required under various specifications and to the satisfaction of Engineer-in-charge. The contractors shall remain liable for the payment of all wages or other remunerations to his labourers or employees

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under the Payment of Wages Act 1936, Minimum Wages Act 1948, Employers liability Act 1938, Workmen's Compensation Act 1923, ESI Act 1948, or any other Acts or enactments relating thereto and rules framed there under from time to time. In the event, the contractor fails or neglects to pay any amount due by him under the workman's compensation Act, ESI Act or other Labour Laws, the Company is entitled to withhold the same from any other amount payable by it to the contractor and remit the same to the authority concerned and such payment shall be binding on the contractor.

- b) In the event of contract, the contractor shall be responsible for implementing the provision of the contractor Labour Act in to and also responsible for any repercussions arising there from for non-compliance thereof.
- c) The intending tenderers should quote their organization registration/code numbers for the registration with ESI/PF Authorities. It may be noted that other things being equal, preference will be given in the acceptance of tender to firms having independent registration with ESI/PF Authorities.
- d) BEML shall arrange to recover from the contractors bills requisite amounts of both Employer's and Employee's contribution for both ESI and PF calculated on the basis of 25% of the value being taken as the labour cost and recover such amounts from the respective bills and keep the same in suspense account. On production of requisite documentary evidence supporting payment of ESI/PF Authorities/supported by the acquaintance rills, the amount earlier recovered from contractor's bills shall be paid duly adjusting the shortfall in remittance, if any.
- e) In the event of any accident/injury/disablement, the contractor shall arrange to pay the requisite compensation legally payable to the concerned employee/dependents and also indemnify to BEML in case of any claim arising therefore later.
- f) CONTRACTOR should employ only ESI Registered workmen on any item of work. If contractors have workman who have not yet been Registered under the ESI they should ensure that the workers have been duly registered before employing them in work.
- g) CONTRACTORS should produce his MUSTER ROLL duly certified by Engineer-in-charge once in a month say before 5th of each month to the Pay roll section, so that the ESI amount can be ascertained and recovered/payment obtained irrespective of the fact whether work order is issued or not.
- h) If there is any default on the part of the contractor, an estimated amount towards ESI liability including the would-be penalty/damage, will be recovered by the company from the bills of the contractors.
- i) CONTRACTORS should maintain all registers and records required for ESI, PF Payment of wages, etc., under the statutes and produce them for verification as and when called for by company inspecting Authorities.

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- j) THE contractor shall disperse the wages to the workmen in the presence of the authorized representative of the company.
- k) CONTRACT Labour (Regulation and Abolition) Act 1970 under section 12 and Rule 21 prescribes that every contractor who employs labour for executing contract works should obtain license from Labour Authorities to carry out any works contract, so that the labourers employed by the contractor are not deprived of the facilities provided under the Act. Such license shall be produced to BEML Authority before commencement of the work.

33. TRAINING APPRENTICES:

The CONTRACTOR shall comply with the provision of the Apprentices Act 1961 and the rules and order issued there under from time to time. If he fails to do so his failure will be a breach of contract and the Accepting Officer may in his discretion cancel the contract. The contractor shall also be liable for any pecuniary liability arising on account of any violation by him of the provision of the Act.

34. FAIR WAGES:

The Contractor shall not pay less than fair wage to labourers, workmen engaged by him on the work. Fair wages means wage for the various categories of labour, workmen, fixed from time to time by the labour authorities of the area. The contractor shall ascertain the minimum fair wages prevailing in the area before submitting his tender. The Contractor should also abide by labour regulations in regard to the payment of wages, wage period, fines and deductions from wages, maintenance of wage book, wage slip, publication of scales of wage and other terms of employment, inspection and submission of periodical returns and all other matter relating to labour rule in force.

35. DISPUTE RESOLUTION AND JURISDICTION:

All disputes or differences whatsoever arising between the parties out of or relating to the construction, meaning and operation or effect of the contract or the breach thereof arising during the progress of work or after completion or abandonment thereof shall be mutually discussed and settled amicably by conciliation Committees/ Councils comprising of independent subject experts constituted by BEML, failing which, the dispute shall be settled by arbitration consisting of sole arbitrator appointed by the Company in accordance with the provisions of Arbitration and Conciliation Act 1996 and the arbitration proceedings shall be conducted at Bengaluru.

The court at Bengaluru only shall have jurisdiction to entertain any dispute/matter relating to the contract

In case of any dispute between the Company and any other Public Sector / Government department relating to the interpretation and application of the provisions of the contract, such disputes / differences shall be referred by either party to the arbitration of one of the

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arbitrators in the Department of Public Enterprises. The Arbitration and Conciliation Act, 1996 and amendment thereof shall not be applicable to this clause. Any party aggrieved by such award, shall make further reference to the Ministry of Law and Justice, Government of India.

In case BEML challenges the Arbitral Award passed against it, 75% of the award may be paid to the contractor / concessionaire against Bank Guarantee without prejudice to the final order of the Court in the matter under challenge. The payment may be made into a designated Escrow Account with the stipulation that the amount so released will be used, first, for payment of lenders' dues, second, for completion of the project and then for completion of other projects of BEML, as mutually agreed / decided. Any balance remaining in the Escrow Account subsequent to settlement of lenders' dues and completion of projects of BEML, may be allowed to be used by the contractor / concessionaire with the prior approval of the lead banker and BEML.

In case the subsequent court order required refund of the money paid by BEML to the contractor / concessionaire against Bank Guarantee, the amount shall be refunded by the contractor / concessionaire along with appropriate interest. The rate of interest on such refund amount shall be decided by BEML keeping in view the cost of capital to BEML or the rate of interest provided for in the Contract Agreement or the rate of interest awarded under the Arbitral Award under challenge

General conditions stated under Clause 1 to 35 are fully read and are acceptable to me/us.:

DATE:

SIGNATURE OF THE CONTRACTOR 'S

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1. The tender shall remain open for acceptance for a period of 90 days from the date on which the tenders are due to be submitted.
2. The contractor shall visit the site to acquaint himself with site conditions and study the drawings and specifications in detail prior to tendering, and no claims will be entertained later on the ground of ignorance or otherwise of the conditions under which the work shall have to be executed.
3. The contractor shall either himself supervise the execution of the contract or shall appoint competent and experienced engineers on his own for supervision of the work. Where the contractor is not a qualified engineer or even if he is so qualified but in the opinion of the accepting authority, cannot give full attention to the works, the contractor shall at his own expense employ adequate Engineers, as indicated in manpower deployment schedule, to supervise the work and to receive instructions from the Engineer-in-charge. The employment of engineers as aforesaid shall be with the approval of the Engineer-in-charge who may verify the qualifications/experience required for timely completion of work.

The proposed minimum engineers shall be under:

Project manager- 1 no	Electrical engineer with over 7-15 years of experience for works of similar nature.
Site supervisor / Quality control Engineer -1 no	Electrical / Mechanical engineer with over 3-5 years of 1 experience for works of similar nature.

They shall be further supported by a team of Junior engineers and supervisors as per requirements at site as directed by Engineer-in-charge.

Penalty for non-compliance of required manpower is as follows:-

Project manager -Rs 40,000/- per month

Site Supervisor/ Quality control Engineer - Rs 30,000/- per month

4. The setting of the building shall be done by the contractor himself. All measurements shall comply with the dimensions noted on the drawings. The contractor shall construct centre line pillars and Bench Marks wherever necessary at his own cost and the setting out shall be got checked, approved and certified by the Engineer-in-charge before execution of the work.
Not applicable
5. Foundations shall generally conform to the dimension indicated on the drawings, unless the nature of soil after excavation examined by the Engineer-in-charge of works necessitates modifications. The foundation trenches for RCC columns and walls after excavation indicated on the drawing shall be got inspected, approved and certificated by the Engineer-in-charge of works before laying concrete. **Not applicable**

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6. Provision shall be made during the progress of work for embedding Electric conduits etc., wherever necessary as directed. Openings shall be left for service lines, machine foundations, as required and as per instructions of the Engineer-in-charge.
7. Care shall be taken in execution of work not to damage service lines etc., coming in the way of construction. If any damage is caused in the lines, the cost of replacing or repairs shall be borne by the contractor.
8. CONTRACTOR(S) shall provide himself/themselves with requisite number of welding sets, mixers with hoppers, vibrators builders hoist, Tools, meters and testing equipment, transport vehicles, etc., required for the complete satisfactory execution of work.
9. **WATER:**
Contractor shall use water supply from nearest place of availability. The Contractor shall make his own arrangement for drawing the water for the work. Contractor shall not waste the power and shall use judiciously. Non availability of water shall not be a reason for delay in work
10. **POWER SUPPLY TO THE CONTRACTORS:**
Contractor shall use Power supply from nearest place of availability. The Contractor shall make his own arrangement for drawing the power supply with suitable safety precaution for the work. Contractor shall not waste the power and shall use judiciously. In the event of non-availability of power during any exigency, contractor shall make his own arrangements for power supply for work. Non availability of power will not be a reason for delay in work.
11. **Submittals and Cost of Tests:**
On commencement of the Project, the Contractor shall submit the following to the Engineer in Charge: -
Detailed Baseline Programme stating the various activities along and the time for completion of each activity. Results of any tests, as and when conducted and as required by the Engineer in Charge. All tests shall be carried out at the contractor's cost.
12. **MATERIAL AND WORK MANSHIP: GENERAL**
 - a) This Materials and Workmanship Specification for work shall be read in conjunction with all the documents forming part of the Contract.
 - b) No Permanent Works shall be carried out until all methods and materials have been approved by the Engineer in charge.
 - c) Unless noted otherwise in the Contract, all components and materials shall be handled, transported and stored, in accordance with the manufacturer's recommendations with prior approval of Engineer.
 - d) The test results of each test to be carried out as per Employer's requirement shall be recorded and submitted in a format approved by the Engineer and shall include graphical presentation of results as well as numerical base data wherever required.

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e) All drawings, records, reports, documents, Performa etc. shall be submitted in both hard copy and electronic copy.

f) Work and Workmanship Guarantee Compliance of entire Provisions is obligatory to Contactor

13. INSTRUMENTS

a) All instruments deployed in the Contract shall be in good condition and properly calibrated.

b) Calibration certificates and/or statements of services by local authorized instrument agents of not more than six months shall be the proof that the instruments are in good service conditions.

c) Notwithstanding the above, instruments shall again be checked to ensure good condition before the Contractor proceeds to carry out a critical survey task. Any error causing superfluous work will have to be rectified by the contractor at his own cost.

14. SPECIAL INSTRUCTION.

All construction materials used in the contract shall be get approved from concerned engineer in charge.

15. TAXES:

WHATEVER Taxes and duties, as applicable, chargeable in respect of this contract whether by the Central or State Government shall be borne by the contractor(s) and the price quoted shall be inclusive of such taxes, cess or any other statutory duties or taxes payable by them and price quoted shall be firm and shall be inclusive of such duties and taxes. WHEREVER Taxes are deductible at source, the company will recover the amount as per the statutory requirement.

16. THE Contractor shall agree to execute the work progressively in co-ordination with the concerned officers or shop supervisors and as directed by Engineer-in-charge.

17. THE specifications contained in the MES Schedule (referred to in the tender) in appropriate sections shall apply to this contract to the extent applicable, cement co-efficient shall also form part of MES Schedule.

18. VALUATION OF DEVIATIONS:

Every deviation shall be subject to the limits specified as under:

a) The net value of all deviations (additions and deductions) including non-tendered items, of the value of work completed, shall not exceed 20% of the approved contract value and 40% in respect of any individual item, indicated in Schedule A-BOQ

b) In case of non-tendered items, the total value of such non-tendered items shall not exceed 5% of the approved contract value.

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The basis for ascertaining the non-tendered items shall be as follows:

- a) The value of all deviations shall be ascertained by measurements, on the basis of the rates or prices for similar work in the bill of quantities of the same contract in so far as such rates or prices apply.
- b) Where the rates or prices in Bill of Quantities do not apply, the value shall be based upon rates or prices deduced there from to the extent practicable to do so.
- c) The rates for NT items shall be based on the MES SSR rates after proportionate adjustment in comparison with the tendered rates of like items in the contract. The basis to be adopted for working out the NT rate is the comparison of the NT item with similar trade item in the bill of Quantity for which the contractor has quoted.
- d) wherever NT items cannot be deduced from the like items quoted in the tender or SSR rates, market rate shall be allowed based on vouchers/invoices as per the actual including transportation, labour etc., plus 10% overheads and the labour rate shall be taken as per minimum wages inforce, based on the recommendations of the Chief Engineer.
- e) As a last resort a tender shall be floated to ascertain the rate for NT items. All Deviations in contracts for works including non-tendered items shall be approved by the Competent Authority as per DoP within the limits prescribed in the contract. The deviations and NT items shall be technically checked and processed by the respective "Engineer-in-charge " in concurrence with Finance Department of the respective division.

19. PROVISION OF FITTING/FIXTURES OF DIFFERENT MAKE:

The contractor shall provide the same make of fittings/fixtures specified in the tender documents unless he has quoted for other equivalent for genuine reasons. In case due to exigency of the work and difficult market conditions, the contractor is not able to provide the same make, he shall be allowed to provide equivalent approved make subject to his obtaining the concurrence of the Chief Engineer for the price adjustment as between the quotation and the purchase price for the item involved. The base for reckoning shall be the date of purchase. The contractor shall produce purchase invoice as a proof of expenditure for the items other than those specified in the tender documents allowed for incorporation in the work. Construction Department in respective Divisions/Regional/District Offices shall ensure the reasonableness of the rate in the purchase bill produced by the contractor. The price adjustment shall be the difference between the two makes on the date of purchase.

- 20.** The Company reserves the right to accept the tender in parts i.e. on the basis of lowest quotation in each part or as a whole, at its own discretion and hence it is important that the tenders take sufficient care and quote reasonable rates in each part, so that if one part only is separated and entrusted to one Contractor he should be able to do it without difficulty. The rates quoted for similar items should be consistent. THE company also reserves the right

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to accept the lowest or any other tender at its discretion without assigning any reasons whatsoever.

21. EXTENSION OF TIME:

Time is the essence of the contract. The contractor is bound to complete the work within the stipulated time. The Chief Engineer has to assess the delay arising out of default of the contractor. Where the delay is due to default of the contractor, and if there is no financial loss due to such delay, the Chief Engineer can recommend for grant of extension of time by the same authority who accepted the tender/awarded the contract, subject to recording the reasons for granting such extension of time.

Where the delay is due to default of the contractor, and if there is a financial loss due to such delay, the extension of time requires the approval of Competent Authority. In the absence of Competent Authority approval, Liquidated Damages for delay in completion of the work shall become enforceable.

Where the delay is not due to default of the contractor, for example: - a) not providing clear work front to the contractor by the Company, b) Company's delay in decision making for changes relating to original work., etc necessary extension of time shall be granted with the approval of Competent Authority, as per DoP without sanctioning escalation claimed by the contractor except statutory levies.

Extension of time when granted with the approval of the Competent Authority as per Company's Delegation of Powers shall have the effect of rendering the clause 'Liquidated Damages for delay in completion work' inoperative upto the period of extension of time so granted unless otherwise specifically stated.

22. LIQUIDATED DAMAGES FOR DELAY IN COMPLETION OF WORKS

In case the Contractor fails to complete the works and clear the site on or before the stipulated time mentioned in the Work order he shall without prejudice to any other right or remedy of the Company in this behalf pay, as agreed Liquidated Damages and not as penalty, pay sum equal to 0.5% of the Contract sum (excluding non-tendered/extra items, if any) for every week's delay subject to maximum of 10% of the total final bill value of the Contract.

Liquidated Damages shall be applicable in the following cases:

- a) where the contractor fails to complete the work within the stipulated time;
- b) where the extension of time is granted with levy of LD;
- c) Where extension of time is granted without levy of LD but the contractor has failed to complete the work within the extended period.

The amount of Liquidated Damages shall be adjusted or set off against any sum payable to the contractor under this or any other contract/s awarded by the Company.

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In case where the contract is subjected to levy of LD, the Chief Engineer shall be the authorized person to issue 'Work Completion Certificate', which shall be final and binding the Company as well as the Contractor concerned.

23. FORE-CLOSURE OF CONTRACT:

It shall be noted that at any time after acceptance of the tender, the Company can decide to abandon or reduce the scope of work for any reason whatsoever, the Chief Engineer shall give notice in writing to that effect to the contractor. The compensation, if any, payable for such foreclosure of work shall be discussed mutually between the Company and the contractor and settled after taking into consideration the loss suffered by the contractor on account of foreclosure of the contract. The contractor shall have no claim for any compensation whatsoever on account of any profit or advantage which he might have derived consequent to foreclosure of the whole or part of the works. The Company shall have the option to take over the contractor's materials or any part thereof, either brought to the site. The amount of compensation payable to the contractor due to foreclosure shall be decided by the authority one level above the level of the authority competent to award the contract, or by the CMD.

24. BEML revised General Conditions together with BEML specifications will form part of the contract. Should there be any discrepancy between the provision in the Bill of quantities and drawings, the former shall be deemed to take precedence there over.

25. No modification or change of specifications in the bill of quantities shall normally be accepted and such changes are to be rejected. Acceptance of such deviations shall be at the discretion of the Engineer-in-charge.

26. EARNEST MONEY DEPOSIT:

TENDERES should submit their tender accompanied by EMD of value indicated in the tender. It should be paid in online mode and proof submitted in SRM. Tender without Earnest money deposit will be rejected. On finalization of the tender, Earnest money deposit will be refunded to unsuccessful tenderers under proper acknowledgement. MSME firms are exempted from EMD and documentary proof to be submitted.

In case, the contractor/firm after quoting, withdraws from the tender or refuse/delay in commencing the work or stop the work abruptly, their EMD/ SD, as the case may be, will be forfeited. No interest amount is payable on EMD.

27. SECURITY DEPOSIT:

The successful tenderer shall be required to furnish security deposit for the fulfillment of contract and amount shall be 10% of the value of the contract exclusive of Taxes, to be paid by the contractor. No waiver can be allowed in this regard. Such security deposit shall not entail any interest payment on refund.

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The contractor shall choose any one of the following options for payment of security deposit in writing as under:

- a) The contractor shall within 30 days of acceptance of the contract deposit the difference between Earnest Money and full Security Deposit by Demand Draft/Banker's cheque drawn on any of the commercial bank made in favour of Company. PEMD held with BEML cannot be considered for such adjustment in the Security Deposit payable by the contractor.
- b) Bank guarantee from any commercial bank equivalent to the amount of security deposit valid for a period required by BEML shall also be accepted.
- c) Security Deposit amount shall be deducted from the running bills of the contractor at the rate of 10% or higher of the gross value of each bill. However, the entire security deposit amount shall be deducted before completion of 90% of work.

The above deposit shall be held by the Company as security for the satisfactory performance of the contract. All compensations or other sums or money payable by the contractor to the Company under the terms and conditions of this contract shall be deducted from this security deposit or from any other sums that shall be due, or shall become due to the contractor by the Company on any account whatsoever and in the event of the security deposit being reduced by reasons of any such deductions the contractor shall within ten days thereafter make good these deductions.

28.1 REFUND OF SECURITY DEPOSIT

The above deposit, as the name itself signifies, shall be held as Security for performance of the contract. One half of the Security Deposit i.e. 50% shall be refunded to the contractor on completion of the contract based on the recommendations of the Chief Engineer in writing that the work has been physically completed in all respects.

The balance 50% of the security deposit shall be refunded to the contractor on written demand from the contractor after the expiry of the DEFECT LIABILITY PERIOD or on payment of final bill whichever is later, with the recommendation of the Chief Engineer, provided the Chief Engineer is satisfied that there are no dues outstanding against the contractor.

If the Security Deposit is in the form of Bank Guarantee, on completion of the contract, the BG already with BEML will be returned to the contractor. The contractor has to then submit a fresh Bank Guarantee for 50% of the security deposit value valid for a period of 1 year from the actual date of completion of the entire contract shall be deposited by the contractor.

Any refund of security deposit shall be made only with the recommendation of the Chief Engineer.

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During the progress of work, contractor shall submit the claims giving complete details of work done, rate and value to the Engineer-in-charge, nominated by Chief Engineer who shall certify the rate and quantity as per the MB and prepare a statement showing the description and quantity for which he recommends payment. These claims are called RAR bills and RAR payments are made once in a calendar month or more depending upon the periodicity of contract/progress of work.

Where the RAR payment is based on the measurements recorded in the MB, the recommendation for payment shall be stage-wise co-related with the bill of quantities.

Due to technical reasons, where pro-rata payments on stage-wise progress of work is considered necessary though not specified in the contract, the Chief Engineer with the approval of competent authority, shall decide the number/type of stages correlating with the bill of quantities and submit a statement showing the stage-wise break-up of the contract value indicating work progress details including percentage of completion, cost, and remarks, if any, of the Engineer-in-charge with a copy to Accounts in the respective Division for regulating the quantity and payment. This shall form the basis for the Engineer-in-charge to prepare a bill for actual progress of work. The basis as decided above shall uniformly be adopted for regulating all RAR payments till the final bill is submitted.

However, in respect of hidden works, recording of measurements in MB shall invariably be made then and there and the MB produced to Accounts at the time of RAR payment.

RAR bills shall be paid within a fortnight's time from the date of receipt based on the certification of the Engineer-in-charge and after necessary check/verification.

The contractor shall also be paid 'Material Advance' for the material brought to site for incorporation in the work duly certified by the Engineer-in-charge. For such materials brought inside by the contractor, the contractor has to produce necessary test certificates from reputed Testing Laboratories for steel and hypothecation deed duly executed by the contractor in favour of the Company on a non-judicial stamp paper of requisite value.

Payment of 'Material Advance' shall be recommended by the Engineer-in-charge for materials required to be used in the works as per the planned progress of work. However, payment of material advance against materials brought to site by the contractor ahead of scheduled progress of work shall be considered not exceeding 75% of the value of such material in exceptional cases with the approval of Competent Authority, with justification recorded in writing.

RAR payments shall be regulated to the extent of the value of work done, with due adjustments for recoveries and other payments (including material advance/adhoc payments made if any) effected so far against the contract.

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1. 50% of the rate quoted for the bought out items will be paid after receipt and acceptance of items at the site along with all necessary quality records like inspection reports, test certificate, circuit drawings (wherever applicable).
2. 25% of the rate quoted for the bought out items or 75% of rate quoted for service will be paid after satisfactory installation/ completion of service duly certified by the Engineer in charge and Consultant.
3. For Electrical works : 15% of the rate quoted will be paid after complete installation, connection, testing, commissioning of total electrification work & obtaining Necessary certification by inspection agency and duly certified as satisfactorily completed in all respects by the Engineer in charge and Consultant.
4. For other works : 15% of the rate quoted will be paid after complete installation, connection, testing and commissioning of all items in particular category of items like Mechanical, Telephone & Data network , Plumbing etc and duly certified as satisfactorily completed in all respects by the Engineer in charge and Consultant.
5. Balance 10% of amount will be released after satisfactory completion of all works duly approved by the Engineer in charge and Consultant in final bill.

