BID DOCUMENT

Development of Science Park Consisting of Civil works, Architectural Works and Electrical works along with Operation and Maintenance in Rourkela on Percentage Rate Basis

2021 –22

ROURKELA
SMART CITY LTD.

November – 2021

Rourkela Smart City Limited
1st Floor, RMC City library Udit Nagar,
Rourkela-769012

INVITATION FOR BIDS (IFB)

NATIONAL COMPETITIVE BIDDING

ROURKELA
SMART CITY LTD.

Bid Id No. RSCL/4228(v) /2021/Dated 05/11/2021

NATIONAL COMPETITIVE BIDDING

(CIVIL WORKS)

	Development of Science Park Consisting of Civil works, Architectural Works and Electrical works along with Operation and Maintenance in Rourkela on Percentage Rate Basis
Date of Invitation of Bid	06/11/2021
Pre- bid	15/11/2021 at 12:30 Hrs.
Last date and time for receipt of bids	23/11/2021 at 17:00 Hrs.
Last date of Physical Submission of Bid	26/11/2021 at 15:00 Hrs.
Time and date of opening of bids	26/11/2021 at 16:00 Hrs.
Place of Sale/Receiving of bids	Online mode only
Officer inviting bids	The Chief Executive Officer , Rourkela Smart City Limited, Rourkela, Odisha
Officer of Accepting bids	The General Manager(E&T),Rourkela Smart City Limited, Rourkela, Odisha

CHECK LIST TO BE ENSURED BY THE BIDDER

S.No.	Particular	Reference to DTCN Clause	Whether		Reference to Page no.
			Yes	No	
01	Cost of tender paper Rs.10,000.00 and GST Rs.1,200/- (Scanned copy of financial instrument shall be furnished)	No.4 & 5(i)			
02	E.M.D /Bid Security Declaration	No.5(i) & 20			
03	Copy of valid Registration Certificate	No.5 (i) & 21			
04	Copy of PAN Card	No.5 (i) & 21			
05	Turn over certificate	No. 111 (h)			
06	No Relationship Certificate in Schedule – A	No.35			
07	Information regarding current litigation, debarring /expelling of the tender or abandonment of the work by the tenderer (Schedule-D)	No.49			
08	Affidavit (Schedule-E)	No.49			
09	Works Experience : List of projects under execution/ executed that are similar in nature to the work	Schedule-B & Schedule - C			
10	M.O.U. (Memorandum of Understanding duly notarized) with eligible registered electrical contractor having valid M.V. license;	No. 8 & Schedule - J			
11	Affidavit for Eligible Class of Contractor e-mail ID & Contact no	Schedule K to Schedule-O			

CONTRACT DATA

A.GENERAL INFORMATIONS

S. No.	Item	Detail
1	Name of Work	Development of Science Park Consisting of Civil works, Architectural Works and Electrical works along with Operation and Maintenance in Rourkela on Percentage Rate Basis
2	Employer	Rourkela Smart City Limited
3	Employer's Representative	The Chief Executive Officer
4	Estimated Cost	Rs.8,32,89,056/- (Rs. Eight Crore Thirty Two Lakhs Eighty Nine thousand and Fifty Six Only)
B. BID INFORMATION		
5	Intended completion period/Time	Twelve (12) Calendar Months
	period assigned for Completion	Thirty Six (36) Calendar Months (O&M period 24 Months)
6	Last Date & time of online submission of Bid	Date: 23/11 /2021.
		Time 17:00 hours
7	Cost of Bid Document	
	i Bank draft amount	Rs.10,000/- + Rs.1,200/-(GST) i.e. Rs.(11,200/-)
	ii in favour of	RSCL(Smart City Mission Grant Fund)
	iii payable at	Rourkela
8	Earnest Money Deposited	
	i In Form of Bid Security Declaration	As per Annexure-II
	ii In favour of	NA
	iii payable at	NA
	iv Type of instrument	As specified in the bid document
9	Period of submission of original Bid security Declaration and Demand draft towards cost of Bid documents in the office of the Chief Executive Officer, Rourkela Smart City Ltd, Rourkela	Date: 06/11/2021 to 23/11/2021 15:00 Hours
10	Bid validity period	90 days

11	Currency of Contract	Indian Rupee
12	Language of Contract	English
13	Retention Money	5(five)%

Instruction to Bidders (ITB) e- procurement
(Relevant clauses in the DTCN/Bid document shall be superseded)

1. NOTICE INVITING BID AND OBTAINING BID DOCUMENTS:

1.1. The authority belonging to the major discipline is competent to invite tender of composite bids. He will also nominate the G M (E &T), Rourkela Smart City Limited, who will deal with all matters relating to the bids in the invitation of bids.

1.2. For composite tender, estimated cost of each component should be clearly indicated in addition to combined estimated cost put to tender. The eligibility of bidders will correspond to thee combined estimated cost of different components

1.3. The contractor shall comply with the provisions of the Apprentices Act 1961, and the rules / amendments issued there under from time to time. If he fails to do so, it will be considered a breach of the contract and the GM (E&T) may at his discretion Without prejudice to any other right or remedy available under law, cancel the contract. The contractor shall also be liable for any pecuniary liability arising on account of any violation of the provisions of the said Act by him.

1.4. The contractor shall be deemed to have satisfied himself as to the correctness and sufficiency of the Tender and of the rates and prices quoted in the Bill of Quantities, all of which shall, except in so far as it is otherwise provided in the Contract, cover all his obligations under the Contract (including those in respect of the supply of goods, materials, plant & services or of contingencies for which there is a Provisional Sum) and all matters and things necessary for the proper execution and completion of the work and the remedying of any defects therein.

1.5. The successful bidder shall complete the works by the intended completion date specified in the Contract data.

1.6. Throughout these bidding documents, the terms “bid and tender” EMD and Bid Security Declaration and their derivatives (bidder / tenderer, bidding / tendering, etc.) are synonymous.

1.7. In case the tender for composite work includes in addition to main work / building work all other ancillary works such as sanitary and water supply installations drainage installation, electrical work, horticulture work, roads, paths ,sculpture and mural paintings etc. , the bidder apart from being a registered civil Contractor of appropriate class must associate himself with agencies of appropriate class those who is eligible to tender for sanitary and water supply drainage, electrical

, horticulture works, artistic & sculpture works in the composite tender. Intending Employers are not required to produce any documents viz. copy of Registration, PAN at the time of purchase of tender documents but will be required for verification purpose at later stage.

1.8. PARTICIPATING IN THE BID IN THE E-PROCUREMENT PORTAL: The Contractor/ Bidder intending to participate in the bid is required to register in the Portal with some information about the firm/Contractor. This is a onetime activity for registering in Portal. During registration, the contractor has to attach a Digital Signature Certificate (DSC) to his / her unique user ID. The DSC used must be of appropriate class (Class II or Class III) issued from a registered Certifying Authority such as n-Code, Sify, TCS, MTNL e-Mudra etc.

1.8.1 To log on to the portal the Contractor/Bidder is required to type his/her username and password. The system will again ask to select the DSC and confirm it with the password of DSC. For each login, a user's DSC will validated against its date of validity and also against the Certificate Revocation List (CRL) of respective CAs stored in system database. The system checks the unique ID, password and DSC combination and authenticates the login process for use of portal.

1.8.2 The tender documents uploaded by the Tender Inviting Officer in Website www.tendersodisha.gov.in, will appear in the section of Upcoming Tender" before the due date of tender sale. Once the due date has arrived, the tender will move to "Active Tender" Section of the homepage. Only a small notification will be published in the newspaper specifying the work details along with mention of the specific website for details. The publication of the tender will be for specific period of time till the last date of submission of bids as mentioned in the 'Invitation for Bid' after which the same will be removed from the list of Active tenders. Any bidder can view or down load the bid documents from the web site.

1.8.3 Contractor exempted from payment of EMD/ Bid security Declaration will be able to participate the tender directly by uploading documentary evidences towards his eligibility for such exemption.

1.8.4 If the software application has the provision of payment of cost of tender document through payment gateways of authorized bankers by directly debiting the account of the bidders, bidders will be required to avail on-line payment.

1.9 The bidder intending to participate in the bid on-line shall prepare the bid security declaration and demand draft towards cost of bid as per IFB (except for exempted contractors) and up load the scanned copy of the draft and bid security declaration to the portal against the bid where he is participating and the original shall be deposited to the tender inviting officer within the period specified in the "contract data". If the Bidder fails to deposit the original bid security declaration and demand draft towards cost of bid within the stipulated time his bid shall be rejected and action as per prevailing rule shall be taken..

1.10 In the case of any failure, malfunction, or breakdown of the electronic system used during the e-procurement process, the tender inviting officer shall not accept any responsibility for failures or breakdowns other than in those

systems strictly within their own control.

1.11 Any third party/company/person under a service contract for operation of e- procurement system in the State or his/their subsidiaries or their parent companies shall be ineligible to participate in the procurement processes that are undertaken through the e-procurement system irrespective of who operates the system.

2. ELIGIBLE BIDDERS:

2.1 This Bid is open to all Special Class & Super class contractors as per OPWD Code, registered with the State Governments and Contractors of Equivalent Grade/ Class Registered with Central Government/ MES/ Railways for execution of civil works. The Bidders are required to enclose the proof of registration from the registering authority along with the Bid subject only the registration in the portal using his/her DSC for on-line bids.

Contractors not registered with Govt. of Odisha can participate in the e-procurement after necessary enrolment in the portal but have to subsequently register themselves with the appropriate registering authority of the state Govt. before award of the work as per prevalent registration norms of the state.

2.2 All bidders shall provide a statement that the bidder is neither associated, nor has been associated, directly or indirectly, with the Consultant or any other entity that has prepared the design, specifications, and other documents for the Project or being proposed as Project Manager for the Contract. A firm that has been engaged by the Engineer-in-Charge to provide consulting services for the preparation or supervision of the works, and any of its affiliates shall not be eligible to bid.

2.3 If the bidder has a relative employed as an Officer in the rank of an Assistant Engineer/Under Secretary and above in the Government of Odisha in the concerned Department, he shall inform the same in Schedule-G of the bid document mentioning the exact details in a covering letter along with the tender, failing which his bid will not be considered. Also, if the fact of relationship subsequently comes to light, his contract will be rescinded. The bid security declaration or the performance security will be forfeited, and he shall be liable to make good any loss or damage resulting from such cancellation. In case the bidder has no relationship with any of the officers mentioned above he shall have to furnish with his bid an undertaking to that effect.

2.4 He shall also intimate the names of persons who are working with him in any capacity or are subsequently employed by him and who are near relatives to any gazetted officer in the concerned Department. Any breach of this condition by the contractor would render him liable for penal action for suppression of facts.

2.5 No Engineer of gazetted rank or other gazetted officer employed in Engineering or Administrative duties in an Engineering Department of the Government of Odisha is allowed to work for contractor for a period of two years after his retirement from Government service, without prior permission of the Government of Odisha in writing. Such a contract is liable to be cancelled if either the contractor or any of his employees is found any time to be such a person who had not obtained the permission of the

Government of Odisha as aforesaid before submission of the tender for engagement in the contractor's service.

3. QUALIFICATION CRITERIA:

3.1 For submission of Bids through the E-Procurement Portal, the bidder shall up-load the scanned copy/copies of documents listed under clause 3.2 in prescribed format wherever warranted in support of eligibility criteria and qualification information. The L-1 bidder shall have to produce the original documents in support of the scanned copies and statements uploaded in the portal within 5 days of opening of price bid. Bids from Joint ventures are not acceptable.

3.2 The bid shall include following information and documents.

a) Copy of valid contractor's registration certificate, PAN card, GST Registration should accompany the technical bid.
b) Copies of original documents defining the constitution or legal status, place of registration, and principal place of business; written power of attorney of the signatory.
c) The contractor shall furnish ownership documents for those machineries which he is planning to deploy for the tendered work.
d) Details of work under progress as per tender documents.
e) Details of works executed during the last five years and works in hand (list of on-going works) as per bid documents.

3.3 The Bidders are subject to be disqualified if they have:

a) Made misleading or false representations in the forms, statements and attachments submitted in proof of the qualification requirements; and/or
b) Record of poor performance such as abandoning the works, not properly completing the contract, inordinate delays in completion, litigation history, or financial failures etc.; and/or
c) Indulged in unlawful & corrupt means in obtaining bids
d) Been black listed/their registrations by the competent authority.

4. ONE BID PER BIDDER:

4.1 Each bidder shall submit only one bid for one package. A bid is said to be responsive if accompanied by cost of bid document and appropriate bid security declaration. The system shall consider only the last bid submitted through the E-Procurement portal.

5. COST OF BIDDING:

5.1 The bidder shall bear all costs associated with the preparation and submission of his

bid, and the Engineer-in-Charge will in no case be responsible and liable for those costs.

5.2 All the rates and prices in the bid shall cover all taxes, viz. or any other local taxes, ferry, tollage charges and royalties and any other charges except GST

5.3 The rate of royalties and taxes prevailing on the date of measurement shall be considered while making deductions in the bills.

5.4 The successful bidder shall make his own arrangement for all materials unless otherwise specified in the conditions of contract.

6. SITE VISIT :

6.1 Bidders are advised to inspect and examine the site and its surroundings and satisfy themselves before submitting their tenders as to the nature of the ground and sub-soil (so far as practicable), the form and nature of the site, the means of access to the site, the accommodation they may require and in general shall themselves obtain all necessary information as to risks contingencies and other circumstances which may influence or affect their bid. A Bidder shall be deemed to have full knowledge of the site whether he inspects it not and no extra charges consequent on any misunderstanding or otherwise shall be allowed. The Bidder shall be responsible for arranging and maintaining workers and all other services required for executing the work unless otherwise specifically provided for in the contract documents. Submission of a bid by a bidder implies that he has read this notice and all other contract documents and has made himself aware of the scope and specifications of the work to be done and of conditions and rates at which tools and plant, etc. will be issued to him by the Government and local conditions and other factors having a bearing on the execution of work.

6.2 The bidder, in preparing the bid, shall go through the site Investigation Reports provided in the Contract Data before filling up the Bid document.

6.3 The Officer inviting the bid / Engineer-in-Charge will clarify queries on the Contract Data on requisition by the intending Bidder. The bidder may ask question in the e-procurement portal using his DSC; provided the questions are raised before the date mentioned in the home page under critical dates.

B. BIDDING DOCUMENTS

7. GENERAL INSTRUCTIONS:

7.1 The description of the work is as mentioned under Invitiation for Bid

7.2 The bids uploaded by the Tender Inviting Officer may consist of general arrangements drawings or typical sections of the project. . Bidder may down load these drawings and take out the print for detail study. Any other drawings and documents pertaining to the works available with the officer inviting the Bid as well as in the office of the RSCL) as mentioned in the contract data will be open for inspection during working hours on all working days by the bidders. The bidder is required to down-load all the documents including the drawings for preparation of his bid. It is not necessary on the part of the Bidder to up-load the drawings other Bid documents (after signing) while up- loading his bid. He is required to up load documents related to his qualification information and Bill of Quantities duly filled in. It is assumed that while participating in the bid, the bidder has referred to all the drawings and documents uploaded by the Officer Inviting the Bids. Seeking any revision of rates or backing out of the bid claiming for not having referred to any or all documents provided in the Bid document by the Officer Inviting the Bids will be construed as plea to disrupt the bidding process and in such cases he will suspend/prohibit/debar/blacklist from participating in bidding in any contract of the State for a minimum period of 180 days and /or Cancelation of Empanelment (registration of from OPWD) action will be taken RSCL.

7.3 The bidder is expected to examine carefully all instructions, conditions of contract, contract data, forms, terms, scope of work, technical specifications, bill of quantities, forms, Annexes and drawings in the Bid Document. Failure to comply with the requirements of Bid Documents shall be at the bidder's own risk.

8. CLARIFICATION OF BIDDING DOCUMENTS:

8.1 Bid documents consisting of drawings, plans, specifications, the schedule of quantities of the various items of work to be done and the set of terms & conditions of contract to be complied with by the contractor who intends to bid and other necessary Documents can be seen in the office of the officer inviting the Bid during office hours every day except on Sundays & Public Holidays till last date of sale of tender paper.

8.2 No paper copy of the bid shall be sold.

8.3 The Contract Data to bid shall be filled and completed in the office of Officer inviting bid before issue of bid documents. If the documents are issued to the intending bidder without having been so filled in & completed, he shall request the officer inviting the bid to have this done before he completes and delivers his bid.

8.4 The bidder can seek clarification on the bids which he received earlier than 14 days prior to the deadline for submission of bids. The Employer's response will be uploaded in e-tendering portal before deadline for submission of bid.

8.5 PRE-BID MEETING: As scheduled in the NIT

(One request for each interested Participant will be entertained only)

9. AMENDMENT OF BIDDING DOCUMENTS:

9.1 Before the deadline for submission of bids, the officer inviting the Bid may modify the bidding documents by issuing addenda.

9.2 Any addendum thus issued shall be part of the bidding documents and shall be notified in the website www.tendersodisha.gov.in / notice board and through paper publication.

9.3 To give prospective bidders reasonable time in which to take an addendum into account in preparing their bids, the Officer inviting the Bid if also happens to be the Engineer-in-Charge with the permission of the higher authority may, at his discretion, extend as necessary the dead line for submission of bids.

C. PREPARATION OF BIDS

10. LANGUAGE OF THE BID:

10.1 All documents relating to the Bid shall be in the English language. Bids submitted in any other language shall be summarily rejected.

11. DOCUMENTS COMPRISING THE BID:

11.1 Following documents will be deemed to be part of the bid even if not submitted with the bid.

i. Invitation for Bids (IFB)
ii. Instructions to bidders (ITB)
iii. Conditions of Contract
iv. Contract Data
v. Specifications
vi. Drawings

11.2 All the volumes/documents shall be provided in the portal by the Officer inviting the bid. The bidder shall carefully go through the document and prepare the required documents and up load the scanned documents in Portable Document Format to the portal in the designated locations of Technical Bid. He will fill up the percentage rate in the BOQ down loaded for the work in designated Cell and up- load the same in designated locations of Financial Bid. Submission of document shall be effected by using DSC of appropriate class.

A. Cost of "Bid document" & "Bid Security Declartion" shall comprise

i. Cost of Bid Document
ii. Bid Security Declaration in prescribed Format.

B. "Technical Bid" shall comprise.

i. Declaration under the Official Secret Act, 1923
ii. Qualification Information and supporting documents,
iii. Certificates, undertakings, affidavits,

C. "Financial Bid "shall comprise".

i. Priced Bill of Quantities

12. PROPOSAL BY THE BIDDER:

12.1 In the E-Procurement Portal, an intelligent Bill of Quantity in Microsoft Excel format shall be made available to the bidder.

12.2 Deleted

12.3 In case of percentage rate tender, the bidder will only fill in the designated cell and activate "less" or "excess" to indicate how much his price offer is excess or less (Up to two decimal Place) than the estimated amount.

12.4 The bidder shall bid for the whole works as described in the Bill of Quantities.

12.5 Bidders shall submit offers that fully comply with the requirements of the bidding documents, Minutes of meeting of the Pre-Bid meeting, Including the Conditions of Contract basic technical design as indicated in the drawing and specification. Conditional offer or alternative offers will not be considered in the process of bid evaluation.

12.6 All duties, taxes, excluding GST and other levies including Building and other

Construction Workers Welfare Cess @ 1% payable by the contractor under the contract, or for any other cause shall be included in the rates, prices by the bidder. GST, purchase tax, turnover tax or any other tax on material in respect of this contract shall be payable by the Contractor and Government will not entertain any claim whatsoever in respect of the same.

12.7 The contractor shall be deemed to have satisfied himself as to the correctness and sufficiency of the Tender and of the rates and prices stated in the Bill of Quantities, all of which shall, except in so far as it is otherwise provided in the Contract, cover all his obligations under the Contract (including those in respect of the supply of goods, materials, plant & services or of contingencies for which there is a Provisional Sum) and all matters and things necessary for the proper execution and completion of the work and the remedying of any defects therein.

12.8 The contractor shall conform in all respects, by giving all notices and paying all fees, with the provisions of:

i. Any national or State Statue, Ordinance, or other Law, or any regulation, or bye-law of any local or other duly constituted authority in relation to the execution and completion of the works and remedying of any defects therein, and
ii. The rules and regulations of all public bodies and companies whose property rights are affected or may be affected in any way by the works.

12.9 FOR COMPOSITE BIDS: DELETED.

13. CURRENCIES OF BID AND PAYMENT:

13.1 The estimated unit rates and the prices are in Indian Rupees.

14. VALIDITY:

14.1 Bids shall remain valid for a period not less than 90 days or the period mentioned in the Contract Data, after the deadline date for submission of bid as specified in the notice inviting the Bids. A Bid valid for a shorter period shall be rejected by the Engineer-in-charge as non-responsive.

14.2 In exceptional circumstances, prior to expiry of the original time limit, the Officer inviting the Bid may request the bidders to extend the period of validity for a specified additional period. The request and the bidders' responses shall be made in writing or by cable or by e-mail.

15. BID SECURITY DECLARATION:

15.1 The Bidder shall furnish, as part of his Bid, a Bid security declaration as per format of Annexure II. The bidder shall scan all the written pages of the bid security declaration and up load the same to the system in designated place. The successful lowest bidder will

produce the original of all scanned documents for verification within 5 days of opening of the tender (Price Bid) In the eventuality of failure on the part of the successful bidder to produce the original documents, he will be lost her Empanelment (registration of OPWD) and / or suspend/prohibit/debar from participating in bidding in any contract of the State for a minimum period of 180 and will be blacklisted by the competent authority. In such a situation, successful L-2 bidder will be required to produce his original documents for consideration of his/her tender at the negotiated equal to L-1 bidder.

15.1.1 **Deleted**

15.2. The Bid shall be declared non-responsive and shall be rejected if submitted without an acceptable Bid Security Declaration and not secured as indicated in Sub-Clauses 15.1.