29. PRE FINAL RARs

Pre-final RAR is raised only when the work is completed and the complete measurement is recorded in the MBs by the Engineer-in-charge designated by Chief Engineer duly accepted by the contractor.

Pre-final RAR shall be sent to the Accounts Department by the Engineer-in-charge Only after Technical check of the measurements and endorsement in the MBs by the Chief Engineer.

The Engineer-in-charge, shall recommend for payment not exceeding 90% of the value of work completed with due adjustments for recoveries and RAR payments (including Material advance if any) effected so far against the contract.

Such bills shall be paid within 2 weeks from the date of their receipt in the Finance Department after scrutiny and check for the correctness of the bill duly linking up with the MBs.

The recommendation of Pre-final RAR is based on the discretion of the Chief Engineer on case to case basis.

30. ADHOC PAYMENTS:

If payment for final bill could not be arranged within 5 months from the date of the completion of the contract for genuine reasons other than undue delay in submitting the final bill by the contractor, an Adhoc payment not exceeding 90% of the value of the work

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done after making all necessary deductions for statutory dues, RAR payments, Material advances if any paid, shall be recommended by the Chief Engineer with the approval of respective Complex chief/ respective Business Group Director. Such Adhoc payment can be recommended only if the contractor is having concurrent running contracts in the Complex.

The following guide-lines shall be adopted while making such adhoc payment;

- a) Such payment shall not exceed 90% of the final bill value.
- b) All conditions of contract and recoveries to be effected shall be taken care before effecting Adhoc payment.
- c) If a contractor has no other contract concurrently running in the Complex, adhoc payment need not be made. Instead, final bill shall be expedited and paid atleast within six months from the date of completion of the contract.

31. COMPLETION CERTIFICATE:

As soon as the Contractor completes the work assigned to him the same shall be inspected and if found satisfactory shall be taken over by the Chief Engineer. A "Completion Certificate" shall be issued to the contractor within 30 days from the date the contractor has given request for the same. If there are minor defects which can be rectified even after the building has been taken over, the defects shall be listed out and the contractor shall be asked to rectify the same before the final bill is submitted. The final bill along with the completion certificate duly certified by the Engineer in charge, shall be submitted to Finance Department for payment. The completion certificate shall have the following details:

- a) Particulars of the work and Contract Number,
- b) The date of work order to commence the work,
- c) Date of completion as per original contract agreement,
- d) Actual work done value.
- e) Extension of time if any, granted,
- f) Date on which contractor was required to complete the work,
- g) Actual date of completion and taking over by BEML.

32. FINAL BILL:

On completion of the work and the recording of measurements in the MBs, a final bill shall be submitted by the contractor. On receipt of the final bill duly signed by the contractor, the same shall be scrutinized by the Engineer-in-charge to see that the claim is in order.

The final bill prepared by the Department and accepted by the contractor, shall be accompanied with the following documents:

- Original Completion certificate
- No claim certificate duly signed by the contractor

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- Original Contractor's All Risk Insurance Policy covering up to the actual date of completion of work.
- Contract Agreement
- Revised estimate as duly approved by Competent Authority.
- ESI & PF statement duly co-ordinated by Welfare Section.
- Measurement books duly technically checked by Engineer in charge.
- Any other documents which are specified by the Management from time to time.

The Engineer-in-charge has to certify in the work Completion certificate as well as in the Measurement Book, that the work is executed in conformity with the contract specification, drawings and other conditions. The final bill duly checked and co-ordinated by the Engineer-in-charge shall be sent to the Finance Department through Chief Engineer along with the documents stated above.

33. DEFECT LIABILITY PERIOD:

The period of maintenance for the subject work shall be **ONE YEAR**. During this period, the contractor shall be responsible to rectify all the defects noticed and attributable to the work done by him in respect of works executed by him. As soon as any defect in the work come to the notice, the Chief Engineer shall inform the contractor, in writing, to rectify the defect and inform him that in case he fails to do so within a reasonable time, the Company would rectify the defects at his risk and expense as per the conditions of the contract.

If the contractor does not attend to the rectifications in-spite of repeated requests, the Company shall proceed at his risk and expense and get the work completed. The cost incurred by the Company shall be recovered from the defaulting contractor. The Company shall forfeit the balance 50% of the Security Deposit retained and adjust this amount against the expenses so incurred. The balance amount, if any, after recovering the expenses incurred shall be refunded to the contractor. In case the amount available is insufficient to cover the expenses in full, that portion of the expenditure still remaining unadjusted shall be recovered from any of the subsequent bills due for payment to the contractor against any other contract.

Even after such adjustments, the amount available is insufficient to cover the expenses in full, the Company reserves the right to take legal course of action to recover such unadjusted amount.

34. CONTRACTORS LIABILITY AND INSURANCE:

From commencement to completion of the works, the contractor shall take full responsibility taking precautions to prevent loss or damage. He shall be liable for any damage or loss that shall happen to the works or any part thereof.

In addition, the contractor shall indemnify and keep the Company indemnified against all losses and claims for injuries or damages to any person or any property whatsoever which

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shall arise out of or in consequence of the construction works. For this purpose, the contractor shall take an insurance policy-"**Contractors All Risks Insurance**"- to cover the risks, as per the Conditions of the Contract. The insurance policy has to be kept valid till the work is completed and the possession handed over to the Company. The policy shall be taken at his cost showing the Company as the 'principal' to simplify the work in the matter of raising claims and settlement thereof.

35. HANDING OVER THE WORKS ON COMPLETION:

On satisfactory completion of all the works as per the provision of the Contract, the Contractor shall hand over the works to the BEML. The Contractor shall ensure that all the testing commissioning & trial run operation of all the system are simultaneously carried out so as to make the same functional immediately on completion.

Contractor has to submit the test reports, manufacturer manual, and referred IS code /MES specification for inspection of material.

36. The measurement for payment of said works as per the contract will be paid as per the standards mentioned in IS 1200.

THE various provisions in this special condition shall be deemed to take precedence over those in General conditions/specifications to the extent applicable.

Special Condition as stated in Clause 1 to 36 are fully read and are acceptable to me/us.

DATE:

SIGNATURE OF THE CONTRACTOR 'S

Bid invitation No: 6300038764**Closing Date: 22/03/2024****06.SAFETY CONDITIONS****1. General:**

The Contractor shall take all safety precautions / measures and ensure safety for the works, he has been contracted to execute. He shall follow all relevant safety codes of BEML/MES/CPWD and IS codes and safety manuals. The Contractor shall indemnify BEML from any consequences arising due to Contractor's failure in respect of safety measures. Some of the more important measures are listed below. The Contractor shall implement any further measures which may be required as per the safety codes of BEML /MES/CPWD/ IS codes etc. and the measures which the Engineer may call for during the execution of the work.

2. Scaffolding:

Suitable scaffolds shall be provided for workmen for all work that cannot safely be done from the ground, or from solid construction except such short period work as can be done safely from ladders. When a ladder is used an extra labourer shall be engaged for holding the ladder and suitable footholds and handholds shall be provided on the ladder and the ladder shall be given an inclination not steeper than 1/4 to 1 (1/4 horizontal and 1 vertical).

3. Guard Railing in Scaffolding / Staging / Platforms:

Scaffolding or staging more than 3.25 meters above the ground floor or floor swung or suspended from an overhead support or erected with stationary support, shall have a guard rail properly attached, bolted, braced and otherwise secured at least 1 meter high above the floor or platform of such scaffolding or staging and extending along the entire length of the outside and ends thereof with only such openings as may be so fastened as to prevent it from swaying from the building or structures.

4. Working Platform / Gangway / Stairway:

Working platform, gangways and stairways shall be so constructed that they do not sag unduly or unequally, and if height of a platform or gangway or stairways is more than 3.25 meters above ground level or floor level, it shall be closely boarded, have adequate width and be suitably fenced provided with guard rail as described in 2 above.

5. Access to working platforms and other working places:

Safe means of access shall be provided to all working platforms and other working places. Every ladder shall be securely fixed. No portable single ladder shall be over 5 meters in length. Width between side rails in a rung ladder shall in no case be less than 30 cm. for ladders upto and including 3 meters in length. For longer ladders this width shall be increased at least 6 mm. for each additional 30 cm. of length. Uniform step spacing shall not exceed 30 cm.

6. Hoisting Machines:

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Use of hoisting machines and tackle including their attachments, anchorage and supports shall conform to the following:

Those shall be of good mechanical construction, sound material and adequate strength and free from patent defects and shall be kept in good repair and in good working order. Every rope used in hoisting or lowering materials or as a means or suspensions shall be of durable quality and adequate strength, and free from patent defects.

Every crane driver or hoisting appliance operator shall be properly qualified and no person under the age of 21 shall be in charge of any hoisting machine including any scaffold winch or give signals to operator.

In case of every hoisting machine and of every chain ring hook, shackle swivel and pulley block used in hoisting or lowering or as means of suspension, safe working load shall be ascertained by adequate means. Every hoisting machine and all gear referred to above shall be plainly marked with safe working load. In case of hoisting machine having a variable safe working load, each safe working load and the condition under which it is applicable shall be clearly displayed on the machine prominently. No part of any machine or of any gear referred to above in this paragraph shall be loaded beyond safe working load except for the purpose of the testing.

Motors gearing, transmission, electric wiring and other dangerous parts of hoisting appliances shall be provided with efficient safeguards; hoisting appliances shall be provided with such means as will reduce to the minimum, risk of accidental descent of load. Adequate precautions shall be taken to reduce to the minimum risk of any part of a suspended load becoming accidentally displaced. When workers are employed on electrical installations which are already energized, insulating mats, working apparel such as gloves, sleeves and boots, as may be necessary shall be provided. Workers shall not wear any rings, watches and carry keys or other materials which are good conductors of electricity.

Load tests: All cranes, hoisting machines etc. shall be load tested. Contractor shall submit test certificate from competent, authorized person before use.

7. Demolition works:

Before any demolition work is commenced and also during the process of the work:

- a. All roads and open areas adjacent to the work site shall either be closed or suitably protected.
- b. No electric cable or apparatus which is liable to be a source of danger over a cable or apparatus used by Contractor shall remain electrically charged.
- c. All practical steps shall be taken to prevent danger to persons employed, from risk or fire or explosion, or flooding. No floor, roof, or other part of a building shall be so overloaded with debris or materials as to render it unsafe.
- d. All blasting materials shall be stored and handled as per guidelines of relevant authorities.

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- i. Contractor shall erect and maintain barricades required in connection with his operation to guard or protect:
 - a. Excavation / Hoisting / Lifting areas
 - b. Slab Openings
 - c. Areas adjudged hazardous by Contractor's or Engineer's Inspection.
 - d. Existing property subject to damage by Contractor's operations.
- ii. Contractor's employees and those of his sub-Contractors shall become acquainted with BEML / Engineer's barricading practice and shall respect the provisions thereof.

9. Net & Protective Platform:

The Contractor shall provide and maintain a closely knitted PVC net all-round tall buildings throughout the construction period. This shall be strictly followed and work shall be permitted only when complied to satisfaction of the Engineer. If the above are not fully taken care of the Engineer reserves the right to get the same carried out through other agency at the risk and cost of the Contractor.

10. Prevention of Fire and Protection :

All combustible waste materials, wood scaling, soiled rags, etc. should be removed daily and burned in suitable areas.

Fire, welding, and flame cutting should not be permitted in combustible areas. Fires and open flame devices should not be left unattended.

Smoking should be prohibited in all flammable material storages, viz. carpentry, paint shops, garages, service stations, etc. "No Smoking" signs should be posted on all such areas.

Accumulation of flammable liquids on floor, walks, etc, should be prohibited. All spills of flammable liquids should be cleaned up immediately.

Flammable liquids, lubricants, etc. should be handled and transported in safety containers and drums which can be kept tightly capped.

Petrol or other flammable liquids with a flash point below 100 Deg F should not be used for cleaning purposes.

Oxygen cylinders should not be stored with combustible materials.

All electric installations should be properly earthed. Repairs should not be made on electrical circuits until the circuit has been de-energized.

Fire extinguishers and fire buckets, painted red, should be provided at all fire hazardous locations. Extinguishers should be inspected, serviced and maintained in accordance with manufacturer's instructions. The inspections should be evidenced by the notations on the tag attached to the extinguisher.

Handling of Hazardous materials shall be as per statutory regulation.

11. Electrical Equipment:

All temporary and permanent electrical installations, power distribution and supply required for execution of Work shall be carried out conforming to existing industrial and domestic safety rules and regulations. Important specific points to be noted are as under:

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Meter room and main switches should be freely accessible at all times and fully protected against all weathers.

Power distribution system shall be identifiable with display marking on switches.

All power distribution shall be carried out with coated, adequately, insulated and of appropriate current / load rating cables. It shall be securely routed for this purpose. No loose, naked, hanging wires shall be permitted.

Over load protection devices shall be installed whenever and wherever heavy current / load consuming construction or plant machinery susceptible to hazard is in use and as directed by the Engineer.

Metallic plugs and sockets shall be used in field work. Switch board shall be in close proximity so as to have quick control over the supply

Proper and adequate earthing connection to be provided for all installation, plant machinery and distribution system.

Hand lamps and inspection lamps shall be adequately insulated and guarded with wire mesh and will have proper plugs for use.

Security and illuminatory light shall be secured firmly and protected to withstand all weather.

12. Protective equipment / gears:

All necessary personal protective equipment as considered adequate by the BEML and the Engineer shall be available for use of the persons employed on the site and maintained in a condition suitable for immediate use; and the Contractor shall take adequate steps to ensure proper use of equipment by those concerned.

Workers employed on mixing cement concrete shall be provided with protective footwear and protective goggles, hand gloves of polythene type.

Those engaged in handling any material which is injurious to eyes shall be provided with protective goggles.

Those engaged in welding works shall be provided with welder's protective eye-shields.

The following safety equipment should be provided to workers as required and their use enforced. Rubber boots; hard toe protective safety boots; hard hats & helmets, safety belts; goggles for stone/concrete cutters., gas welding aprons, respirator shields, manila ropes and slings for life lines, gloves, flash lights, battery lamps, safety nets, boatswains chairs, helmets, life and ring buoys.

Items of personal wear should be maintained in serviceable condition and should before being reissued to other employees or returned to stores to be cleaned, sterilized, inspected and repaired, if necessary.

Loose and frayed clothing, hand rings, loose watch chains, etc. should not be worn around moving machinery or other sources of entanglement.

13. Other Safety Measures:

Every receptacle used for raising or lowering stones, bricks, tiles, slates, or other subjects should be enclosed, constructed or designed so as to prevent the accidental fall of such objects.

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All gears, tools, goods or loose material should be properly loaded into the bucket or receptacle in which they are being raised or lowered. If necessary, they should be properly secured or effective precautions should be taken to prevent their fall.

No timber or materials with projecting nails should be used in any work because they can be a source of danger to people.

Adequate precautions shall be taken to prevent danger from electrical equipment. No materials on any of the sites shall be so stacked or placed as to cause danger or inconvenience to any person or the public. The Contractor shall provide all necessary fencing and lights to protect public accidents and shall be bound to bear expenses of defence of every suit, action or other proceeding at law that may be brought by any person for injury sustained owing to neglects of the above precautions and to pay any damages and costs which may be awarded in any such suit, action or proceedings to any such person or which may with the consent of the Contractor be paid to compromise any claim by any such person.

14. First Aid and Industrial Injuries:

i. Contractor shall maintain first aid facilities for his workmen. First aid appliance including an adequate supply of sterilised dressings and sterilised cotton wool should be maintained in a readily accessible place. Appliances should be kept in good order and they should be placed under the charge of a responsible person who should be readily available during the working hours.

ii. Contractor shall make adequate arrangements for ambulance service and for treatment of injuries. Names of those providing these services shall be furnished to BEML prior to start of constructions and their telephone numbers shall be prominently posted in Contractor's field office.

iii. All critical industrial injuries shall be reported promptly to the ENGINEER - IN - CHARGE and a copy of Contractor's report covering each personnel injury requiring the attention of a physician shall be furnished to BEML.

15. Maintenance:

All scaffolds, ladders and other safety devices mentioned or described herein shall be maintained in a safe condition and no scaffold, ladder or equipment shall be altered or removed while it is in use. Adequate washing facilities shall be provided at or near places of work.

16. Enforcement:

To ensure effective enforcement of the rules and regulations relative to safety precautions, arrangements made by the Contractor shall be open to inspection by the Engineer or his representatives and the Inspecting Officers.

17. Displays:

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These safety provisions shall be brought to the notice of all concerned by display on a notice board at prominent places at the work spot. Persons responsible for ensuring compliance with the Safety Code shall be named therein by the Contractor.

18 Work permits:

Contractor shall take work permits from concerned departments of BEML as per requirements before commencement of the work everyday.

The contractor shall at his own cost and responsibilities follow all the safety rules and regulations and safety codes such as:

IS codes (Latest Revisions)	As applicable to the relevant work
3696 1987	Safety code for scaffolds and ladders.
4014 (part 2) -1986	Safety regulations for steel tubular scaffolding
3764 1966	Safety code for excavation work.
4081 1986	Safety code for blasting and related drilling operation.
4130 1976	Safety code of demolition of building.
4138-1977	Safety code for working in compressed air
4912-1978	Safety requirements for floor and wall openings, railings and toe board
7969-1975	Safety code for handling and storage of building materials
13415-1992	Safety code for protective barriers in and around the building
13416-(part 2) - 1992	Recommendations for preventive measures against hazards at workplace- fall prevention
5916 1970	Safety code for construction involving use of hot bituminous material.
7293 1974	Safety code for working with construction machinery.
8989 1978	Safety code for erection of concrete framed structure.
7205 – 1973	Safety code for Erection of Structural steel works

Safety Conditions as stated in Clause 1 to 18 are fully read and are acceptable to me/us.

DATE:

SIGNATURE OF THE CONTRACTOR 'S

Bid invitation No: 6300038764**Closing Date: 22/03/2024****07. SCOPE OF WORK & OTHER TERMS & CONDITION:**

1. The Contractor shall carry out all Mechanical, Electrical, Telephone & Data networking, Plumbing & Firefighting works as per the Drawing, Technical Specification, and BOQ. The contractor shall use materials as per the List of approved materials. Bill of Quantities enclosed in **Annexure-A** & Drawings enclosed in **Annexure-B**.
2. Measurement records for the work carried out will be prepared jointly by the Contractor & Engineer in Charge and payment will be made only for the actual quantity of work executed as per the measurement record. The measurement record shall be concurred by the Consultant.
3. The contractor has to work in close co-ordination with BEML, Consultants, Other contractors like EOT crane, Civil & PEB & Interior works for carrying out the work for timely completion of project.
4. All necessary approvals, sanctions, permits, licenses related to the work of the tender from Govt./ Boards/Local Bodies/ Statutory Bodies and any other agency as required time to time are to be complied with. The necessary help shall be provided by the Consultants and BEML for the same. However the primary responsibility of obtaining the above or any other approval shall be with the contractor/tenderer.
5. The contractor shall offer the pre-delivery inspection of materials at manufacturers work to the Engineer-in-charge. The intimation for such inspections shall be given at least 15 days in advance from the date of proposed inspection.

6. APPLICATION FOR ELECTRIC SUPPLY & / LIASON

The Contractor shall be responsible for filing and follow up application for obtaining CEA approval and any other NOC from Electrical Safety Inspector of the State/Central to the project. The contractor shall carry out all the liaison work required for obtaining energization approval for site, CEA approval and other NOC from Electrical Safety Inspector commencing from filing of application form till approval.

7. INSPECTION & APPROVAL OF THE WORK BY LOCAL AUTHORITY

The contractor has to obtain, if required, all clearances & approvals from any statutory authority/local bodies pertaining to whole Installation work. The contractor shall obtain all information relating to local regulations, by laws, applicable if any and all laws related to his work or profession and his having to execute work as required. Contractor shall obtain approval of the installation from the relevant inspection authorities at all stages and on completion of the installation work if any. Any fee payable to the statutory authority for obtaining approvals is required to be paid by the contractor. However the necessary reimbursement of the fee deposited by the contractor to any statutory authority (as

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mentioned above) will be made on production/submission of the valid documentary proof/evidence.

8. TENDER DRAWINGS

The work shall be executed as per latest working drawings to be prepared by the contractor after award of work and submitted to the Consultants/Engineer-in-charge for approval. The Drawings & data provided are for guidance to the contractor. The exact dimensions, location, distance & levels etc shall be governed by the site conditions. The tender drawings are indicative and are for the guidance of the contractor.

9. SHOP DRAWINGS

On the award of the work, the Contractor shall immediately proceed with the preparation of detailed working drawings showing the detail of each equipment that are to be installed and the ancillary works that are to be carried out. All the works are deemed to be included in various items of bill of quantities as applicable.

The Bidder shall make their independent check for selection of equipments etc. The drawings appended with the tender documents are intended to show the space allotted for various equipment, bus duct, cable routes etc. besides general electrical layout. The equipment offered shall be suitable for installation in the spaces shown in these drawings / available at site. The contractor shall prepare and submit to consultants/Engineer-in-charge for approval of detailed shop/working drawings of all works on award of the work. All the drawings shall be received by the Consultants/ Engineer-in-charge for approval within 7 days from the date of award of work.

The approval of the drawings by the Consultants / Engineer-in-charge shall in no way relieve the Contractor from his obligations to provide a complete and satisfactory installation, testing and commissioning as per intent and purpose as laid down in the specifications.

The contractor shall also take parallel action (after award of work) for submission of applications along with the drawings, documents & details etc. to various Statutory Bodies/Authorities for obtaining their approval/clearances. The contractor shall re-submit all the drawings to the Engineer-in-charge/Consultants within 5 days from date of receiving comments if any from the Engineer-in-charge/Consultants after incorporating the comments.

Shop drawings like Electrical panel, cable layout, Earthing drawings, Lightning arrestor, plumbing, compressor, water pipe line , fire hydrant drawing etc shall be prepared by the contractor.

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In the case of Discrepancies between the schedules of quantity, the specifications and/ or the Drawings, the following order of preference shall be followed.

- a. Description of schedule of quantities/BOQ.
- b. Technical Specifications and Special Conditions, if any.
- c. Drawings.
- d. MES Specifications.
- e. Indian standard Specifications of BIS.

11. ATTENTION NOTE:

1. Contractor shall follow general, rules, regulations and disciplinary instructions of BEML. The employees of the firm shall obtain necessary pass from Maintenance/ Security department by following BEML rules before commencement of work.
2. All the items supplied/ brought by the firm shall be entered in BEML main security gate by producing proper delivery challans/ documents as per the rules of BEML. The items shall be kept inside the factory in a place identified by BEML only during the course of work. The firm shall make his own arrangement for safe custody of his items and the firm will be the custodian of items brought by him. BEML is not responsible for any loss/ damage to firm's items.
3. The loading/ unloading of the materials for the work at site is under the scope of the firm and shall carry out without affecting the man and material movement of BEML.
4. From commencement to completion of the work the firm shall take full responsibility, taking precautions to prevent loss or damage to BEML property at related work site. The firm shall be liable for any damage or loss that may occur during the progress of work. It is the responsibility of the firm to make correction/ rectification/ providing new one of damaged property etc whichever is required as per the site condition, failing which the BEML will withheld the equivalent amount incurred for correction/ rectification/ providing new one from the bill of firm.
5. The firm shall make its own arrangement for boarding & lodging for their employees. The employees of the firm can avail the canteen facility if required during the working hours on actual chargeable basis as per the BEML rules subjected to availability and prior intimation.
6. The firm has to carry out the work in concurrence with BEML and complete the work to the satisfaction of BEML. Work has to be carried out without disturbing the working atmosphere. No inconvenience should be caused to BEML in all respect

Bid invitation No: 6300038764**Closing Date: 22/03/2024****8.0 TECHNICAL SPECIFICATIONS****A TECHNICAL SPECIFICATIONS FOR ELECTRIFICATION WORK****A.1. TECHNICAL SPECIFICATION FOR LT SWITCHBOARDS****A.1.1 SCOPE**

This specification covers the technical requirements for Design, Engineering, Manufacture, testing at manufacture works of 433 V LV Panel complete with all accessories for efficient and trouble-free operation.

A.1.2 STANDARDS

The equipment covered by this specification shall, unless otherwise stated, be designed, constructed and tested in accordance with the latest revisions of relevant Indian Standards and shall conform to the regulations of Local Statutory Authorities.

IS:722	A.C. electricity meters
IS:732	Code of practice for Electrical wiring installation.
IS:375	Marking and arrangement for switchgear busbar main connections and auxiliary wiring.
IS:1248	Direct acting electrical indicating instruments.
IS:13947	LV Switchgear and Control Gear.
IS:2705	Current Transformers.
IS:2824	Method for determining the comparative tracking index of solid insulating materials under moist 'conditions.
IS:3156	Voltage transformers
IS:3231	Electrical relays for power system protection.
IS:3618	Phosphate treatment of iron and steel for protection against corrosion
IS:5082	Material data for aluminum bus bars.
IS:5578	Guide for marking of insulated conductor.
IS:6005	Code of practice of Phosphating of iron and steel.
IS:8623	Specification for factory Built assemblies for Voltages upto1000V A.C. and 1200V D.C.
IS:4237	General requirement of switchgear and control gear for voltage not exceeding 1000V
IS:2959	AC Contactors for voltage not exceeding 1000V.
BS:162	Specification for Electric Power Switchgear and Associated apparatus.
IS:2834	Capacitors
IS:1353	Guide for uniform system marking and identification of conductors and apparatus terminals.
IS: 13703	Low voltage fuses.
IS: 13947	LV Switchgear and control gear

Bid invitation No: 6300038764**Closing Date: 22/03/2024****A.1.3 CONSTRUCTION****A.1.3.1 General**

The panel shall be factory-built assembly, metal-enclosed, free standing, compartmentalized, modular type Main panel (form 4B) and Sub Panels (Form 4A) suitable for indoor installation. The panel shall be dust and vermin proof and the enclosure shall provide a degree of protection of not less than IP-42/44. The panel shall be of uniform height not exceeding 2200mm. The fabrication shall be rigid, robust, flaw less and shall have a smooth finish.

The board shall be fabricated out of sheet steel of not less than 2.0mm thickness. The internal partition shall be 1.6mm thick.

The panel shall be extendable on either side by the addition of a module. It shall be possible to extend the switch board irrespective of the type of end panel. The busbars shall be suitably drilled for future extension.

Incomers and outgoing feeders shall be provided with their own separate modules having separate doors, isolating switch of each unit shall be mechanically interlocked with its respective doors. Knob type screws shall be provided for securing the doors.

The Number of Modules in one vertical panel shall not exceed six.

All doors shall be provided with concealed hinges. All identical cover plates shall be interchangeable. The rear cover shall be Bolted type. No Hinged Door is acceptable.

Each cable chamber shall have cable entry from top / bottom and suitable removable Aluminium gland plates shall be provided for this purpose. The cable chamber shall be provided with suitable supporting arrangement between the gland plate and terminals, in the middle.

All feeder terminals shall be segregated fully and efficiently, using SMC / DMC / FRP Shroudes such that it shall be possible to work on one set of terminals when the other feeders are live.

Due consideration shall be given to the following during design of the Switchgear Panel and locating the various components viz. Circuit Breakers, Instruments & Relays, Busbar and secondary wiring.

- a. Facility for inspection, maintenance & repair
- b. Minimum vibration and Noise
- c. Risk of accidental short circuit, open circuit and damage to personnel due to accidental contact with live parts.
- d. Inter changeability of Components
- e. Secure and vibration proof connection for power and control circuit
- f. Shrouding of all live parts in feeder component and cable chamber.

All retaining catches, screws and bolts for doors and covers shall be zinc passivated. Screws and bolts shall be captive. All covers, doors and joints shall be gasketed.

Equipment to be mounted outside cubicles shall be flush mounted on cubicle door. No externally mounted equipment shall be mounted above 1.9m or below 0.4m from floor

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level. The panel shall be fabricated in suitable transport sections and assembled on rolled steel channel box frames, to form a continuous flush fronted switchboard.

All components like ACB/MCCB/ Contactor shall be of same make & shall be suitably rated to achieve type - 2 co-ordination.

Main Distribution Board shall be provided with Voltage Surge Devices and current related arc protection devices.

A.1.4 BUSBARS

The busbars shall be air insulated and made up of high conductivity, electrolytic Aluminium.

All busbars shall be fully screened by means of PVC sleeves in their own compartment running throughout the length of the panel both vertical as well as horizontal and also suitable allowance shall be made for bus expansion. Suitable segregation shall be provided in between busbar chamber and adjoining compartments.

The busbars shall be 0.7 Amps per Sq mm. of TPN with Neutral Bus being half the size of phase busbar.

The busbar shall be PVC sleeved with colour strips of red, yellow, blue and black and the same shall be arranged in accordance with IS-375.

The busbar shall be properly segregated, suitably braced with insulated supports (SMC) placed at appropriate intervals to withstand the electromagnetic stresses during short circuit.

Minimum electrical clearances shall be maintained between phase, neutral and body as per standards.

The insulation used shall be non - hygroscopic and shall be treated for preventing fungus growth. The main incoming busbars shall be brought up to the top rear busduct flange and shall be provided with necessary drilled holes for fixing the fish plates for connection to the busbars of the busduct.

A.1.5 INTERCONNECTION

The interconnections of all the phases between the busbars and the incoming side of the switch control shall be inaccessible when the doors of the controls are opened.

For each and every tapping from the busbars, separate connections shall be made.

No direct tappings from the busbar shall be made for any feeder without control and protection. All interconnections shall be by rigid busbars only.

Wherever lugs are used for terminations of rigid busbars, it shall be soldered and not crimped.

A.1.6 AIR CIRCUIT BREAKERS**General**

Air circuit breakers shall be of 3 /4 pole. They shall be complete in all respects having the following minimum requirements and with microprocessor control

- Motorized spring assisted closing mechanism
- Full draw out type with indication for service, test and isolated positions

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- Trip Free mechanism
- Mechanical open, closed and spring charged indication
- Magnetic blow out arc control device
- Facilities for pad locking
- 3Nos. indicating lamps for ON / OFF and Breaker 'Auto Trip' indication
- Microprocessor based Protection for S/C, O/C, E/F faults with RS 485 ports for communication and remote control.

A.1.7 CONSTRUCTION

The breaker shall be designed, manufactured as per IS : 13947. The Circuit breaker shall be fully draw out type. Suitable guides shall be provided to facilitate easy with drawl of the trolley The breaker shall be self-ventilated and shall be mounted on the fixed portion of the compartment .All current carrying contacts of the breaker shall be silver plated. Contact subjected to arcing shall be tipped with suitable arc resisting material. Mechanical wear indicator be provided to facilitate inspection of main contacts. The contacts shall be self-aligning, plug in type, designed to ensure adequate contact pressure on the main busbars and requiring minimum maintenance.

A.1.8 OPERATING MECHANISM

The breaker mechanism shall be 230V AC Motor charged spring operated type. Tripping and closing shall be effected by means of DC coils. The operating mechanism shall be trip free. Failure of spring, vibration or shocks shall not cause unintended operation of breaker or prevent intended tripping operation. Closing of breakers shall be prevented unless the spring is fully charged. Under voltage coil shall not be used for Tripping the Circuit Breaker.

A.1.9 INTERLOCKS

The breaker shall be provided with all necessary interlocks to prevent inadvertent operations and to ensure safety of operating personnel and also the equipment.

It shall not be possible to push in a drawn-out breaker in closed condition or withdraw a breaker in closed condition. Compartment doors shall be interlocked against opening when breaker is in closed condition. It shall not be possible to operate the breaker is in 'Closed' condition. It shall not be possible to operate the breaker in intermediate position while inserting or withdrawing a circuit breaker.

INTERLOCK LOGIC SYSTEM

Two Lock One Key System (For Mechanical)

A.1.10 MOULDED CASE CIRCUIT BREAKER

The MCCB shall conform to IS:13947 / IEC947 in all respects. The MCCB shall comprise of switching mechanism, contact system, arc extinguishing device, all mounted in a moulded case, made of high strength heat resistant and flame-retardant thermosetting insulating material.

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MCCB shall employ quick make and quick break switching mechanism independent of the speed of operation of the operating handle. The operating mechanism shall be trip free. The operating handle shall indicate the position of the MCCB in ON / OFF / TRIPPED. The operating handle shall have provision for door interlock and padlocking.

The MCCB shall be provided with micro-Processor based relay suitable for short circuit and overload and earth fault protection.

The over load protection shall be field settable. MCCB shall be suitable for horizontal and vertical mounting and with line load reversibility. All MCCB shall be of current limiting type.

MCCB shall be provided with RS 485 ports for Communication.

MCCB in Main Panel shall be CAT B Type and Sub Panels shall be CAT A Type.

A.1.11 CONTACTORS

Contactors shall be of electromagnetic type rated for uninterrupted duty as defined in IS-13947 unless otherwise specified and also suitable for capacitor duty wherever required.

The main contacts shall be of silver or silver alloy.

The insulation class for the coil shall be class H.

Each Contactor shall be provided with 2 N/O and N/C aux. Contacts as spare.

Contactors coil rating shall be minimum pick up of 85% of rated voltage and minimum drop out of 75% rated voltage.

A.1.12 MEASURING INSTRUMENTS

Measuring instrument shall be of digital type, RS 485 Port with LED Display, they shall be capable of carrying the normal full load current (via CTs) and shall not be damaged by effects of rated fault current. The instruments shall have an accuracy class of 1.0 as per IS - 1248.

A.1.13 CONTROL WIRING

Panel shall be supplied with all internal wiring comprising of PVC insulated 1.1 KV grade, multistranded flexible copper conductor of 2.5sqmm wire shall be used for current element & 1.5sqmm wires shall be used for voltage elements.

Wiring associated with a particular phase shall be the colour of that phase viz. Red / Yellow, or Blue, wiring associated with earthing shall be with green colour insulation and for neutral it shall be with black colour insulation.

Wiring shall be neatly laid and run on insulated cleats of limited compression type insulated straps.

All cables shall have crimped terminations and shall be Identified by means of glossy plastic ferrules at both ends, showing the wire number as indicated in the schematic diagrams. The ferrules shall be indelibly marked.

Wiring to items mounted on hinged doors or wiring that is subject to movement, shall run in helical binding. The binding shall be securely anchored at both ends and sufficient slack provided to prevent any strain being imposed on wiring.

A.1.14 Routine Tests

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The Vendor shall offer the panel for inspection and the following routine test shall be conducted during the inspection.

1. Mechanical operation test
2. Dielectric tests
3. Physical check & dimension check megger test

A.1.15 DRAWINGS AND DOCUMENTS

The following drawings and documents shall be furnished.

- a. General Arrangement drawing of the panel showing.
 - i. Overall Dimensions (GA Drawing)
 - ii Terminal locations
 - iii. Total weight
 - iv Foundation details
 - v. Sectional view
 - vi. Bill of materials
- b. Single line diagram and wiring diagram.
- c. Technical details for Switchgear, lamps, meters etc.
- d. Manufacturing schedule and test schedule.
- e. Calculation for sizing of busbars.

A.1.16 TECHNICAL REQUIREMENTS FOR MAIN PANELS

- | | | | |
|-----|--|---|---------------------------------------|
| 1 | Application | : | Indoor |
| 2 | Type | : | Cubicle, Metal enclosed free standing |
| 3 | Degree of Protection | : | IP 42/44 |
| 4 | Rated Voltage | : | 433V |
| 5 | Design Ambient Temperature | : | 45°C |
| 6 | Temperature rise over an ambient temperature of 45°C | : | 40°C |
| 7 | Busbar | | |
| | a. Number Phase / Wires | : | 3 Phase, 4Wire |
| | b. Continuous Current | : | As specified |
| | c. Frequency | : | 50 Hz |
| | d. Fault Level | : | 50KA (As per BOQ) |
| | e. Material | : | Aluminium |
| 8 | Insulation Level | | |
| | a. Power Frequency withstand Voltage | : | 2.5KV |
| 9 | Painting | : | Epoxy Powder Coating |
| 10. | Control Voltage | : | 230V, AC, Single Phase, 50Hz |
| 11 | Reference Standard | : | IS 4237/ IS 13947 |

Bid invitation No: 6300038764**Closing Date: 22/03/2024****A.2 TECHNICAL SPECIFICATION FOR LT BUSDUCT (SANDWICH TYPE)****A.2.1 SCOPE**

This specification covers the Technical requirements of design, manufacture, test at manufacturer works, supply, Installation, Testing and Commissioning of LT Sandwich type Busduct. The scope also includes providing technical assistance during installation of Busduct.

A.2.2 STANDARDS

The equipment covered by this specification shall unless otherwise stated, be designed, constructed and tested in accordance with the latest revisions of relevant Indian / International Standards.

- IS : 8623 (Part II) - Particular Requirements for Bus Trunking System.
- IEC : 60529 - Degrees of protection provided by Enclosure.
- IEC : 60439 - 1 / 2 - Low Voltage Switchgear and Control gear Assemblies (Bus way)
- IEC 61439 – Part 1 & 6 : Busbar Trunking Systems (busways)

A.2.3 CONSTRUCTION

The Busduct shall comprise of suitably rated bus bars in sandwich configuration, enclosed in a GS/Al. Enclosure. The Enclosure shall be provided with necessary gas ketts/sealant to provide a dust and vermin proof Enclosure.

The construction of the Enclosure shall be rigid and robust and shall be treated to prevent any corrosion. The Enclosure shall act also as an integral ground.

The busbar shall be suitable for operation in a 415V / 600V / 1000V system, with impulse withstand voltage of 8kV & frequency of either 50 Hz. System shall be earthed.

A.2.3.1. Manufacturer:

The manufacturer must have an established track record in design and manufacture of sandwich busbar trunking system and must have supplied busbar systems for at least 20 years. The manufacturer must have ISO 9001, ISO14001, ISO18001 certification for design, manufacture and testing of busbar trunking system.

A.2.4 BUSBARS

The Busbar shall be made up of high conductivity Aluminum in sandwich configuration. The busbars shall have a continuous rating as mentioned in the particular requirement and shall have fault withstand capacity as specified.

Busbars shall be identified with red, yellow, blue, black and Green colour tape bands at appropriate places and at terminations / Joints.

Both ends of bus duct shall be provided with necessary copper flexible connector with appropriate termination chamber.

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The insulation of busbars shall be made from high voltage insulation by extrusion process to withstand class F (155°C) temperature.

The busbars shall be made of high conductivity Aluminum (99.99% IACS) / The busbar shall be made of high conductivity electrical grade Aluminum Purity of Aluminum conductor should not be less than 99.6%. The neutral bus should be maintained 50% cross section of the phase. Where an earth conductor is required, it shall be possible to provide integral earth conductor of the same high conductivity material as the phase conductors and at least of 50% cross section of the phase conductor. Provision for mounting external earth strip to be provided on both side of busduct if required.

A.2.5 JOINTS

All joints shall be maintenance free and shall employ single bolt operating system. It shall be possible to check the tightness of the joints without de-energising the Busduct system. It shall also be possible to remove one section of the Busduct in the system, without disturbing the adjacent sections.

A.2.6 EARTHING

The Enclosure of the Busduct shall have earth continuity and shall act as integral Earthing. To meet the local statutory regulations, 2Nos. 50 x 6 mm GI extend earth continuity strip tapes shall be run along the full length of the Busduct. Necessary cleats / clamps for fixing these copper tapes to the Enclosure shall also be provided.

A.2.7 .1 Type Tests

The Vendor shall furnish type test reports for the following tests conducted on similar equipment.

- Short time current test.
- Temperature rise test
- One minute power frequency voltage withstand test.

A.2.7.2 Routine Test and Inspection at Manufacturer's Works

Fully assembled Busduct shall be offered for inspection at works with prior intimation.

Following routine tests shall be conducted on the Busduct.

- Physical verification check
- Megger Test
- Power frequency with stand test
- Millivolt drop test on Rigid and expansion joints
- Temperature Rise Test
- Any other tests as stipulated by the relevant standards .The Vendor shall submit the following drawings / documents for Approval.

❖ GA Drawings for Busduct.

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- ❖ Routing Drawings.
- ❖ Support Arrangement.
- ❖ End Termination Box with copper flexible.
- ❖ Design Calculation for copper flexible.

A.2.8 TECHNICAL PARTICULARS

- | | | |
|--|---|----------------|
| 1. Service | : | Indoor |
| 2. Type | : | Sandwich |
| 3. Normal System Voltage KV rms | : | 415V |
| 4. Rated continuous current A | : | As Specified |
| 5. Frequency | : | 50 Hz |
| 6. System Earthing | : | Earthed |
| 7. No. of Phases | : | 3 Ph + Neutral |
| 8. Max. Temp. Rise over design ambient of 45 Def C | : | 40 Deg C |
| 9. Insulation levels | | |
| a. Power Frequency withstand voltage dry KV rms | : | 2.5 |
| 10. Busbar | | |
| a. Material | : | Aluminum |
| 11. Enclosure | | |
| a. Material | : | GS /AL |
| b. Degree of Protection | : | IP52 |
| 12. Bus Insulation | : | Class F |

A.3.LT CABLES - CROSS LINKED POLYETHYLENE POWER CABLES**A.3.1 SCOPE**

The section covers the supply, installation, storing, laying, fixing, jointing/termination, testing and commissioning of low voltage XLPE insulated armoured sheathed aluminium conductor cables laid in built up trenches, directly buried underground, on cable trays, clamped directly to wall or structures etc., as called for in the drawing. The contractor shall provide all materials, labour, equipment, scaffolding etc., as required for the completion of LV cables, as called for.

A.3.2 STANDARDS

The cables covered by the specification shall, unless otherwise stated, be designed, manufactured and tested in accordance with the latest revision of relevant India standard.
IS 3975 : Mild Steel Wires, strips and tapes for armouring of cables.

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IS: 8130	: Conductor for insulated electric cables and flexible cords.
IS 5831-84	: PVC Insulation and Sheath of Electric Cables
IS 7098	: Cross Linked Polythyethylene Insulated PVC sheathed
IS 1554-88	: PVC insulated (heavy duty) electric cables Part I for working voltages upto and including 1100V.
IS 3961-67	: Recommended current ratings for cables: (Part 2): PVC insulated and PVC sheathed heavy duty cables.

A.3.3 CONDUCTOR

The conductor shall be Aluminium / Copper as specified.

The conductor shall be smooth, uniform in quality and free from scale and other defects.

The Aluminium conductor for 10sq.mm and above (upto 6sq.mm copper cable or otherwise specified) shall be stranded and shall be clear and reasonably uniform in size and shape. The conductor shall be circular or Sector Shaped.

The stranded conductor shall be compacted to reduce dimension and to give smoother profile.

A.3.4 CONDUCTOR SCREEN

The conductor screen shall be semi conducting compound and shall be extruded in the same operation as the Insulation.

A.3.5 INSULATION

Insulation shall be cross-linked polyethylene and shall be gas cured for LT Cables.

A.3.6 INSULATION SCREEN

The semi conducting insulation shield shall be preferably be strippable and shall be triple extruded thermoset type.

A.3.7 CORE SCREENING

The low voltage 1.1K above cable, shall be provided with copper tape screen over cores to achieve full coverage. The number and thickness of tape shall be suitable for the short circuit rating of the cables.

A.3.8 INNER SHEATH

The inner sheath shall be extruded PVC Polypropylene filler shall be provided.

A.3.9 ARMOUR

Galvanized steel wire / strips armour shall be provided over the inner sheath for protection against mechanical damage.

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The armour coverage shall be more than 95% to achieve better mechanical protection and low armour resistance.

A.3.10 OUTER SHEATH

The outer sheath shall be extruded PVC and shall be resistant to termite and rodent attack. Progressive sequential marking, size marking, voltage grade name of manufacture at every one meter shall be made on the outer sheath.

A.3.11 TYPE AND QUALITY

Medium voltage cables shall be circular, multicore annealed copper or aluminium conductor, PVC insulated, PVC sheathed and steel wire armoured or steel tape armoured construction or unarmoured. The conductors of cable shall be stranded. Sector shaped stranded conductors shall be used for cables of 50 sq.mm size and above. The cables shall conform to IS:1554 part-I in all respects.

M.V power cables shall have 3, 3.5 or 4 cores, as required and shall have conductors made from electrical purity aluminium conductors conforming to IS : 8130 - 84.

Conductors shall be insulated with high quality PVC base compound. Insulation and outer sheathing compounds shall conform to IS 5831 - 84.

A common covering shall be applied over the laid-up cores by an extruded sheath of unvulcanized rubber compound. Armoring of galvanized round steel wires or galvanized flat steel strips shall be provided over the inner sheath. Outer sheath of PVC shall be extruded over the armoring. Cables shall be manufactured and tested in accordance with IS 1554.