15.3. Combined bid security Declaration for more than one work is not acceptable.

15.4. In the case of Government Undertakings, Co-operatives Societies, Diploma or Degree holders in Engineering who are registered with the Government of Odisha, the rules framed by government from time to time about Cost of Bid documents, Bid security Declaration , performance security will apply.

15.5. **Deleted**

15.6. **Deleted**

15.7. The Bidder may be lost her Empanelment (registration of OPWD) and / or suspend/prohibit/debar/blacklist from participating in bidding in any contract of the State for a minimum period of 180 days.

15.7.1. If the bidder withdraws the bid after opening of the bid but within the period of validity.

15.7.2. If the Bidder seeks any revision of rates or backs out of the bid claiming for not having referred to any or all documents provided in the Bid by the Officer Inviting the Bids.

15.7.3 In the case of a successful bidder, if the bidder fails within the specified time limit to

15.7.3.1 Sign the Agreement; or

15.7.3.2 Furnish the required Performance Security including additional performance security if any

16. FORMAT AND SIGNING OF BID:

16.1. The bidder can download the tender of his choice and save it in his system and undertake the necessary preparatory work off-line and upload the completed tender at his convenience within the final date and time of submission.

The bidder shall only submit single copy of the required documents and Price Bid in the portal. In the Financial bid, the bidder cannot leave any figure blank. He has to only write the figures; the words will be self-generated. The Bidders are advised to up-load the completed Bid document well ahead of the last date & time of receipt to avoid any last moment problem of power failures etc.

16.2 The Bidder shall go through the Bid carefully and list the documents those are asked for submission. He shall prepare all documents including cost of Bid Document, Bid Security Declaration, Declaration form, price bid etc and store in the system.

16.3. The bidder shall log on to the portal with his DSC and move to the desired tender for up-loading the documents in appropriate place one by one simultaneously checking the documents. Once the Bidder makes sure that all the documents have been up-loaded in appropriate place, he clicks the submit button to submit the bid to the portal.

16.3.1 Tender cannot be pre-opened and cannot be submitted after due date and time. Therefore, only after satisfying that all the documents been uploaded, the Bidder should activate submit button.

16.3.2 . In the e-procurement process, each process is time stamped. The system can identify each individual who has entered into the portal any bid and the time of entering into the portal.

16.3.3 The Bidder should ensure clarity of the document up-loaded by him to the portal, especially the scanned documents by taking out sample printing. Non-submission of legible documents may render the bid non- responsive. However, the Officer inviting the Bids if so desires, can ask for legible copies for clarification within a stipulated period of 7 days, provided such document in no way alters the Bidder's price bid. If the Bidder fails to submit Such documents with in the stipulated date, his bid shall be evaluated on it's own merit.

D. SUBMISSION OF BIDS

17. SECURITY OF BID SUBMISSION:

17.1 All bid data uploaded by the Bidder to the portal will be encrypted by the DSC of the opener(s). The system shall require all the mandatory forms and fields

filled up by the contractor during the process of submission of the bid/tender.

17.2 The Bid shall be received in encrypted format by the system which can only be time.

18. DEADLINE FOR SUBMISSION OF THE BIDS:

18.1. The online bidding will remain active till the last date and time of the bid submission. Once the date and time (Server date and time) is over, the bidder will not be able to submit the bid. The date & time of bid submission shall remain unaltered even if the specified date for the submission of bids declared a holiday for the Officer inviting the Bid.

18.2. The officer inviting the bid may extend the deadline for submission of bids by issuing an amendment in accordance with Sub-Clause 9.3, in which case all rights and obligations of the officer inviting the bid & Engineer-in-Charge and the bidders previously subject to the original deadline will then be subject to the new deadline.

19. LATE BIDS:

19.1. The system shall reject submission of any bid through portal after closure of the receipt time. For all purpose the server time displayed in the e-procurement portal shall be the time to be followed by the bidder and concerned officers.

20. MODIFICATION AND WITHDRAWAL OF BIDS:

20.1 In the E-Procurement Portal, it is allowed to modify the bid any number of times before the final date and time of submission. The bidder shall have to log on to the system and resubmit the documents as asked for by the system including the price bid. In doing so, the bids already submitted by the bidder will be removed automatically from the system and the latest bid only will be admitted. But the bidder should avoid modification of bid at the last moment to avoid system failure or malfunction of internet or traffic jam or power failure. If the bidder fails to submit his modified bids within the designated time of receipt, the bid already in the system shall be taken for evaluation.

20.2 In the E-Procurement Portal, with-drawl of bid is allowed. But in such case he has to write a letter with appropriate reasons for his withdrawal addressed to the Officer inviting the bid and up load the scanned document to portal in the respective bid before the closure of receipt of the bid. The system shall not allow any withdrawal after expiry of the closure time of the bid.

E. OPENING AND EVALUATION

21. OPENING OF THE BID:

21.1 Bid opening dates are specified during tender creation or can be extended vide corrigendum. These dates are available in IFB, tender document as well as the home page of portal. Bid opening can be done by the authorized users which are defined

during the tender publication / approval stage. The bids are encrypted using there public keys and can be decrypted only on or after the Bid Opening due date. The bid openers private key will be required to open the bids and all the openers have to log on to the portal during that time.

21.1.1. The bidders who participated in the on-line bidding can witness opening of the bid from any system logging on to the portal with the DSC away from opening place. Contractors are not required to be present during the bid opening at the opening location if they so desire.

21.1.2. Each activity is date and time stamped with user details. For time stamping, server time is taken as the reference.

21.2. In the event of the specified date of bid opening being declared a holiday for the Officer inviting the Bid/Engineer-in-Charge, the bids will be opened at the appointed time on the next working day.

21.3. In case bids are invited for more than one package, the order for opening of the "Bid" shall be that in which they appear in the "Invitation for Bid".

21.4 During bid opening, the covers containing original demand draft towards Cost of bid in the form specified in the Invitation for Bid, received after last of receipt of bid and before opening of the bids shall be opened and declared. The original copy of the Bid Security declaration in the form, mention Annex-II and period of validity in conformity with clause 15 shall be checked and announced. The list of bidders who have submitted the original copy of the cost of Bid and Bid Security Declaration shall be prepared and announced.

21.4.1 Combined bid security Declaration for more than one work is not acceptable. If the bid security declartion has not been furnished in the form specified in Clause 15, the bid will be declared non-responsive and rejected.

21.5 The Bid openers; who have been pre-defined shall log on to the portal with their respective DSC. Unless all the Officers who have been declared as Opening officers, log on the portal with their DSC the Tender cannot be opened.

21.5.1 The Opening Officers will systematically check the scanned demand draft towards cost of the bid document and the scanned document of Bid security declaration with that of the original submitted. If found in order, they will continue opening of all other documents in the system provided under

Technical Bid.

21.5.2. The bids accompanied with appropriate bid cost and valid bid security declartion will be taken up for evaluation with respect to the qualification Information and other information furnished in Part - I pursuant to Clause 3.

21.5.3. Immediately on receipt of these clarifications, the Evaluating Officers; predefined in the system for the bid, will finalize the list of responsive bidders. They will log on to the site with their DSC and record their comments on the Technical evaluation page in the system. The Officer Inviting the Bid if also the accepting authority, shall log on to the system with his digital signature and check technical evaluation. He can either accept or pass on to the evaluating officers for re-evaluation. Upon acceptance of technical evaluation by the Accepting authority in the system, the system shall automatically generate letter to all the responsive bidders and the system shall forward the letter to all the responsive bidder that their technical bid has been evaluated responsive with respect to the data/information furnished by him and the letter shall also intimate him the date & time of opening of financial bid. The system shall also inform the non- responsive bidders in their email ID that their bid has been found non- responsive.

21.6 The Technical evaluation of all the bids will be taken up as per the information furnished by the Bidders. If any of the information/ statements/documents/ /certificates furnished by the bidder is found to be false/fabricated/bogus, his registration in the portal shall be blocked and the bidder is liable to be blacklisted.

21.7 After technical evaluation of the bidders and selection of the qualified bidders, the financial bids of the technically qualified bidders shall be opened on the due date of opening. Members of the bid opening committee log on to the system in sequence and open the financial bids for the technically qualified bidders. The opening of financial bid by the opening officer using their DSC shall decrypt the financial bids.

21.7.1 Opening of price bid and evaluation of lowest bidder is subject to satisfaction of other qualification information asked for in the bid pursuant to Clause-3.

21.7.2 The Officer inviting Bid shall ensure that all the Bidders are individually

intimated about the date, time & venue of opening of the financial bid along with the responsiveness of the Technical Bid.

21.7.3 The Financial Bid will be opened on the notified date & time in the presence of bidders or their authorized representative who wish to be present.

21.7.4 At the time of opening of "Financial Bid", the names of the bidders whose bids were found responsive in accor dance with Sub-Clause 24.1 will be announced. The bids of only those bidders will be opened. The remaining bids will be rejected.

21.7.5 The responsive bidders names, percentage rates, any discounts and withdrawals, and such other details as the officer inviting the tender may consider appropriate, will be announced by him or his authorized representatives at the opening.

21.7.6 Special conditions and/or rebate/discount offer if any uploaded to the system shall be declared and recorded first.

21.7.7 The Financial bid of the bidders shall be opened one by one by the designated officers. The system shall auto-generate the Comparative statement.

21.7.8 The Bidder can witness the principal activities and view the documents/summary reports for that particular work by logging on to the portal with his DSC from anywhere.

22. PROCESS TO BE CONFIDENTIAL:

22.1 Information relating to the examination, clarification, evaluation, and comparison of bids and recommendations for the award of a contract shall not be disclosed to bidders or any other persons not officially concerned with such process until the award to the successful bidder has been announced. Any effort by a bidder to influence the officer inviting the bid, processing of bids or award decisions may result in the rejection of his bid.

23. CLARIFICATION OF BIDS:

23.1To assist in the examination, evaluation, and comparison of bids, the officer inviting the bid may, at his discretion, ask any bidder for clarification of his rates including breakdowns of unit rates. The request for clarification and the response shall be in writing or by cable or by e-mail, but no change in the bid price or substance of the bid shall be sought, offered.

23.2 Subject to sub-clause 23.1 , no bidder shall contact the officer inviting the bid on

any matter relating to his bid from the time of the opening to the time the contract is awarded. If the bidder wishes to bring additional information to the notice of the officer inviting the bid, it should do so in writing.

24. EXAMINATION OF BIDS AND DETERMINATION OF RESPONSIVENESS:

24.1 During the detailed evaluation of "Technical Bids", the officer inviting the bid will determine whether each bid:-

24.1.1 Whether the Bid security Declaration is submitted in proper format.

24.1.2 Has submitted legible documents for evaluation

24.1.3 Meets the eligibility criteria defined in Clause 3 and;

24.1.4 Is substantially responsive to the requirements of the bidding documents.

24.2 During the detailed evaluation of the "Financial Bid", the responsiveness of the bids will be further determined with respect to the remaining bid conditions, i.e., priced bill of quantities, technical specifications and drawings.

24.3 A substantially responsive "Financial Bids" is one, which conforms to all the terms, conditions, and specifications of the bidding documents, without material deviation or reservation. A material deviation or reservation is one

24.3.1 Which affects in any substantial way the scope, quality, or performance of the works.

24.3.2 Which limits in any substantial way, inconsistent with the bidding documents, the right of the officer inviting the bid or the bidder's obligations under the contract or

24.3.3 Whose rectification would affect unfairly the competitive position of other bidders presenting substantially responsive bids.

24.4 If a "Financial Bid" is not substantially responsive, it will be rejected by the officer inviting the bid, and may not subsequently be made responsive by correction or withdrawal of the non-conforming deviation or reservation.

24.5 On opening of the price bid the system shall arrange the financial bids in order of their value (L1 first, followed by L2, L3 ….) for subsequent evaluation. The evaluation status (Sheet) will be visible to all the participating bidders after opening on their respective logins. Each activity is recorded in the system with date and time stamping.

25. EVALUATION OF BIDS:

25.1 If the officer inviting the Bid in his opinion judges that the price quoted by the lowest

qualified bidder is high or a special condition imposed by the bidder is to be withdrawn, the bidder shall be invited for negotiation by the officer inviting the Bid or by an officer authorised by him in writing.

F. AWARD OF CONTRACT

26. AWARD CRITERIA:

26.1 The officer inviting the bid will award the contract to the bidder whose bid has been determined to be substantially responsive to the bidding documents and who has offered the lowest evaluated price.

26.2 On acceptance of the tender, the Contractor shall name in writing his accredited representative(s) who would be responsible for taking instructions from the Engineer-in-Charge.

26.3 Competent Authority reserves to himself the right of accepting the whole or any part of the bid and the bidder shall be bound to perform the same at the rate quoted.

26.4 The successful bidder registered under other State Government / MES / Railways / CPWD in equivalent rank has to register under state PWD signing of the agreement.

27. OPTIONS IF THE BIDDER BACKS OUT FROM BIDDING PROCESS:

27.1 In case the 1st lowest Bidder or even the next lowest Bidder withdraw in series one by one, thereby facilitating a particular Bidder for award, then they shall be penalized with Appropriate action i.e. Cancelled the (registration of OPWD) and / or suspend/prohibit/debar/blacklist from participating in bidding in any contract of the State for a minimum period of 180 days the bidder as per Guiding of OPWD/Govt. of Odisha Guiding.

27.2 The bidding process shall be deemed to be complete after the issue of letter of acceptance. If the bidder fails to sign the agreement within the stipulated period mentioned under clause 29.2, his bid security shall stand forfeited.

28. RIGHT TO ACCEPT OR REJECT ANY OR ALL BIDS:

28.1 The competent authority on behalf of Rourkela Smart city Limited, does not bind him to accept the lowest or any other tender and reserves to him the authority to reject any or all the tenders received without assigning any reason.

28.2 All bids in which any of the prescribed condition is not fulfilled or any condition including that of conditional rebate is put forth by the bidder shall be summarily rejected.

29. NOTIFICATION OF AWARD AND SIGNING OF AGREEMENT:

29.1. In the E-Procurement Portal, the system shall generate the template of award letter and the Officer Inviting the Bid shall mention the amount of Performance Security and additional security required to be furnished in the letter and intimate the bidders in his e-mail ID. The issue of the letter of acceptance shall be treated as closure of the Bid process and commencement of the contract.

29.2 The bidder shall within 15 days of issue of letter of acceptance, furnish the Performance security & additional Performance security (if any) in the form & the work programme & shall sign the agreement in prescribed format, failing which the Engineer-in-Charge shall without prejudice to any other right or remedy available in law, be at liberty to either he will suspend/prohibit/debar/blacklist from participating in bidding in any contract of the State for a minimum period of 180 days or Cancelation of Empanelment (registration of from OPWD) action will be taken or both. The agreement will incorporate all agreements between the officer inviting the bid and the successful bidder. If L1 bidder does not turn up for agreement after finalization of the tender, then he will suspend/prohibit/debar/blacklist from participating in bidding in any contract of the State for a minimum period of 180 days and /or Cancelation of Empanelment (registration of from OPWD) action will be taken . In that case, the L2 bidder, if fulfils, required criteria would be called for

drawing agreement for execution of work subject to the condition that L2 bidder negotiates at par with the rate quoted by the L1 bidder otherwise the tender will be cancelled.

In case a contractor is black listed, it will be widely published and intimated to all departments of Government and also to Govt. of India agencies working in the state.

(Amendment to Para-3.5.14 Note-I of OPWD Code Vol.-I by inclusion).

29.2.1 Following documents shall form part of the agreement.

29.2.1.1 The notice inviting bid, all the documents including additional conditions, specifications and drawings, if any, forming the bid as issued at the time of invitation of bid and acceptance thereof together with any correspondence & documents leading thereto & required amount of performance security including additional performance security as per sub clause 29.2 hereof.

29.2.1.2 Standard Bid Document P.W.D. Form P-1

29.3 The letter to proceed with the work shall be issued by Engineer-in-charge only after signing of the agreement. The notification of award will constitute the formation of the contract subject only to the furnishing of performance security and additional performance security in accordance with the provisions of the agreement.

29.4 On acceptance of the composite bids by the competent authority the letter of award will be issued by the Engineer-in-Charge of the major component of the work.

29.5 Upon signing of the agreement by the successful bidder, the Engineer-in-Charge will promptly notify the other bidders that their bids have been unsuccessful.

30. CORRUPT OR FRAUDULENT PRACTICES:

30.1. The Engineer-in-Charge will reject a proposal for award if he determines that the bidder recommended for award has been engaged in corrupt or fraudulent practices in competing for the contract in question. He will report to the Officer Inviting Bid / next higher authority.

30.2 Canvassing whether directly or indirectly, in connection with tenders is strictly prohibited and the tenders submitted by the contractors who resort to canvassing will be liable for rejection.

DETAILED TENDER CALL NOTICE

Sealed percentage rate bids are invited in double cover system from the Class of eligible contractors registered with the State Government and contractors of equivalent Grade / class registered with Central Government / MES / Railways having registration for Civil, Electrical and P.H works for execution of Civil / E.I. / P.H. works on production of definite proof from the appropriate authority in prescribed form to be eventually drawn in P.W.D. FORM P-1 for the work/Project : "Development of Science Park Consisting

of Civil works, Architectural Works and Electrical works along with Operation and Maintenance in Rourkela on Percentage Rate Basis" an estimated cost of Rs.8,32,89,056/- (Rs. Eight Crore Thirty Two Lakhs Eighty Nine thousand and Fifty Six Only" Contractors not registered with Govt. of Odisha can participate in the e- procurement after necessary enrolment in the portal but have to subsequently register themselves with the appropriate registering authority of the state Govt. before award of the work as per prevalent registration norms of the state.

a) This tender is of composite nature and consisting of Civil, Electrical and PH works.
b) This detailed Tender Call Notice along with the Pre-Bid Meeting minutes, clauses mentioned herein shall form a part of the contract and agreement.

2. The Bid documents are available on official website of Government: https://www.tendersodisha.gov.in & www.rmc.nic.in, from 06.11.2021 17:00 Hrs to 23.11.2021 17:00Hrs.The last date and time of submission of Bid is as per contract data.
3. The Technical Bid documents (Cover–I) will be opened by the assigned officer in the office of Chief Executive Officer, RSCL at 16:00 Hours on 26.11.2021.in the presence of the bidders or their authorized representatives who wish to attend. After evaluation of the documents contained in Cover-I, the Cover-II containing price bid/s of the technically responsive bidder/s will be opened. The date, time and place of opening the price bid will be intimated to the eligible qualified bidders through system generated E-mails.
4. The cost of Bid documents in shape of demand draft issued from any Nationalized / Scheduled bank may be prepared in the name of RSCL(Smart City Mission Grant Fund), and payable at Rourkela for Rs.11,200/- towards tender paper cost. The online bid must be accompanied with scanned copies of demand draft towards cost of tender paper.
5. The bid is to be submitted in two covers.
   i. Cover-I is to contain scanned copy of EMD and Cost of bid document, Registration Certificate, PAN, Profit Loss statement, GST Registration Certificate, List of similar nature of works, work in hand, affidavit, turn over certificate and all other documents required as per the relevant clauses of this DTCN. Before award of final contract, such bidders will have to produce the GST clearance certificate. ii) The similar nature of work are of following types: One or more civil engineering project (s) in any one year during last five years.

   ii. Cover-II is to contain the PRICE BID duly filled in and signed by the bidder.

6. Furnishing scanned legible copy of Original Registration certificate, PAN card & GST Registration Certificate along with the Technical Bid is mandatory otherwise his/ her bid shall be declared as non responsive and thus liable for rejection.
7. Deleted
8. Deleted
9.
   i. The contract will be drawn in P.W.D. P-1 contract form and will constitute all civil, electrical and PH works.

The contract shall be drawn & signed by Chief Executive Officer on behalf of Rourkela Smart City Limited.

ii. The entire works of the Agreement shall be supervised measured and check measured by the Engineer in Charge.

10. If an individual makes the application, the individual should sign (with DSC) above his full type written name and current address.

11. If the application is made by proprietary firm, it shall be signed (with DSC) by the proprietor & furnish full type written name and the full name of his firm with its current address in a forwarding letter.

12. If the application is made by a firm in partnership, it shall be signed (with DSC) by a partner holding power of attorney for the firm in which case a certified copy of the power of attorney shall accompany the application. A certified copy of the partnership deed and current address of all partners of the firm shall also accompany the application.

13. If the application is made by a limited company or a corporation, it shall be signed (with DSC) by a duly authorized person holding power of attorney for signing the application in which case a certified copy of the power of attorney shall accompany the application. Such limited company or corporation will be required to furnish satisfactory evidence of its existence along with the technical bid.
14. The tender should be strictly in accordance with the provisions as mentioned in the tender schedule. Any change in the wordings will not be accepted.
15. The work is to be completed (Construction work) in all respects within Twelve(12) calendar months from the date of issue of work order. Before acceptance of tender, the successful bidder will be required to submit a work programme and milestone basing on the financial achievement so as to complete the work within the stipulated time and in case of failure on the part of the agency to achieve the milestone liquidated will be imposed (Amendment to Para-3.5.18 Note-VIII of OPWD Code Vol.-I).
16. All tenders received will remain valid for a period of 90 days from the last date prescribed for receipt of tenders and validity of tenders can also be extended if agreed by the tenderers and the Department
17. The tenderer shall carefully study the tentative drawings and specifications applicable to the contract and all the documents, which will form a part of the agreement to be entered in to, by the accepted tenderer and detailed specifications for Odisha, and other relevant specifications and drawings, which are available. Complaint at a future date that the tenderers have not seen plans and specifications cannot be entertained.
18. The drawings furnished with the tender are tentative and subject to revision or modification as tendered during the execution as per actual necessity and detail test conducted. But the tendered rates quoted by the tenderer will hold good in case of such modification of drawings during the time of execution and shall in no way invalidate the contract and no extra monetary compensation will be entertained. The work shall however be executed as per final approved drawing to be issued by the Engineer-in- Charge as and when required.
19. By admission of a tender for the work, a tenderer will be deemed to have satisfied himself by actual inspection of the site and locality of the work, about the quality and availability of the required quantity of material, and that rates quoted by him in the tender will be adequate to complete the work according to the specifications attached there to and that he had taken in to account all conditions and difficulties that may be encountered during its progress and to have quoted rates including labour and materials with taxes, octroi, other duties, lead, lifts, loading and unloading, freight for all materials and all other charges necessary for the completion of the work, to the entire satisfaction of the Engineer-in Charge of the work and his

authorized subordinates. After acceptance of the contract rate Government will not pay any extra charges for any reason in case the contractor claims later on to have Misjudged as regard availability of materials, labour and other factors. For the purpose of estimate, the approved quarry lead is to be provided judiciously. Engineers in charge would be responsible for ensuring the quality of the materials supplied. The contractors would, however, be responsible for procurement of material from authorized sources and voluntarily disclose the source of procurement for the purpose of billing. Besides, the bidder would be required to submit the details of quarry for procurement while submitting the bids.