Unless otherwise specified, all control cables shall be multicore, 1100V grade PVC insulated, armoured and overall PVC sheathed with stranded copper conductors of 2.5 sq.mm, conforming to IS 1554. Cores shall be identified by colour scheme of PVC insulation.

A.3.11.1 JOINTS IN CABLES:

The contractor shall take care to see that all the cables received at site are apportioned to various locations in such a manner as to ensure maximum utilisation and avoidance of straight cable jointing. This apportioning shall be got approved by the Construction Manager. Before the cables are cut to lengths.

Where straight joints in cable are unavoidable, the use and location of such straight joints shall be got approved by Construction Manager/Engineer-in-charge.

A.3.11.2 JOINTING BOXES FOR CABLES:

Cable joint boxes shall be of appropriate size, suitable for PVC insulated armoured cables of particular voltage rating.

A.3.11.3 JOINTING CABLES :

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All cable joints shall be made in suitable, approved cable joint boxes, jointing of cables in the joint boxes and the filling in of compound shall be done in accordance with manufacturer's instructions and in an approved manner. All straight joints shall be done in epoxy mould boxes with epoxy resin only of makes/types as indicated in the list of approved makes. All terminal leads of conductors shall be heavy soldered upto at least 50mm length.

All cables shall be joined colour to colour and tested for continuity and insulation resistance before jointing commences. The seals of cables shall not be removed until preparations for jointing are completed. Joints shall be finished on the same day as commenced and sufficient protection from the weather shall be arranged. The conductors shall be efficiently insulated with high voltage insulating tape and by using preaders of approved size and pattern. The joints shall be completely filled with epoxy compound and taped so as to ensure that the box is properly filled.

A.3.11.4 TERMINATION OF CABLES

Cable termination shall be done in terminal box or cable end box or distribution boards, or apparatus/ equipments. Terminations are to be made with mechanical and glands be tinned/nickel plated, anti-corrosive, three piece improved pattern which is to grip inner and outer PVC sheaths as well as the armour of the cable. The cable ends or the core conductor are to be connected by solder less lugs or sockets using crimping tool of approved make for all cables.

All terminations of cable conductors and base conductors shall be mechanically and electrically sound and shall comply with the requirements of IEE regulations.

The connectors or connecting sockets are to have such dimensions so as to limit temperature rise.

When required the water tightness of the terminal boxes may be obtained by filling with a compound preferably plastic flame-retarding and non-dripping type within the normal range of temperatures.

When the cable is cut during the course of installation the open ends are to be sealed immediately by means of self-adhesive non-hygroscopic tape over a wax water seal to make an air and watertight joint.

A.3.11.5 INSTALLATION OF CABLES

Cable shall be laid in a manner as indicated on the drawings. Generally cables are laid in the following manner.

- i. In the underground masonry trench.
- ii. On the cable tray/or on cable ladders.
- iii. Buried underground.
- iv. Through pipe sleeves.

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Various installation methods are discussed in the following paragraphs. Cables shall be laid by skilled and experienced workmen using adequate rollers to minimize stretching of the cable. The cable drums shall be placed on jacks before unwinding the cable. The cable drums shall be rotated in the direction as indicated by the manufacturer. Care shall be exercised in laying cables to avoid forming kinks. The drums shall be unrolled and cables run over wooden rollers, placed at intervals not exceeding two (2) meters.

All cables shall be adequately protected against any risk of mechanical damage to which they may be liable in normal conditions of service.

When cables pass through holes in metal work, precautions shall be taken to prevent abrasion of the cables on any sharp edges.

In every vertical cable ladder, channel, duct, trunking or cable trench containing cables and exceeding three meters in length, internal barriers shall be provided so as to prevent the air at the top of the unit from attaining an excessively high temperature. In every vertical cable shaft, cable trench or any passage of cable through wall, ceiling, floor barriers against spread of fire and smoke shall be provided for compliance with IEE regulations.

Where cable passes through walls, ceiling, floor, it shall run through sleeves of PVC pipes or hume pipes of adequate diameter. After pulling the cable through sleeves, both the ends of the sleeves shall be sealed water tight with fire-resistant material to prevent spread of fire and seepage of water.

Generally along each cable route either in trench or in cable trays/ladders or in pipe separate Two Nos. of earth strips/wires shall run exposed.

Where an installation comprises medium voltage cables as well as extra low voltage circuits, precaution shall be taken in accordance with IEE regulations and shall be physically separated by minimum of 300mm distance.

Metal sheaths and armour of all cables, metal conduits, ducts, trunking, and bare earth continuity conductors associated with such cables, which might otherwise come into fortuitous contact with other fixed metal work shall be effectively bonded there to earth so as to prevent appreciable potential difference at such possible points of contact.

If it is necessary to install cables in a situation where flammable and/or explosive dust, flammable volatile liquid/vapor/gas is likely to be present or where explosive materials are handled or stored, the cabling shall be as per IEE regulations.

A.3.11.6 FRP CABLE TRAYS

The FRP cable tray shall be antistatic and ultra violet resistant. FRP cable trays shall be manufactured in accordance with NEMA FG-1-1984 and ASTM E-84 standards/ IS-6746

A.3.12 TEMPERATURE RISE

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The maximum conductor temperature shall not exceed 50degree C during continuous operation at full rated current. The temperature after short circuit for 1.0 second shall not exceed 250 degree C with initial conductor temperature of 50 degree C.

Bidder shall give the following information in the Bid for each conductor cross section specified.

- a. Rated continuous current
- b. Rated 1.0 second current Rating factor shall be given by the Bidder for the following:
 - I. Variation in ground temperature
 - II. Variation in soil thermal resistivity
 - III. Variation of Ambient temperature
 - IV. For the cables laid side by side, at ID spacing and in Tier formation.

The Bidder shall also indicate the percentage overload that the cable can carry and its duration, when operating initially at a conductor temperature of 90 degree C, with final conductor temperature of 130 degree C.

A.3.13 CABLE DRUMS

Cables shall be supplied on non-returnable drums of sturdy construction as new in condition. All ferrous and other metal parts of drum shall be treated with a suitable rust preventive finish or coating to avoid rusting during transit or storage.

The length of cable on each drum shall be determined by manufacturer considering the transport limitations from manufacture's works to the site.

The marking done on the drum shall have the following information:

- a. Trade name, if any
- b. Name of the manufacturer
- c. Number of cores and nominal area of the conductor
- d. Type of the cable and voltage for which it is suitable
- e. Length of the cable on the drum
- f. Direction of rotation of drum (an arrow)

The outer ends of the cables shall be sealed by means of non-hygroscopic sealing materials.

A.3.14 ROUTINE TESTS (To be performed on each drum length)

These shall include, among others normally performed by the manufacturer, the following:

- a. Conductor D.C. resistance test
- b. Capacitance
- c. Partial discharge level measurement at Power frequency
- d. High voltage test

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Scope of work under this section shall include inspection at suppliers/manufacturer's premises, appropriate, receiving at site, safe storage, transportation from point of storage to point of erection and erection of light fittings, fixtures and accessories including all necessary supports, brackets, down rods and painting as required. The contractor shall supply all materials and accessories (other than those supplied by the owner), labor, tools, transportation, scaffolding etc., required for the completion of above work in all respects.

STANDARDS APPLICABLE:

The lighting and their associated accessories such as lamps, reflectors, housings, ballasts etc., shall comply with the latest applicable standards, more specifically the following :

Electric light fittings General and safety requirements	- IS - 1913.
Industrial lighting fittings with metal reflectors	- IS - 1777
Decorative lighting outposts	- IS - 5077
Flood Lights	- IS - 1947
Luminaries for street lighting	- IS - 2149
Bayonet lamp holders	- IS - 1258
Bi-pin lamp holders for tubular fluorescent lamps	- IS - 3323
Ballast for use in fluorescent light fittings	- IS - 1534
Starters for fluorescent lamp	- IS – 2215

A.4.2 Light Fittings - General Requirements :

Fittings shall be designed for continuous trouble free operation under atmospheric conditions, reduction in lamp life or without deterioration of materials and internal wiring. Outdoor fittings shall be weather - proof and rain proof.

- a. Fittings shall be so designed as to facilitate easy maintenance including cleaning, replacement of lamps/starters etc.
- b. Outdoor type fittings shall be provided with weather proof boxes.
- c. Each fitting shall have a terminal block suitable for loop-out connection by 1100 V PVC insulated copper conductor wires up to 4 Sq.mm. the internal wiring should be completed by the manufacturer by means of standard copper wire and terminated on the terminal block.
- d. All hardware used in the fitting shall be suitably plated or anodized and passivated for use in industrial plants.

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- e. Earthing each light fitting shall be provided with an earthing terminal. All metal or metal enclosed parts of the housing shall be bonded and connected to the earth terminal so as to ensure satisfactory earthing continuity throughout the fixture.
- f. Painting/Finish All surfaces of the fittings shall be thoroughly cleaned and degreased and the fittings shall be free from scale, rust, sharp-edges, and burrs.
- g. The housing shall be stove-enameled or anodised as required. The surface shall be scratch resistant and shall show no sign of cracking or flaking when bent through 90 deg. over 12 mm dia mandrel.

A.4.3 ACCESSORIES FOR LIGHT FITTINGS REFLECTORS:

The reflectors shall be made of CRCA sheet steel/aluminum/silvered glass/Chromium plated sheet copper as required. The thickness of reflectors shall be as per relevant standards. Reflectors made of steel shall have stove enameled/vitreous enameled/epoxy coating finish. Aluminium used for reflectors shall be anodized/epoxy stove enamelled/mirror polished. The finish for the reflector shall be as specified. The reflectors shall be free from scratches blisters and shall have a smooth and glossy surface having no premium light reflecting coefficient. Reflectors shall be readily removable from the housing for cleaning and maintenance without use of tools.

A.4.4 MODE OF MEASUREMENT IS AS FOLLOWS :

Installation of light fittings with all associated works including fixing accessories is measured in numbers (No) Supply and installation of down rods and C.P. chain with associated works as per BOQ and specifications are measured in linear metre (Rm).

A.4.5. LED Batten - 20/40 watts surface mounted

High Efficiency LED Batten with CRCA housing and high efficiency polycarbonate diffuser.'The system lumens shall not be less than 2000 lumens with (6500K) 'CCT and wattage shall not be less than 20W. The CRI shall be > 80. A specially designed heat management system to ensure luminous efficacy ≥ 105 lm/ W. The luminaire shall be designed to meet its specifications on performance & life time at a design ambient temperature of 45 deg C and ensure lumen depreciation upto 30% over 40k burning hours as per L70. The luminaire shall be able operate from 140V - 270V AC, 50Hz with PF > 0.95 & THD $\leq 10\%$. The luminaire shall be compatible for short circuit and over voltage cut off protection. Luminaire shall be supply with suitable mounting accessories.

A.4.6. SURFACE/RECESS MOUNTED SQUARE/ROUND TYPE LED DOWN LIGHT**a) 13W LED 9S-4000K fitting**

Surface/Recess mounted LED luminaire with efficient optics , System lumen efficacy > 100Lumen/Watt , System Luminous flux of 1300 lumens and System Wattage shall not be

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less than 13W with system burning hours of 50,000 hours as per L70. Color rendering index > 80 with SDCM of <5 and Color temperature 6500K. CRCA housing with high efficiency opal diffuser. Luminaire with completely isolated LED compartment and integral construction. Zero maintenance, Zero mercury. Luminaire with surge protection of upto 3kV. Electronic In-Built PF > 0.9 , THD < 10% , IEC Compliant for Safety , Performance & EMI. The luminaire shall be able operate from 140V - 270V AC.

A.4.7. RECESS MOUNTED 2' X 2' FITTING**• 35/36W LED 35S – 6500K fitting**

Recess mounted High Efficiency LED 2'x2' Luminaire with CRCA housing and high efficiency OPAL diffuser. The system lumens shall not be less than 3500 lumens with 6500K CCT and wattage shall not be greater than 38W. The CRI shall be > 80. The luminaire shall be designed to meet its specifications on performance & lifetime at a design ambient temperature of 45 deg C. The burning hours of the LED luminaire shall be 50,000 hours @L70. A specially designed heat management system to ensure luminous efficacy ≥ 92 lm/ W for the system. The luminaire shall be able operate at, 50Hz with PF > 0.9 & THD ≤ 10 with IEC compliance for safety, performance and EMI.

A.4.8. Bulk Head and High Bay type LED fitting**a) 10W LED Bulk Head fitting**

Supply of LED Bulkhead with a nominal system lumen output of 600 lumens and a minimum system efficacy of 60 lm/W. The luminaire shall have a rated system lifetime of 50,000 burning hours at L70. The luminaire should have a color temperature of 6500K and CRI > 70. The luminaire shall meet IP66 rating and IK 09 rating with THD < 20% and PF > 0.9. The luminaire housing should be made of High pressure die cast Aluminium with polycarbonate front diffuser. The total power consumption should not exceed 10W (including driver).

b) 100/200W LED High bay fitting

Supply, installation, testing and commissioning of LED High bay light with LM6 Pressure die-cast aluminium Housing and High efficiency Glass cover. The system lumen output shall not be less than 10000/20000 lumens and system wattage shall not be more than 100/200W. The Driver Efficiency : > 85% and Life L70, 50k Hrs. Color temp shall be 5700K. The luminaire shall be provided with Graduation disk for aiming and Suitable 'C' clamp mounting. The luminaire shall have an efficacy > 120lm /W. The luminaire shall be IP 65, Class I protected. The luminaire shall not weigh more than 6kg. The luminaire shall be operated with > 0.9 and THD < 10%. The operating voltage shall be 140-270V AC. The luminaire shall be with \geq IK05 and inbuilt surge protection ≥ 3 kV. The luminaire shall be with toughened glass and Suitable high efficient Poly carbonate UV stabilized secondary lens. The luminaire shall be with

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individual LEDs with dedicated peanut lens. The LEDs shall be SMD type only. The CRI shall be >70. Luminaire shall be provided with rigid eye bolt for mounting. Luminaire shall have Manufacturer warranty of minimum 3 years.

c) 70W LED Street light fitting

The wall mount shall be installed with clamp bolt nuts. Along with LED street light with die cast aluminium housing, inbuilt driver, system wattage maximum of 70 Watts, lumen output of lamp greater than 7000 lumens, power factor > 0.9, rated life of L70 @ 50,000 hours. system efficacy greater than 100lumen/watts, IP 66 compliant including all necessary accessories as required complete, IK08 compatible. Luminaire with IEC compliance of IEC10322, IEC 60598. The operating voltage of the luminaire shall be 140V - 270V, power factor of PF>0.9. The luminaire shall be supplied along with the decorative 5m to 7m pole. Luminaire shall have Manufacturer warranty of minimum 3 years.

A.5. DISTRIBUTION BOARD, MCBs, ELCB and RCBOs**A.5.1 SCOPE**

This specification covers the safety first selection of SPN DBs, VTPN DB and 7 Segment DBs, testing at works as per IS 8623. Complete with all accessories for efficient and trouble free operation.

A.5.2 CONSTRUCTION

The distribution boards shall be totally enclosed, dust and vermin proof, dead front, door-reverse, key lock convertible, door and shield independent, DPX type suitable for flush mounting and surface mounting.

Each board shall have gasketed doors with cam lock arrangement. Removable conduit/cable entry plates shall be provided at top and bottom of the board to facilitate drilling the conduit holes at site to suit individual requirements or knockout shall be provided.

Protective insulated cover plate shall be provided inside the board to shroud all the live parts. Only the operating handle of the switch and the operating knobs of the miniature circuit breakers shall be projecting outside the inner cover plate. The unused outgoing gap of board shall be suitably blanked with PVC plate at no extra cost. The incoming switch terminals shall be suitably shrouded to avoid accidental contact. Circuit identification cables shall be provided on the cover.

All boards shall be phase segregated (seven Compartment) and shall be provided with Double Door arrangements.

All components in the Distribution boards shall be of same make.

A.5.3 BUSBARS

The busbars shall be fully insulated and made of high conductivity high strength copper busbars liberally sized with high safety factor for the required rating (both short circuit and

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continuous currents). The neutral busbar shall have adequate number of terminals for all outgoing single phase circuits.

A.5.4 MINIATURE CIRCUIT BREAKERS

The Miniature Circuit Breakers (MCBs) shall be heat resistant, moulded type, designed, manufactured and tested as per IS 8828. The MCBs shall have inverse-time tripping characteristic against over loads and instantaneous trip against short circuits. The MCBs shall be of fault current limiting type also. The MCBs shall be slip on type to the busbar. The ON and OFF positions of the switch handle shall be clearly marked. The incoming and outgoing of the MCBs shall be accessible only after opening the front door of the DB. The MCBs shall be suitable for 433V, 3 phase, 4 wire, 50 Hz system with the fault level of 9-10 KA RMS symmetrical. The terminals of MCBs shall be suitable for use with eye lugs. The 4 pole, 3 pole and 2 pole MCB knobs shall be trunked with tandem pin of adequate strength.

Watt loss per pole shall not exceed 2W for 6A & 16A, 2.5W for 20A, 4W for 32 A and 6W for 63A.

A.5.5 EARTH LEAKAGE CIRCUIT BREAKER

Earth leakage miniature circuit breakers current operated with a sensitivity of 30 mA or 100mA wherever mentioned. The ELCB shall have Trip free mechanism and shall operate even on neutral failure.

The ELCB shall be provided with a Test Push Button to stimulate leakage and test the ELCB. The ELCB shall operate and switch off the circuit within 300 milli seconds in case of a fault.

The enclosures of the ELCB shall be moulded from High quality insulating materials, which shall be fire retardant, anti-tracking, non-hygroscopic, impact resistant and shall withstand high temperatures.

A.5.6 GROUNDING

The board shall be provided with two brass earthing stud terminals with suitable nuts, washers for connection to earth bus outside the boards.

A.5.7 TESTS

All necessary routine tests shall be performed on the equipment to demonstrate satisfactory performance at works without any extra cost. Equipment shall not be dispatched without obtaining approval of test certificates for type, routine and acceptance tests. The test certificated shall be provided by vendor along with the delivery of the material.

A.5.8 DRAWING & INSTRUCTION MANUALS

Along with the offer, the Contractor shall submit the following documents, in Triplicate.

- a. General arrangement of board size.

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- b. Technical leaflets on board, MCB, isolator etc.
- c. Type test reports as per IS 8828
- d. Tripping characteristic curves for MCB.

After award of the order, the contractor shall submit the following documents for approval, in six copies.

- a. General arrangement drawing showing the constructional features, dimensions, installation details etc.
- b. Complete technical particulars of Distribution boards, miniature circuit breakers, isolators etc.
- c. Tripping characteristic curves for MCB.

Before taking up manufacturing of the equipment the Contractor shall have to take the approval of, for design and drawing. Any manufacturing done prior to approval shall be rectified by the bidder at his own cost and the equipment shall also be supplied within the stipulated period.

A.6. TECHNICAL SPECIFICATION FOR EARTHING

A.6.1 SCOPE

This specification covers the supply, installation testing and commissioning of earthing system.

STANDARDS

IS 3043 : Code of Practice for earthing
CEA guidelines: 1956
Indian Electricity Act : 1910 CEA Regulations.

A.6.2 EARTH ELECTRODE

Earth Electrode shall be used AS MES.

The Electrode shall be enclosed in a concrete earth pit with suitable RCC covers and Lifting Hooks. Each earth electrode shall have provision for individually testing the electrode.

Earth electrodes shall be erected 1.5 Mts. away from the building edge and minimum spacing between the electrodes shall be maintained as per IS: 3043

All the earth pits shall be identified with name plates.

A.6.3 EARTHING LAYOUT

Earthing conductors in outdoor areas shall be buried atleast 300mm below finished grade level unless stated otherwise.

Wherever earthing conductors cross cable trenches, underground service ducts, pipes, tunnels, etc. it shall be laid minimum 300 mm below and shall be re-routed in case it fouls with equipment structure foundations.

Tap-connections from the earthing grid to the equipment/structure to be earthed shall be terminated on earthing terminals of the equipment/structure, if the equipment is available at the time of laying the grid, otherwise, "earth riser" shall be provided near the

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equipment foundation/ pedestal for future connections to the equipment earthing terminals.

Earthing conductors along their run on cable trench ladder columns, beams, walls, etc. shall be supported by suitable cleating at intervals of 750 mm. Earthing conductors along cable trenches shall be cleated to the wall nearer to the equipment. Cable trays and supports shall be connected to the earth mat at every 30 meters interval. Wherever it passes through walls, floors, etc. GI sleeves shall be provided for the passage of the conductor.

Earthing conductor around the building shall be buried in earth at a minimum distance of 1500 mm from the outer boundary of the building.

A.6.4 EQUIPMENT EARTHING

All electrical power items shall be earthed by two separate and distinct earth connections from main earth bus.

Metallic conduits shall not be used as earth continuity conductor.

Wherever earthing conductor crosses or runs along metallic structures such as gas, water, steam, conduits, pipes etc. and steel reinforcement in concrete, it shall be bonded to the same. Cable end boxes, glands, etc. shall be connected to the earthing conductor running along with the supply cable which, in turn, shall be connected to earthing grid conductor at minimum two points.

The metallic screens of the single core cable, shall be connected to earth at one end only.

A.6.5 JOINTING

Earthing connections ground rods with equipment earthing pads shall be by cad welded moulding type. Contact surface shall be free from scale, paint enamel, grease, rust or dirt. Two bolts shall be provided for making each connections Bolted connections, after being checked and tested shall be taped with PVC tape.

Resistance of the joint shall not be more than the resistance of the equivalent length of the conductor. The earth strip jointing, painting with bitumen paint.

A.6.7 GENERAL

Excavation and refilling of earth necessary for laying of underground earth bus and earth pipes shall be the responsibility of the Contractor.

All earth electrodes shall be tested for earth resistance by means of standard earth resistance tester.

Earthing resistance of the main bus shall be measured after connecting all the electrodes to the bus and the resistance shall not exceed one (1) ohm.

The exact location of Earth Bus/conductor, earth electrodes and earthing points on the equipment shall be determined at site in consultation with EIC. Any change of methods, routing, size of conductor shall be subject to approval by Contractor.

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The equipment erected shall be in accordance with the latest revision of relevant Indian Standards.

IS:10118 : Code of Practice for Selection, Installation and Maintenance
of Switchgear and Control Gear

IS:12063 : Degree of Protection provided by enclosures

IS:8623 : Specification for Factory Built Assemblies for Voltages upto
1000V AC & 1200V DC

IS:732 : Code of Practice for Electrical Wiring Installation.