(Amendment to Para-3.4.16 (a) (vii) of OPWD Code Vol.-I by substitution). Design,

20. The bid must be accompanied by Bid security declaration accepting, that if the bidder withdraw or modify its bid during the period of validity .i.e. not less than 90(Ninety) days from the bid due date or if the bidder is awarded the contract and fail to sign the contract or to submit a performance security and Addition Performance Security. Tender Not accompanied with Scanned copy of Bid security declaration shall be declared as non-responsive and thus liable for rejection. The bid security Declaration should remain valid minimum of 45(Forty-five)days beyond the bid validity period

21. The tender should be accompanied with the Scanned copies of the valid Registration certificate of Class of Contractor , GST Registration Certificate and PAN card which are mandatory, otherwise his/her bid shall be declared as non-responsive and thus liable for rejection.
22. The tender containing extraneous conditions not covered by the tender notice are liable for rejection and quotations should be strictly in accordance with the items mentioned in the Tender Call Notices. Any change in the wording will not be accepted.
23. The department reserves the right of authority to reject any or all tenders received without assigning any reason whatsoever.
24. **Deleted**.
25. The Engineer-in-charge will notify the bidder / tenderer whose bid has been accepted of the award prior to expiration of the validity period by cable, telex or facsimile confirmed by registered letter. This letter (hereinafter and in the conditions of Contract called the "Letter of Acceptance") will state the sum that the Engineer-in-charge will pay the contractor in consideration of the execution and completion of the Works by the contractor as prescribed by the contract (Hereinafter and in the contract called the "Contract Price").

    The Notification of award will constitute the formation of the contract, subject only to the furnishing of a performance security (Initial Security Deposit) in form of Deposit receipt of Schedule Bank / Kissan Vikash Patra / Post Office Savings Bank Account/National Savings Certificate/ Post Office Time Deposit Account/Bank Guarantee of Nationalised Bank /Schedule Bank of India counter guaranteed by local Branch at Rourkela with validly of One year / duly pledged in favour of the Chief Executive Officer Rourkela Smart City Limited. Rourkela & payable at Rourkela and in no other form, which including the amount already deposited as bid security (earnest money) shall be 2% of the value of the tendered amount and sign the agreement in the P.W.D. form No. P-1 (Schedule XLV No. 61) for the fulfilment of the contract in the office of the Chief Executive Officer and payable at Rourkela or as directed. The security deposit together with the earnest money and the amount withheld according to the provision of P-1 agreement shall be retained as security for the due fulfilment of this contract

and additional performance security in accordance with the provisions of the agreement.

The agreement will incorporate all agreements between the officer inviting the bid/ Engineer-in Charge and the successful bidder within 15 days following the notification of award along with the Letter of Acceptance. The successful bidder will sign the agreement and deliver it to the Engineer-in Charge. Following documents shall form part of the agreement.

a) The notice-inviting bid, all the documents including additional conditions, specifications and drawings, if any, forming the bid as issued at the time of invitation of bid and acceptance thereof together with any correspondence leading thereto & required amount of performance security including additional performance security.
b) Standard P.W.D. Form P-1 with latest amendments. Failure to enter in to the required agreement and to make the security deposit as above shall entail either he will suspend/prohibit/debar/blacklist from participating in bidding in any contract of the State for a minimum period of 180 days or Cancelation of Empanelment (registration of from OPWD) or both. .No contract (tender) shall be finally accepted until the required amount of initial security money is deposited The security will be refunded after 12 (Twelve) months of completion of the work and payment of the final bill and will not carry any interest. As concurred by Law Department & Finance Department In their U.O.R. No 848, dt.21.05.97 .O.R.No.202 W.F.D. dt.06.03.98 respectively the E.M.D. will be forfeited case, where tenderers back out from the offer before acceptance of tender by the competent authority.

26. The contractor should be liable to fully indemnify the Department for payment of compensation under workmen compensation act. VIII of 1923 on account of the workmen employed by the contractor and full amount of compensation paid will be recovered from the contractor.

27. Tenderers are required to liable by fair wages clause as introduced by Govt. of Odisha Works Department letter No.VII (R&B) 5225, dt.26.2.55 and No.II, M-56/61-28842 (5), dt.27.9.61.

28. The contractor shall bear cost of various incidentals, sundries and contingencies necessitated by work in full within the following or similar category.

a) Rent, royalties, cess and other charges of materials, Octroi and all other taxes except prevailing GST from time to time. Ferry tolls, conveyance charges and other cost on account of land buildings including temporary building required by the tenderer for collection of materials, storage, housing of staff or other purpose of the work are to be borne by the contractor at his own cost. No rent will be payable to Govt. for temporary occupation of land owned by govt. at the site of the work for bonafide use of the land for work and all such construction of temporary nature by the contractor shall be done after obtaining written permission from the Engineer-in-Charge of Civil portion of the work and all such construction shall have to be demolished and debris removed and ground made good and cleared after completion of the work at no extra cost.
b) Royalty will be recovered from each bill as notified by Govt. from time to time unless K Forms are enclosed. Refund of royalty at later date after passing of the bills cannot be entertained as the recovery of royalty is being

credited to revenue.

c) Labour camps or huts necessary to a suitable scale including conservancy sanitary arrangements therein to the satisfaction of the local labour laws and health authorities shall have to be provided by the Contractor.

d) Arrangement of suitable water supply including pipe water supply where available for the staff and labour as well as for the execution of the work is sole responsibility of the Contractor and no extra cost for carriage of water will be entertained.

e) All fees and dues levied by Municipal, Canal or Water Supply Authorities are to be borne by the Contractor.

f) Suitable safety equipments and dresses, gloves, life belts etc. for the labour engaged in risky operations are to be supplied by the contractor at his own cost.

g) Suitable fencing barriers, signals including paraffin and electric signals where necessary at work and approaches in order in project the public and employees from accident has to be provided by the Contractor at his own cost.

h) Compensation including cost of any legal suit for injury to persons or property arising out of execution of the work and also any sum, which may become payable due to operation of the workmen compensation act, shall have to be borne by the contractor.

i) The contractor has to arrange adequate lighting arrangements for the work wherever necessary at his own cost.

29. No payment will be made for layout, benchmark, level pillars, profiles and benching and levelling the ground required, which has to be carried out by the contractor at his own cost. The rates to be quoted should be for finished items of work inclusive of carriage of all materials and all incidental items of work.

30. After the work is finished all surplus materials should be removed from the site of work, preliminary work such as vats, mixing platforms, etc. should be dismantled and all materials removed from the site and premises left neat and his should be inclusive in the rates. No extra payment will be made to the Contractor in this account.

31. It should be understood clearly that no claim what-so-ever will be entertained to extra items of works quantity of any item besides estimate amount unless written order is obtained from the competent authority and rate settled before the extra items of work or extra quantity of any items of work is taken up.

32. The tenderers shall have to abide by the C.P.W.D. safety code rules introduced by the Govt.of India, Ministry of Works and Housing & Supply in their standing order No.44150, dt.25.11.57.

33. No part of the contract shall be sublet without written permission to the concerned Engineer In Charge or transfer to be made by the power of attorney authorizing others to receive payment on contractor's behalf.

34. Bid documents consisting of plans, specifications, the schedule of quantities and the set of terms and conditions of contract and other necessary documents can be seen in all he offices issuing the documents and office of the under signed during office hours every day except on Sundays and Public Holidays till last date of sale and receipt of tender papers. Interested bidders may obtain further information at the same address. But it must be clearly understood that tenders must be received in order and to instructions in complete shape. Incomplete tender is liable for rejection.

35. No Relation Certificates.

The contractor shall furnish a certificate along with the tender to the effect that he is not related to any officer in the rank of an Assistant Engineer & above Rourkela Smart City Limited. or Assistant/Under Secretary & above in the Department. If the fact subsequently proved to be false, the contract is liable to be rescinded. The earnest money & the total security willbe forfeited & he shall be liable of make good to damages the loss or damages resulting for such cancellations. The proforma for no relationship certificate is contained in a separate sheet vide Schedule-A

36. Payment for variation in price – As per latest guideline of OPWD after schedule Completion Period

36(a) (i) REIMBURSEMENT / RECOVERY DUE TO VARIATION IN PRICE OF MATERIALS OTHER THAN (STEEL, CEMENT, BITUMEN, PIPES & P.O.L.).

36.(a) (ii) REIMBURSEMENT / RECOVERY OF DIFFERENTAL COST DUE TO VARIATION IN PRICES OF PRINCIPAL MATERIALS (STEEL, CEMENT, BITUMEN, PIPES & P.O.L) NOT ISSUED BY DEPARTMENT, AFTER SUBMISSION OF TENDER: As per latest guideline of OPWD after schedule Completion Period.

36.(b) REIMBURSEMENT / REFUND DUE TO STATUTORY RISE IN COST OF MINIMUM WAGES BY GOVERNMENT: As per latest guideline of OPWD after schedule Completion Period.

36(c) REIMBURSEMENT / REFUND DUE TO VARIATION IN PRICES OF P.O.L.: As per latest guideline of OPWD after schedule Completion Period.

36(d) Deleted.

36(e) APPLICATION OF ESCALATION CLAUSE: Contract price shall be adjusted for increase or decrease in rates and price of Labour, Cement, Steel, Bitumen, Pipes, POL & other material component in accordance with the principles and procedure as per formula to be finalized by Government in Works Department latest Guideline after schedule Completion Period.

37. If any advance / Secured advance is granted by the Department the same will bear Interest at the rate of 18% P.A.

38. All items of work as per schedule of quantities of this tender should confirm to Odisha Detailed Standard Specification. I.R.C. & I.S.I. Codes & Bridge code section I, II, III, IV & VII & latest design criteria for pre-stressed concrete bridge specially for Roads & Bridges issued by MoRT&H, Government of India, Compacting shall have to be carried out with help of mechanical vibrators from the range of I.S.:2505, I.S.:2006, I.S.:2514. I.S.:4656.

39. Centring & Shuttering shall be with suitable steel shutters in side of which shall be lined with suitable sheeting and made leak proof and watertight. All joints in formwork shall be properly sealed preferably with P.V.C. joints sealing tapes & compounds.

40. Form work including complete false work shall be designed by the Contractor without any extra cost to employer and the Department will have the right to inspect scaffolding, centering and shuttering made for the work and can reject partly of fully such structures, if found defective in their opinion. Any eventually such as loss of lives or properly due to failure of centering and shuttering shall be the responsibility of the Contractor regarding compensation of all claims thereof.

41. Cement shall be used by bags and weight of one bag of Cement should be 50 (fifty) Kg. net & the Engineer-in-Charge or his representative shall have the right to test the weight & quality from time to time.

42. The tenderers shall make all arrangements for proper storage of materials but no cost for raising shed for store and pay of security guard etc. will be borne by the Department. The department is not responsible for any theft or loss of materials at site. It is contractor's risk. Under any such plea, if the tenderer stops the work he shall have to pay the full penalty as per clauses of the contract.
43. Approach road to site of work for transport of materials to site of work is sole responsibility of the Contractor. Statutory traffic restriction in the town area for Transport of construction material to site of work is to be taken in to consideration before tendering and no consideration for extra time or compensation thereof shall considered.
44. The contractor should at his own cost arrange necessary tools and plants required for efficient execution of work and the rates quoted should be inclusive of transportation, hire and running charges of such plant and cost of consumables.
45. The contractor shall properly co-ordinate with the execution of P.H. and Electrical works and take care of the safety of workers.
46. The machineries if available, with the department may be supplied on hire as per charges noted in the enclosed statement and may be changed from time to time subject to the condition that the contractor will execute in advance an agreement with the Engineer-in-Charge.
47. No claim whatsoever will be entertained for supply of machineries. No extension of time will be granted to the contractor under this ground under any circumstances.
48. The tenderer should furnish along with their tender a list of works executed during the last five years duly certified by the concerned Engineer-in-charge indicating the satisfactory completion for Civil, P.H. & Electrical works as per the Performa enclosed in a separate sheet of Schedule-C.
49. The tenderer or any of its constituent partners of whose contract for any work has been rescinded or who has abandoned any work in the last five years prior to the date of Bid shall be debarred from qualification. The tenderer is to furnish an affidavit at the time of submission of tender paper about the authentication of tender documents. An affidavit to this effect is to be furnished in Schedule-E and information in Schedule-D.
50. It should be clearly understood that:

a) The joints of the bars are to be provided with lapping, welds or bolts nuts as well be directed by the Engineer-in-charge.

b) Concrete test specimens 150mm × 150mm × 150mm in size (whether plain or reinforced concrete) for the testing shall be taken for each structural member by a representative of the contractor in the presence of responsible officer of the rank not lower than that of an Assistant Engineer or sub-Divisional Officer. The contractor shall bear the cost so involved in testing. The test specimen in cube should be carried out in the Departmental Control and Research Laboratory Cuttack or Rourkela. Test should be carried out in accordance with the stipulation in Bridges code section-III.

c) Test specimens shall be formed carefully in accordance with the standard method of taking test specimen and no plea shall be entertained later on the grounds that the casting of the test specimen was faulty and that the result of the specimen did not give a correct indication of the actual quality of concrete.

d) Plain concrete and reinforced concrete specimens will be tested in Quality Control and Research Laboratory as per direction of Engineer-in-charge. Cost of testing of all specimens and samples will be borne by the Contractor.

51. The rates quoted should be inclusive of carriage of water required in connection with execution of the work. No claim for carriage of water whatsoever will be entertained.

52. The contractor shall employ one or more Engineering Graduate or Diploma holders as apprentice at his cost if the work as shown in the tender exceeds Rs.2,50,000.00. The apprentices may be selected by the Chief Executive Officer, Rourkela Smart City Limited. The period of employment will commence within one month after the date of work order and would last till the date, when 90% of the work is completed. The fair wage to be paid to the apprentices should not be less than the emolument of personnel of equivalent qualification employed under Government.

53. List of tool & plants in running condition in possession of contractor is to be furnished in a separate sheet.

54. It is the responsibility of the contractor to procure and store explosive required for blasting operation if necessary. Department may render necessary possible help for procuring license.

55. For submission of a tender for the work, the tenderer will be deemed to have satisfied himself by actual inspection of the site and locality of the work about the quality and availability of the required quantity of materials, Medical aid, labour and Flood stuff etc and that the rates quoted by him in the tender will be adequate to complete the work according to the specifications attached thereto and that he had taken in to account all conditions and difficulties that may be encountered during its progress and to have quoted labour rates and materials with taxes, Octroi and other duties lead, lifts, loading and unloading freight for materials and all other charges necessary for the completion of the work to the entire satisfaction of the Engineer-in-charge of the work and his authorized subordinates. After acceptance of the contract rates RSCL will not pay any extra charges for any reason in case the contractor finds later on to have misjudged the conditions as regards the availability of materials, labour and other factors. The contractor will be responsible for any misuse, loss or damages due to any reasons whatsoever of any departmental material during the execution of work. In case of loss, damage or misuse, recovery at the rate at 5 times the cost of the materials will be deducted from the bills or his other dues.

56. The prevailing percentage of I.T. Department of the gross amount of the bill towards income tax will be deducted from the contractor's bill.

57. Deleted.

58. It must be clearly understood that under no circumstances any interest is chargeable for the dues or additional dues if any payable for the work executed and final bill pending disposal due to any reason whatsoever.

59. No extra payment will be made for removing spreading and consolidating salvaged metals and materials.

60. Under section 12 of contractors labour (Regulation and Abolition) Act. 1970 the contractor who undertakes execution of work through labour should produce valid license from licensing authorities of labour Department.

61. Performance Security:

61.1 If the rate quoted by the bidder is less than 15% of the tendered amount, then such a bid shall be rejected and the tender shall be finalized basing on merits of rest bids. But if more than bid is quoted at 14.99% (Decimals up to two numbers will be taken for all practical purpose) less than the estimated cost, the tender accepting authority will finalize the tender thorough a transparent lottery system where all bidders / their authorized representatives, the concerned CEO

and CFO will remain present.

(Amendment to Appendix-IX, Clause-36 of OPWD Code Vol.-II by inclusion).

61.2 Additional performance security shall be obtained from the bidder when the bid amount is less than the estimated cost put to tender. In such an event, the bidders who have quoted less bid price/rates than the estimated cost put to tender shall have to furnish the exact amount as per mentioned in below table i.e.

S.No	Range of Difference between the estimated cost put to tender and Bid amount	Additional Performance Security to deposited by the Successful Bidder
i	Below 5%	No Additional Performance Security
ii	From 5% and above and below 10%	50% of (Difference between Estimated cost put to tender and Bid Amount)
iii	From 10% and above	150% of (Difference between estimated cost put to tender and Bid Amount)

as Additional Performance Security in shape of Demand draft/ Bank Guarantee from Nationalised Bank, Schedule Bank for validly of one year/ Term Deposit Receipt of Schedule Bank/ Nationalized Bank pledged in favour of the Chief Executive Officer, Rourkela Smart City Limited and payable at Rourkela before signing the Agreement. The additional performance security in any other from will not be accepted. If the Contractor fails to complete the work, the amount so furnished as additional performance security will be forfeited in addition to the other penal clauses, if any to be imposed.

RSCL has already been appointed Project Management Consultant to supervise "Development of Science Park Consisting of Civil works, Architectural Works and Electrical works along with Operation and Maintenance in Rourkela on Percentage Rate Basis" and his role & responsibility as follows :

- Project Planning and Construction Supervision
- Supervision Manual
- Design, drawings and tender specifications
- Material Testing Quality Control
- Environmental Protection and Safety during Construction
- Certification of Interim and final payments
- Contract Administration
- Operation & Maintenance Manual Approval
- As Built Drawing approval
- Certification in Defect Liability Period
- Any Contract Dispute and assist in case of Arbitration.

The contractor has to assist and obey the technical assistants and guidance's of the consultant.

62. Sample of all material - The contractor shall supply sample of all materials fully before procurement for the work for testing and acceptance as may be requiring by the concerned Engineer in Charge.

63. All reinforced cement work should conform to Odisha Detailed specification and should be of proportion as per Contract Agreement having desired compressive strength (in work test) in 15 Cm cubes at 28days, after mixing and test conducted in

accordance with IS 456 and IS 516.

64. Bailing out of water from the foundation, pipeline trenches S. Tanks / Soak pits/ Sumps/ M.H. etc. either rainwater or sub-soil water if necessary should be borne by the contractor. No payment will be made for benchmarks. Level pillars, profiles and benching and levelling the ground wherever required. The rates quoted should be for finished items of works inclusive of these incidental items of work. It should be understood clearly that no claims whatsoever would be entertained.
65. The tenderer shall have to abide by the C.P.W.D. safety code rules introduced by the Government of India, Ministry of work Housing and Supply in their standing order No-44150 dt .25.11.57.
66. The Contractor will have to submit to the PMC monthly return of labour both skilled and unskilled employed by him on the work.
67. All fittings for doors and windows P.H. & Electrical works as supplied by the Contractor should be of best quality and conform to relevant I.S. specification and should be got approved by the Engineer-in-charge/PMC of the respective wing before they are used on the work.
68. After completion of the work the contractor shall arrange at his own cost all requisite equipments for testing buildings, if found necessary and bear the entire cost of such test, including the inspection of Electrical Inspectorate.
69. The Tenderer should furnish along with their tender 1. A list of works, which are at present in their hand Schedule-F 2. List of work executed (Schedulele-C) in the prescribed proforma(s) enclosed herewith in appropriate place of bid document.
70. All reinforced cement concrete works should be finished smooth Extra charges for plastering if required to any R.C.C. structures like roof slab, Columns, Chajjas, fins, parapets, shelves etc. shall not be paid.
71. Deleted
72. Deleted
73. The tenderer may at his option quote reasonable rate for each item of work carefully so that the rate for one item should not be unworkable low and for others too high.
74. The contractor has to arrange the samples of materials required for execution to be got tested and approved by the Department before taking up the work and during course of execution required from time to time. All such samples will be tested at any of the Govt. of Odisha /Govt. of India accredited Laboratory, at the cost of the Contractor with no extra cost to the Department.
75. If there is any damage to the work due to natural calamities like flood or cyclone or any other cause during the course of execution of work or up to 12 months after completion of work or if any, imperfection becomes apparent to the work within 12 months from the date of final certificate of completion of work the contractor shall make good of all such damages at his own cost with no extra cost to the Department. No claims, whatsoever, in this regard will be entertained.
76. The K. B. Bricks should be well burnt and of good qualities. The bricks should be approved by the Engineer-in-Charge before use in the work and should confirm to the minimum strength and other criteria as per National Building Code.
77. Under Section 1 of contract labour Regulation and Abolition Act 1970 the contractor who undertakes execution of work through labour should produce valid license from the licensing authority of labour Department.
78. Standard co-efficient for linear measurement will be adopted while calculating

consumption of steel and no claim whatsoever regarding difference in co-efficient of steel will be entertained. The rates quoted shall be inclusive of any eventuality of difference for co-efficient for linear measurements.

79. Engineer Contractor desirous to avail the facility of exemption of E.M.D is required to submit an affidavit to the effect that he has not yet availed the facility / participated in the tender for more than two works (Excluding this work) during the current financial year. The name of work for which participated and the authority to whom the tender was submitted must be mentioned in the affidavit, failing which the tender will be rejected.