IS:1646 : Code of Practice for Fire Safety of Buildings (General)
Electrical Installation

IS:3043 : Code of Practice for Earthing

A.7.2 DRAWINGS

Before start of execution work from the Contractor shall prepare all necessary installation drawing based on the drawings supplied by the consultants.

All design calculation, installation drawing prepared by the Contractor shall be submitted to the BEML / Consultant for Approval.

The Contractor shall be responsible for preparing necessary drawings for submission and obtain approval from statutory authority including but not limited to CEIG and EB.

All drawings need to be approved by BEML / Consultant prior to start of Erection or Installation.

A.7.3 EQUIPEMENT AND MATERIALS

All equipment and materials supplied by the Contractor shall be suitable in all respects, for the type of environment specified.

All equipment and materials supplied shall be to the approval of the BEML regarding Quality, Conformity to the specification and standards and suitability for the specified site conditions.

A.7.4 STORAGE AND CARE PRIOR TO ERECTION

The Contractor shall be fully responsible for the safe storage and care of equipment and materials. The Contractor shall be responsible for care and maintenance of all the Electrical equipments, whether supplied /erected by him or by BEML, after the installation is completed and until the final certificate of acceptance of Electrical Installation is signed.

A.7.5 MAIN PANEL

Main Panels shall be erected as per relevant code of practice for Installation. After erection of all the panels, necessary inter panel wiring shall be done.

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All panel fixing bolts and busbar bolts shall be tightened using torque wrench. Necessary front / rear / side clearance shall be maintained as per statutory regulations. All unused holes shall be blocked.

The contractor can do basic tests as physical check, ration test, insulation resistance etc.

A.7.6 LV_PANELS

All busbar joints shall be tightened using torque wrench and all shipping sections shall be properly bolted together.

After completion of cable terminations, all unused cable entry holes are to be covered to make the panel vermin proof.

The LV Panels shall be installed such that the length of Busduct between Transformer and Panels are kept to the minimum.

The contractor can do basic tests as physical check, ration test, insulation resistance etc.

A.7.7 DISTRIBUTION BOARDS

Distribution boards shall be erected on wall / structure using GI Anchor Rail (2.5mm Thick) with spring loaded Nuts.

Necessary clearance shall be maintained in front of the Distribution Boards for operation and maintenance.

The contractor can do basic tests as physical check, ration test, insulation resistance etc.

A.7.8 LIGHTING

The installation shall include all fittings, support brackets, clamps, cleats, down rods, ball & socket, earthing, cabling, wiring & conduits, in accordance with the requirements of this specification.

Wiring shall be done using Single Core PVC insulated multi stranded copper conductors, laid in GI Conduits unless otherwise mentioned separately. Suitable nonmetallic junction boxes shall be provided wherever required.

The contractor can do basic tests as physical check, insulation resistance etc.

A.7.9 CABLING

No cable shall be laid alongside a water main. Spacing equal to the diameter of the cable shall be maintained between adjacent power cables.

Selection of cable drums for each run shall be so planned as to minimise straight through joints. In each cable run, extra length shall be kept at a suitable point to enable one straight through joint to be made, should the cable develop a fault at a later date.

Whenever straight through joints are made, a "S" loop of sufficient length shall be kept at both ends for future of use.

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All due care shall be taken during unreeling, laying and termination of cable, to avoid damage due to twist, kink and sharp bends, etc. Cable drum jacks shall be used wherever cables are to be unreeled and cables shall not be unreeled when the drums are lying on their sides. Wherever cables pass through floor or through wall openings, it shall be taken through pipe sleeves. The open ends of the sleeves shall be sealed by cold setting compound after cables are pulled through them to prevent entry of vermin and ingress of water.

The Contractor shall replace at his cost any cable pulled off from drums lying on its side.

While laying cable, cable rollers shall be used. The cables shall be pushed over the rollers by a gang of people positioned between rollers. The cable shall not be pulled from the end without intermediate pushing arrangement. The bending radius shall not be less than that specified by the manufacturer.

Each cable shall be provided with punched aluminium identification tags at every 50M intervals and at both ends.

The tag shall be of aluminium, with the number punched on it and securely attached to the cable by stainless steel straps. All multi core cables shall be secured to the cable tray by UV rated PVC ties at every 600mm intervals. The contractor can do basic tests as physical check, ration test, insulation resistance etc.

A.7.9.1 Laid On Cable Tray

Cable trays shall be of prefabricated Epoxy Painted (2.5mm thick) with necessary accessories like Tees/Bends etc. and shall be supplied along with fasteners. All the type trays shall be supported at every 2.0m intervals.

Cables on horizontal trays shall be tied at every 300 mm and on vertical trays, they shall be tied at every 150 mm.

Vertical spacing between cable racks/trays shall be minimum 250 mm. Different voltage grade cables shall be laid in separate trays when trays are arranged in tiers. Earthing of trays shall be done as specified earlier at every 30mtr.

A.7.9.2 Cable Termination

LT Cable Termination

Termination of LT armoured cables shall be by means of compression method using compression type cable glands and compression type lugs.

Whenever aluminium cables are to be terminated on copper busbar or vice versa, necessary bimetallic washers shall be provided.

All control cables shall be terminated using pin type lugs.

Cable tails shall be sufficiently long to run all cores to the farther most terminal and then back to the appropriate point of connection.

All cable glands shall be properly earthed using suitable earthing clips and connected to main earth bus. Wherever required, extension boxes shall be provided.

(A Government of India Mini Ratna Company under Ministry of Defence)
Kinfra Wise Park, Kanjikode, Palakkad – 678621, Telephone: 0491-2568178

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The Contractor shall submit samples of all cable gland, lugs & Bi - Metallic washers. The contractor can do basic tests as physical check, ration test, insulation resistance etc.

A.7.10 EARTHING

The Earth Electrodes will be located in the Substation Area and will be connected to a Earthing Terminal Board. The main Earth Bus in all the L.V. Panels will be connected to the Earth Terminal Board using suitably sized PVC insulated copper cables. The contractor can do basic tests as physical check, ration test, insulation resistance etc.

A.7.11 INSPECTION

After completion of erection/installation, each piece of equipment shall be thoroughly inspected in the presence of Engineer in Charge / Consultant for correctness and completion of erection and operation.

A.7.12 MISCELLANEOUS ITEMS

The Contractor shall supply and install the safety devices as required by the statutory authorities but not limited to the following.

- Danger boards for LT Panels & Transformers.
- Rubber mats for switchgear panels, power distribution boards etc.
- Rubber gloves, first aid charts, first aid box etc.
- Fire extinguishers and Fire Buckets.
- Earth Rod.
- The contractor can do basic tests as physical check, ration test, insulation resistance etc.

A.7.13 STATUTORY REQUIREMENTS / APPROVAL FROM STATUTORY AUTHORITIES.

Work for electrical installation shall be carried out in accordance with this specification and complying with the relevant statutory requirements and national standards. It shall be the responsibility of Contractor to obtain approvals of competent Central or State Government authorities and satisfy them regarding the compliance with relevant regulations for this scope of work.

The Contractor should possess a valid **ESA /EA grade** license issued by the Electrical Licencing Board. The work should be carried out only under the supervision of licenced supervisors. The licences possessed by the Contractor's supervisor shall be made available to the Client for scrutiny before commencement.

Test certificate for installation shall be prepared in the form required by Chief Electrical Inspector/Electricity Board. Any rework on account of remarks by Electrical Inspector shall have to be carried out by the Contractor at no extra cost.

Bid invitation No: 6300038764**Closing Date: 22/03/2024****B. TECHNICAL SPECIFICATIONS OF DATA & VOICE NETWORK****B.1.1 DATA AND VOICE SYSTEM**

It covers Scope of work and technical requirement for supply, installation, testing and commissioning of Data & Voice Networking to be done in the Proposed Overhauling Hangar and in Office building.

B.1.2 TECHNICAL SPECIFICATION

The following is the general list of components, which shall constitute the IT & Voice networking.

- A. Network Racks
- B. 48 port patch panel fully loaded
- C. Data patch cords
- D. Fiber Optic cable
- E. CAT 6 cable
- F. CAT 6 Information Outlet

A. Network Racks

- Network racks are standardized enclosure for mounting multiple equipment modules required for IT & Voice networking. Each module has a front/side panel that is 19 inches wide, including edges or ears that protrude on each side which allow the module to be fastened to the rack frame with screws.
- Suitable for wall / floor mounting with required Power Manager, Cable Manager, Cooling fan and Stationery tray.
- Tempered glass front with locking door.
- Required knockouts for cable entry at the top and bottom.
- Racks are to be positioned as per the layout arrangement.

B. 48 port patch panel

- Horizontal Cabling refers to all communication cables, connectors, panels, and termination-blocks that comprise the physical path from the patch panel. Horizontal cabling provides voice and data connectivity to the workplace/workstation.
- Patch panels are 48 ports RJ45 with replaceable modules.
- 1 U height and suitable for 19" Rack mountable.

C. Data patch cords

- Category 6, 550 MHz ultra-high speed 4 pair stranded UTP Ethernet cable molded network patch cord.

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- Patch cords used inside the Network rack shall be of 3 foot length and in the workstation shall be of 7 foot length.
- Color of the patch cord to be decided in consultation with the Engineer.
- Category 6 network cables are equipped with snag less boots that are molded to RJ45 connectors which also acts as a strain relief.

D. Fiber Optic cable

- Cabling between buildings for Data communication should be fiber optic cable.
- Fiber optic cable shall be 12 cores, single mode, shall be used for server rack communication. These are to be terminated at both ends on LIU patch panels.
- The laying of fiber cable shall confirm to the manufacturer's recommendation on minimum bending radius.
- There shall be no through joints made in optical fiber links.
- Each cable shall contain a sufficient number of system fibers to fulfill the requirements of the General Contractors design plus an even number of spare fibers to give a minimum of 100% spare capacity.
- Outer sheath shall be marked – fiber type, cable type, and manufacturer and Length markings.
- The fiber shall be protected in jelly filled loose tubes stranded around a central strength member to ensure optimum performance and long life. Outer sheath shall be made of UV stabilized and weather resistant material.
- The nominal thickness of the insulation shall be as specified in BS 6724/BS 7211.

E. CAT 6 cable

- All copper cabling for IT network should be of minimum CAT6 grade, 8 strands, UTP, capable of supporting sustained traffic at 1Gbps.
- Run all cables in a "Star" configuration. That is to say that they all emanate from, and are "homerun" to, one central location, known as the wiring hub.
- Keep all cable runs to a maximum of 295 feet for LAN (for each run).
- Always install jacks in such a way as to prevent dust and other contaminants from settling on the contacts. The contacts (pins) of the jack should face up on flush mounted plates, or left, right, or down (never up) on surface mount boxes.

F. CAT 6 Information Outlet

- RJ45 sockets for data and RJ11 sockets for voice to be used.
- Dual/Quad faceplate for LAN & Voice outlet and Single faceplate for either LAN or Voice outlet along with the required back box to be provided for each workstation as marked in the layout drawings.
- Shall have shuttered jacks for dust exclusion when not equipped with patch cord.

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- Data and voice points shall be identified by separate color coding of the *Cable and wiring installation*:
- Copper & Fiber cabling should run on the cable tray / aluminum raceways / conduits.
- Each and every cable end shall be clearly tagged and identified as per the tagging philosophy which will be decided later.

C. TECHNICAL SPECIFICATIONS OF COMPRESSED AIR PIPING SYSTEM:**C.1.0 COMPRESSED AIR PIPING**

The scope under this tender is limited to Designing, Supply of pipe and pipe fittings, valves, Gaskets and supports structural, Installation, pre commissioning, painting as per code and commissioning of piping system for supply of Compressed air. The Compressed air shall be brought in a main header/tapping from Hangar 2 and Hangar 4 floor area for as per requirement. From this main header a ring main to be installed inside the work area and tapings are to be given to the individual machines as per requirement and schematic drawings.

C.2.0 Pipe Rack & Pipe Support :

The scope shall include but is not limited to the installation Designing the layout Installation of pipe rack and supports structural where ever necessary to support the piping and other accessories and system, Installation, pre commissioning, commissioning and painting as per code and standards, specification given by Consultant /BEML authorized engineer for laying and supporting. All routings and support fabrication are to be got approved from Consultant /BEML authorized engineer

C.3.0 MATERIAL SPECIFICATIONS FOR PIPES & FITTINGS

PIPING MATERIAL: GALVANISED MILD STEEL AS PER IS 1239 CLASS C FOR SIZES UP TO 50-mm AND AS PER IS 3589 WITH 6.25-mm WALL THICKNESS FOR SIZES 200-mm AND ABOVE.

C.4.0 GI PIPES AND FITTINGS FOR AIR CONNECTIONS

GI pipes and fittings shall be used for Compressed Air services above and below ground applications. All internal and external piping shall be of Class C galvanised iron, screwed socketed and shall conform to IS 1239 (Part-I). All fittings shall be malleable iron galvanized fittings of approved best Indian make. The details of pipes and sockets regarding nominal bore, thickness and weight in kg/m are as per IS-1239 (Part-I).

C.5.0 VALVES

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Plug Valve: All valves for shut-off purposes for sizes below 50 mm shall be PLUG valves for handling compressed Air. The valve body and plug shall be carbon steel as per ASTM A216-WCB. The seats and stem packing shall lined with PTFE. All Valves shall have in full bore construction. The valves should have a pressure rating of ANSI 50/40 flanged ends from the sizes of 25MM NB.

Ball Valve: All valves for shut-off purposes for sizes below 50 mm shall be ball valves. The valve body and body connector shall be carbon steel as per ASTM A216-WCB, the ball and stem shall be stainless steel SS 304/316. The seats and stem packing shall be PTFE. All Valves shall have socket weldable ends, in 2/3 piece construction and the central portion could be bolted out for maintenance. All valves should be supplied in full bore construction. The valves should have a pressure rating of ANSI 150.

C.6.0 Pipe Installation:

1. On Award of Contract, the Contractor should prepare and submit for approval detailed shop drawings indicating the pipe routing, levels, tapping points, riser points etc.,
2. All pipes shall be properly supported from roofs, walls, etc., Vertical risers shall be supported at all floor casting with Rigid MS Channels and rubber pads OR similar resilient material shall be provided between the floor and the support channel.
3. All pipes shall necessarily be clamped to the pipe supports with specially made pipe clamps. The clamps shall be made out of mild steel and painted with a coat of primer and final coat of black enamel paint. The clamps should take into account any lateral moment of the pipes owing to temperature variations and in no case the clamps should induce stresses on the pipe and supports.
4. For insulated pipes, an interposing insulating member made out of extra rigid Polyurethane Foam having a density of 64 Kg/cum. shall be provided between the pipe and the clamp. This RPUF member shall be properly contoured to suite the pipe.
5. Pipe supports shall be made out of structural steels with sections selected to suite the dia and weight of pipe being supported. The supports shall be painted with a primer coat of red-oxide and finished painted with two coats of black enamel paint. The pipe support spacing shall be as under:
6. All pipe joints shall be welded construction, unless otherwise specified. However, flange joints shall be provided as mentioned below. All pipes below 40 mm NB shall have socket welding using fillet welding. Pipes 50 mm NB and above shall have butt welding using butt weldable fittings. In this case the welding edges shall be properly "V" Grooved before welding. All pipe cuttings shall be carried out using Hacksaw OR pipe cutting tools. If in case, Gas cutting is utilized care should be taken to properly finish the edges

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so that the edges are smooth and are without any burs. Flange joints shall be provided at the following positions.

7. GI Pipes whenever welded; the welded portions should be immediately finished by painting the same with zinc chromate primer.

C.7.0 Testing:

1. Pipes after full welding is completed shall be hydraulically tested, without giving connections to the equipment. Pipes could be tested in sections and after testing the ends should be capped. No insulation or painting for the pipes shall be carried out before the hydraulic testing is completed and approved by their Engineer in-charge.

C.8.0 Measurements:

- a. The pipe lengths specified in the BOQ shall deemed to be inclusive of all fittings like Bends, Elbows, Reducers, Flanges, Pipe Nipples for instruments etc., Pipe Supports, clamps etc., These will not be measured separately and paid for. The pipes shall be in unit length round off to the nearest centimeter and measured along the centre line of the pipe and fittings. The center line distances between flanges of valves, strainers etc., shall not be measured. The rates quoted shall also be inclusive of necessary painting as specified.
- b. All valves, strainers etc., shall be measured per unit in each size and paid for. The price quoted shall deemed to be inclusive of mating flanges, gaskets, net, bolts etc.,
- c. All air vents, drain valves shall be measured per unit.

D: TECHNICAL SPECIFICATIONS FOR PLUMBING AND FIRE FIGHTING**D.1.0 WATER SUPPLY, SANITARY INSTALLATIONS AND DRAINAGE**

D.1.1 The contractor shall furnish all labour, materials and equipment, transportation and incidental necessary for supply, installation, testing and commissioning of the complete Plumbing / Sanitary system as described in the Specifications and as shown on the drawings. This also includes any material, equipment, appliances and incidental work not specifically mentioned herein or noted on the Drawings/Documents as being furnished or installed, but which are necessary and customary to be performed under this contract. The Plumbing / Sanitary System shall comprise of following:

- Sanitary Fixtures and Fittings.
- Internal and External Water Supply.

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- Internal and External Drainage
- Balancing, testing & commissioning.
- Completion drawings

- D.1.2** The contractor shall procure and install all pipes, Sockets /Nipples including shut-off valve etc for mounting sensors/transmitters for the interface to Building Automation System.
- D.1.3** The contractor shall ensure that senior and experienced plumbers are assigned exclusively for this work. The project management shall be done through modern technique. For quality control & monitoring of workmanship, contractor shall assign at least one engineer who would be exclusively responsible for ensuring strict quality control, adherence to specifications and ensuring top class workmanship for the installation.
- D.1.3** The work shall be in conformity with the Bye-laws, Regulations and Standards of the local authorities concerned. But if these Specifications and Drawings call for a higher standard of materials and / or workmanship than those required by any of the above regulations and standards, then these Specifications and Drawings shall take precedence over the said regulations and standards. However, if the Drawings and specifications require something which violates the Bye-laws and Regulations, then the Bye-laws and Regulations shall govern the requirement of this installation.
- D.1.4** The Plumbing / Sanitary Drawings given by the Engineer In-Charge or issued with tenders are diagrammatic only and indicate arrangement of various systems and the extent of work covered in the contract. These Drawings indicate the points of supply and of termination of services and broadly suggest the routes to be followed. Under no circumstances shall dimensions be scaled from these Drawings. The contractor shall follow these drawings in preparation of his shop drawings, and for subsequent installation work.
- D.1.5** The contractor shall examine all architectural, structural, plumbing, electrical and other services drawings and check the as-built works before starting the work, report to the Engineer In- Charge any discrepancies and obtain clarification. Any changes found essential to coordinate installation of his work with other services and trades, shall be made with prior approval of the Engineer In-Charge without additional cost to the department.
- D.1.6** All the shop drawings shall be prepared on computer through Autocad System based on Architectural Drawings and site measurements. Within two months of the award of the contract, contractor shall furnish, for the approval of Engineer In-Charge, the two sets of detailed shop drawings of complete work and materials including layouts for Plant room, Pump room, Typical toilets drawings showing exact location of supports, flanges, bends, tee connections, reducers, detailed piping drawings showing exact location and type of supports, valves, fittings etc; external insulation details for pipe insulation etc.

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- D.1. 7** These shop drawings shall contain all information required to complete the work. These Drawings shall contain details of construction, size, arrangement, operating clearances, performance characteristics and capacity of all items of equipment, also the details of all related items of work by other contractors. Each shop drawing shall contain tabulation of all measurable items of equipment/materials/works and progressive cumulative totals from other related drawings to arrive at a variation-in-quantity statement at the completion of all shop drawings. Minimum 4 sets of drawings shall be submitted after final approval along with CD. When he makes any amendments in the above drawings, the contractor shall supply two fresh sets of drawings with the amendments duly incorporated along with check prints, for approval. The contractor shall submit further four sets of shop drawings to the Engineer In-Charge for the exclusive use by the Engineer In-Charge and all other agencies. No material or equipment may be delivered or installed at the job site until the contractor has in his possession, the approved shop drawing for the particular material/equipment / installation.
- D.1. 8** Shop drawings shall be submitted for approval four weeks in advance of planned delivery and installation of any material to allow the Engineer In-Charge ample time for scrutiny. No claims for extension of time shall be entertained because of any delay in the work due to his failure to produce shop drawings at the right time, in accordance with the approved programme.
- D.1. 9** Samples of all materials like valves, pipes and fittings etc. shall be submitted to the Engineer In-Charge prior to procurement for approval and retention by Engineer In-Charge and shall be kept in their site office for reference and verification till the completion of the Project. Wherever directed a mockup or sample installation shall be carried out for approval before proceeding for further installation without any extra cost.
- D.1. 10** Approval of shop drawings shall not be considered as a guarantee of measurements or of building dimensions. Where drawings are approved, said approval does not mean that the drawings supersede the contract requirements, nor does it in any way relieve the contractor of the responsibility or requirement to furnish material and perform work as required by the contract.
- D.1. 11** All materials and equipment shall conform to the relevant Indian Standards and shall be of the approved make and design. Makes shall be in conformity with list of approved manufacturers.
- D.1. 12** Balancing of all water systems and all tests as called for the CPWD Specifications shall be carried out by the contractor through a specialist group, in accordance with the

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Specifications and ASPE / ASHRAE Guide lines and Standards. The installation shall be tested and shall be commissioned only after approval by the Engineer In-Charge. All tests shall be carried out in the presence of the representatives of the Engineer In-Charge and nothing extra shall be payable on this account.

- D.1. 13** The contractor shall submit completion plans for water supply, internal sanitary installations and building drainage work and other services done under E&M works within 15 days of the date of completion. These drawings shall be submitted in the form of two sets of CD's and four portfolios (300 x 450 mm) each containing complete set of drawings on approved scale indicating the work as - installed. These drawings shall clearly indicate complete plant room layouts, piping layouts and sequencing of automatic controls, location of all concealed piping, valves, controls and other services. In case the contractor fails to submit the completion plans as aforesaid, security deposit shall not be released and these shall be got prepared at his risk and cost
- D.1. 14** The CCI/CI/PVC pipe and GI pipe etc. wherever necessary shall be fixed to RCC columns, beams etc. with rawl plugs and nothing extra shall be paid for this.
- D.1. 15** The variation in consumption of material shall be governed as per CPWD specification and clauses of the contract to the extent applicable.