80. That for the purpose of jurisdiction in the event of disputes if any of the contract would be deemed to have been entered in to within the State of Odisha and it is agreed that neither party to the contract will be competent to bring a suit in regard to the matter by this contract at any place outside the State of Odisha.

81. SPECIAL CONDITIONS (PART OF THE CONTRACT)

(I) All materials before they are being used in the items of works as per this Schedule of quantities and also the finished items of work where tests are applicablee shall have to be tested through the Engineer-in-charge of the respective wing at appropriate Laboratories according to the relevant I.S. specifications of the materials and the said items of works and the cost of all such tests shall have to be borne by the Contractor and the rates of the items of works should be inclusive of cost of such tests.

(II) The tests have to be planned & carried out such that the progress of work is not hampered

(III) The tests are mandatory as per the prescribed frequencies and I.S specifications. However, these are not exhaustive and the Engineer-in-charge/PMC has the right to prescribe other required test if any as will be considered from time to time.

82. In case of ambiguity between clauses of this D.T.C.N. and the P-1 contract form, the relevant Clauses of the P-1 contract form shall prevail over the D.T.C.N. The clauses not covered under P-1 contract form shall be governed by the clauses of the D.T.C.N.

83. Schedule of quantities is accompanied in Cover-II (Price Bid). It shall be definitely understood that the Government does not accept any responsibility for the correctness or completeness of this schedule and that this schedule is liable for alternation or omissions, deductions or alternations set forth in the conditions of the contract and such omissions, deductions, additions or alternations shall no way invalidate the contract and no extra monetary compensation, will be entertained.

84. In case of any complaint by the labour working about the non-payment or less payment of his wages as per latest minimum Wages Act, the Engineer in Charge will have the right to investigate and if the contractor is found to be in default, he may recover such amount due from the contractor and pay such amount to the labour directly under intimation to the local labour office of the Govt. The contractor shall not employ child labour. The decision of the Engineer in Charge is final and binding on the contractor.

85. The contractor should arrange the materials like Steel, Cement, paint and bitumen etc. of approved quality and specification at his own cost for completion of the work with the time schedule. No extension of time will be granted on the application of the contractor due to delay in procurement of materials.
86. Wastage of bars and unnecessaryary lapping will not be considered for measurement and payment).
87. The contractor is required to pay royalty to Govt. as fixed from time of time and produce such documents in support of their payment to the concerned Engineer in Charge with their bills, falling which the amount towards royalties of different materials as utilized by them in the work will be recovered from their bills and deposited in the revenue of concerned department.
88. Trial Boring - The foundation level as indicated in the body of the drawings are purely Tentative and for the general guidance only. The RSCL has no responsibility for the suitability of actual strata at the foundation level. The contractor has to conduct his own boring before starting the work and get the samples tested at his own cost to ascertain the S.B.C. and credibility of the strata at founding level while quoting his rates for tender the contractor shall take in to account of the above aspects.
89. Any defects, shrinkage or other faults which may be noticed within 24 (Twenty four) months from the completion of the Construction work arising out of defective or improper materials or workmanship timing are upon the direction of the Engineer-in-Charge to be amended and made good by the contractor at his own cost unless the Engineer for reasons to be recorded in writing shall be decided that they ought to be paid for and in case of default Department may recover from the contractor the cost of making good the works. The contractor is also required to maintain the Constructed Work for 24 (Twenty Four) months from the date of successful completion of the work. The RSCL will deduct retention money which will be Retention Money (5%) five percent from each running bill after correction if any by RSCL + Additional percentage to be deducted & withheld from each payment in voice after correction , if any by RSCL for repair/replacement of the work during defect liability period of 730 days from the date of completion of original work. Performance Security or additional Performance security will be release after the Completion of Defect Liability Period (DLP).
90. From the commencement of the works to the completion of the same, they are to be under the contractors charge. The contractor is to be held responsible to make good all injuries, damages and repairs occasioned or rendered necessary to the same by fire or other causes and they hold the RSCL harmless for any claims for injuries to person or structural damage to property happening from any neglect, default, want of proper care or misconduct on the part of the contractor or any one in his employment during the execution of the work. Also no claim shall be entertained for loss due to earthquake, flood, cyclone, epidemic, riot or any other calamity whether natural or incidental damages so caused will have to be made good by the contractor at his own cost.
91. Gradation of ingredients: The coarse and fine aggregate shall meet the grade requirement as per the latest provision of relevant. I.S. Code / I.R.C. code / MoRT&H specifications.
92. Where it will be found necessary by RSCL, the Officer-in-Charge of the work shall

issue an order book to the contractor to be kept at the site of the work with pages serially numbered. Orders regarding the work whenever necessary are to be entered in this book by the Rourkela Smart City Corporation Limited Officer-in-Charge with their dated signatures and duly noted by the contractor or his authorized agents with their dated signature. Orders entered in this book and noted by the contractor's agent shall be considered to have been duly given to the contractor for following the instructions of the Department. The order Book shall be the property of the Rourkela Smart city Limited and shall not be removed from the site of work without written permission of the Engineer In Charge and to be submitted to the Engineer-in charge every month.

93. The contractor should attach the certificate in token of payment deposit with the registration authority as per recent circular of the Government relating to his registration.

94. In case of any discrepancy in printing or omissions of statutory specifications or any other part or portion of the approved document during download of the bid document, the decision of the officer inviting the bid will be binding on the bidder.

95. The rates quoted by the contractor shall cover the latest approved rates of SOR excluding GST i.e., Labours, Materials, P.O.L. and Royalties. Arrangement of borrow areas i.e. Land, Approach Road to the building site etc. are the responsibility of the contractor.

96. The rate for each work of concrete items wherever dewatering is imperatively necessary the term dewatering shall mean the execution or operation of the items due to standing water as well as due to percolation of water. The quoted rates will be inclusive of this.

97. The contractor shall make requisition of claim book from the date of commencement of the work from the RSCL and shall maintain in proper P.W.D. form with pages serially numbered in order to record items of works are not covered by his contract and claimable as extra. Claims shall be entered regularly in this book under the dated signature of the contractor or his duly authorized agents at the end of each month. A certificate should be furnished along with the claim to the effect that he has no other claim beyond this claim up-to-date. If in any month there are no claims to record, a certificate to that effect should be furnished by the contractor in the claim book. Each claim must be defined and should be given as for as possible regarding the quantities as well as the total amount claimed. The claim book must be submitted by the contractor regularly by 10^{th} and 16^{th} days of each month for orders of the Engineer-in- Charge or competent authority. Claims not made in this manner or the claim book not maintained from the commencement of the work is liable to be summarily rejected. The claim book is the property of the Rourkela Smart city Limited and shall be surrendered by the contractor to the Engineer-in-charge after completion of the work or before recession of the contract by the Department whichever is earlier for record.

98. Number of test s as specified in I.R.C. / MoRT&H / I.S.I specification required for the construction of roads / bridges / buildings or any other structural works will be conducted in any Govt. of Odisha /Govt. Of India accredited Laboratory to be decided by the Engineer-in-charge. Testing charges including expenditure for collection / transportation of samples /specimens etc. will be borne by the contractor. The collection of samples and testing are to be conducted for both prior to execution and during execution as may be directed by the Engineer-in-charge and on both the

accounts the cost shall be borne by the contractor.

99. Even q u a li fie d criteria are me t , the bidders can be disqualified for the following reasons, if enquired by the Department

a) Making a false statement or declaration.
b) Past record of poor performance.
c) Past record of abandoning the work half way/ recession of contract.
d) Past record of in-ordinate delay in completion of the work.
e) Past history of litigation.

100. In case the 1st lowest tenderer or even the next lowest tenderers withdraw in series one by one, thereby facilitating a particular tender for award, then they shall be penalized with adequate disincentives with forfeiture of EMD unless adequate justification for such back out is furnished. Appropriate action for black listing the tenderers shall also be taken apart from disincentives against the tenderer.

101. The following documents which are not submitted with the Bid, will be deemed to be part of the Bid:

S.No.	Particular
1	Notice Inviting tender
2	Instruction to the Bidder
3	Conditions of Contract
4	Contract data
5	Specifications
6	Drawings
7	Pre-Bid Meeting Minutes

102. ELIGIBILITY CRITER IA:

I. To be eligible for qualification, applicant s shall furnish the followings. Non- furnishing of the following particulars shall be treated as ineligible. The facility for exemption of EMD & ISD , either in full or in part ,as per instruction/guidelines of Govt. of Odisha / OPWD Code/Govt of India/direction of Hon'ble Courts in India(with specified limitation and liberty) can be availed by intending and eligible class/category of Bidder(Contractors with Physical Disabilities/Engineer Contractors/ ST or SC Contractors/Such other Agency(s) conferred with this exemption facility if any). However this facility availed by any bidder for the above mentioned work shall be treated as genuine and admissible / Accept able subject to submission of required documentary evidence/support in hard copy as described in DTCN and subsequent Verification of the same by RSCL..

II. Scanned copy of required E.M.D as per the Clause No. 5 (i) and Clause No.20 of DTCN.

III. Scanned copy of demand draft towards cost of tender paper as per Clause No.4 and 5(i) of DTCN.

IV. After the date & time of receipt of bid is over, the original Bid security and Demand draft towards cost of Bid documents shall be submitted in the office of the undersigned on or before date & time of opening of Bid as specified at Contract data above, and as per date mentioned in contract Data during office hours on working days failing which the bid will be rejected.

V. Scanned cop y of valid Registration Certificate, PAN card along with the tender documents and the originals of all scanned documents & VAT clearance certificate in form

VAT 612/GST Clearance Certificate of the successful lowest bidder only are to be produced within 5(five) days after opening of Cover-II of the tender in the office of the Chief Executive Officer, RSCL otherwise his/her bid shall be declared as non-responsive he will suspend/prohibit/debar/blacklist from participating in bidding in any contract of the State for a minimum period of 180 days and /or Cancelation of Empanelment (registration of from OPWD) action will be taken by the competent authority. In such a situation , successful L-2 bidder will be required to produce his original documents for consideration of his tender at the negotiated rate equal to L-1 bidder

VI. License criteria as per Clause No.8 of DTCN and Schedule-H need to be furnished

VII. Joint Ventures are not accepted

1 Bidder/ Firm should furnish list of similar works executed during last five years stating the Agreement No., date of commencement and completion, actual date of completion duly certified by the employer. The certificate to that effect has to be obtained from an officer not below the rank of Executive Engineer concerned with the work under report in case of Govt. Project and in case of Non Govt. Project Client certificate along with Form 16A and 26 AS of Income Tax. The bidder must have completed /Substantial Completed (80 % of awarded cost) any one or more landscaping/Science Park/Park or etc. project(s) in any one year during last five years up to value of **Rs. 8.33 Cr.(Rs. Eight Crore and Thirty three Lakhs).**

Bidder should submit all the credentials along with all experience certificates. Copy of Completion Certificate / Work order / Agreement any other document in support of successful completion of job along with Reference of person under whom jobs are executed. Substantial Completion shall be based on 80 (eighty) percent value wise or more works completed under the contract and Completed value must be equal or more of **Rs. 8.33 Cr.(Rs. Eight Crore and Thirty three Lakhs).**

2 The Bidder should have annual turnover of Civil Engineering works equal to the estimated cost of the Project i.e. . **Rs. 8.33 Cr.(Rs. Eight Crore and Thirty three Lakhs).** in any one year during last five (5) financial years. Turnover of previous year will be escalated @10% per financial year (on compound basis) shall be considered on the value of annual turnover of the proceeding years and cost of completed / executed similar nature of work shall be given additional weightage of percentage per year to bring them to current price level to account for price escalation as illustrated below:

Year	Turnover/Similar work	Effective cost executed work at previous completed financial year's price level
2016-17	E	1.61 x E
2017-18	D	1.46 x D
2018-19	C	1.33 x C
2019-20	B	1.21 x B
2020-21	A	1.10 x A

The Turn over need to be certified with 'UDIN' by a registered Chartered Accountant

Note: Technical Bud must be accompanied by the annual turnover Certificate of the Bidder for the last 5 (five) financial years, preceding the year in which the bid is submitted.

I. Scanned copy for information regarding current litigation, debarring / expelling of the applicant or abandonment of work by the applicant in schedule "D" and scanned copy of affidavit to that effect including authentication of tender documents in schedule "E" & furnish the original affidavit in Schedule-E within 5 (five) working days of opening of Cover-II as per clause 49.
II. No Relationship Certificate in Schedule – A
III. List of projects under execution in Schedule-F
IV. List of projects executed that are similar in nature to the work as per Schedule-
V. Affidavit of eligibility from schedule –K to O
VI. Certificate of employment of unemployed Engineering Graduate as per format Schedule-G for Special Class/Class A Regd. Contractor
VII. Undertaking of Bidder as per format Schedule G.
VIII. Declaration of relation in the Dept. if any in Schedule I
IX. MOU with Electrical Contractor in Schedule –J
X. List of equipment on Owned/lease basis in Schedule K
XI. Affidavit for SC/ST Bidder in format Schedule-L
XII. Affidavit for Physically Handicapped Bidder in format Schedule-M
XIII. Affidavit for Engineering Contractor in format Schedule-N
XIV. Affidavit for Bidder not registered in EPFO in format Schedule-O
XV. BID CAPACITY Declartion:- (Vide Works Department Office Memorandum No. 6300 dtd.16.06.2011) OM No.07556900052021(pt)-dt.27.04.2021

Applicants who meet the minimum qualification criteria will be qualified only if their available bid capacity at the expected time of bidding is more than the total estimated cost of the Project.

The available Bid Capacity will be calculated as under.

Assessed Available Bid Capacity= (A*N*2-B), where

A = Maximum value of Civil Engineering works executed in any one year during the last five years (updated to the current price level) rate of inflation may be taken as 10% per year(escalation factor) which will taken into account the completed as well as works in Progress.

N = 1 year (In word One Years) Number of years prescribed for completion of the works for which the bids are invited.

B = Value of Current price level of the existing commitments and on-going works to be completed during the next years(Period of completion of work for which Bids are invited. The Statement showing the value of existing commitments and ongoing works as well as the stipulated period of completion remaining for each of the works listed should be countersigned by the Engineer-In-Charge not below the rank of an Executive Engineer. Escalation factor: Following enhancement factors will be issued for the Cost

of works executed and the financial figures to a common base value for works completed in India.

Year Before	Multiplying Factor
One	1.10
Two	1.22
Three	1.33
Four	1.46
Five	1.61

(Applicant should indicate actual figures of costs and amounts for the works executes by them without accounting for the abovementioned factors)

In case the financial figures and value of completed works are in foreign currency the above enhanced multiplying factors will be applied . Instead , current market exchange rate (State Bank of India BC selling rate as on the last date of submission of the Bid) will be applied for the purpose of conversion of amount in foreign currency into Indian Rupees.

103. Time Control :- (Vide Works Department Office Memorandum No.24716 dtd.24.12.2005 and No.8310 dtd.17.05.2006) Progress of work and Re-scheduling programme.

a)

i. The Engineer-in-Charge shall issue the letter of acceptance to the successful contractor.
The issue of the letter of acceptance shall be treated as closure of the Bid process and commencement of the contract.

ii. Within 15 days of issue of the letter of acceptance, the contractor shall submit to the Engineer-in- Charge for approval a Programme showing the general methods, arrangements, and timing for all the activities in the Works along with monthly cash flow forecast.

iii. To ensure good progress during the execution of the work the contractors shall be bound in all cases in which the time allowed for any work exceeds one month to complete, 1/4th of the whole time allowed under the contract has elapsed, ½ of the whole of the work before ½ of the whole time allowed under the contract has elapsed, 3/4th of the whole of the work before 3/4th of the whole time allowed under the contract has elapsed.

iv. If at any time it should appear to the Engineer-in-Charge that the actual process of the work does not conform to the programme to which consent has been given the Contractor shall produce, at the request of the Engineer-in-Charge, a revised programme showing the modifications to such programme necessary to ensure completion of the works within the time for completion. If the contractor does not submit an updated Programme within this period, the Engineer-in-Charge may withhold the amount of 1% of the contract value from the next payment certificate and continue to withhold this amount until the next payment after the date on which the overdue Programme has been submitted.

v. An update of the Programme shall be a programme showing the actual progress achieved on each activity and the effect of the progress achieved on

the timing of the remaining work including any changes to the sequence of the activities.

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

c) Extension of the Completion Date.

If the contractor fails to maintain the required progress in terms of clause-2 of P-1 Contract or to complete the work and clear the site on or before the contract or extended date of completion, he shall, without prejudice to any other right or remedy available under the law to the Government on account of such breach, pay as agreed compensation the amount calculated at the rates stipulated below as the Municipal Commissioner (whose decision in writing shall be final and binding) may decide on the amount of tendered value of the work for every completed day / month (as applicable) that the progress remains below that specified in Clause-2 of P-1 Contract or that the work remains incomplete. This will also apply to items or group of items for which a separate period of completion has been specified. Compensation @ 1.5% per month of for delay of work, delay to be completed on per Day basis. Provided always that the total amount of compensation for delay to be paid under this condition shall not exceed 10% of the Tendered Value of work or to the Tendered Value of the item or group of items of work for which a separate period of completion is originally given. The amount of compensation may be adjusted or set-off against any sum payable to the Contractor under this or any other contract with the Government. In case, the contractor does not achieve a particular milestone mentioned in contract data, or the rescheduled milestone(s) in terms of Clause-2.5, the amount shown against that milestone shall be withheld, to be adjusted against the compensation levied at the final grant of extension of time. Withholding of this amount on failure to achieve a milestone shall be automatic without any notice to the contractor. However, if the contractor catches up with the progress of work on the subsequent milestone(s), the withheld amount shall be released. In case the contractor fails to make up for the delay in subsequent milestone(s), amount mentioned against each milestone missed subsequently also shall be withheld. However no interest whatsoever shall be payable on such withheld amount.

d) Bonus for early completion

Deleted

e) Management meetings

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

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

Rescission of Contract (Amendment as per letter No.10639 dt.27.05.2005

of Works Department, Odisha):- To rescind the contract (of which rescission notice in writing to the contractor under the hand of the Municipal Commissioner shall be conclusive evidence), 20% of the value of left over work will be realized from the contractor as penalty.

104. Building and other Construction Workers Welfare Cess @ 1% of the estimated cost as per tender notification read with latest corrigendum if any will be proportionately deducted from the contractor's bill at the time of making payment of each bill.
105. The tenderers are required to go through each clause of P.W.D. Form P-1 carefully in addition to the clauses mentioned here in before tendering.

106. A Contractor may be black listed as per amendment made to Appendix XXXIV to OPW D Code Vol.-II on rules for black listing of Contractors vide letter no.3365 dt.01.03.2007 of Works Department, Odisha.

As per said amendment a Contractor may be blacklisted

a) Misbehaviour/threatening of Departmental & supervisory officers during execution of work/tendering process.
b) Involvement in any sort of tender fixing.
c) Constant non-achievement of milestones on insufficient and imaginary grounds and non-adherence to quality specifications despite being pointed out
d) Persistent and intentional violation of important conditions of contract.
e) Security consideration of the State i.e. any action that jeopardizes the security of the state.
f) Submission of false/ fabricated / forged documents for consideration of a tender.

107. The safety certificate of the E.I. work will be furnished by the agencies after getting necessary verification from the electrical inspector / equally competent authority responsible for the work prior to Energisation of the building.
108. Percentage rate contract (vide Works Department letter no.8310 dt.17.05.2006) In case of percentage rate tender:-

i. The Contractor has to mention percentage excess or less over the estimated cost (In figures as well as words) in the prescribed format appended to the tender document.

ii. Contractors participated in the tender for more than one work may offer conditional rebate. Rebate offer submitted in separate sealed envelope shall be opened, declared and recorded first. The rebate so offered shall be considered after opening of all packages called in the same Tender Notice. The Contractors who wish to tender for two or more works shall submit separate tender for each. Each tender shall have the Bid Identification No., Name & Sl. No. of the work (as per IFB) to which they refer, written on the envelope.

iii. Only percentage quoted shall be considered. Percentage quoted by the Contractor should be accurately filled-in figures and words, so that there is no discrepancy.

1) If any discrepancy is found in the percentage quoted in words and figures, then the percentage quoted by the Contractor in words shall be taken as correct

2) If any discrepancy is found in the percentage quoted in percentage excess/ less and the total amount quoted by the Contractor, then percentage will be taken as correct.
3) The percentage quoted in the tender without mentioning excess or less and not supported with the corresponding amount will be treated as excess.
4) The percentage quoted in the tender without mentioning excess / less supported with corresponding amount does not tally with either to percentage excess or less then it will be treated as percentage excess.
5) The percentage quoted in the tender without mentioning excess / less supported with corresponding amount if tallied with the percentage then it will be treated as to which side the amount tallies.

6) The Contractor will write percentage excess/ less up to two decimal points only.

7) The tender shall be written legibly and free from erasures, over writings or corrections of figures. Corrections, over writings & interpolations where unavoidable should be made by making out, initialing, dating and rewriting.

iv. In the contract P1 time is the essence. The contractor is required to maintain a certain rate of progress specify in the contract.

v. The quantity mentioned can be increased or reduced to the extent of 10% for individual items subject to a maximum of 5% over the estimated cost. If it exceeds the limit stated above prior approval of competent authority is mandatory before making any payment.

vi. The period of completion is fixed and cannot be altered except in case of exceptional circumstances with due approval of next higher authority.

vii. Bills for percentage rate tenders shall be prepared at the estimated rate for individual items only and the percentage excess or less shall be added or subtracted from the gross amount of the bill.

APPROVED
Chief Executive Officer
Rourkela Smart City Ltd.

<u>Tenderer (s) is/are required to submit the information in the following Schedules</u>

SCHEDULE - A

CERTIFICATE OF NO RELATIONSHIP

/We hereby certify that I/We* am/are* related / not related(*) to any officer of Rourkela Smart City Limited of the rank of Assistant Engineer & above and any officer of the rank of Assistant /Under Secretary and above of the Works Department, Govt. of Odisha I/We* am/are* aware that, if the facts subsequently proved to be false, my/our* contract will be rescinded with forfeiture of E.M.D and security deposit and I/We* shall be liable to make good the loss or damage resulting from such cancellation.

(*) - Strike out which is not applicable

Signature of the Tenderer Date:-

SCHEDULE – B

A. Brief Company profile

SL.NO.	PARTICULARS Name of Bidder	DESCRIPTION OR DETAILS
1	Name of Bidder	
2	Legal status of Bidder (company, Pvt. Ltd., LLP etc.)	
3	Main business of the Bidder	
4	Registered office address	
5	Incorporation date and number	
6	GST Registration Certificate (State And Central)	
7	PAN details	
8	Primary Contact Person (Name, Designation, address, mobile number, fax, email)	

9	Secondary Contact Person (Name, Designation, address, mobile number, fax, email)	
10	EMD/Bid Security Declaration details	

B. Certificate of Incorporation

(To be submitted by sole Bidders)

C. Financial Turnover
(To be submitted by Sole Bidder)

The financial turnover of the company is provided as follows as per Clause no 102 of DTCN

	2016 – 17 (Y5)	2017-2018 (Y4)	2018-19 (Y3)	2019-20 (Y2)	2020-21 (Y1)
Annual Turnover					

Copy of audited financial statements or declaration from the appointed Chartered Accountant to be provided as proof of the financial turnover with UDIN no. on its certificate.

SCHEUDLE – C

WORK EXPERIENCE

LIST OF SIMILAR NATURE OF PROJECTS EXECUTED AS PER CLAUSE NO 102 OF

i.

Name of Employer	Name of location and name of work	Contract price in Indian Rupees/ Agreement no.	Major Items of works	Date of starting the work as per Agreement	Stipulated date of completion of the work as per Agreement	Actual date of completion of the work	Reasons for delay in starting/ completion if any
1	2	3	4	5	6	7	8

ii.

S.no	Name of the Projects Code	Year 1 Total Receipt from Project	Year-2 Total Receipt from Project	Year-3 Total Receipt from Project	Year-4 Total Receipt from Project	Year-5 Total Receipt from Project
1	A					
2	B					
3	C					
..	..					
Total		Total of Year 1	Total of Year 2	Total of Year 3	Total of Year 4	Total of Year 5
Escalation		1.10	1.21	1.33	1.46	1.61
Total (After Multiplying with)						

Note: The above information is to be certified by the Engineer in Charge / Employer not below the rank of Executive Engineer vide Completion Certificate.

Signature of the Tenderer

Date.

SCHEDULE – D

INFORMATION REGARDING CURRENT LITIGATION, DEBARRING EXPELLING OF TENDERER OR ABANDONMENT OF WORK BY THE TENDERER

1	a)	Is the tenderer currently involved in any litigation relating to the works.	Yes / No
	b) If Yes : given details:		
2		Has the tenderer or any of its constituent partners been debarred/ expelled by any agency in India during the last 5 years.	Yes / No
3	a)	Has the tenderer or any of its constituent partners failed to perform on any contract work in India during the last 5 years.	

b) If yes, give details

Note:

If any information in this schedule is found to be incorrect or concealed, qualification application will summarily be rejected.

Signature of Tenderer

SCHEDULE – E

AFFIDAVIT

1. The undersigned do hereby certify that all the statements made in the required attachments are true and correct.
2. The undersigned also hereby certifies that neither my / our firm / company / individuals _____ nor any of its constituent partners have abandoned any road/ bridge/Irrigation /Buildings or other project work in India nor any contract awarded to us for such works have been rescinded during the last five years prior to the date of this bid.
3. The undersigned hereby authorise(s) and request(s) any bank, person, firm or Corporation to furnish pertinent information as deemed necessary and as requested by the Department to verify this statement or regarding my (our) competency and general reputation.
4. The undersigned understands and agrees that further qualifying information may be

requested and agree to furnish any such information at the request of the Department.

(Signature of Tenderer)
Title of Officer
Name of Firm
Date:

Original Affidavit sworn before Notary Public or Executive Magistrate

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Schedule-F

EXISTING COMMITMENTS AND ON-GOING WORKS:

i.

Description of works	Place & State	Contract No.	Name & Address of Employer	Value of Contract (`In lakh)	Stipulated Period of Completion	Value of works* remaining to be completed (`In lakh)	Anticipated date of completion

ii.

S.no	Name of the Projects Code	Year 1 Total Receipt from Project	Year-2 Total Receipt from Project	Year-3 Total Receipt from Project	Year-4 Total Receipt from Project	Year-5 Total Receipt from Project
1	A					
2	B					
3	C					
..	..					
Total		Total of Year 1	Total of Year 2	Total of Year 3	Total of Year 4	Total of Year 5
Escalation		1.10	1.21	1.33	1.46	1.61
Total (After Multiplying						

Schedule-G

Certificate of Employment of Unemployed Graduate Engineer/Architecture/Diploma Holder
(For Above A Class Contractors only)

I/We herby certify that at present , the following Engineering Personnel are working with me/in our firm/Company and their bio-data are furnished below:
:

S.No.	Name of Engineering Personnel appointed for supervising	Qualification	Date of Appointment	Monthly Emoluments	Whether full time engagement and continuous	if they are superannuated/ retired/dismissed or removed personnel from State Govt. /Central Govt./

	Contractor s work with Address					PSU/Pvt. Companies or any one ineligible for Government Service
1	2	3	4	5	6	7
2						
3						
4						
5						
6						
7						

*There Must be a Bio data of Landscape expert (B. Arch) –'1 No.' having Minimum Experience 5 Year in list of employee.

Schedule-H

UNDERTAKING

This is to certify that

1. My firm has neither been associated , directly or indirectly , with the Consultant or with any other entity that has prepared the design ,specifications, and other documents for the Project nor has any person associated with been proposed as Project manager for the Contract.
2. My firm has not engaged any agency and any of its affiliates engaged by the Engineer in Charge to provide Consulting services for the preparation or supervision of this work.
3. My firm has not engaged any Engineer of Gazetted rank employed in Engineering or Administrative duties in an Engineering Department of the Government of

Odisha or other Gazetted Officer retired from Government Service during last two years without prior permission of the Government of Odisha in wining before submission of this tender. I am aware that my contract is liable to cancelled if either i or any of my employees is found any time to be such a person who had not obtained the permission of the Government of Odisha as aforesaid.

4. I/We have visited the site and have fully acquainted with the local condition regarding the materials labour and factors pertaining to work for completion in all respect before submitting the tender.
5. I/We have carefully studied the conditions of the Construction ,specification, contract condition and all other documents relating to this work and agree to execute the same accordingly.

6. I/We solemnly pledge that I/We shall sincere in discharging my/our duties as responsible contractor and complete the work within the prescribed time limit. In case there are deviation from the Construction Programme , I/We shall abide by the decision of Engineer –In-Charge for revision of programme and arrange for the labours, materials, equipments etc accordingly.
7. In the event of award of the work to me/us. I/We undertake the entire responsibility for the structural stability to reconstruct/replace the whole or part of the Component of the structure in the event of failure or improper functioning /Improper Construction within a period of one year from the date of completion without asking extra payment from the account of department.

8. I/We undertake that I/We shall not claim any escalation of cost on account of materials , labours, taxes from any account in connection with work with execution of the work till the actual completion period and shall not be entertained by Rourkela Smart City Limited,

9. In case of vaiolation of contents of department's tender documents in shape of extra conditions or in any form , my offer/tender shall be rejected by the department without any intimations to me/us.

Signature of the Tenderer

Date:

SCHEDULE –I

RELATIONSHIP DECLARATION

To,

Chief Executive officer,

Rourkela Smart City Limited

Subject: (Name of Work"…… Bid reference number)

Sir,

Pursuant to clause 2 of the ITB, it is to inform that I have relative(s) employed as an Officer in the rank of an Assistant Engineer/Under Secretary under the

Department. His (Their) details are as follows.

Relationship			
Name:			
Office			
Address			
Pursuant to clause 2 of the ITB, I am to submit herewith the names of persons who are working under my firm having near relatives to any gazetted officer in the rank of an Assistant Engineer/Under Secretary in the _____ Department.			
S.No	Name of the my employee and his designation in the firm	Presently working at	Details of his relatives working in the Department
			Relationship
			Name:
			Designation
			Office
			Address
			Relationship
			Name:
			Designation
			Office
			Address

I am also duty bound to inform the relationship of any subsequent employment with any gazetted officer in the rank of an Assistant Engineer/Under Secretary in the Department. I am aware that any breach of this condition would render my firm liable for penal action for suppression of facts.

Yours Sincerely
Signature of the Tenderer

SCHEDULE –J

MEMORANDUM OF UNDERSTANDING

First Party I Sri/Smt.……, Aged …. years, S/O- ……..……,

At / P.O. / Dist-…… (Hereinafter called the First Part)

AND

Second Party I Sri/Smt.……, Aged …. years, S/O-

……..…., At / P.O. / Dist-…… (Hereinafter called the Second Part) having M.V. license registration No……. valid up to ……..

AND WHEREAS the First Party of 1st part is the managing partner of ……. AND WHEREAS the First Party willing to appoint the Second Party to execute the E.I. portion for the tender work, "……"

AND WHEREAS the Second Party accepted the offer of First Party.

NOW THIS DEED OF AGREEMENT WITNESSES AS FOLLOWS;

1) That, the Second Party shall do all E.I. works, if the tender is awarded to First Party.

2) That, the Second Party shall fulfill all the E.I. works as per the tender schedule by instruction of Engineer-in-Charge.

3) That, the First Party shall receive payment, signing the bill the document for the concerned work.

4) That, the Second Party shall abide the rules, regulations and specification of E.I. works of above said matter.

In witness where of both the party have signed in presence of

WITNESS

W_1 –

W_2 –

Schedule-K

Information (Machineries owned/possessed on lease/hire) Details of machinery possessed owned / leased/ hired

SL No	Name of the Machineries	No of Machineries	Owned/Hired/Leased
1	10/7 Concrete Mixer	2	
2	Excavator	1	
3	Vibrator	5	
4	Tractor /Tipper	2	

5	Water Tanker	1	
6	Basic Calibrated Civil quality set up	1	
7	Earth compactor	2	
8	Dewatering Pump 5 HP	2	

NB. Scan copies of Owned or leased or hired receipts/Agreements of the above machineries must be uploaded into Technical Cover.

Schedule-L

AFFIDAVIT

(Applicable for SC/ST Bidders)

1. I, Sri/Smt/Ms……,Son/Daughter/Wife of ……..., hereby declare that;

   a. I am a registered ……..Class ST/SC Contactor under Govt. of Odisha

   Or

   b. The Partnership Firm/Private Ltd. Company named/titled, as "……" is a registered SC/ST Contractor under Govt. of Odisha within the ambit specified in

Works Department Resolution No. 27748 dt. 11.10.77 and I, Sri/Smt/Ms……..……, Son/ Daughter/ Wife of ……..., is authorized signatory on behalf of the Firm/Company (scanned authorization copy with my signature duly certified and attested/identified has been submitted on-line with our tender).

[Tick (a) or (b) above whichever is applicable and fill up accordingly.]

2. As per Works Department, Govt. of Odisha Resolution No.27748 dt.. 11.10.77, I/My Firm am/is entitled for exemption of 50% EMD & ISD and accordingly, I/My Firm have/has submitted tender for the work.
3. I/My Firm hereby submit willingness to avail price preference as ST/SC category Civil Contractor as entitled in the aforesaid resolution.
4. Necessary documentary evidence(s) as prescribed in the Tender Notice at * in support of my/our aforesaid claim for exemption of EMD & ISD have/has been duly up-loaded on- line/submitted along with my/our tender for the aforesaid work.
5. In addition to those, other documents and original(s), as required by CEO, RSCL to sustain my/our aforesaid claim shall be submitted by me/us within a week from the date of instruction/intimation of CEO,, RSCL through telephone/letter/e-mail failing which my/our tender shall be liable for rejection .

(*) –Strike out which is not applicable.

(Deponent)

(Signature of the Tenderer/Authorised Signatory in case of
Partnership Firm/Company with Seal of the Firm/Company) . Original Affidavit sworn before Notary Public or Executive Magistrate

Schedule-M

AFFIDAVIT

(Applicable for Contractors with Physical Disabilities)

1. , Sri / Smt / Ms ……,Son / Daughter / Wife of …… ….., hereby declare that I am a registered ……..Class Contactor with Physical Disabilities within the ambit prescribed in Works Department, Odisha- Resolution No.23934 dt.8.11.91

2. As per the said Resolution, I am entitled for exemption of EMD & ISD and accordingly

, I have submitted tender for the work.

3. Necessary documentary evidence(s) as prescribed in the Tender Notice at in support of my aforesaid claim for exemption of EMD & ISD have/has been duly up-loaded on-line/submitted along with my tender for the work.
4. In addition to those, other documents and original(s), as required by CEO, RSCL to sustain my aforesaid claim shall be submitted by me within a week from the date of instruction/intimation of CEO, RSCL through telephone/letter/e-mail failing which my tender shall be liable for rejection.

(Deponent)

Original Affidavit sworn before Notary Public or Executive Magistrate

Schedule-N

AFFIDAVIT

(Applicable for Engineer Contractors Intending to Avail Exemption of EMD & ISD as per OPWD Code)

1. I, Sri/Smt/Ms……. hereby declare as the Contractor/as the authorized signatory on behalf of the Contractor,"……..."(Strike out whichever is not applicable) do hereby solemnly affirm and state as follows.
2. That, I/we am/are a registered …….. Class Engineer

Contractor

3. That, I/we herewith claim exemption of EMD during the Year……. For participation in the tender for this work.

4. That, I/we have not exhausted the facility available to me/us an Engineer Contractor during the year……. for exemption of EMD & ISD as per Works Deptt. Guideline & OPWD Code.
5. That, I/we shall ensure production of my/our valid Original Contractor's Registration Certificate (license) after or during opening of bids (as per direction of CEO, RSCL for the above work for verification and also for subsequent entry of exemption of EMD and ISD (if selected as the contractor for this work and availed the exemption of EMD and ISD in my/our license as per direction of CEO,RSCL, within such time as directed by him failing which action, as decided by RSCL, may be taken against me/us and appropriate steps may be taken by RSCL to facilitate execution of the tendered work

(*)- Strike out which is not applicable

(Deponent)

(Signature of the Tenderer /Authorised Signatory in case of Partnership Firm/Company with Seal of the Firm/Company)

Original Affidavit sworn before Notary Public or Executive Magistrate

Schedule-O

Affidavit

(Applicable for the Bidder not registered under EPF)

I, Sri/Smt/ Ms.…..hereby declare as the Contractor /as the authorised signatory on behalf of the Contractor ……(Strike out whichever is not applicable) do hereby solemnly affirm and state as follows.

1. That as on date, I/We am/are not registered with RPFC(Regional Provident Fund Commission) and solemnly affirm that, I/We shall follow the " Employees Provident Fund and Misc Provision Act, 1952 & Rules /Schemes" made there under, in case the work is awarded to me/us
2. That I/We shall submit, after execution of work and before payment of any bill, the detail list of labours, such as

    a) Name:
    b) Father's name:
    c) Place of Permanent Residence:
    d) Statement of Wages paid to them till the completion of the Work

3. The RSCL Authority will be at liberty to deduct 26% of the labour component amount of the Contract & shall retain it as an additional security with RSCL.
4. That. In case I/We submit the EPF Registration Certificate, then the said additional security shall be released to me /us by RSCL without any interest subject to fulfilment of other Compliances/conditions.
5. That , this affidavit is required to be produced before the authority of Rourkela Smart City Limited for tender purpose.

That the facts stated above are true to the best of my /our knowledge.

(Deponent

(Signature of the Tenderer/Authorised Signatory in case of Partnership Firm/Company with Seal of the Firm/Company)

Original Affidavit sworn before Notary Public or Executive Magistrate

ANNEXURE-I
FORM OF AGREEMENT

(First page to be filled up and signed in non –judicial stamp paper of worth Rs.100/-)

This contract made on Dt……between Rourkela Smart City Limited (RSCL) , hereinafter called " the employer" and ……..(name and address of the selected bidder), hereinafter called "the Contractor"

Whereas, the employer is desirous that the Contractor shall execute;
"Development of Science Park Consisting of Civil works, Architectural Works and Electrical works along with Operation and Maintenance in Rourkela on Percentage Rate Basis".".

vide Bid Reference no……/Dt……,,,,,,(hereinafter called "the work") and the employer has accepted the bid of the Contractor for execution and completion of such works and rectifications of defects , if any, at an accepted tender/contract price of Rs……(Rupees) only.

Now, therefore, it is herby agreed upon by RSCL and the Contractor as follows:

1. In this contract, words and expressions shall have the same meanings as are respectively assigned to those in this DTCN and the Contract form as a whole. The DTCN and agreement shall be deemed to form and be read as construed as part of this contract with a view to maintaining the sanctity of this contract for successful execution and completion of the work unless otherwise clarified/redefined at a later stage during the Contract remains in force including the defect liability period.
2. In consideration of the payments to be made by the employer, the Contractor herby covenants with the employer to execute and complete the work and rectify the defects therin, if any , in conformity with the provisions of this contract.
3. The employer hereby covenants to pay the Contractor in consideration of the execution and completion of the work and for rectification of defects , if any , wherein the contract price or such other sum, as may become payable under the provisions of the contract and in the manner prescribed under this Contract.
4. The following documents shall be deemed to form, read and construed in conjunction with other portions/clauses/conditions of this contract and DTCN.

   I. DTCN invited for the work including the Short Notice
   II. Contractor's Bid and negotiation correspondence , if any
   III. Letter of Acceptance/Letter of Intent for the Work(LOA/LOI)
   IV. Notice to proceed with the work (Work Order) to be issued by RSCL and subsequent instructions of RSCL to the selected Bidder subject to confirmation of the same, if required , by RSCL through written notice to the selected bidder.
   V. P1 Agreement which includes Items, Quantities, Rates and Amounts of the work to be duly signed by RSCL and the Contractor.
   VI. Copy of agreements drawn by the contractor with electrical Contractor vide scope of work of DTCN for Electrical Works.
   VII. Instruction/intimation of RSCL for execution of extra work/item/quantity found essential for the work and corresponding rates not covered in the agreement/DTCN /Financial Bid and also curtailment/exclusion of any items of the Financial Bid from execution.
   VIII. Drawing, design, work programme or part thereof submitted by the contractor and duly approved by RSCL with or without modification.
   IX. Letter/ Intimation/ Instruction(including physically and over telephone) of RSCL for repair/replacement/ defect rectification, if any, with respect to modified quality/specification for such repair/ replacement/ defect rectification work and allowed time to accomplish the same either during the execution of the work or during the defect liability period of 365 days from the officially declared /notified/noted date of completion of the whole work including additional/curtailed items/ quantities of the work as per direction of RSCL.

RSCL reserve the right to declare/ note the date of completion of the original work and date of expiry of defect liability period which will be binding upon the Contractor.

In witness whereof , the aforesaid two parties have entered into this contract on the date mentioned above.

Binding Signature of Employer signed by……..
(for and on behalf of Rourkela Smart City Limited-Employer)

Binding Signature of Contractor signed by……..
(authorised signatory in case of firm/company with applicable authorisation letter/declaration attached to this Contract)

In presence of witnesses
1. Name:
Address:
Tel No: Signature
2. Name:
Address:
Tel No: Signature

Signature of Contractor
(Authorised Signatory with Seal)
(Authorised Signatory with Seal)

Signature of Employer
(Authorised Signatory with Seal)

APPENDIX - II

Form of Bid Security Declaration

(Refer DTCN Clause 20)
Letter head of the Bid –
Date
Name of the Project: Construction of……. Drain in Rourkela on Percentage Rate Basis

Bid No.

To

Chief Executive Officer,
Rourkela Smart City Ltd.
Udi
(Insert complete name and address of the Authority/Employer/Tender Inviting Authority)

We, the undersigned declare that:

1. We understand that, according to your conditions, bids must be supported by a Bid Security Declaration.
2. We accept that the Authority/Employer/Tender Inviting Authority shall cancel our Empanelment (registration of OPWD) and / or suspend/prohibit/debar/blacklist from participating in bidding in any contract of the State for a minimum period of 180 days, if we are in breach of our obligation(s) under the bid conditions, because we:

(a) Have withdrawn out Bid prior to the expiry date of the bid validity specified in the letter of Bid or any extended date provided by us; or

(b) Having been notified of the acceptance of our Bid by the Employer prior to the expiry date the bid validity in the Letter of Bid or any extended date provided by us,

(i) Failure of use to furnish the Performance Security and Additional Performance Security, if required in accordance DTCN/Terms of the Bid Document, or

(ii) Fail to agree to the decisions of the contract negotiation meeting or

(iii) Failure refuse to execute the Contract.

3. We understand this Bid Security Declaration shall expire, if we are not the successful Bidder, upon the earlier of your notification of the name of the successful Bidder through award of contract;

or

(ii) after the expiry date of the Bid validity.

Name of the Bidder_____
Name of the person duly authorized to sign the Bid on behalf of the Bidder_____
Title of the person signing the Bid _____
Signature of the person named above _____
Date signed _____ day of_____

• In the case of the Bid submitted by joint venture specify the name of the Joint Venture as Bidder- NA

• Person signing the Bid shall have the power of attorney given by the Bidder attached to the Bid.(In case of Partnership firm/Company/LLP/ Cooperative society

Annexure-III
All Financial Transaction Related to the Project must be abide with the Following Instruction

As per Govt. of Odisha Finance Department No. 32921 /F Dt.11.12.2020 or any amendment "Selection of Banks for handling business and deposits of State Public Sector Undertakings (SPSUs) and State Level Autonomous Societies (SLASs) for the years 2020-21 followings banks have been selected for handling Business & Deposits (Copy attached) for Ref.:-

Public Sector Banks		Private sector banks	
1	Canara Bank	11	ICICI Bank
2	Punjab National Bank	12	Axis Bank Ltd.
3	State Bank of India	13	HDFC Bank
4	Union Bank of India	14	Bandhan Bank
5	Bank of India	RRBs & OSCB	
6	Bank of Baroda		
7	UCO Bank		
8	Indian Bank	15	Odisha Gramya Bank
9	Indian Overseas Bank	16	Utkal Grameen Bank
10	Central Bank of India	17	Odisha State Co-Op. Bank

Annexure-IV

FORM OF BANK GUARANTEE
[Performance Security/Additional Performance Security]

To

_____ [name of Authority]

_____ [address of Authority]

WHEREAS_____[name and address of Contractor]

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

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

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

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

1. The Bank hereby unconditionally and irrevocably guarantees the due and faithful performance of the Contractor's obligations during the {Construction Period/ Defects Liability Period and Maintenance Period} under and in accordance with the Contract, and agrees and undertakes to pay to the Authority, upon its mere first written demand, and without any demur, reservation, recourse, contest or protest, and without any reference to the Contractor, such sum or sums up to an aggregate sum of the Guarantee Amount as the Authority shall claim, without the Authority being required to prove or to show grounds or reasons for its demand and/or for the sum specified therein.