D.1. 16 PLUMBING WORKS INCLUDES OVERALL PLUMBING WORKS INTERNAL & EXTERNAL:

- a) Plumbing Fixtures, Chrome Plated Fittings & Accessories.
- b) Soil, Waste & Vent Pipes & Fittings
- c) Rainwater Pipes & Fittings
- d) Internal / External Water Supply System (Cold & Hot)
- e) External Sewerage & Drainage
- f) External Rainwater System
- g) External Flushing Water System
- h) Drinking Water System

Samples of all materials shall be got approved before placing order and the approved samples shall be deposited with the Engineer. If directed, materials shall be tested in an approved testing laboratory and the contractor shall produce the test certificate in original to the Engineer and the entire charges for original as well as repeated tests shall be borne by the Contractor. If required by the Engineer, the Contractor shall arrange to test portions of the work at his own cost in order to prove their soundness and efficiency. If after any such test the work or portions of work is found in the opinion of the Engineer, to be defective or unsound, the Contractor shall pull down and re-do the same at his own cost. Defective materials shall be removed from site.

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All sanitary fixtures like sanitary ware, CP fittings, bath room accessories, wall flanges, valves and all related to bath room, kitchen utility fittings (CP and sanitary fittings). And also supply small accessory piping and any specialties furnished for fixtures such as adopters, pipe fittings, cement, brick work supports for AWC, CP Extension pieces, Check nuts, screws, washers, gasket etc., waste connector, WC connector, PVC or CP connection pipe, connecting nipple, screws, clamps, white cement wall flanges, washers, sealant and other accessories of this type as required.

The contractor responsibility to install the fittings received from the client engineer in a good condition otherwise contractor shall pay for the entire fittings cost. (Including transportation charges, all taxes, and other accessories)

Scope of installation to be performed by the contractor is outlined below:

The contractor shall hydrostatically test all the sanitary appliances and CP fittings installation including accessories and specialties.

Contractor shall supply all Jointing material as required for all joints. Like screws, washers, sealants, Installation tools, tackles, drilling machine as required to complete the work.

Tile Sanitary fixtures and fittings shall be installed at the correct aligned position as shown on the drawings and as directed by the engineer, and shall fully meet with the aesthetic and symmetrical requirements as required

All fixtures and accessories shall be fixed in accordance with a set pattern matching the tiles or interior finish as per Project Engineer requirements. Wherever necessary the fittings shall be centered to dimensions pattern as called for.

Fixture shall be installed by skilled plumber with appropriate tools according to the best trade practice. Manufacturer's instruction shall be followed for the installation of fixtures.

Fixtures in all toilets shall be standard height, mounting as called for on the drawings.

Fixtures shall be mounted rigid, plumb and true to alignment

All fixtures shall be fixed firmly to the floor / wall with accessories supplied by the manufacturer. Use chrome plated brass cap nuts for fixation screws.

All ferrous accessories used for the installation of sanitary fixtures shall have anti-rust treatment given at the factory.

Refer to interior architectural documents for details of toilet and bathroom accessories.

These are part of the finishing works

Contractor shall do mock-up for each type of sanitaryware fittings & fixtures, before final installation.

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Care shall be taken in fixing all approved chromium plated (CP) fixtures and accessories so as not to leave any tool marks or damages on the finish. All such fixtures shall be tightened with fixed spanners.

Use of 'Stiltson' type pipe wrenches with toothed jaws shall not be allowed.

All fixtures shall be thoroughly tested after connecting the drainage and water supply system. All fixtures shall be thoroughly finished and any leakage in piping valves and waste fittings corrected to the complete satisfaction of the Engineer.

Upon completion of the work, all labels, stickers, plaster, etc. shall be removed from the fixtures and all fixtures shall be cleaned with soap and water so as to present a neat and clean toilet.

D.1. 19 MOCK UP AND TRIAL ASSEMBLY

The installation of the sanitary fixtures and shall be as per the shop drawings approved by the Engineer.

The Contractor shall assemble on trial basis at least one set of each type of sanitary fixture and fittings in order to determine precisely the required supply and disposal "connections. Relevant instructions from manufacturer shall be followed as applicable. This trial, assembly shall be developed to facilitate determining the location of punctures, holes, holding devices etc, which will be required for final installation In position of all sanitary fixtures and fittings. The above assembly shall be subject to final approval by the Engineer.

The fixtures in the trial assembly can be reused for final installation without any additional payments for fixing or dismantling of the fixtures.

D.1. 20 Operation & maintenance training to employer's staff, supply of basic minimum spares for equipment.

D.2.1 INDIAN TYPE WATER CLOSET

Providing and fixing water closet squatting pan (Indian type W.C. pan) with 100 mm sand cast Iron P or S trap, 10 litre low level white P.V.C. flushing cistern, including flush pipe, with manually controlled device (handle lever) conforming to IS : 7231. White Vitreous china Orissa pattern W.C. pan of size 580x440 mm with integral type foot rests.

D.2.2 EUROPEAN TYPE PEDESTAL WATER CLOSET

Providing and fixing white vitreous china pedestal type water closet (European type) with seat and lid, 10 litre low level PVC flushing cistern & C.P. flush bend with fittings & C.I.brackets, 40 mm flush bend, overflow arrangement with specials of standard make and mosquito proof coupling of approved municipal design complete, including painting of

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fittings and brackets, cutting and making good the walls and floors wherever required. W.C. pan with ISI marked white solid plastic seat and lid

D.2.3 EUROPEAN TYPE WALL MOUNTING WATER CLOSET:

Providing and fixing Star white vitreous china extended wall mounting water closet of size 790x370x690 mm of approved shape including fixing of cistern with lid and dual flush fitting of flushing capacity 3/6 litre including chair brackets, EWC pan connector, necessary fittings including seat cover with all fittings and fixtures complete, angle valve with riser pipe, including cutting and making good the walls and floors wherever required:

D.2.4 Installation of Water Closet:

Fixing chair bracket with bolts in concrete grout, bolts of 12mm \varnothing at a distance of 200mm \pm 10mm between two fixing bolts in the wall such that the height of front rim up to finished floor should be 400mm & bolts should be projected 70 mm from the finished wall. Fix the rag bolt with the help of sleeves and the outlet hole in the wall should be made as 190 mm \pm 5mm.

D.2.5 Installation of Cistern:

- Fit the bottom inlet ball valve in the inlet hole of Constellation Cistern.
- Fit the beta valve tail pc in the central outlet hole & tight the check nut at the bottom of Cistern.
- Put the rubber of rubberized bolt inside all the three holes of extended part of EWC.
- Insert the diverter pipe inside the back side of EWC and outlet of diverter pipe should be in the center such that front mark should be in front.
- Place the Cistern with matching the hole of cistern & insert the outlet of diverter inside beta valve hole & tight the brass bolt in all the three holes from inside the cistern with screw driver.
- Fit the beta valve into the tail pc and dual flush knob on lid & screw with the beta valve bracket for the fitment of lid on cistern shell.
- Put both the buttons (6L/3L) inside the dual flush.

D.2.6 EUROPEAN TYPE WALL MOUNTING WATER CLOSET:

Providing and fixing white vitreous china wall mounted water closet of size 550x360x385 mm of approved shape including fixing of Concealed cistern size 460x450x80mm with dual flush chromium plated/ stainless steel dual flush push plate for concealed cistern flush plates of flushing capacity 3 litre/ 6 litre including chair brackets, EWC pan connector, necessary fittings including seat cover with all fittings and fixtures complete, angle valve with riser pipe, including cutting and making good the walls and floors wherever required:

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Fixing chair bracket with bolts in concrete grout, bolts of 12mm \varnothing at a distance of 180mm \pm 5mm between two fixing bolts in the wall such that the height of front rim up to finished floor should be 400mm. Fix the rag bolt with the help of sleeves and the outlet hole in the wall should be made as 135 mm \pm 5mm.

Put the outlet rubber gasket in the outlet to fit in waste outlet hole. Put polysheet in between wall & EWC. Fit the EWC in the bolts (fitted inside wall) & tight the same & put chrome plated cap on the bolts.

D.2.8 Installation of Concealed Cistern:

- Drill two holes diameter of 8mm and depth of 40mm, and fill the bracket holes with wall plug and tighten the screws.
- Install inlet valve, place inside cistern, with nut on outside and tighten nut. After installing the fixing bracket, put the cistern on the wall bracket.
- Install the back nut, sealing ring and gasket on the flushpipe, then tighten the back nut.
- Drill hole in required location. Install the button in the hole, with wall bracket underneath, adjust button and fix wall bracket on the button, then tighten the back nut.
- Install the fixing block into the outlet.
- Open the tank cover and fix the pneumatic pipes to the flush valve nozzle.
- Install the small button and large button correctly.
- Close the cistern lid.
- Install the water pipe to the inlet pipe of cistern for water supply.

D.2.9 Installation of Chrome Plated/Stainless Steel Flush Plates:

- Install two (2) threaded lock pins (part of actuator assembly).
- Adjust lock pin length to be flush with finished wall, turn to lock in place.
- Place actuator frame onto front of box with spring at the bottom facing outward.
- Secure frame onto lock pins with two (2) self-tapping screws provided.
- Insert actuator push rod into rocker bushing so that taps are in contact with the actuator frame surface.
- Install rod and turn clockwise to lock it into the bushing.
- To complete the installation attach the actuator plate on to spring at lower side push up and snap the upper edge onto frame.
- Secure actuator plate to frame, test for function.
- Remove protective foil.

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Rate shall include cost of all materials, labour charges, transportation, cost, scaffolding charges, taxes, hire charges for tools and plants, finishing charges and curing etc. complete.

D.2.10 FLAT BACK LARGE URINALS (TYPE-1):

Providing and fixing white vitreous china flat back half stall urinal of size 580x380x350 mm with flush valve, with fittings, standard size C.P. brass flush pipe, spreaders with unions and clamps (all in C.P. brass) with waste fitting as per IS : 2556, C.I. trap with outlet grating and other couplings in C.P. brass, including painting of fittings and cutting and making good the walls and floors wherever required.

D.2.11 Installation of Urinals:

Mark the screw fixing position at top and bottom end on the wall such that the height of front rim should be at a distance of 700 mm from finished floor.

Make holes with drill on wall at marked position with drill bit of 5 mm dia and insert PVC sleeve inside the holes.

Fix the urinal on wall with screws. Connect the incoming water line on top & connect waste pipe on outlet.

D.3 WASH BASIN :

Providing and fixing white vitreous china Counter top wash basin size 550 x 450 x 200mm, installed counter top at Granite / Marble counter with 15 mm C.P.brass Pillar cock, 32mm C.P brass waste coupling of standard pattern, including 2 nos. angle valve with riser pipes, connectors, adopters, all fittings etc cutting and making good the walls/slabs wherever required.(cut size it is recommended to make the cut in the marble/ Slab according to Wash Basin)

D.3.1 Installation of Wash Basin:

- a. The cutout is made on the slab according to the size of the fixing area of Wash Basin.
- b. If tap hole is required in Wash Basin, then fix the water tap in tap hole to connect the connection of Pillar tap with angle valve.
- c. Place the Wash Basin on the slab and put sealant at the bottom of rim of Wash Basin to fix Wash Basin. Fit the waste hole coupling in waste outlet of Wash Basin.
- d. Connect waste coupling to drain with beneath the marble/Slab through bottle tarp.
- e. Connect Water tap with angle valve.

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Providing and fixing white vitreous china Table top wash basin size - 610*460*140mm, installed above granite / marble counter with 15 mm C.P. brass basin mixer tap, 32mm C.P brass waste coupling of standard pattern, including 2 nos. angle valve with riser pipes, connectors, adapters, all fittings etc. cutting and making good the walls/slabs wherever required.

D.4.1 Installation Of Wash Basin:

Cut the marble / Slab for waste hole of Wash Basin to accommodate the outlet area at desired location where the Wash Basin is to be placed. Area of the hole should be made suitable for the bottle trap (100 mm Ø approx).

If tap hole is provided in Wash Basin, then fix the basin mixer tap in tap hole to connect the connection of tap with hot & cold connection angle valve

Fix the waste coupling and place Wash Basin on marble plate/slab. To fix put sealant between slab and Wash basin.

After fixing the Wash Basin on marble slab, connect to drain with bottle trap beneath the marble /slab. Connect cold & hot connection pipe of tap with cold & hot connection angle valve.

Rate shall include cost of all materials, labour charges, transportation, cost, scaffolding, charges, taxes, hire charges for tools and plants, finishing charges and curing etc. complete.

D.6 Kitchen Sink:

Providing and fixing Stainless Steel A ISI 304 (18/8) kitchen sink as per IS: 13983 with C.I. brackets and stainless steel plug 40 mm, including painting of fittings and brackets, cutting and making good the walls wherever required :510x1040 mm bowl depth 300 mm.

Rate shall include cost of all materials, labour charges, transportation, cost, scaffolding, charges, taxes, hire charges for tools and plants, finishing charges and curing etc. complete.

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Providing and fixing PTMT towel ring trapezoidal shape 215 mm long, 200 mm wide with minimum distances of 37 mm from wall face with concealed fittings arrangement of approved quality and colour, weighing not less than 88 gms.

Rate shall include cost of all materials, labour charges, transportation, cost, taxes, hire charges for tools and plants, finishing charges and curing etc. complete.

D.8 PTMT TOWEL RAIL

Providing and fixing PTMT towel rail complete with brackets fixed to wooden cleats with CP brass screws with concealed fitting including wall brackets arrangement of approved quality and colour.

600 mm long towel rail with total length of 631 mm, width 70 mm and effective height of 69 mm, complete as per standard specifications.

Rate shall include cost of all materials, labour charges, transportation, cost, taxes, hire charges for tools and plants, finishing charges and curing etc. complete.

D.9 FLOOR TRAP GRATING

Supplying and fixing of Square (125x125mm) & Round Stainless Steel grating of SS-304 including GI hopper for connection of wash basin/ urinal with fittings, connectors & adopters. and all fittings etc., complete.

Rate shall include for all materials, labour charges, transportation, scaffolding, all taxes, hire of tools and plants etc. complete for the finished work.

D.10 FLOOR CLEAN OUT (FCO)

Supplying and fixing of Square (125x125mm) & Round Stainless Steel – SS 304 clean out cover and include GI hopper for connection of CI pipe with fittings, connectors & adopters and all fittings etc., complete.

Rate shall include for all materials, labour charges, transportation, scaffolding, all taxes, hire of tools and plants etc. complete for the finished work.

D.11 BALL VALVE (BRASS) (Upto 50mm size)

Supply and fixing in position the following lever operated, full flow, quarter turn, Ball Valves of Forged Brass body and chrome plated brass ball with chrome plated steel handle with PVC

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sleeve and PTFE seal tested to 25 Kg / Cm² pressure rating, conforming to BS : 5159 manufacturing standards, including all unions and effecting proper connections.

The ball valve shall be of Brass or Gunmetal as specified conforming to IS 1703. The ball valve shall be of following two classes:—

- a. High Pressure: High pressure float valves are indicated by the abbreviation ‘HP’ and are designed for use on mains having pressure of 0.175 MPa or above.
- b. Low Pressure: Low Pressure float valves are indicated by the abbreviation ‘LP’ and are designed for use on mains having a pressure up to. 0.175 MPa.

The ball valves shall be of following nominal sizes 15 mm, 20 mm, 25 mm, 32 mm, 40 mm and 50 mm.

D.12 SINGLE ACTING AIR VALVE W/ BALL VALVE

Supply and fixing in position the following Single Acting Air Valve of large orifice type Cast iron body pressure rating of 10 Kg / Cm² , 16 Kg / Cm² conforming to IS 14845 : 2000 with lever operated, full flow, quarter turn, Ball Valves of Forged Brass body and chrome plated brass ball with chrome plated steel handle with PVC sleeve and PTFE seal tested to 25 Kg / Cm² pressure rating, conforming to BS : 5159 manufacturing standards, and including all unions and effective proper connections.

D.13 SOLENOID VALVE

Supply and fixing in position the following Solenoid Valves with Brass body, SS-304 spring, pressure limit of 12 Kg / Cm² and assembled with NBR seal, Include power cable, control cable, level probe/sensor/ electrode with all fitting & accessories complete set.

Solenoid Valves are compact, general-service, two-way guide type. They are available in brass with a normally closed design and can be oriented in any position. The solenoid enclosure provides protection against dust, while also protecting against seepage of oil and noncorrosive coolants. The Series SBSV-B valves come assembled with an NBR seal, having a maximum process temperature of 176°F (80°C). The series offers a wide range of valve

sizes and flow ranges, with connection sizes from 1/8” to 2” NPT and orifices from 3 mm to 50 mm.

Line Size	1/8 to 2” NPT.
End Connections	Female NPT.
Operating Pressure	1/8 to 1/4” : 0 psi (0 bar) to 188.5 psi (13 bar); 3/8 to 2” : 7.3 psi (0.5 bar) to 188.5 psi (13 bar).

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Pressure Limit	246.6 psi (12 bar).
Wetted Material	
Body	Brass;
Spring	304 SS;
Seal	NBR.
Temperature Limits	
Process	176°F (80°C);
Ambient	32 to 149°F (0 to 65°C).
Power Requirements	
Standard	110 VAC;
Power Consumption	110-VAC
Enclosure Rating	NEMA 13 (IP54).
Electrical Connection	DIN connection.
Other Materials	Nylon.
Mounting Orientation	Any position, best if solenoid vertically above valve.

D.14 UNPLASTICISED POLYVINYL CHLORIDE PIPES AND FITTINGS

Providing and fixing PVC Pipes shall conform to Type A pipes of IS 14735. The internal and external surfaces of the pipes shall be smooth and clean and free from groovings and other defects. The end shall be clearly cut and shall be square with the axis of the pipe. The end may be chamfered on the plain sides. Slight shallow longitudinal grooves or irregularities in the wall thickness shall be permissible provided the wall thickness remains within the permissible limit.

D.14.1 Colour of Pipe

Surface colour of the pipes shall be dark shade of grey or as specified .

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Each pipe shall be clearly and indelibly marked with the following informations at intervals not more than 3 meter.

- a) Manufacturer's name or trade mark.
- b) Nominal outside dia of pipe.
- c) Type 'A'
- d) Batch number.

D.14.3 Diameter and Wall Thickness:

Mean outside diameter, outside diameter at any point and wall thickness for type –A manufactured plain or with socket shall be as given in Table- 1 of IS 14735. UPVC rain water pipes shall be of the dia, specified in the description of the item and shall be in nominal lengths of 2,3,4 or 6 metres either plain or with sliding/grooved socket unless shorter lengths are required at junctions with fittings. Tolerances on specified length shall be + 10 mm and – 0 mm.

D.14.4 Fixing and Jointing

Pipes shall be either fixed on face of wall or embedded in masonry as required in the description of the item. Plain pipes shall be secured to the walls at all joints with PVC Pipes clips by means of 50 x 50 x 50 mm hard wood plugs, screwed with M.S. screws of required length i/c cutting brick work and fixing in cement mortar 1:4 (1 cement : 4 coarse sand). The clips shall be kept about 25 mm clear off finished face of wall, so as to facilitate cleaning of pipes. Pipes shall be fixed perfectly vertical or to the lines as directed. The pipes shall be fitted to fittings with seal ring conforming to IS 5382 allowing 10 mm gap for thermal expansion.

D.14.5 Installation in Wall/Concrete

The walls/concrete slots should allow for a stress free installation. Pipes and fittings to be inserted into the slots without a cement base have to be applied first with a thin coat of PVC solvent cement followed by sprinkling of dry sand (medium size). Allow it to dry. The process gives a sound base for cement fixation. This process is repeated while joining PVC material to CI/AC materials.

D.14.5 Fittings

Fittings used shall be of the same make as that of the PVC pipes Injeciton moulded or fabricated by the manufacturer and shall have a minimum wall thickness of 3.2 mm. The fittings shall be supplied with grooved socketted ends with square grooves and provided

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with Rubber Gasket conforming to IS 5382. The plain ends of the fittings should be chamfered. The fittings shall be joined with the help of Rubber lubricant. The details of fittings refer IS 13592.

The fittings shall be measured by numbers. The pipes shall be measured net when fixed correct to a running metre. including all fittings along its length.

D.15.Pipes- Centrifugally Cast (Spun) Iron Pipes

D.15.1 The spun iron pipes shall conform to IS 1536. The spun iron pipes shall be of cast iron cast centrifugally and vary in diameters from 80 mm to 750 mm. These shall be of class LA, class A and class B, as specified. Pipes shall be tested hydrostatically at the pressure specified in table.

Specials: The specials shall conform to IS 1538. The hydraulic test pressure of each class shall be as detailed in Table.

<i>Hydrostatic Test pressure for centrifugally cast socket & spigot pipes in MPa</i>		
<i>Hydrostatic Test pressure for works in MPa</i>		
<i>Class</i>	<i>Up to DN 600</i>	<i>DN 700 & above</i>
LA	3.5	1.5
A	3.5	2.0
B	3.5	2.5

<i>Hydrostatic Test pressure for centrifugally cast pipes with screwed on flanges in MPa</i>		
<i>Class</i>	<i>Up to DN 600</i>	<i>DN 700 & above</i>
B	2.5	1.6

<i>Hydrostatic Test pressure for fittings in MPa (N/mm²) (metre head)</i>		
<i>Nominal - Diameter</i>	<i>Fitting without branches or with branches not greater than half the principle diameter.</i>	<i>Fitting with Branches greater than half the Principal Diameter.</i>
Up to and including 300 mm	2.5 (25)	2.5 (25)
Over 300 mm and up to and including 600 mm	2.0 (20)	2.0 (20)
Over 600 mm and up to and including 1500 mm	1.5 (15)	1.0 (10)

D.15.POLYVINYL CHLORIDE (PVC) PIPES AND FITTINGS

PVC pipes and fittings of Type B for soil and waste discharging system of pressure rating Max 6Kg/cm² shall be used. The pipes shall be supplied in nominal lengths of 2, 3, and 4 or 6 meters as per IS 14735, tolerance on specified lengths shall be +/-10mm. Any physical test requirements shall be as per IS13592-1992.

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Because of their lightweight, there may be a tendency for the PVC pipes to be thrown much more. Reasonable care should be taken in handling and storage to prevent damage to the pipes. Contractor should hold the fullest responsibility in this case. On no account the pipes should be dragged on the ground. Pipes should be given adequate supports at all times.

D.15.2 LAYING

The PVC pipes shall be laid under the floors below slab or on walls either buried or exposed as the case may be, as per the specifications and instructions of the Engineer. The minimum thickness of fittings shall be of 3.2 mm. The fittings shall be of injection-moulded type with solvent cement joint. The pipes and fittings shall be capable of withstanding sun's rays. PVC pipes laid below slab or suspended in ceiling shall be supported by angle brackets / MS supports as detailed in the drawings and as per the instruction of the Engineer. The cost of drilling holes in RCC slab, floor, RCC/masonry retaining wall with the core cutting machine and making good the same with approved quality cement concrete etc. is at its own cost. If the pipes laid above the floor level (sunken level), it should be rigidly fixed with PCC bedding and levelled at every 1 metre intervals.