2. A letter from the Authority, under the hand of an officer not below the rank of General Manager of Rourkela Smart City Ltd., that the Contractor has committed default in the due and faithful performance of all or any of its obligations under and in accordance with the Contract shall be conclusive, final and binding on the Bank. The Bank further agrees that the Authority shall be the sole judge as to whether the Contractor is in default in due and faithful performance of its obligations during and under the Contract and its decision that the Contractor is in default shall be final and binding on the Bank, notwithstanding any differences between the Authority and the Contractor, or any dispute between them pending before any court, tribunal, arbitrators or any other authority or body, or by the discharge of the Contractor for any reason whatsoever.

3. In order to give effect to this Guarantee, the Authority shall be entitled to act as if the Bank were the principal debtor and any change in the constitution of the Contractor and/or the Bank, whether by their absorption with any other body or corporation or otherwise, shall not in any way or manner affect the liability or obligation of the Bank under this Guarantee.

4. It shall not be necessary, and the Bank hereby waives any necessity, for the Authority to proceed against the Contractor before presenting to the Bank its demand under this Guarantee.

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

5. The Authority shall have the liberty, without affecting in any manner the liability of the Bank under this Guarantee, to vary at any time, the terms and conditions of the Contract or to extend the time or period for the compliance with, fulfillment and/ or performance of all or any of the obligations of the Contractor contained in the Contract or to postpone for any time, and from time to time, any of the rights and powers exercisable by the Authority against the Contractor, and either to enforce or forbear from enforcing any of the terms and conditions contained in the Contract and/or the securities available to the Authority, and the Bank shall not be released from its liability and obligation under these presents by any exercise by the Authority of the liberty with reference to the matters aforesaid or by reason of time being given to the Contractor or any other forbearance, indulgence, act or omission on the part of the Authority or of any other matter or thing whatsoever which under any law relating to sureties and guarantors would but for this provision have the effect of releasing the Bank from its liability and obligation under this Guarantee and the Bank hereby waives all of its rights under any such law.

6. This Guarantee is in addition to and not in substitution of any other guarantee or security now or which may hereafter be held by the Authority in respect of or relating to the Contract or for the fulfillment, compliance and/or performance of all or any of the obligations of the Contractor under the Contract.

7. Notwithstanding anything contained hereinbefore, the liability of the Bank under this Guarantee is restricted to the Guarantee Amount and this Guarantee will remain in force for the period specified in paragraph 8 below and unless a demand or claim in writing is made by the Authority on the Bank under this Guarantee all rights of the Authority under this Guarantee shall be forfeited and the Bank shall be relieved from its liabilities hereunder.

8. The Guarantee shall cease to be in force and effect on ****[$]. Unless a demand or claim under this Guarantee is made in writing before expiry of the Guarantee, the Bank shall be discharged from its liabilities hereunder.

9. The Bank undertakes not to revoke this Guarantee during its currency, except with the previous express consent of the Authority in writing, and declares and warrants that it has the power to issue this Guarantee and the undersigned has full powers to do so on behalf of the Bank.

10. Any notice by way of request, demand or otherwise hereunder may be sent by post addressed to the Bank at its above referred branch, which shall be deemed to have been duly authorized to receive such notice and to effect payment thereof forthwith, and if sent by post it shall be deemed to have been given at the time when it ought to have been delivered in due course of post and in proving such notice, when given by post, it shall be sufficient to prove that the

[$]Insert date at least 24 (Twenty four) Month from the date of issuance of this Guarantee (in accordance with Clause 29 of the DTCN).

envelope containing the notice was posted and a certificate signed by an officer of the Authority that the envelope was so posted shall be conclusive.

11. This Guarantee shall come into force with immediate effect and shall remain in force and effect for up to the date specified in paragraph 8 above or until it is released earlier by the Authority pursuant to the provisions of the Contract.

12. This Guarantee is subject to the Uniform Rules for Demand Guarantees (URDG) 2010 Revision, ICC Publication No. 758, except that the supporting statement under Article 15(a) is hereby excluded.

13. This guarantee shall also be opera table at our…….. Branch at Rourkela , from whom, confirmation regarding the issue of this guarantee or extension / renewal thereof shall be made available on demand. In the contingency of this guarantee being invoked and payment thereunder claimed, the said branch shall accept such invocation letter and make payment of amounts so demanded under the said invocation

14. Bank Detail of Rourkela Smart City Ltd.

S.No.	Particulars	
1	Name of Bank	State Bank of India
2	Name of Branch	Udit Nagar Branch
3	A/c No	36450132867
4	Type of A/c	Saving Bank A/c
5	IFSC	SBIN0007474

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

SIGNED, SEALED AND DELIVERED

For and on behalf of the Bank by:

(Signature)

(Name)

(Designation)

(Code Number)

(Address)

Annexure-IV

Format for Power of Attorney for signing of BID
(Refer Clause Annexure-II)

Know all men by these presents, We…….. (name of the firm and address of the registered office) do hereby irrevocably constitute, nominate, appoint and authorize Mr./ Ms (name), …… son/daughter/wife of …… and presently residing at ……., who is presently employed with us/ the Lead Member of our Joint Venture and holding the position of……. , as our true and lawful attorney (hereinafter referred to as the" Attorney") to do in our name and on our behalf, all such acts, deeds and things as are necessary or

required in connection with or incidental to submission of our BID for the "**Development of Science Park Consisting of Civil works, Architectural Works and Electrical works along with Operation and Maintenance in Rourkela on Percentage Rate Basis**" Project proposed or being developed by the Rourkela Smart City Ltd. (the "Authority") including but not limited to signing and submission of all applications, BIDs and other documents and writings, participate in Pre-BID and other conferences and providing information/ responses to the Authority, representing us in all matters before the Authority, signing and execution of all contracts including the agreement and undertakings consequent to acceptance of our BID, and generally dealing with the Authority in all matters in connection with or relating to or arising out of our BID for the said Project and/ or upon award thereof to us and/or until the entering into of the EPC Contract with the Authority. AND we hereby agree to ratify and confirm and do hereby ratify and confirm all acts, deeds and things done or caused to be done by our said Attorney pursuant to and in exercise of the powers conferred by this Power of Attorney and that all acts, deeds and things done by our said Attorney in exercise of the powers hereby conferred shall and shall always be deemed to have been done by us.

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

For ……..
(Signature, name, designation and address) of person authorized by Board Resolution (in case of Firm/ Company)/ partner in case of : Partnership firm "Copy enclosed"

Witnesses

1.

2.

Accepted

……

(Signature)

(Name, Title and Address of the Attorney) **(Notarised)**

(Person identified by me/ personally appeared before me/)

Attested/ Authenticated*

(*Notary to specify as applicable)

(Signature Name and Address of the Notary)

Seal of the Notary

Registration No. of the Notary

Date:……

SCOPE OF WORK AND TECHNICAL SPECIFICATION

For

Design, Development and execution of Science park at Chhend, Rourkela

1. SCOPE OF WORK

1.1 Broad Scope of Work.

The scope of works consists of preparation **of Carrying out topographical survey, architectural, structure and landscape design , preparation of good for construction drawings for Development of Science park at Chhend,Rourkela**.

The scope of work covered in this tender shall be as per the Bill of Quantities, specifications, drawings, instructions, orders issued to the contractor from time to time during the pendency of work. The drawings for this work, which may be referred for tendering, provide general idea only about the work to be performed under the scope of this contract

The Work Shall be executed on Preparation of Working Drawings, Procurement and Construction Basis. Details and drawings given in Tender document is for information purpose only and successful bidder shall undertake confirmatory survey for accuracy and completeness of data. It is in scope of successful Bidder to undertake all Site surveys, Geotechnical investigations, obtaining all required approvals from the relevant authorities. Further detailing and designing of Structural works, Electrical, Mechanical, Plumbing, Landscape, External Infrastructure works …etc as per Employers requirement and submit the same to client for review and approval, Prepare Good for Construction Drawings, Carry out Shop Drawings ,submit maintenance manual to client for approval before start of Maintenance period. The successful bidder shall have to prepare and submit 'As Built Drawings' depicting the exact construction carried out on site, in soft and hard copy format.

The quantities of various items as entered in the "BILL OF QUANTITIES" are indicative only and may vary depending upon the actual requirement. The contractor shall be bound to carry out and complete the stipulated work irrespective of the variation in individual items specified in the bill of quantities. The variation of quantities will be governed as per conditions of contract.

Conceptual drawings are attached in the Tender Notification on the basis of which Contractor has to prepare GFC and submit for approval etc. However if the design requires any changes as per site then it has to be considered by the contractor and drawings to be modified accordingly. **The cost incurred for the survey, investigation, and drawings is deemed to be included in the over all quoted price and no additional payment shall be made on account of this**.

The work is divided into following parts:

A. Preliminary works.
B. Waterbody Beautification works.
C. Architectural and landscaping works.
D. Installation of Science Equipment
E. Water supply and Landscaping irrigation works
F. Drainage works
G. Electrical Works

1.2 Preliminary Works

All preliminary works such as site clearance in all types of conditions, survey, investigations, marking of alignment, layout etc. as described elsewhere in these specifications, for such work no extra

payment shall be made to the Contractor except the BOQ items. The Contractor is advised to inspect site before tendering to ascertain the quantum and cost of such work and include this cost in their offer. After survey and investigation, contractor shall submit following drawings & documents for approval before construction works:

- Methodology of dewatering, cleaning of pond and site development
- Pond embankment section
- Site plan
- Design and drawing of pond guard wall
- Drawing of cafeteria
- Grading Plan of Landscaping area
- Landscape drawings
- Design and drawing of Landscape irrigation network
- Drawing and specification of Science equipment & FRP objects
- Drawing of fountain

1.3 Pond Beautification Works

Scope includes but not limited to

- Pond cleaning including removal of vegetation, slush & mock
- Construction of guard wall & railing on the existing retaining wall
- Development of Pond embankment for walk way around the pond
- Installation of floating aerator
- Construction/repair of the inlet and outlets

1.4 Architectural and Landscaping Works

Architectural Works

- Construction of cafeteria and outdoor seating
- Development of Open Air Theatre.
- Bio toilets along with bio digester to be provided.

Landscape Works

- Different types of seating (FRP benches, Concrete benches, brick work seating with kota stone coping).
- Planting of different trees like Roystonea regia, Terminalia arjuna, Baula, Kadamba etcc of height 1.5 m as mentioned in the drawing.
- Shrubs and ground covers like Duranta erecta, Ocimum tenuiflorum etc to be done as/drawing and specs.
- Seasonal flowers to be planted as mentioned in the drawing.
- Gazebos along with seating to be installed as per drawing and specs.
- Adequate lighting arrangements to be provided.

- Science equipment to be provided as/drawing and specs.
- Zoological park/Evolution park to be constructed as/drawing and specs

1.5 Water Supply & Landscape irrigation

Scope includes but not limited to

- Sinking and development of bore well including installation of pumps along with electrical, piping works.
- Laying of pipe network including installation of sprinkler system
- Installation/construction of water storage tanks both underground and over head
- Pumping works

1.6 Sanitation

Scope includes but not limited to

- Installation of Bio toilets.
- Collection pit for treated effluent from bio digestor including discharge arrangement upto existing Nala
- Rain water drainage & Harvesting system

1.7 Safety

- Contractor has to take care of all safety measures as per Owner / Engineer-in-charge's HSE requirements. Local barricading shall be provided around the other work areas, where main barricading of 15m was not provided. No extra payment shall be made for the local barricading works provided for protection.
- Proper management of loose earth, mud, water, oily material is to be ensured to avoid making the area messy and slippery.
- Working area needs to be properly cordoned off and proper care is to be taken so that surrounding equipment, instruments etc. are not damaged during the construction.
- An experienced safety engineer shall be deployed to site to ensure that the construction work is carried out in a safest manner and shall work in coordination with Owner / Engineer-in-charge's safety Engineer.
- Following codes shall be followed as applicable as per direction of engineer.

CONSTRUCTION SAFETY	IS 3696 (Part 1):1987 Reaffirmed 2017	Safety code of scaffolds and ladders: Part 1 Scaffolds(first revision)
CONSTRUCTION SAFETY	IS 3696 (Part 2):1991 Reaffirmed 2017	Safety code of scaffolds and ladders: Part 2 Ladders(first revision)
CONSTRUCTION SAFETY	IS 7969:1975 Reaffirmed 2017	Safety code for handling and storage of building materials.
CONSTRUCTION SAFETY	IS 8989:1978 Reaffirmed	Safety code for erection of concrete

	2015	framed structures.

1.8 Co Operation with other Contractors

The contractor shall provide all facilities and give complete co-operation for the execution of various other works, if required to be carried out simultaneously by other agencies. While his own work is in progress, the co-ordination will be affected in consultation with the Engineer-in-Charge of the work. Other contractors are also likely to work in the same area during the construction stage.

1.9 Traffic Interference & Inconvenience to The Public

The contractor shall conduct his operations so as to interfere as little as possible with the traffic. When interference to traffic is inevitable, notice of such interference shall be given to the Engineer-in-Charge well in advance (at least 2 days). The contractor shall take all precautionary and other measures, such as providing warning signals, temporary diversions, etc., all as directed by the Engineer-in-Charge. The contractor shall exercise full care to ensure that no damage is caused by him or his workmen, during the operations, to the existing water supply and power lines. The cost of any such damage and risks arising out of this shall be entirely borne by the contractor.

1.10 Preamble to Bill of Quantities

(a) The Bill of Quantities shall be read in conjunction with the Instructions to Bidders, Conditions of Contract, Technical Specifications, and Drawings.

(b) The quantities given in the Bill of Quantities are estimated and provisional, which may be varied, and are given to provide a common basis for bidding. The basis of payment will be the actual quantities of work ordered and carried out, as measured by the Contractor and verified by the Engineer and valued at the rates and prices tendered in the priced Bill of Quantities, where applicable, and otherwise at such rates and prices as the Engineer may fix within the terms of the Contract.

(c) General directions and descriptions of work and materials are not necessarily repeated or summarized in the bill of Quantities. The contractor shall refer to the relevant sections of the contract documentation before entering rates or prices against each item in the Bill of Quantities.

(d) The method of measurement of completed work for payment shall be in accordance with the Particular Specifications, guidelines issued by Bureau of Indian Standards as per order of precedence and also as per the method mentioned in the contract and standard specification.

(e) The amount provisioned for O&M shall be paid quarterly after successful completion of O&M for the preceding quarter.

(f) Unless stated otherwise, all rates and prices entered in the Bills of Quantities shall be deemed to include the following:

- Labour and all costs in the connection with the execution and maintenance of the work.
- The supply of materials, goods, storage and all costs in connection therewith including wastages, shrinkage and delivery to site.
- Sampling and testing materials and goods, checking workmanship, providing, storing, packing and transporting samples to and from the place of testing.
- Fixing, erecting, installing or placing of material and goods and excavated materials, including stacking, storing, loading, transporting and unloading.
- All Temporary works.
- Construction, maintenance of temporary access roads within the sites and any roads required for the access to any part of the site for the purpose of carrying out the Works , taking into account that the access roads under the Contractor's maintenance control will also be used by the Employer and his staff vehicles.
- Construction , maintenance and removal , if required , of temporary Sites drainage on the Site and for ensuring that all drains are kept clear of debris and blockages at all times.
- Safety
- Survey, Investigation, design and drawings.
- All general obligations, liabilities and risks involved in the execution and maintenance of the works set forth or reasonably implied in the documents on which the Bid is based.
- Establishment charges, overheads and profits.
- Co-operating with other Contactors.

The price for transportation included in any of the items in the Bills of Quantities are to include for all labour and equipment required for unpacking , loading , conveying , unloading , storing and multiple handling of all and every item to be transported.

SCOPE OF SUPPLY

2.1 Contractor's Scope of Supply

All materials (consumables & non-consumables), tools tackles etc. as required for satisfactory completion of the job shall be supplied by the contractor. Prior approval from Owner/ Engineer In-charge shall be obtained prior to use of all material at site.

3.0 SPECIFICATIONS

The works shall be performed conforming to the Indian Standard codes, P.H.D & P.W.D. specifications of the State Government. Wherever such specifications are not available, CPWD specifications, relevant references, manuals etc. shall be followed as directed by Owner. For Horticulture and landscaping works CPWD-Delhi Schedule of Rates, Analysis of Rate and Specifications (Horticulture & Landscaping) 2014 and RMC-Rourkela Schedule of Rates 2014 shall be followed.

The successful bidder shall have to prepare and submit 'As Built Drawings' depicting the exact construction carried out on site, in soft and hard copy format

DESIGN CRIETRIA

(Civil Works)

Codes, standards and specifications

The design shall comply with the latest editions and revisions of the codes, specifications, and standards listed below:

Table 1: Latest edition and revision of codes

1	NBC	National Building Code of India.
2	IS: 1893 (Part 1)	Criteria for Earthquake Resistant Design of Structures (Part 1 – General Provisions and Buildings).
3	IS: 1893 (Part 2)	Criteria for Earthquake Resistant Design of Structures (Part 2 – Liquid retaining tanks – Elevated and ground supported).
4	IS: 1893 (Part 3)	Criteria for Earthquake Resistant Design of Structures (Part 3 – Bridges and retaining walls).
5	IS: 1893 (Part 4)	Criteria for Earthquake Resistant Design of Structures (Part 4 – Industrial Structures including Stack-Like Structures).
6	IBC	International Building Code.
7	IS 3414	Code of practice for design and installation of joints in buildings

Table 2 : Latest edition and revision of RCC

1	IS: 432	Specification for mild steel and medium tensile steel bars and hard drawn steel wire for concrete reinforcement.
2	IS: 456	Plain and Reinforced Concrete – Code of Practice.
3	IS: 1786	High strength deformed steel bars and wires for concrete reinforcement.
4	IS: 2502	Code of Practice for Bending and Fixing of Bars for Concrete Reinforcement.
5	IS: 4326	Code of practice for earthquake resistant design and construction of buildings.
6	IS:13920	Code of practice for ductile design and detailing of reinforced concrete structures subjected to seismic forces.
7	IS: 1904	Code of practice for design and construction of foundations in soils: General requirements.
8	IS: 3370 (Part 1 to 4)	Concrete structures for the storage of liquids - Code of Practice.
9	IS: 5249	Determination of dynamic properties of soil, method of test.
10	IS: 8009 (Part 1 & 2)	Code of practice for calculation of settlements of foundations.
11	IS: 3414	Code Of Practice For Joints In The Buildings.

12	SP: 16	Design Aids for Reinforced Concrete to IS 456: 1978.
13	SP: 24	Explanatory Hand Book on Indian Standard Code of Practice for Plain and Reinforced Concrete (IS 456: 1978).
14	SP: 34	Hand Book of Concrete Reinforcement and Detailing.
15	SP: 20 (S & T)	Explanatory Hand Book on Masonry Design and Construction.

Material, workmanship and design criteria

The proposed structure will consist of concrete and steel reinforcement as main materials used for construction of the structures.

Structural design of RCC elements

The design aims to achieve an acceptable probability that structures being designed will perform satisfactorily during their intended life. With an appropriate degree of safety, they should sustain all the loads and deformations of normal construction and use and have adequate durability and resistance to the effects of earthquake, wind as well as misuse and fire. Structures and structural elements will be designed by Limit State Method. Due consideration will be given to the accepted theories, experience and modern design philosophy and practices

Construction joint

Construction joints and shrinkage strips to be planned by the contractor, at design stage (as per IS code: 3414) itself and only be used in locations pre-approved by consultants. Water stops shall be provided in all construction joints below ground level in addition to any joint which may be detailed on the drawing.

Expansion joint

To relieve the structure from temperature stresses, expansion joints are provided at several locations as per the IS requirements. As per BIS code requirement expansion joints are proposed if the length of the structure exceeds 45m. Depending upon geometry of building and for lateral load resisting system expansion joint may be provided for the RCC structures like retraining wall as recommended by IS codes. Gap for the expansion / separation joint shall be provided as per the provisions mentioned in IS 1893 part IV.

Permissible deflections

Permissible deflections shall be as per IS: 456 clauses 23.2. Total deflection of various structural members shall be calculated as per ANNEX C of IS 456. Provisions of IS 1893 and IS 875 shall be followed for lateral deformations.

- The final vertical deflection due to all loads including the effects of temperature, creep and shrinkage and measured from the as-cast level of the supports of floors, roofs and all other horizontal members should not normally exceed span/250.

- The part deflection including the effects of temperature, creep and shrinkage should not normally exceed span/350 or 20 mm whichever is less.
- Under wind load, the lateral sway at the top of building should not exceed height/500.

CRACK WIDTH

Various structural members shall be designed for crack width mentioned as below as per clause no. 35.3.2 IS 456:2000 & clause no. 4.4.1.2, IS 3370(Part-2):2009.

For structural members exposure to serve exposure condition = 0.1mm

- For water retaining structures = 0.2 mm
- For members exposed to soil or ground water = 0.2 mm
- All other structural members = 0.3 mm

Design loads

The design of various structural members for this building should follow the following loads and also effects due to shrinkage, creep, temperature, etc., where applicable.