D.15.3 JOINTING

The jointing of pipes to fittings shall be done as per the manufacturer's instructions / recommendations and as per the Engineer instruction.

The PVC pipes and fittings shall be joined with Solvent Cement and jointing shall be carried out as follows:

1. Cut the spigot end of the pipe square.
2. All burrs from the internal and external surfaces should be removed.
3. The spigot should be marked with a pencil line and a distance equivalent to the socket depth. Clean the surface within the marked area.
4. Apply uniform coat of solvent cement on the external surface to the pipe and a lighter coat on the internal surface of the fitting.
5. Insert the pipe end into the socket of the fitting and push it in upto the mark.

Remove the excess solvent cement and hold the joint firmly in position for 30 seconds to dry. Gluing should be avoided in a rainy or foggy weather.

The other method of jointing shall be by rubber rings. The material of rubber ring should conform to IS 5382-1969. The ring is housed in groove formed in a plastic or metallic housing. The rubber is compressed and makes a seal between the pipe and housing. Lubricating paste should be applied before compressing the rubber. Where natural rubber 'O' rings are used, mineral oil or petrol or grease should be used.

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PVC pipes and fittings shall be tested in accordance with IS 13592 - 1992. The openings of the pipes shall be sealed for the section to be tested. These are of non pressure pipe and testing carried out by gravity water pressure or smoke test. The water pressure of 0.5Mpa (1.5m of H₂O or 0.15 kg/cm²) shall be maintained for a minimum period of 15 minutes and there should be no leakage at any joint. The Engineer shall examine carefully all the joints for leakage. The cost of equipments and accessories required for testing the system shall be supplied by the contractor at his own cost.

D.15.5 MODE OF MEASUREMENT PVC PIPES

PVC Pipes shall be measured along pipeline including the specials in running meter.

The quoted rate shall include the following:

- i) The cost of pipes, specials and other jointing materials.
- ii) Laying, jointing and curing.
- iii) Testing and making good the defects, if any.

D.16 S.W. Gully Trap:

Gully traps shall conform to IS 651. These shall be sound, free from visible defects such as fire cracks, or hair cracks. The glaze of the traps shall be free from crazing. They shall give a sharp clear tone when struck with light hammer. There shall be no broken blisters. Each gully trap shall have one C.I. grating of square size corresponding to the dimensions of inlet of gully trap. It will also have a water tight C.I. cover with frame inside dimensions 300 x 300 mm the cover weighing not less than 4.50 Kg and the frame not less than 2.70 Kg. The grating, cover and frame shall be of sound and good casting and shall have truly square machined seating faces

Fixing S.W. Gully Trap

Excavation : The excavation for gully traps shall be done true to dimensions and levels as indicated on plans or as directed by the Engineer-in-Charge.

Fixing : The gully traps shall be fixed on cement concrete foundation 65 cm square and not less than 10 cm thick. The mix for the concrete will be 1:5:10 (1 cement: 5 fine sand: 10 graded stone aggregate 40 mm nominal size). The jointing of gully outlet to the branch drain shall be done similar to jointing of S.W. pipes described above.

Brick Masonry Chamber : After fixing and testing gully and branch drain, a brick masonry chamber 300 x 300 mm (inside) in brick work of specified class in cement mortar 1:4 (1 cement: 4 fine sand) shall be built with a half brick thick brick work round the gully trap from the top of the bed concrete up to ground level. The space between the chamber walls and the trap shall be

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filled in with cement concrete 1:5:10 (1 cement: 5 fine sand: 10 graded stone aggregate 40 mm nominal size). The upper portion of the chamber i.e. above the top level of the trap shall be plastered inside with cement mortar 1:3 (1 cement: 3 coarse sand), finished with a floating coat of neat cement. The corners and bottom of the chamber shall be rounded off so as to slope towards the grating. C.I. cover with frame 300 × 300 mm (inside) shall then be fixed on the top of the brick masonry with cement concrete 1:2:4 (1 cement: 2 coarse sand: 4 graded stone aggregate 20 mm nominal size) and rendered smooth. The finished top of cover shall be left about 4 cm above the adjoining ground level so as to exclude the surface water from entering the gully trap.

Measurements : The work shall be enumerated. Excavation shall be measured separately under relevant item of earth work.

Rate : The rate shall include the cost of materials and labour involved in all the operations described above, except earth work which shall be paid for separately.

D.17 INSPECTION CHAMBER

At every change of alignment, gradient or diameter of drain, there shall be an inspection chamber. Bends and junctions in the drain shall be grouped together in inspection chamber as far as possible. The maximum distance between chambers shall be 30m.

Inspection chambers of different types and sizes as specified shall be constructed in the drainage line at such places and to such levels and dimensions as shown in the drawings or as directed by the Engineer-in Charge. The size specified shall indicate the inside dimensions between brick faces of the inspection chamber.

Where the diameter of the drain is increased, the crown of the pipe shall be fixed at the same level and necessary slope given in the invert of the inspection chamber. In exceptional cases and where unavoidable, the crown of the branch drainage may be fixed at lower level but in such cases the peak flow level of the two drainages shall be kept the same.

Drainage of unequal sectional area shall not be jointed at the same invert in an inspection chamber. The invert of the smaller drainage at its junction with main shall be at least 2/3 the diameter of the main above the invert of the main. The branch drainage shall deliver drainage in the inspection chamber in the direction of main flow and the junction must be made with care so that flow in main is not impeded.

Inspection chamber of 455 × 610 mm and 45 cm deep for single pipe line, 500 × 700 mm and 45 cm deep for one or two inlets and 600 × 850 mm and 45 cm deep for three or more inlets are generally constructed for drainage line.

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Excavation The excavation for inspection chamber shall be true to dimensions and levels shown on the plans or as directed by the Engineer-in-Charge.

Bed Concrete The inspection chambers shall be built on a bed of cement concrete 1:5:10 (1 cement: 5 coarse sand: 10 graded stone aggregate 40 mm nominal size) unless required by local authorities. The thickness of the bed concrete shall be 15 cm unless otherwise specified or directed by the Engineer-in-Charge and 40 mm thick cement concrete 1:2:4 (1 cement: 4 coarse sand: 4 grade stone aggregate 40 mm nominal size).

Brick Work The brick work shall be with class 75 bricks in one brick thickness in cement mortar 1:4 (1 cement: 4 coarse sand). The external joints of the brick masonry shall be

Plaster and Pointing The walls of the inspection chambers shall be plastered inside including bed with 12 mm thick cement plaster 1:3 (1 cement: 3 coarse sand) finished smooth. For earth work excavation, bed concrete, brick work, plaster and pointing, R.C.C. work and refilling of earth, respective specifications shall be followed.

Inspection Chamber Covers and Frames The frame of inspection chambers shall be firmly embedded to correct alignment and levels in R.C.C. slab or plain concrete as the case may be on the top of the masonry. After completion of the work, inspection chambers covers shall be sealed by means of thick grease.

Measurements Inspection chambers shall be enumerated under relevant items. The depth of the inspection chambers shall be reckoned from the top level of C.I. cover to the invert level. The depth shall be measured correct to a cm. The extra depth shall be measured and paid as extra over the specified depth.

Rate The rate shall include the cost of materials and labour involved in all the operations described above but excludes the cost of excavation, 12 mm thick cement plaster with water proofing material applied at the external surface of the inspection chambers if required, 40 mm thick cement concrete 1:2:4 (1 cement: 2 coarse sand: 4 grade stone aggregate 40 mm nominal size). These items shall be paid for separately under relevant items of work. Payment for extra depths of inspection chambers shall be made separately under relevant items of work.

D.18 Overhead Tank

3 layer PVC Water storage tanks (ISI marked) separately for general use, drinking purpose as per NBC norms and CPWD Specifications. The PVC Water storage tanks shall be located minimum 1.0 metre above the terrace level of toilet block and shall be suitably designed for the same.

D.19 Water Dispenser (Large)

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- A. Supplying, fixing and commissioning of approved make & suitable model for Large Water Dispenser with purified normal hot and cold water outlets including all fittings and accessories complete.,

Sl. No	Parameter	Requirement
1	Power supply	230V+/-10%, 50+/-2Hz, 1 Phase AC Supply
2	Water dispensing options	Normal, Hot & Cold
3	Flow Rate	125-130 Ltrs/ Hr
4	Storage tank capacity (Normal)	30-40 Ltrs
5	Storage tank capacity (Hot)	3-5 Ltrs
6	Storage tank capacity (Cold)	30-40 Ltrs
7	Normal tank MOC	LDPE/ SS 304
8	Cold & Hot water tank MOC	SS 304
9	Outer body, tray & legs	SS 304/ SS 202
10	Insulation material	PUF/ EPE
11	Cooling equipment	Compressor with grooved copper condensing coil
12	Compressor Make	Tecumseh/ Emerson
13	Refrigerant	R134a or any other environment friendly refrigerant
14	Heater Wattage	1000 Watts
15	Thermostat	Externally controlled thermostat with auto cut OFF system
16	No.of Faucets	3 Nos, Brass chrome plated
17	Power cords with plug top (With proper Earth connection)	3 Pin 15 Amps
18	Mounting	Floor mounting
19	Input water pressure	Water cooler/ dispenser shall work on input water pressure of max. 2 kg/cm ² .
20	Water flow control	Float valve system
21	Inlet/ outlet	Shall be provided with ½" water inlet connection, over flow pipe and drain outlet.
22	Pre filter assy	External mountable Spun cartridge & Activated carbon with housing & accessories sustaining mor than 2 bar pressure shall be supplied along with water cooler/ dispenser and shall have provision

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		to mount on the Water cooler.
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B. Water Dispenser - Small

Supplying, fixing and commissioning of approved make & suitable model for Small Water Dispenser with purified normal hot and cold-water outlets including all fittings and accessories complete.,

Sl. No	Parameter	Requirement
1	Power supply	230V+/-10%, 50+/-2Hz, 1 Phase AC Supply
2	Water dispensing options	Normal, Hot & Cold
3	Flow Rate	75-85 Ltrs/ Hr
4	Storage tank capacity (Normal)	14-16 Ltrs
5	Storage tank capacity (Hot)	3-4 Ltrs
6	Storage tank capacity (Cold)	14-16 Ltrs
7	Normal tank MOC	LDPE/ SS 304
8	Cold & Hot water tank MOC	SS 304
9	Outer body, tray & legs	SS 304/ SS 202
10	Insulation material	PUF/ EPE
11	Cooling equipment	Compressor with grooved copper condensing coil
12	Compressor Make	Tecumseh/ Emerson
13	Refrigerant	R134a or any other environment friendly refrigerant
14	Heater Wattage	1000 Watts
15	Thermostat	Externally controlled thermostat with auto cut OFF system
16	No.of Faucets	3 Nos, Brass chrome plated
17	Power cords with plug top (With proper Earth connection)	3 Pin 15/6 Amps
18	Mounting	Floor mounting
19	Input water pressure	Water cooler/ dispenser shall work on input water pressure of max. 2 kg/cm ² .
20	Water flow control	Float valve system
21	Inlet/ outlet	Shall be provided with ½" water inlet connection, over flow pipe and drain outlet.

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22	Pre filter assy	External mountable Spun cartridge & Activated carbon with housing & accessories sustaining mor than 2 bar pressure shall be supplied along with water cooler/ dispenser and shall have provision to mount on the Water cooler.
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E: TECHNICAL SPECIFICATIONS FOR FIRE FIGHTING

These special conditions are meant to amplify the specifications and General Conditions of Contract. If any discrepancy is noticed between these conditions, General Conditions of Contract, Specifications, Bills of Quantities and Drawings, the most stringent of the above shall apply for execution of the work.

The materials, design and workmanship shall satisfy the specifications contained herein and Codes Referred to. Where the technical specifications stipulate the requirement in addition to those contained in the Standard Codes and specifications those additional requirements shall also be satisfied. In the absence of any Standard/ Specifications covering any part of the work covered in this tender document, the instructions/directions of EIC will be binding on the contractor.

The scope of this section is to describe materials and systems for Fire Fighting installations of building which form together with the project documents, a complete volume of work and quality description.

All Fire Fighting installations shall be of high quality, complete and fully operational including all necessary items and accessories whether or not specified herein. All Fire Fighting work shall be completed in accordance with the regulations and standards to the satisfaction of the Consultants. The general provisions, special provisions and general requirements apply to the entire installation.

The work shall be carried out simultaneously with building work and shall be continued till it is completed satisfactorily along with the completion of essential portions of the building works. All installed Fire Fighting works shall be protected till the end - by the Fire Fighting contractor.

During the progress of work, completed portion of the building may be occupied and be put to use by the owner but the contractor shall remain fully responsible for the maintenance of Fire Fighting works till the entire work covered by this contract is satisfactorily completed by him and handed over to the owner.

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The general character and the scope of work to be carried out under this contract are illustrated in the drawings, specifications and schedule of quantities. The Contractor shall carryout and completes. The said work under this contract in every respect in conformity with the rules and regulations of the Local Authority. The contractor shall furnish all labour, supply and install all new materials, appliances, equipment necessary for the complete provision and testing of the complete Fire Fighting services installation as specified herein and in accordance with relevant BIS codes and as shown on the drawings. This also includes any material, appliance, equipment not specifically mentioned herein or noted on the drawings as being furnished or installed but which are necessary and customary to make a complete installation.

In general the work to be performed under this contract shall comprise of the following:

- a) Without restricting to the generality of the foregoing, the Fire Fighting Installations shall include the following:-
 1. Hydrant System Installation, testing and commissioning.
 2. Wet Risers, testing and commissioning.
 3. Valve chambers for underground valves along with CI covers.
 4. Instruments as required.
 5. Control and power cables from alarm valves to MCC-cum-ICP.
 6. Signal and control cables shall be laid underground by VENDOR as per the relevant standards.
- b) All incidental jobs connected with firefighting services installation such as excavation of trench and back filling, cutting & welding work, cutting/ drilling holes through walls, floors and grouting for fixing of fixtures, equipment foundation, Structural supports & other supports as required at site shall be part of firefighting works.
- c) Contractor shall submit the samples/catalogues of each material/equipment giving technical data. Only after written approval of samples/catalogues, the Contractor shall place the order.
- d) **Preparation of shop drawings** - Contractor shall submit the detailed shop drawings after Coordinating with structural, architectural and other services drawings. All structural Openings & Pipe sleeves shall be identified. **Shop drawings shall be furnished within 14 days after the award of the contract.**

Contractor shall furnish and install a complete working firefighting services installation as per approved shop drawings and as described in these specifications and as per the latest BIS codes. If any item (s) of work (s) which are explicitly/implicitly not specified in B.O.Q but are Necessary either as per specifications/BIS Codes or as per mandatory, these shall be

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identified by the contractor with cost implication at the time of submission of tender (as an annexure) failing which no claims to this respect shall be permitted during execution of the Contract.

- f) Before starting the work at site the contractor shall examine all services drawings and report to Consultant for discrepancies and obtain clarifications. Any work done without regard or consultation with other trades, shall be removed by the contractor without additional cost to the owner.
- g) Cleaning of all fixtures/ equipment and piping including flushing of all pipe work to remove any foreign matter shall be carried out in sections as the work progresses.
- h) Contractor shall temporarily cover & protect all fixtures, equipments & open pipe ends etc. It is the responsibility of the Contractor to protect all the installed fixtures/fittings and all equipments until the time of testing, commissioning & handing over to the owners.
- i) At least 10% of all the weld joints shall be radiographically tested and half of the joints radiographed shall be field joints.
- j) Painting of all concealed and exposed pipes, equipment as specified including weather proof treatment on exposed/ buried pipe work shall be part of this contract, even if it is implicitly/explicitly not specified in B.O.Q.
- k) Testing & commissioning of all systems in full including submission of test reports.
- l) Contractor shall submit “as installed” drawings, operation and maintenance manual for all equipments /operations etc. Framed operating & maintenance instructions shall be provided in plant room.
- n) Contractor shall carry out all the require liasioning with the local authority as per rules and regulations of NBC / Local Norms.

E. General:

Upon completion of installation the contractor shall test the system and hand over the same in operating condition to the owner or the agencies as assigned by the owner. Necessary operating and maintenance manuals together with as – built drawings. All in quadruplicate shall be submitted. The system shall be deemed to be taken over only upon submission of these documents and against the issuance of completion certificate from the Consultants.

Approvals:

- a) After completion of installation, necessary submission drawings shall be prepared by the contractor and to be submitted to BEML & Consultant.

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- b) The BIDDER shall carefully study all sections and drawings enclosed with specification and indicate deviations in the Section F of the specification. If no deviations are stated it will be assumed that the offer conforms in all respects to the specification and the PURCHASER reserves the right to evaluate the Bid as such without further reference to the BIDDER.
- c) BIDDER shall ensure that makes of various equipments are in line with Make list. In case of any deviation at time of execution, the vendor shall obtain prior approval of PURCHASER.

E.1 FIRE HYDRANT SYSTEMS

All materials shall be of the best-approved quality obtainable and unless otherwise specified they shall conform to the respective Bureau of Indian Standard specifications.

Samples of all materials shall be got approved before placing order and the approved samples shall be deposited with the Employer.

In case of non – availability of materials in metric size, the nearest size in FPS units shall be provided only with prior approval of the Employer / Consultants for which neither extra will be paid nor shall any rebate be recovered.

If directed / found necessary, materials shall be tested in any testing laboratory selected by the Employer and the Contractor shall produce the test results to the Consultant for his scrutiny and approval. The entire charges for original as well as repeated tests shall be borne by the Contractor. If required, the Contractor shall arrange to test portion of work at his own cost in order to prove the soundness of the same, to the Employer/Consultant or their representatives. The work or portion of work if found to be not satisfactory in the opinion of the Employer / Consultant or their representatives. Contractor shall pull down and re – do the same at his own cost. All defective materials shall be removed from the site immediately as ordered.

It shall be obligatory for the contractor to furnish certificates, if so demanded by the Employer / Consultant from manufacturer or the material supplier, that the work has been carried out by using their material and installed / fixed as per their recommendations.

E.2 FIRE HYDRANT PIPES:

All fire hydrant pipes, sprinkler etc., shall be of MS ERW BLACK `C` class, heavy grade, IS 1289/3589.

E.3 Pipes:

All pipes within the building in exposed locations and shafts including connections Buried under floor shall be ERW mild steel tubes conforming to IS:1239/3589 (Heavy Class) with screwed or welded joints as specified by the engineer in charge. Fittings of 50 mm or below shall be forged steel with socket weld ends of approved Makes. For 65 mm and above shall be W.I. / M.S with butt weld ends.

Bid invitation No: 6300038764**Closing Date: 22/03/2024****E.3.1 Pipe fittings:**

The fittings shall be of mild steel tubes as called for complying with all the appropriate requirements given in Para F.1.1 or as specified. The fitting shall be designated by the respective nominal bores of the pipes for which they are intended.

The fittings shall have screw threads at the ends and conforming to the requirement of IS-544 – 1955 (or revised). Female threads or fittings shall be parallel and male threads (except on running nipples and collars of unions) shall be tapered.

E.3.2 Cutting, Laying and Jointing:

The pipes and fitting shall be inspected at site before use to ascertain that they confirm to the specifications given in para F.1.1 above. The defective pipes shall be rejected. Where the pipes have to be cut or rethread, the ends shall be carefully filed out so that no obstruction to born is offered. The ends of the pipes shall then be threaded confirming to the requirements of IS: 544 – 1955 with pipe dies and taps carefully in such a manner as will not result in slackness of joints when two pipes are screwed together.

The taps and dies shall be used only for the straightening screw threads which have become bent or damaged and shall not be used for turning of the threads so as to make them slack, as the later procedure may not result in a water tight joint. The screw threads of pipes and fittings shall be protected from damage until they are fitted.

E.3.3 Jointing:

The pipes shall be cleaned of all foreign matter before being laid. In jointing the pipes, the inside of the socket and the screwed end of the pipes shall be oiled and rubbed over with white lead and a few turns of cotton thread spun yarn wrapped round the screwed in the socket, tee etc., with the pipe wrench. Care should be taken that all pipes and fittings are properly jointed so as to take the joints completely watertight and pipes are kept at all time free from dust and dirt during the fixing, the joint shall be removed after screwing. After lying, the open ends of the pipes shall be temporally plugged to prevent access of water, soil or any other foreign mater.

Any threads exposed after jointing shall be painted or in the case of underground piping thickly coated with approved anticorrosive paint to prevent corrosion.

E.3.4 External Works:

The mild steel ERW Black pipes and fittings in external work for fire hydrant / yard hydrant piping shall be laid in neatly excavated trenches. The widths and depths of the trenches for

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different diameters of the pipes shall be as given in the table below, and shall be deep enough to have a clear cover of at least 400mm above the top of pipes.

Dia. Of pipe	Width of trench	Depth of trench
80mm to 100mm	450mm	600mm
150mm to 200mm	600mm	750mm

At joints the trench; width shall be widened wherever it is necessary. The work of excavation and refilling shall be done true to line and gradient.

The pipes shall be painted with two coats of anticorrosive bitumastic paint of approved quality followed by wrapping with burlap or hessian based bitumen pipe of 4mm thickness with overlap of minimum 25mm. The pipes shall be laid on a layer of 7.5cm sand and filled with excavated earth. The supplies earth shall be disposed off as directed. The filling shall be done after testing & rectifying leakages and after final passing of work by the Consultant.

When the excavation is done in rock the bottom shall be cut deep enough to permit the pipes to be laid on a sand cushion of minimum 7.5cm. in case of bigger diameter pipes where the pressure is very high thrust blocks of cement concrete 1:2:4 (1cement :2 coarse sand: 4graded stone aggregate of 20 nominal size) shall be constructed on all bends to transmit the hydraulic thrust without impairing the ground and spreading it over a sufficient area, as directed by the engineer – in – charge / Consultants.

E.3.5 Testing the joints:

After laying and jointing, the pipes and fittings shall be inspected under working conditions of pressure and flow. Any joint found leaking shall be redone and all leaking pipes removed and replaced without extra cost to Owner. The pipes and fittings after they are laid shall be tested to hydraulic pressure of 15kg/ sq.cm. (100 meter or double the designed working pressures whichever is more). The pipes shall be slowly and carefully charged with water allowing all air to escape and avoiding all shock or water hammer. The draw off takes and stop cooqs shall be then closed and specified hydraulic pressure shall be applied gradually. Pressure gauge observations shall be made for at least 2hrs. The pipes and fittings should be tested in section as the work of laying proceeds, keeping the joints exposed for inspection during the testing.

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The lengths shall be measured in running meter correct to a cm for the finished work, which shall include MS pipes and sockets, MS fittings such as bends, tees, elbows, reducers, crosses, plugs, sockets, nipples and nuts, but exclude brass or gunmetal taps (cocks), valves, lead connection pipes and shower rose. The length shall be taken along the central line of the pipefitting. All pipes and fittings shall be classified according to their diameter of the internal bore. The pipe shall be described as including all cuttings and wastage. In case of fittings of unequal bore, the largest bore shall be measured. Digging and refilling of trenches shall be measured separately or clubbed with main item as called for in the item specification/tender bill of quantities.

E.4 Internal work:

The rate of internal fire hydrant piping shall include the cost of labour and material involved in all the operations. The rate shall include the cost of cutting holes in walls and floors making good the same including clearing of the debris. Insulation of pipes for hot water supply will be paid separately as extra item.

E.5 External work:

The rate of external fire hydrant work shall include the cost of labour and materials involved in all operations including excavation of trenches, painting of pipes and refilling all around the pipes.

E.6 Gun metal Fittings: (General)

The brass or gunmetal fitting shall be heavy quality and approved manufacture and pattern with screwed or flanged ends as specified. The fittings shall in all respects comply with the Indian standard specifications No. I.S. 778 – 1984 (Fourth revision) and I.S. 781 – 1984 (Second revision). The standard size of brass or gunmetal fittings shall be designated by the nominal bore of the pipe outlet to which the fittings are attached. A sample of each kind of fittings shall be got approved from the Consultants / Employer and all supplies should be made according to the approved samples.

All cast fittings shall be sound and free from laps, blowholes and filings. Both internal and external surfaces shall be clean, smooth and free from sand etc. Burning, plugging, stopping or patching of the casting shall not be permissible. The bodies, bonnets, spindles and other parts shall be truly machined so that when assembled the parts shall axial, parallel and cylindrical with surfaces smoothly finished. The area of the water – way of the fittings shall be less than the area of the nominal bore.

The fittings shall be fully examined and cleared of all foreign matters before being fixed. The fittings shall be fitted in the line in a workman – like manner. The joints and fittings shall be

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leak – proof when tested to a pressure of 6kg / sq.cm. as described in Para above and the defective fittings and joints shall be replaced or redone, without any extra cost.

E.6.1 Gun-metal full way valve with wheel:

These shall be of the gunmetal fitting with wheel and shall be of gate valve type opening full way and of the size as per specification. These shall generally conform to I.S. 780-1984 (Sixth Revision).

E.7 Butterfly / Ball Valves:

Valves up to 40 mm dia and below shall be Nickel plated brass body heavy stainless steel ball, lever operated, tested to 20Kg/sq.cm with female screwed ends. All ball valves shall be of full-bore type and of RB make.

Valves from 50mm up to 150mm dia shall be of cast iron body butterfly valves lever operated with flange ends. Valves shall carry IS certification mark.

All valves shall be approved by consultants before they are used on work.

All globe and check valves shall have working parts suitable for cold water, as required. Valves shall be tagged with permanent label under hand wheel indicating type or duty.

E.8 Masonry Valve Chambers:**E.8.1 General:**

All masonry valve chambers for Gate valves, etc., shall be built as per the drawings approved by the consultants / shall be of size 1200 x 1200 x 1500mm depth with 600x600 mm cast iron manhole cover.

E.8.2 Excavation:

The excavation for valve chambers shall be done true to dimension and levels as indicated on plans or as directed by the Consultants / Site Engineering.

E.8.3 Bed Concrete:

This shall be cement concrete 1:3:6 (1cement: 3 fine sand: 6 graded stone aggregate 40mm nominal size).

E.8.4 Cement Concrete locks:

This shall be in Cement Concrete blocks with crushing strength not less than 35kg / sq.cm, in cement mortar 1:4 (1 cement: 4 fine sand). Confirming to relevant IS. Code

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Plastering not less than 12mm thick shall be done in cement mortar 1:3 (1 cement: 3 coarse sand) finished with a floating coat of neat cement.

E.8.6 Surface Box:

This shall be of cast iron, well made and free from casting and other defects. All sharp edges shall be removed and finished smooth. The shape and dimensions for surface boxes for stopcocks, sluice valves etc., shall be as per approved samples.

E.8.7 Measurements:

Masonry chambers shall be enumerated under the relevant items.

E.8.8 Rating:

The rate shall include the cost of materials and labour involvement in all the operations described above, except the excavation in soft or decomposed and hard rock. The difference in cost, between ordinary soil and soft or decomposed or hard rock as the case may be, shall be paid for separately if the rock is met with.

E.9 Thrust Blocks and Anchorage:

At all changes of directions or gradients, thrust blocks made of cement concrete M15 duly designed should be provided around the bends of the pipes made of MS withstand dynamic and static forces likely to be developed due to water running the pipes. The thrust blocks shall be made after the joints are tested and found OK.

E.10 `Y` Strainers:

Strainers shall be of approved make, equal `Y` type of pot strainers, with cast / MS fabricated bodies. Strainers shall have bronze screen with 3mm perforations. Screen shall be removable and replaceable without disconnection of the main pipes. All strainers shall be provided with equal size isolation valves, so that the strainer may be cleaned without draining the system. All `Y` type strainers wherever specified shall be MS fabricated type only.

All pipe supports shall be mild steel, thoroughly cleaned and given on primary coat of red oxide paint before being installed.

E.11 External Stand Post Type Hydrant Assembly:

MS stand post with MS heavy grade pipe for seating the yard hydrant valve 80mm dia x 1800mm long

Bid invitation No: 6300038764**Closing Date: 22/03/2024****E.11.1 Single Headed Hydrant Valve:**

Gun metal oblique type hydrant valve of single outlet with necessary hose coupling adapter of 63 mm size, instantaneous spring lock arrangement and blank cap conforming to IS 5290.

E.11.2 Hose with coupling:

Controlled percolation, hose confirming to IS 8423 of 63mm dia. x 15 RMT long shall be provided with suitable fire hose delivery coupling of instantaneous spring lock arrangement comprising of male and female half and rubber cap washer as per IS 903.

E.11.3 Hose cabinet:

The cabinet is made of MS sheet of 16 SWG thick, the cabinet to accommodate two nos. of hosepipes with coupling and 1no branch pipe shall be provided for each yard hydrant valve. This cabinet shall be glass fronted with hinged door and lock. The cabinet shall be powder coated to scarlet red colour.

E.11.4 Fire Brigade Inlet Connection:

Provide as shown on drawing gunmetal Four way collecting head with 63 mm dia instantaneous type inlets with built in check valve of 100/150 mm dia. outlet connection to the fire main grid and for tank filling, collecting head shall conform to IS 904-1965.A.6.0

E.12 Internal Hydrant Assembly:**E.12.1 Single Headed Hydrant Valve:**

Provide on each landing One Signal headed gunmetal landing valve with 63 m dia outlets and 80 mm inlet (I.S 5290-1969) with individual shut off valves and cast iron wheels. Landing valves shall have flanged inlet and instantaneous type outlet as shown on the drawings/BOQ.

E.12.2 Hose with Coupling:

Controlled percolation hose confirming to IS 8423 of 63 mm dia x 15 RMT long shall be provided with suitable fire hose delivery coupling of instantaneous spring lock arrangement comprising of male and female half and rubber cup washer as per IS 903.

E.12.3 Fire Brigade Hoses:

Provide for each internal fire hydrant station two numbers of 63mm dia 15 meter long reinforced rubber lined hose pipes with gunmetal male and female instantaneous type coupling machine wound with G.I wire (hose to IS 636 type A and couplings to I.S 903 with I.S certification), fire hose reel , gunmetal branch pipe with nozzle I.S 903 fireman's axe.

Bid invitation No: 6300038764**Closing Date: 22/03/2024****E.12.4 Air Release Valves**

Provide 20/25mm screwed inlet GM single acting air release valve on all high points in the system.

E.12.5 Rain Valve

The contractor shall provide 25 mm dia M.S pipe to IS: 1239 (heavy class) with brass gate. Valve for draining any water in the system in low pockets as shown in drawings or as directed by the owner.

E.12.6 First Aid Hose Reels

Provide standard fire hose reels with 20 mm dia high pressure rubber hose of 36 meters length with gunmetal nozzle with 6 mm bore , and control valve , shut of nozzle connected wall mounted on circular hose reel of heavy duty mild steel construction and cast iron brackets . Hose reel shall conform to I.S 884 – 1969. The hose reel shall be connected directly to the MS pipe rise through an independent connection.

E.12.7 Hose Reel Cabinet:

Provide doors / hose cabinets for internal / external hydrants respectively fabricated from 16 Gauge M.S sheet with double glass front door and locking arrangement, with breakable glass key access arrangement, duly painted red as per specifications and fixed to wall / floor as per site conditions. The cabinet shall have a separate chamber to stave a key with breakable glass as per approved design. Hose cabinets shall be hinged double door partially glazed with locking arrangement, painted as per specifications with “Fire hose” written on it prominently. Samples of hose cabinet for indoor and outdoor works shall be got approved from Owner before production delivery at site.

For external hydrants the hose cabinets shall be fabricated from 16 gauge thick MS sheet with double shutter glass front door and locking arrangement with breakable glass key access arrangement. The cabinet shall have “Fire Hose” written on it prominently. Sample of hose cabinet shall be got approved from the Owner before installation at the site.

E.12.8 Hose and Extinguisher Cabinet:

Where indicated on the plan installs the auxiliary hose stations within a fire hose cabinet. Recessed Style – box shall be 18 gauge steel with 20 gauge hollow metal door and 16 gauge steel trim – door shall be due panel type with finish interior with trim – door shall be due panel type with finish interior with factory prime exterior set finished specified Croakers standard 5000 series.

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Tender drawings indicate schematically the size and location of pipes. The contractor on the award of the work shall prepare detailed working drawings, showing the cross section, longitudinal sections, details of fittings, locations of isolating and control valves, drain and air valves, and all pipe supports. He must view the specific openings in buildings and other structures through which pipes are designed to pass.

E.13.1 Above Ground Piping:

All pipes inside and outside the building, laid above the ground shall be properly supported on, or suspended from, stands, clamps and hangers as specified and as required. The contractor shall adequately design all the brackets, saddles, anchors, clamps and hangers, and be responsible for their section and usage. Approved type of anchor fastener shall be used along with standard pipe supports, like HITEC supports.

The pipes shall be duly painted with one coat red oxide primer and two coats of synthetic enamel paint of fire red colour as per shade No 536 per IS 5.

The spacing of supports shall be 3.5 m for 80, 100 and 125 mm dia. pipes, 5m for 150, 200 and 250 mm dia pipes and 7 m for above 250 mm dia pipes.

E.13.2 Vertical risers shall be parallel to walls and column lines and shall be straight and plumb. Risers passing from floor to floor shall be supported at each floor by clamps or collars attached to pipe and with a 15mm thick rubber pad or any resilient material. Where pipes pass through the terrace floor, suitable flashing shall be provided to prevent water leakage. E.13.3 Pipe sleeves 50mm larger diameter than pipes shall be provided wherever pipes through walls and slabs and annular space filled with fiberglass and finished with retainer rings.

E.13.4 All pipe work shall be carried out in a workman like manner causing minimum disturbance to the existing services, buildings roads and structure. The entire piping work shall be organized in consultation with other agencies work so that laying of pipe supports pipe and pressure testing for each area shall be carried out in one stretch.

E.13.5 Cut outs in the floor slab for installing the various pipes are indicated in the drawings. Modification of these cut-outs / additional cut-outs if required shall be included in the offer.

E.13.6 The contractor shall make sure that the clamps, brackets, clamps saddles and hangers provided for pipe supports are adequate. Piping layout shall take due care for expansion and contraction in pipes and include expansion joints where required.

E.13.7 All pipes shall be accurately cut to the required sizes in accordance with relevant ISI codes and burrs removed before laying. Open ends of the piping shall be closed as the pipe is installed to avoid entrance of foreign matter. Where reducers are to be made in horizontal

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runs, eccentric reducers shall be used for the piping to drain freely. In other location, concentric reducers may be used.

E.13.8 All welding of pipes shall be carried out by certified welding only. A welding procedure shall be prepared and qualified before any welding is done. The welding standard shall be as per AWS D 10.9, level AR- 3. All pipe works of 40 mm NB and below shall be of screwed constructions.

E.14 Under Ground Piping:

All buried piping shall be duly painted with one coat of bituminous primer and above this one layer of tar felt of 4 mm thickness shall be wrapped. Above this a finished wrapping with Pipe shall be provided. The UG piping is to be laid in such a way that TOP level is minimum 1mtr from ground level PCC 1:4:8 anchor supports shall be provided for bends and tees wherever change in flow direction occurs.

E.14.1 Excavation and Back Filling:

Excavation for pipelines shall be in open trenches to line and grade shown on the drawings or as required at site as per the instruction of the Engineer. Pipelines shall be buried to a minimum depth of 1000mm in all types of soil including soft rock, hard rock and disintegrated rock for laying fire water supply pipes. On completion of testing, anti-corrosive treatment with wrapping and coating of the pipelines, trenches shall be refilled with selected earth available from the trench excavation including watering and consolidation in layers of 15cms layers and consolidated. The back fill soil shall be graded soil free from stones, pebbles, clay lumps and vegetation and any organic matter. The surplus earth after backfilling shall be deposited to an initial lead of 30 m or as directed by the Engineer. Excavation shall comply with as per IS:1200.

E.14.2 Testing & Balancing:

All piping shall be tested to hydrostatic test pressure of at least one and Half time the maximum operating pressure but not less than 10kg per sq.cm gage for a period of not less than 2 hours. All leaks and defects in joints revealed during the testing shall be rectified and got approved at site.

E.14.2.1 Piping repaired subsequent to the above pressure test shall be re- tested in the same manner till no leaks and pressure drops are found.

E.14.2.2 System may be tested in sections and such sections shall be securely capped then retested for entire system.

E.14.2.3 The contractor shall give sufficient notice to all other agencies at site of his intention to test a section or sections of piping and all testing shall be witnessed and recorded by owner's site representative.

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Unless otherwise specified measurements for piping for the project shall be on the basis of centerline measurements described herewith.

E.14.2.5 Piping:

Shall be measured in units of length along the center line of installed pipes including all pipe fittings, flanges (with gaskets and nuts and bolts for jointing) unions, bends, elbows, tees, concentric and / or eccentric reducers, inspection pieces, expansion loops etc., the above accessories shall be measured as a part of piping length along the center line of installed pipes and no special rates for these accessories shall be permitted.

E.14.2.6 The quoted unit rates for centre line linear measurements piping shall include all wastage allowance, pipe supports including hangers, MS channel, wooden haunches, nuts and check nuts, vibration isolator suspension where specified or required and any other item required to complete the piping installation as per the specification. None of these items will be separately measure NOR paid for.

However, all valves (gate / globe / check / balancing / butterfly / ball etc.,) strainers, orifice plates, thermometers, pressure gages shall be separately measured and paid as per their individual unit rates.

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Fully charged and tested ISI marked fire extinguishers of various types as required shall be installed in readily accessible locations with brackets fixed to wall by suitable anchor fasteners.

Each appliance shall be provided with an inspection card indicating the date of inspection, testing, change of charge and other relevant data.

All appliances shall be fixed in a true workman like manner, truly vertical and at correct locations.

Fire extinguishers shall be installed as per Indian standard 'code of practice for selection, installation and maintenance of portable first aid appliances' IS-2190-1962.

TYPES OF FIRE EXTINGUISHERS:

1. 4.5 Kg CO₂ Gas Type Fire Extinguisher, Trolley Mounted, Easy Weight Management used Unused Mechanism, Squeeze Grip, Gross weight 19.1 Kg, empty Weight 14.6 Kg,

2. Fire extinguishers filled with mono-ammonium phosphate cited with silicon and pressurized with Nitrogen, as propelling agenda shall be used to extinguish class A, class B and class C fires.

Fire Buckets of 9 litre capacity fabricated out of 24SWG sheet steel filled with clean fine sand shall be provided at required places.

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9. LIST OF APPROVED MAKE / MANUFACTURERS
A. ELECTRICAL , DATA & VOICE NETWORKING WORKS

Sl. No.	Description of material	Approved Make
1	MCCBs and ACBs	Siemens/ Schneider/ L&T/ Legrand
2	MCBs/RCCBs/RCBOs/DBs/EnclosureBox	Siemens/ Legrand/ Schneider/ L&T
3	Timers	L&T / Siemens / Legrand
4	Push Buttons	Siemens/ Teknic/ C&S/ L&T
5	XLPE LT Cables	Finolex/Polycab/Havells/KEI/RR KABEL
6	FRLS and PVC insulated stranded flexible copper wires as per IS 694	Finolex/Polycab/Havells/KEI/RR KABEL
7	PVC rigid conduit heavy duty	Finolex/Precision/Avon Plast/ Vasavi /other ISI make with approval. Minimum thickness 2.0mm upto 25mm and 2.5 mm for above 25mm
8	M.S. Conduit pipe / G.I. Pipe	TATA / GST / Bharath/ BEC
9	Modular type Switches, Socket, Fan Regulator, including Modular Boxes and Plates and accessories	Legrand(Mosaic/Myrise)/ Crabtree(Picadly)/ Schneider Zencello/
10	Selector & Rotary switches	L&T/ Kaycee/C&S
11	LED light Fittings, lamps & accessories	Philips/ Havell's/ Bajaj/ CGL
12	Street Light/High bay light	Philips/CGL/ Havell's/ Bajaj
13	Multifunction meter	El measure/ Schneider/L&T
14	Ceiling Fans (5* rated BLDC as per BEE)	Havell's/Usha/CGL/Bajaj/Orient
15	Exhaust fans/Wall fans	CGL/Bajaj/Havell's/Almonard
16	CT	Kalpa/Kappa/L&T/AE/INDCOIL/C&S
17	Paints	Berger/Asian/Nerolac
18	Indicators	TEKNIC/L&T / BCH/ Siemens
20	Terminals	Connectwell/ CHHABI/ Cab seal / Wago / Elmex
21	Crimping type lugs	Dowells/ Jainsons / Asian / Commet

BEML LIMITED

(A Government of India Mini Ratna Company under Ministry of Defence)
 Kinfra Wise Park, Kanjikode, Palakkad – 678621, Telephone: 0491-2568178

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Sl. No.	Description of material	Approved Make
22	Cable Tray	RICO/PILCO/VENUS/ Profab
23	Rubber Mat	Syntex /Jyoti and IS make
24	Inverter	Numeric/Consul – Fuji/HYKON
25	Battery	Exide/AMCO/Amaron
26	LT Panel	CPRI Approved Manufactures
27	Sandwich Bus Bar Trunking	Schneider/L&T/C&S
28	Telephone cable	Finolex/Havells/Polycab/RR cable
29	Telephone Crone Connector	D-link/systemax/digilinc/molex/Krone or equivalent.
30	Cat-6 LAN Cable	D Link /systemax/digilinc/Finolex/molex
31	Telephone/Cat6 IO/ LIU/Cat6 Jack Panel	Molex/ Systimax / Commscope / D-link /
32	Data Rack	Net Rack / Wall Rack
33	All Other Items	As per approval of BEML & Consultant

B. PLUMBING ANS SANITARY WORKS

Sl. No.	Description of material	Approved Make
1.	European Wall mounted water closet	Hindware/Parryware/Jaquar /Cera
2.	Washbasin	Hindware/Parryware/Jaquar /Cera
3.	Urinals	Hindware/Parryware/Jaquar /Cera
4.	Bib cocks	Hindware/Parryware/Jaquar /Cera
5.	UPVC,PVC pipes with fittings	Supreme/ Finolex/ Astral
6.	All types of Valves	Zoloto/Apollo/Leader/Audco
7.	Solenoid valves	Dwyer/Taylor/Audco
8.	Cast iron pipes and fittings	Nico, Kejriwal, Kesoram, Electro Steel
9.	Cockroach Trap	Chilly/ Player/ Camry/ Viking
10.	Grab bars for Disabled	Dorma/ D-line/ Cera/ Jaquar/ Hindware
11.	Polyethylene Storage Tank	Sintex/ Polycon/ Fusion / Supreme/ Plasto/Aqua

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Sl. No.	Description of material	Approved Make
12.	Water cooler	Crossfields/Aqua clan/ Conway/ Voltas

C. FIREFIGHTING WORKS

Sl. No.	Description of material	Approved Make
1	M.S Pipe	TATA /Jindal / Suryaprakash / Asian
2	M.S Fittings	R-brand / Koel /Swastik
3	Hydrant Valve (ISI Mark)	Fire squad/ Fire Knock/Audco /Newage /KSP/ priyanka / Shah Bhogilai
4	CI Butterfly valves	Leader /Audco /zoloto/ CRI
5	Fire hose (ISI Marks)	Fire squad/ Fire Knock/ Shah Bhogilai/ Newage / Priyanka
6	Hose Cabinet	Fire squad / Fire Knock/ Newage / priyanka
7	Fire bridge inlet	Fire squad/ Fire Knock/ Newage / Priyanka
8	Branch Pipe & Nozzle	Fire squad/ Fire Knock/ Newage / Priyanka
9	Hose Reel Drum	Fire squad/ Fire Knock/New age /Shah Bhogilal / Priyanka
10	Ball Valve	Leader /Audco / zoloto/ CRI
11	Extinguishers	Fire squad/ Fire Knock/safex/ Minimax
12	Cables	Polycab/ Havells / Finolex/ RR KABEL
13	Addressable/ Conventional Zone Panel/Annunciation Panel	Fire squad/ Fire Knock/Agnijain / Inst /Ravel/Honeywell
14	Paint	Asian / Nerolac / Burger/Dulex
15	Passive Fire protection	3M / Promort /Metacaulk (UL Listed)
16	Wrapping & Coating	IWL / Pypokote

Note:

- a) The contactors shell use only above mentioned approved make of materials for the doing the executions.
- b) The samples of the material shall in either case have to be got approved from the Engineer-in-charge.

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c) Material where no make/brand has been mentioned, in this case ISI marked samples shall be submitted by the contractor for approval of Engineer.

d) For any item not covered in the list, the contractor shall get the make & sample approved from the Engineer-in-charge before procurement. The final choice of make to be used in the works will rest with the client and the decision of the Engineer-in-charge shall be final & binding on the contractor in this respect.

e) Contractor will be responsible to ensure the quality of products listed in approved list of makes/brands. Contractor will have to replace the defective and sub-standard materials at his own cost.

NOTE: Bidders must quote lumpsum amount, calculated as total for all the activities and quantities indicated in the BOQ; for the tender in SRM. L1 will be arrived based on lumpsum quote. Price Breakup as per BOQ to be submitted when called for by BEML.