Dead load

The dead loads should be calculated on the basis of unit weights of materials given in IS: 875 (Part 1). The dead load considered in the structural design shall consist of the full weight of all known fixed structural and architectural elements. The unit weight of materials will be used as follows.

Table 4: Unit weight of material

	Particulars	Weight
1	Reinforced concrete	25.00 kN/m^3
2	Plain concrete	24.00 kN/m^3
3	Light weight concrete	12.00 kN/m^3
4	Concrete block work	18.00 kN/m^3
5	Brickwork	20.00 kN/m^3
6	Autoclaved Aerated Concrete Blocks	8.00 kN/m^3
7	Stone cladding	25.00 kN/m^3
8	Floor finishes	20.00 kN/m3
9	Glass	23.50 kN/m^3
10	Structural steel	78.50 kN/m^3
11	Water	09.81 kN/m^3
12	Dry Soil	16.00 kN/m^3
13	Saturated Soil (Garden load with roots)	21.00 kN/m^3

TypicalDead loads considered in the design are as follows:

Self-weight of slabs, beams, columns & walls - As per sectional sizes of the members.

Additional dead loads

- Floor finishes at Typical floors -1.5 kN/m2
- Water Proofing at Terrace -3.0 kN/m2

Live load

All the live loads should be followed as per IS: 875 (Part 2).

Seismic load (sl)

All buildings, structures, foundations should be designed to resist the effects of earthquakes in accordance with IS: 1893 - Criteria for Earthquake Resistant Design of Structures for Design Basis Earthquake. The structure is primarily column and beam framing system and Retaining wall , since due considerations will be given to the major suggestions/ clauses from IS: 13920. The Retaining wall are to be designed to carry lateral loads .

Seismic design forces should be determined based upon the following parameters. Buildings of different materials of construction and lateral force resisting systems shall be investigated separately.

- **Seismic weight calculation**

The seismic weight of building includes all permanent rigidly attached structural and non-structural components of a building, such as walls, floors, roofs, total weight of permanent equipment etc. The

contribution of live load to be considered in the seismic weight calculation shall be taken as per Clause 7.3.1 and as specified in Table – 8 of IS 1893 (part 1).

- **Permissible stresses**

  - Whenever seismic forces are considered along with other normal design forces, the permissible stresses in material shall be governed by the respective codes as per which the structure/ equipment is being designed.
  - For the other provisions of the code Cl.No.6.3.5 of IS: 1893 (part-1) and Cl.No. 7.4 of IS: 1893 (Part-4) shall be followed.
  - Earthquake loads shall not be considered to act simultaneously with wind.

- **Ductile detailing**

The ductility details of reinforced concrete members should be provided as per the provisions of IS: 13920 to avoid premature failure during earthquake.

Surcharge load

Minimum surcharge of 10KN/m2 and as per IRC whichever is higher shall be considered for design of all underground structures to take in to account the construction load and vehicular traffic in the vicinity of structure.

Earth pressure

Earth pressure for walls of basement/ tanks etc. with propped support condition will be calculated using coefficient of earth pressure at-rest. Earth pressure for cantilever walls like cable trenches and Retaining wall will be calculated based on active earth pressure. Unit weight of soil shall be as per section 8.1. Other soil parameters such as cohesion and angle of internal friction shall be considered as per soil investigation report.

Hydrostatic pressure

If envisaged, the ground water load shall be applied on the substructure as super imposed dead load in addition to the earth pressure. The dry density of soil shall be considered in this combination.

Construction loads

Loads produced by the materials of construction plus the equipment required to construct the facility (crane loads, rigging loads, earth moving equipment, temporary bracing, etc.) as applicable shall be considered.

Load combinations

Each element of a building or structure shall be provided with sufficient strength to resist the most critical effects resulting from the following combination of loads.

Load cases and load combination shall be as follow:

Static load cases

- Dead load (DL)
- Live load (LL)
- Seismic load (Spectra) in X-direction (EQX)
- Seismic load (Spectra) in Y-direction (EQY)

(X and Y directions are mutually orthogonal in plan area, to define the direction of seismic forces with reference to building)

The following Load Combinations have been considered for the analysis.

- 1.5 DL

- 1.5 (DL+ LL)
- 1.2 (DL +LL+EQX)
- 1.2 (DL + LL – EQX)
- 1.2 (DL + LL + EQY)
- 1.2 (DL + LL – EQY)
- 1.5 (DL + EQX)
- 1.5 (DL – EQX)
- 1.5 (DL + EQY)
- 1.5 (DL – EQY)
- 0.9 DL + 1.5 EQX
- 0.9 DL -1.5 EQX
- 0.9 DL + 1.5 EQY
- 0.9 DL - 1.5 EQY

Load Combinations for Serviceability

- DL+ LL
- DL + 0.8 LL + 0.8 EQX
- DL + 0.8 LL – 0.8 EQX
- DL + 0.8 LL + 0.8 EQY
- DL + 0.8 LL - 0.8 EQY
- DL + EQX
- DL – EQX
- DL + EQY
- DL - EQY

The design shall be governed by worst load combinations, keeping in view the probability of Each load case acting together and Their disposition in relation to other loads and severity of stresses or deformations caused by combinations of the various loads is necessary to ensure the required safety and economy in the design of a structure.

The allowable stresses and soil bearing values shall not be increased for any condition of dead, live loads acting alone or in combination with each other.

TECHNICAL SPECIFICATIONS

(Civil Works)

General

The works shall be performed conforming to the Indian Standard codes, P.H.D & P.W.D. specifications of the State Government. Wherever such specifications are not available, CPWD specifications, relevant references, manuals etc. shall be followed as directed by Owner.

1. EARTHWORK

1.1 SCOPE OF WORK

The work covered by this section of the specifications consists of furnishing all plant, labor, equipment, appliances and materials and in performing all operations in connection with earthworks of all underground supplies and services and for all structural units, stock piling, of specifications and applicable drawings, and subject to terms and conditions of the contract. The scope of this section of specifications is also covered with detailed specifications as laid down herein.

1.2 GENERAL

The Contractor shall acquaint himself with the nature of the ground, existing structures, foundations and subsoil which might be encountered during excavation of earthworks. The Employer does not guarantee or warrant in any way that the material to be found in the excavation will be similar in nature to that of any samples which may have been exhibited or indicated in the report, drawings or in any other contract documents or to material obtained from boring or trail holes. The contractor shall be deemed to have made local and independent inquiries and shall take the whole risk of the nature of the ground subsoil or material to be excavated or penetrated and the Contractor shall not be entitled to receive any extra or additional payment nor to be relieved from any of his obligations by reasons of the nature of such ground subsoil or material.

All excavations, cutting, and fills shall be constructed to the lines, levels and gradients specified with any necessary allowance for consolidation, settlement and drainage so that at the end of the period of maintenance the ground shall be at the required lines, levels and gradients.

During the course of the Contract and during the period of maintenance any damage or defects in cuttings and fills, structures and other works, caused by slips, falls or basins or any other ground movement due to the Contractor's negligence shall be made good by the Contractor at this own cost.

1.3 SITE PREPARATION

The Contractor shall construct and maintain accurate bench marks so that the lines and levels can be easily checked by the Project Engineer. The Contractor shall Construct and maintain such ditches, in addition to those shown on the plans, as will adequately drain areas under construction.

The Contractor shall perform a joint survey with the Project Engineer's representative of the area where earthwork is required, plot the ground levels on the drawings and obtain approval from him before starting the earthwork.

The Contractor shall Construct and maintain such ditches, in addition to those shown on the plans, as will adequately drain areas under construction.

1.4 EXCAVATIONS

Excavation shall include the removal of all material of every name and nature. Excavations shall be carried out in accordance with excavation plans and sections shown on the Drawings and as directed by the Project Engineer.

The major portion of excavations shall be carried out by mechanical excavators and excavated materials disposed off to stock on spoil as per drawings or as directed by the Project Engineer. The excavation which cannot be done by mechanical means including leveling, trimming and finishing to the required levels and dimensions shall be done manually. The material suitable for fill and back fill shall be stock piled within the free haulage limit of the 200m of the works.

The Contractor shall give reasonable notice that he intends to commence any excavation and he shall submit to the Project Engineer full details of his proposals. The Project Engineer may require modifications to be made if he considers the Contractor's proposals to be unsatisfactory and the Contractor shall give effect to such modifications but shall not be relieved of his responsibility with respect to such work.

For major excavations, the Contractor shall submit for the prior approval of the Project Engineer full details and drawings showing the proposed method of supporting and strutting etc. The design, provisions construction, maintenance, and removal of such works shall be the responsibility of the Contractor and all cost in these respects shall be included in the unit rates for the permanent work.

The Contractor's attention is drawn particularly to his obligations under the general conditions in respect of those works which are in close proximity to existing buildings.

The Contractor shall preserve the complete excavation from damage from slips and earth movements, ingress of water from any source what so ever and deterioration by exposure to the sun and the effects of the weather.

All excavation of every description, in whatever material encountered shall be performed to the elevations and dimensions shown on the drawings in such a manner as to avoid interruption to work in other parts of the site. The Contractor shall be responsible for injury to the permanent works caused by excavation on other parts of the works.

Excavation shall extend to sufficient distance from walls and footing to allow for placing and removal of forms, installations of services and for inspection, except where the concrete for walls and footings is authorized to be deposited directly against excavated surfaces.

All excavations in foundations shall be taken to 150mm and shall be trimmed carefully to a smooth and level surface, immediately after trimming to the final elevation a layer of building concrete shall be placed to the thickness shown on the drawings. All excavations for foundations which have been trimmed and disturbed shall be compacted and covered by concrete by the end of the day. It is specifically brought to the notice of the Contractor that any excavation taken down to the trimmed elevation which is left overnight or for any length of time thereafter, uncovered by the blinding concrete, shall be required to be trimmed to such lower elevation as directed by the Project Engineer and any extra work or any consequent increase in the quantities caused thereby shall not be paid to the Contractor.

No excavation shall be refilled nor any permanent work commenced until the foundation has been inspected by the Project Engineer and his permission to proceed given. If excavation for sub-structures is carried below the required level, as shown in the drawings or as directed by the Project Engineer, the surplus depth shall be filled in with concrete of same grade as of blinding concrete at the sole cost of the Contractor.

All excavation shall be performed in the dry. The placing of blinding concrete, placing of reinforcement and casting of the permanent works in the excavation shall be carried out in the dry and the Contractor shall have sufficient equipment for this purpose. Adequate precautions shall be taken to prevent any corrosion due to undercutting from underneath the previously constructed adjoining foundations.

Existing utility lines to be retained, as well as utility lines constructed during excavation and backfilling, and if damaged, shall be required to be repaired by the Contractor at his expense. Any existing utility lines which are not known to the Contractor in sufficient time to avoid damage, if inadvertently damaged during excavation, shall be repaired by the Contractor and adjustment in payment will be made as

approved by the Project Engineer. When utility lines which are to be removed, are encountered within the area of operations the Contractor shall notify the Project Engineer in ample time for necessary measures to be taken to prevent interruption of the service.

Excavated material suitable for use as filling material shall be stock piled within the free haulage limit 200m of works as directed by the Project Engineer. This stock piled material shall be transported back to places requiring fill or backfill. Surplus or material unsuitable for use as filling shall be disposed of by the Contractor at locations approved by the Project Engineer within specified free haulage limit.

The Contractor shall make independent enquiries and perform and make independent observations to ascertain the water table in the areas of excavations during the period when the construction works are in progress. The Contractor shall take whole risk of any nature for fluctuation of the water table from his own findings. The Employer is not bound in any way and shall not be responsible for any information given by him or any information, observations or values obtained from his reports, drawings and documents.

Excavation for Recharge pits, Recharge trenches shall be taken out to the levels and dimensions as the Project Engineer may direct.

Before starting the excavations, the Contractor shall ensure the correct alignment of the recharge trenches and location of recharge pits on the ground, the depth and width of excavation of the trench and pits, all in accordance with the drawings and instructions of the Project Engineer.

The Contractor at his cost shall provide to the satisfaction of the Project Engineer all timbering, approved supports and shores and bracings to the sides of the excavated trench and foundations in such a manner to secure the sides of the trench and excavations from falling or adverse movement. All responsibility connected with such shoring shall rest with the Contractor. Adequate clearance / working space on both sides of the structure/pipe line shall be provided for which no payment shall be made.

Without the written permission of the Project Engineer no more than 50.0m the trench shall be opened in advance of the completed pipe line. The bottom of all excavations shall be carefully leveled. Any pockets of soft or loose material in the bottom of the pits and trenches shall be removed and the cavities so formed filled with lean concrete at the Contractor's expense.

The Project Engineer may require the Contractor to excavate below the elevations shown on the drawings or he may order him to step above the elevations shown depending upon the suitable foundation material encountered.

If for any reasons, the levels grades or profiles of the excavations are changed adversely, the Contractor shall at his own cost be liable to bring the excavations to the required levels and profiles as shown on the drawings or as directed by the Project Engineer.

1.5 EXCAVATION TOLERANCES

Excavation shall be performed within the tolerances for excavation limits indicated on the drawings. Where no tolerance limits are indicated excavation shall be performed to tolerances established by the Project Engineer as accepted for the design and type of work involved.

2. BACK FILLING

After completion of foundation footing, foundation, walls, and other construction below the elevation of

the final grades and prior to backfilling, forms shall be removed and the excavation shall be cleaned of trash and debris.

The backfilling shall include filling around the foundations, trenches.

Filling shall be approved selected material from excavation or other predominantly granular material and free from slurry, mud, organic or other unsuitable matter and capable for compaction by ordinary means.

The excavated material if found suitable shall be stock piled within the free haulage limit of the site of the works. This material shall be used for backfilling if approved by the project engineer and shall be transported by the contractor any where required for the purpose of backfilling work in this contract.

The contractor shall provide the approved quality fill and backfilling material as required to complete the fill/backfilling work. Filling in trenches and foundation shall be placed in 200 mm layers and compacted at optimum moisture content by mechanical means or other means as approved by the project engineer.

Fill in around trenches and pits– shall be carefully placed with fine material to cover the completely before the normal infilling is done.

Material for back filling shall be as approved by the project engineer and shall be placed in layers of 150 mm measured as compacted material and saturated with sufficient water and compacted to produce in-situ density not less than 95% of the maximum density at optimum moisture content, achieved in test no.15 of IS 1377:1975 or similar clause of relevant is code.

All filled areas shall be left neat, smooth and well compacted with the top surface consisting of the normal site surface soil unless otherwise directed.

Depending on the depth of fill the project engineer may instruct increased thickness of successive layer to be placed.

Fill shall not be placed against foundation walls prior to approval by the project engineer. Fill shall be brought up evenly on each side of the walls as far as practicable. Heavy equipment for spreading and compacting the fill shall not be operated closer to the wall than a distance equal to the height of the fill above the top of footing.

Depending on the depth of fill the project engineer may instruct increased thickness of successive layer to be placed.

Fill shall not be placed against foundation walls prior to approval by the project engineer. Fill shall be brought up evenly on each side of the walls as far as practicable. Heavy equipment for spreading and compacting the fill shall not be operated closer to the wall than a distance equal to the height of the fill above the top of footing.

In case the contractor is instructed to arrange for the fill material the quality of the fill material will be subject to the approval of the project engineer. The project engineer shall require the contractor to carry out various tests of the fill material. All such tests shall be made at an approved laboratory at the cost of the contractor. Once a material from a specific source has been approved, the material for the same quality and from that source only shall be used. Any fill material from borrow pits which has not been approved or the quality of which differs from the approved material shall be rejected out rightly. The project engineer reserves the right to order removal of any such materials brought to the site of works at his discretion at contractor's expense. In order to ensure satisfactory compaction, it will be necessary to carry out, depending upon the type of material, particle size distribution tests, determination of organic

content tests, maximum and minimum density tests and determination of optimum moisture content for the filling material.

The method of compaction, namely type of compactor, type of roller, weight of roller and number of passes proposed by the contractor for any particular fill material shall be subject to the approval of the project engineer after completion of satisfactory field tests, subsequent to the laboratory analyses, using the materials and equipment proposed to be used for the earth work in conditions similar to those likely to be encountered during construction.

The final selection of the soil moisture content, the thickness of layers, the type of compaction equipment and the number of passes shall be decided after these tests, which shall be conducted at contractor's expense.

Having established the method of compaction to be used, no departure from this approved method shall be permitted without the prior approval of the project engineer. Adequate control of the fill and compacting operations shall be ensured by in-situ density tests and in order to obtain significant results, not less than two measurements shall be carried out per one hundred square meters of area compacted. The frequency of tests shall be determined on site and may be varied at the discretion of the project engineer. Compaction shall not be less than 95% in-situ density with respect to the maximum density, at optimum moisture content.

The exact thickness of layers and the method of placing and compacting the fill shall be determined by the field tests, as stated above, but not withstanding the results of these trails, fill shall not be placed in layers exceeding 200mm in thickness. In order to maintain control of the thickness of layers, timber profiles shall be used wherever feasible. The travelers of such profiles for each layer of fill shall be checked by the supervisory staff of the project engineer. The contractor shall provide adequate supply of water and sufficient capacity of mechanical water carriers to ensure uniform and uninterrupted operation of compaction. The project engineer may forbid the contractor to proceed with placing and/or compaction of fill and/or order removal and re-compaction of such fill when he finds that the contractor has insufficient or defective equipment or that the fill has been improperly laid and/or compacted.

If it is found necessary to alter the moisture content of the fill material in any way, then very strict control shall be exercised over the wetting and/or the drying process and frequent moisture content tests.

The fill material should be well graded non-cohesive and nearly silt-free (silt content between 5 to 10 percent) salt free and free of organic materials (less than 2%). It should also be free of stones larger than 100 mm. Maximum dimension. It should be of such nature and characteristics that it can be compacted to the specified densities in reasonable length of time. It shall be free of plastic clays, of all materials subject to decay, decomposition or dissolution and or cinder or other material which corrode piping and other metals.

TOLERANCES

The stabilization of compacted backfill/fill surfaces shall be smooth and even and shall not vary more than 100mm in 3 meters from true profile and shall not be more than 12.5mm from true elevation.

DISPOSAL OF SURPLUS MATERIAL

The rejected unsuitable material and surplus excavated material shall be disposed of within 200 m free haulage limit measured from boundary of the works to places or as directed by the Project Engineer.

The disposal of surplus excavated material shall include loading, unloading, transporting, stacking,

spreading as directed by the Project Engineer.

3. PLAIN AND REINFORCED CEMENT CONCRETE

The work covered by this section of the Specifications consists of furnishing all plant, labor, equipment, appliances and materials, and in performing all operations in connection with the supply and installation of plain and reinforced concrete work, complete in strict accordance with this section of the Specifications and relevant documents, subject to the Conditions of the Contract.

GENERAL

Full co-operation shall be given to other trades to install embedded items and/or any associated services.

Embedded items shall have been inspected, and tests for concrete and other material or for mechanical operations shall have been completed and approved, before concrete is placed.

Formwork shop drawings shall be designed and prepared by the Contractor at his own cost. Approval of shop drawings as well as those of mock-ups /actual samples of finished concrete shall be obtained before Work is commenced.

Contractor shall prepare bar bending schedules, and get the same approved by the Project Engineer, prior to commencement of work.

RELATED SPECIFICATIONS

The codes and standards generally applicable to the work of this section are listed herein after.

IS 269	:	Ordinary and low heat Portland Cement
IS 8041	:	Rapid Hardening Portland Cement
IS 455	:	Portland slag cement
IS 1489	:	Portland Pozzolana Cement
IS 8112	:	High Strength Ordinary Portland Cement
IS 383	:	Coarse and fine aggregates from natural sources for concrete
IS 456	:	Code of practice for plain and reinforced concrete
IS 516	:	Method of sampling and analysis of concrete
IS 1199	:	Method of sampling and analysis of concrete
IS 1139	:	Hot rolled deformed bars
IS 23896	:	Methods of testing of aggregates for concrete (Part I to III)
IS 2751	:	Recommended Practice for welding for reinforcement bars
IS 9103	:	Admixtures for concrete
IS 10262	:	Recommended guide lines for concrete mixed design

MATERIALS

CEMENT

a. Cement shall conform to standards listed in section 2 of IS:456, latest edition as per the work

requirement and direction of engineer.

b. Only one brand of each type of cement shall be used for concrete in any individual member of the structure. Cement shall be used in the sequence of receipt of shipment, unless otherwise directed.

c. There shall be sufficient cement at site to ensure that each section of Work is completed without interruption.

d. Cement reclaimed from cleaning of bags or from leaky containers shall not be used.

e. Contractor shall provide and erect, at his own cost, in a suitable place, dry, well ventilated, and water proof shed of sufficient capacity to store the cement.

f. The cement shall be used as soon as possible after delivery, and cement which the Project Engineer considers has become stale or unsuitable through absorption of moisture from the atmosphere or otherwise shall be rejected and removed immediately from the site at Contractor's expense.

g. The mixing together of different types of cement shall not be permitted.

AGGREGATES

a. The sources of supply of all fine and coarse aggregates shall be subject to the approval of Project Engineer.

b. All fine and coarse aggregates shall be clean and free from clay, loam, silt, and other deleterious matter. If required, Project Engineer reserves the right to have them washed by the Contractor at no additional expenses. Coarse and fine aggregates shall be delivered and stored separately at Site. Aggregates shall not be stored on muddy ground or where they are likely to become dirty or contaminated.

c. Fine aggregate shall be hard coarse sand, crushed stone or gravel screenings and shall conform to requirements of IS: 383 latest edition.

d. Coarse aggregate shall be gravel or broken stone or hard, durable material free from laminated structure and conforming to IS: 383 latest edition. The aggregates shall be graded as follows for use in mass concrete as in foundations:

TOTAL PASSING	PERCENT BY WEIGHT
2" B.S. Sieve (50.00 mm)	100
1-1/2" Sieve (38.10 mm)	95-100
3/4" Sieve (19.00 mm)	35- 70
3/8" Sieve (9.50 mm)	10- 30
No. 4 Sieve (4.75 mm)	0- 5

Coarse aggregate for all cast-in-place concrete other than mass concrete as for foundations shall be graded with the following limits:-

TOTAL PASSING	PERCENT BY WEIGHT
1" Sieve (25.00 mm)	100
3/4" Sieve (19.00 mm)	90-100
3/8" Sieve (9.50 mm)	20- 55
No. 4 Sieve (4.75 mm)	0- 10

Water:

Only clean potable water from the city supply, tube well installed at the Site or from other sources approved by Project Engineer shall be used. Contractor shall supply sufficient water for all purposes, including mixing the concrete, curing and cleaning plant and tools. Where doubts exist as to the suitability of the water, it shall be tested in accordance with IS: 3025. Where water can be shown to contain any sugar or an excess of acid, alkali or salt, Project Engineer may refuse to permit use. As a guide, the following concentrations represent the maximum permissible values:

a. To neutralize 200 ml sample it should not require more than 2 ml of 0.1 normal NaOH.

b. To neutralize 200 ml sample it should not require more than 10 ml of 0.1 normal HCL.

c. Percentage of solids should not exceed the following:

	PERCENT
Organic	0.02
Inorganic	0.30
Sulphates	0.05
Alkali Chlorides	0.10

In case of doubt, Project Engineer may require that concrete mixed with water proposed to be used should not have a compressive strength lower than 90 percent of the strength of concrete mixed with distilled water.

Reinforcement

a. Reinforcement for concrete shall conform to the respective IS or other standards as specified in the drawings and Contract Documents or as may be specified by Project Engineer.

b. Unless otherwise specified, all plain reinforcing bars shall comply with the requirements of IS: 432, and shall have a minimum yield stress of 248 N/sq mm.

c. Unless otherwise specified, all deformed reinforcing bars shall comply with the requirements of IS: 1786 for deformed cold worked steel bars and shall have minimum characteristic stress of 415 N/sq mm.

d. Reinforcement shall be obtained only from manufacturer's approved by Project Engineer. If and when required Contractor shall provide all necessary facilities to Project Engineer for the selection of test pieces and shall cause these to be prepared and submitted where directed for tests at Contractor's cost.

e. If the reinforcement is to be supplied by Employer, Contractor shall inform Project Engineer of his requirements much before its use in construction.

f. Reinforcement of all types is to be stored at Site in an approved manner so as to avoid damage.

g. Contractor shall report immediately on receipt of any consignment, having any deviation in the standard weights of the reinforcing bars beyond those allowed in respective standards mentioned in clause (3.3.3.4.b) and (3.3.4.4.c) herein before.

4. CONCRETE MIX PROPORTIONS

General:

The proportions of ingredients shall be such as to produce a mixture which will work readily into the corners and angles of the forms and around reinforcement by the methods of placing and consolidation employed on the Work, but without permitting the materials to segregate or excessive free water to collect on the surface. Specific approval of the Project Engineer is required to waive limitations on mixture proportions.

The proportions of ingredients shall be selected in accordance with Section 5.7 to produce the proper placebility, durability, strength and other required properties.

Strength

The Specified compressive strength of the concrete cube, shall be 15 N/sq mm. or 20 N/sq mm.. Samples from fresh concrete shall be taken as per IS: 1199 and cubes shall be made, cured and tested at 28 days in accordance with IS: 516.

Durability

Requirements of Clause 7 of IS: 456-1978 shall be followed.

Slump

Unless otherwise permitted or specified, the concrete shall be proportioned and produced to have a slump of 100 mm or less. A tolerance of up to 25 mm above the indicated maximum shall be allowed for individual batches provided the average for all batches or the most recent 10 batches tested, whichever is fewer, does not exceed the maximum limit.

Concrete of lower than usual slump may be used provided it is properly placed and consolidated.

Note: If S.R. Cement is used, permissible water-cement ratio may be increased by 0.05.

Slump shall be determined by the "Test for slump for Portland Cement Concrete" as per relevant IS code.

Maximum Size of Coarse Aggregate:

The nominal maximum size of the aggregate shall be 20.mm for all portions of the structure except footings which may be 38 mm. These limitations may be waived if, in the judgment of the Project Engineer, workability and methods of consolidation are such that the concrete can be placed without honeycomb or voids.

Admixtures:

If required or permitted, admixtures used shall be in accordance with the manufacturer's instructions except as otherwise specified herein.

Methods of Obtaining Mix Design:

For concrete of normal weight, mix proportions to provide the desired characteristics shall be developed using the methods/procedure covered by the Recommended Practice for Selecting Proportions for Normal Weight Concrete ACI-211.1-77/ IS:456- 1978.

Trial mixtures having proportions and consistencies suitable for the Work shall be made based on above codes, using at least three different water-cement ratios which will produce a range of strengths encompassing those required for the Work. Trial mixes shall be designed to produce the specified slump. The temperature of concrete used in trial batches shall be reported.

For each water-cement ratio, compression test of cube shall be made, cured, and tested in accordance with IS:1199 and IS:516. From the results of these tests a curve shall be plotted showing the relationship between the water-cement ratio and compressive strength. From this curve, the water-cement ratio to be used in the concrete shall be selected to produce the required design strength. The cement content and mixture proportions to be used shall be such that this water- cement ratio is not exceeded when slump is the maximum permitted. Control in the field shall be based upon maintenance of proper cement content and slump.

5. STEEL REINFORCEMENT

SCOPE OF WORK

The work to be done under this section consists of furnishing, cutting, fabricating, bending, placing and tying steel reinforcement in concrete structures or elsewhere as shown on the drawings or directed by the Project Engineer. The scope of this section of this section of specifications as laid down herein.

MATERIAL AND SIZE OF BARS

Reinforcement for concrete shall conform to the respective Indian or other standards as specified in the drawings and in the contract documents or as may be specified by the Project Engineer.

Unless otherwise specified, all plain mild steel reinforcing bars shall comply with the requirements of IS: 432 (Part- I) and shall have a minimum yield stress of 250 N/mm.sq.

Unless otherwise specified, all deformed reinforcing bars shall comply with the reinforcements of IS: 1786 for deformed cold twisted steel bars and shall have a minimum characteristic strength of 415 N/mm.

Reinforcement shall be obtained only from manufacturers approved by the Consultant/Project Engineer. Each consignment of reinforcement steel shall be accompanied by a manufacturer's certificate or shall refer to a previous certificate, if the consignment is from the same batch, showing that the reinforcement steel complies with the following requirement

If such certificate is not made available or if the Consultant / Project Engineer considers that the manufacturer's tests are inadequate, samples shall be taken for acceptance test from different consignments as the Project Engineer may direct and shall be tested at the Contractor's cost should the

result of such that any sample does not meet with the specifications, the whole consignment shall be rejected and removed from the site at the Contractor's cost.

Reinforcement of all types is to be stored on site in approved manner so as to avoid damage.

Reinforcement shall be free from all loose or flaky rust and mill scale or coating, including ice, and other substance that would reduce or destroy the bond. Reduced section steel reinforcement shall not be used.

If such certificate is not made available or if the Consultant / Project Engineer considers that the manufacturer's tests are inadequate, samples shall be taken for acceptance test from different consignments as the Project Engineer may direct and shall be tested at the Contractor's cost should the result of such that any sample does not meet with the specifications, the whole consignment shall be rejected and removed from the site at the Contractor's cost.

If such certificate is not made available or if the Consultant / Project Engineer considers that the manufacturer's tests are inadequate, samples shall be taken for acceptance test from different consignments as the Project Engineer may direct and shall be tested at the Contractor's cost should the result of such that any sample does not meet with the specifications, the whole consignment shall be rejected and removed from the site at the Contractor's cost.

Reinforcement of all types is to be stored on site in approved manner so as to avoid damage.

Reinforcement shall be free from all loose or flaky rust and mill scale or coating, including ice, and other substance that would reduce or destroy the bond. Reduced section steel reinforcement shall not be used.

Steel wire mesh reinforcement shall conform to requirement of relevant Indian codes or those of ASTM: A 185-64 or BS. 4483, 1969: Standard Specifications for welded steel wire fabric for concrete reinforcement. It shall be used where shown on the drawings.

Applicable standards

Latest editions of Indian Standards as per 4.3 or other International Standards

DELIVERY & STORAGE

Delivery

Steel reinforcement bars shall be delivered in bundles firmly secured and tagged. Each bars or bundle of bars shall be identified by marks stamped on hot or cold or painted on or by any other means. The identifying marks shall contain the following information:

a. Name of the producer or his trade.
b. Standard to which the bars have been manufactured.
c. The clause, type and strength respectively.
d. The diameter.
e. The number of the test certificate (if available).

Storage

The method of storage shall be approved by the Project Engineer. Reinforcing bars shall be stored in racks or platforms above the surface of ground and shall be protected free from scaling, rusting, oiling, coatings, damage, contamination and structural defects prior to placement in works. Bars of different

diameters and grades of steel reinforcement shall be kept separate.

BAR BENDING SCHEDULES

The Contractor shall prepare bar bending schedule of all the reinforcing steel bars and these bar bending schedules will be supplied to the Consultants/Project Engineer in duplicate on the basis of which the work shall be carried out. However, the Contractor shall be responsible to satisfy himself as to the correctness and accuracy of the bar bending schedule. Any discrepancy shall immediately be notified to the Consultant / Project Engineer before commencing work.

MEASUREMENT & PAYMENT

Except otherwise specified herein or elsewhere in the Contract documents, no measurement and payment will be made for the under mentioned specified works related to the relevant items of the Bill of Quantities. The cost thereof shall be deemed to have been included in the quoted unit rate of the respective items of the Bill of Quantities. Providing and installing chairs, supports, hooks, spacers, binding wires, and laps not shown on drawings including wastage and rolling margin.

6. BRICK MASONRY

GENERAL

Brick Masonry shall consist of all work required in connection with constructing brick masonry at locations shown on drawings including, but not limited to, furnishing brick, portland cement and sand for mortar and all other materials, and mixing, placing brick masonry as per bill of quantities.

MATERIALS

All portland cement for mortar shall be furnished by the Contractor and shall conform to the applicable requirements specified in the section "Plain and Reinforced Concrete". All sand for mortar shall be furnished by the Contractor and shall conform to the applicable requirements for sand specified in the section "Plain and Reinforced Concrete".

All water used in the manufacture of bricks and in the preparation of mortar shall be free

from objectionable quantities of silt, organic matter, alkali, salts and other impurities,

and will be tested and approved by the Project Engineer as per the guidelines of IS: 456.

MORTAR

a. MIX: Mortar for all brick masonry, expect where otherwise directed by the Project Engineer, shall consist of one part cement to six parts of damp loose mortar sand by volume for brickwork 230mm and above. For brick piers, half brick walls, honeycombed brickwork and hollow (cavity) walls, the mortar mix shall consist of one part cement and four parts of sand. Quantity of water shall be just sufficient enough to produce proper consistency for the intended use. Where directed and approved by the Project Engineer, hydrated lime putty, shall be added to the mortar for increased workability. The putty shall, however, not exceed 25% by volume of the dry cement.

b. Methods and equipment used for mixing mortar be such as will accurately determine and control the amount of each separate ingredient entering into the mortar and shall be subject to the approval of the Project Engineer. Mortar shall be mixed only in sufficient quantities for immediate use and all mortar not used within 30 minutes after addition of the water to the mix shall be wasted. Re-tempering of mortar will not be allowed. The mixers shall be thoroughly cleaned and

washed at the end of each day's work.

BRICK

a. All bricks shall be of first class quality made from good brick earth, free from saline deposits and shall be sand moulded. They shall be thoroughly burnt without being vitrified, shall be regular, uniform in shape and size with sharp and square edges parallel faces and of deep red or copper colour. First class bricks shall be homogeneous in texture and emit a clear ringing sound when struck, and shall be free from flaws, cracks, chips, stones and nodules of lime. First class brick in an oven dried condition shall not absorb more than 1/5 of its weight of water when immersed for one hour in water at 21 to 27 degrees centigrade and shall show no signs of efflorescence on subsequent drying. The average compressive strength of five representative first class bricks shall be 15N/mm. sq. and shall no result shall fall below 10 N/mm sq. The bricks in general shall conform to the requirements of IS: 1077.

b. All bricks shall be manufactured by the Trench Kiln method or other standard methods approved by the Project Engineer. The earth used in manufacturing bricks shall be carefully selected and shall be free from objectionable quantities of lime, gravel coarse sand, roots, or other organic matter salts shall not exceed 0.3% and calcium carbonate shall not exceed 2.0%.

c. The moulds used in the manufacture of bricks shall be thoroughly sanded before each use and shall be sufficiently larger than the size of the bricks being manufactured to allow for shrinkage in drying and burning. The size ready for use shall be 9" by 4 3/8" by 2 3/4" (229X 112X 70mm) and shall weigh between 3.2 to 4.2 Kilograms. All bricks shall have a "Frog" 1/4" deep on one face.

PLACING

a. The methods and equipment used for transporting the bricks and mortar shall be such as will not damage the brick nor delay the use of mixed mortar. Brick shall not be placed during rains sufficiently heavy or prolonged to wash the mortar from the brick. Mortar which becomes diluted by rain shall be removed and replaced before continuing with the work. All bricks to be used in brick masonry shall be moistened with water for three to four hours before they are used. The chosen method of wetting shall ensure that all bricks are thoroughly and uniformly wetted. All bricks shall be free from water adhering to their surface when they are placed in the brick masonry.

b. Bricks shall be laid "Frog" upward with mortar joints and in English bond as directed by the Project Engineer. Both bed and vertical joints shall be 6mm in thickness completely filled with cement mortar as specified herein, and each brick shall be bedded by firmly tapping with the handle of the trowel. All horizontal joints shall be parallel and all vertical joints in alternate courses shall be directly over one another. Excess mortar at the outer edges shall be removed and joints drawn straight with the edge of a trowel and a straight edge. All anchors and similar work required to be embedded in the brick masonry shall be installed as the work progresses. At the completion of the work all holes or defective mortar joints shall be cut out and repointed.

c. The exterior faces of the walls shall be finished by striking the joints as the work proceeds. The joints shall be struck by raking the green mortar after the brick work has been laid and finishing the joint with a pointing tool. Horizontal joints shall be struck to form weathered joints and vertical joints shall be struck with a V notch. Care shall be taken that the striking tools do not develop a cutting edge as the object of striking the joint is to compress the mortar into the joints.

CURING AND REPAIR

a. All brick masonry shall be water cured and shall be kept wet for least seven days by an approved method which will keep all surfaces continuously wet. Water used for curing shall meet the requirements of these specifications for water used in the manufacture of bricks.

b. If, after the completion of any brick masonry work, the brick are not in alignment or level or does not conform to the lines and grades shown on the drawings, or shows a defective surface, it shall be removed and replaced by the Contractor at his expense unless the Project Engineer grants permission, in writing to patch or replace the defective area.

TOLERANCES

The brickwork shall be erected plumb and true to line at level with the maximum variation in any storey height of any length of wall being one meter. The maximum tolerance in the length, height or width of any single masonry unit shall be +/- 3mm.

MEASUREMENT AND PAYMENT

GENERAL

Except otherwise specified herein or elsewhere in the contract documents, the measurement and payment will be made for the under mentioned specified works related to the relevant items of the bill of quantities.

MEASUREMENT

Measurement of acceptable completed works of brick masonry will be made on the basis of cubic meters provided and installed in position as shown on the drawing or as directed by the Project Engineer.

PAYMENT

Payment will be made for acceptable measured quantity of brick masonry on the basis of unit rate per cum quoted in the bill of quantities and shall constitute full compensation for all the works related to the items.

7. FINISHING

General

All plaster work shall be of the best workmanship and in strict accordance with the dimensions of the drawings. All plastering shall be finished to true levels including plumbs, without imperfections, and square with adjoining work. It shall form proper foundations for finishing materials such as paint etc. Masonry and concrete surface to which plaster is to be applied shall be clean, free from efflorescence, sufficiently rough and keyed to ensure proper bond.

All chasing, installation of conduits, boxes, etc. shall be completed before any plastering is commenced on a surface. Chasing or cutting of plaster will not be permitted. Broken corners shall be cut back less than 150 mm on both sides and patched with plaster of Paris as directed. All corners shall be rounded to a radius. Contractor shall get samples of each type of plaster work approved by the Architect/Project Manager.

All chasing, installation of conduits, boxes, etc. shall be completed before any plastering is commenced on a surface. Chasing or cutting of plaster will not be permitted. Broken corners shall be cut back less than 150 mm on both sides and patched with plaster of Paris as directed. All corners shall be rounded to a radius. Contractor shall get samples of each type of plaster work approved by the Architect/Project

Manager.

The materials used for plastering shall be proportioned by volume by means of gauge boxes. Alternatively it may be required to proportion the materials by weight.

PLASTER WORK

The joints in the brick work, concrete blocks, shall be raked to a depth of 15 mm while the masonry is green. Concrete surfaces to receive plaster shall be suitably roughened. All walls shall be washed with water and kept damp for 10 hours before plastering.

The plaster unless specified otherwise shall be average of 12 mm thick on walls. The finished texture shall be as approved by the Architect/Project Manager. The mix for plaster unless otherwise specified, shall be one part cement and four parts sand, to walls and one part cement, 3 parts sand to ceiling.

The interior plaster shall be applied in one coat only. The surface shall be trowelled smooth to an approved surface. All plaster work shall be kept continuously wet for seven days

The external plaster shall be of two coats on an overall thickness of minimum 20 mm. Preparations of walls to receive plaster work shall be the same as in internal plaster. Backing coat shall be 12 to 15 mm thick with cement mortar 1:5 and finishing coat shall be with cement mortar 1:3.

Backing coats shall be combed on wet surface to form keys for finishing coat. All external plaster shall be waterproofed with approved water proofing powder added to cement in proportion of 1.5 Kg. to 50 Kg. of cement as per the manufacturers' instruction, for both the coats. Cost of waterproofing powder per Kg. shall be paid for separately.

For sand faced cement plaster, the finishing coat shall be in cement mortar 1:3, sand used shall be of selected color, properly graded and washed so as to give a grained texture. Finishing plaster coat shall be 8 mm thick, uniformly applied and surface finished with special rubbing by sponge pads and other tools and recommended by the Architect/Project Manager.

8. Paver Blocks / Interlocking Concrete Block Pavement:

Shall confirm to IRC 63

Providing and fixing pre-cast Rubber Dye inter locking concrete block 60mm thick with grade of concrete M-30 compressed by mechanically pressed and as per approved design including 50 mm Sand layer for levelling and filling the joint with sand in proper line and level etc complete.

The scope of work includes supplying and lying of precast paver blocks at site, as mentioned in the Item. All relevant provisions of IS 15658:2006 shall apply. Laying of paver blocks at site as per requirement in technical specification, within shortest possible time. The work shall be executed in perfect line and level as per instructions of Engineer in charge. Colored concrete paver blocks shall be manufactured as per specifications using approved color pigment. The color shade shall be as selected by employer before commencement of the work. The contractor shall guarantee that all material and components designed, fabricated, supplied and laid by him shall be free from any type of defect due to faulty material and/Workmanship/erection For a period of One year from the date of completion of work.

9. Grass Pavers

The grass pavers should have perpendiculars after release from the mould and the same should be retained until the laying. The surface should be of anti-skid and anti-glare type. The grass pavers should have minimum 50% opening for grass ,uniform chamfers to facilitate easy drainage of surface run off. The

pavers should have uniform interlocking space of 2mm to 3mm to ensure compacted sand filling after vibration on the paver surface.

The concrete mix design should be followed for each batch of materials separately and automatic batching plant is to be used to achieve uniformity in strength and quality.

The pavers shall be manufactured in single layer only.

Skilled labour should be employed for laying blocks to ensure line and level for laying, desired shape of the surface and adequate compaction of the sand in the joints.

The pavers are to be skirted all round with kerbing using solid concrete blocks of size 100mm x 200mm x 400mm or as directed by the Engineer. The kerbing should be embedded for 100mm depth. The concrete used for kerbing shall be cured properly for 7 days minimum.

10. <u>Outdoor kota stone flooring</u>

Materials

The stone shall be hard, sound, durable, homogeneous in texture and resistant to wear. These shall be without any soft veins, cracks or flaws and shall have uniform colour. They shall have natural surface free from broken flakes on top. Hand cut/ machine cut for exposed edges and machine polished. Kotah stone shall be of the best quality and of the specified thickness, size and the shade, which shall be got approved by the Engineer-in-charge. The slabs / tiles shall be rectangular or square in shape or as per pattern shown in drawing and as directed by the Engineer-in-charge. The sizes given in schedule of quantities are tentative and can vary only slightly as per the availability in the market. The thickness of the slab after it is dressed shall be 20, 25, 30 or 40 mm as specified in the item. Tolerance of (+/-) 2 mm shall be allowed for the thickness. In respect of length &width, tolerance in length & width shall be permissible upto (+/-) 5 mm for hand cut slabs & (+/-) 2 mm for machine cut slabs. At its thinnest, no stone shall be thinner than the specified thickness.

Uniformity of size and colour / shade shall generally be maintained for the stones used in any one room. The exposed surface shall be machine polished to a smooth, even and true plane and the edges hand cut and dressed true and squares. The evenness of the surface of slabs and edges of the slab shall not be marred by careless dressing or handling, and no patching up shall be allowed for the slab. The edges shall be quite straight. The under face may be left as required or rough dressed. Before taking up the work, samples of stone slabs to be used and their dressing and polishing shall be got approved by the Engineer-in-charge and kept in his office as approved sample and the stone slabs to be used shall conform to the same.

Bedding/ Backing Coat

Kota Stone floorings when laid on ground , a base course of lean concrete mixCement Mortar 1:4:8 (Cement, Course Sand, Stone Aggregate 40mm nominal size) is to be provided between flooring and

well compacted sub-base. The minimum thickness of Base-Course will be 100 mm for floors of buildings/ Platform/Concourse/Pathway etc.

Construction Details

Cement mortar as specified for bedding shall be uniformly mixed. The amount of water added shall be the minimum necessary to give just sufficient plasticity for laying and satisfactory bedding. Care shall be taken in preparing the mortar to ensure that there are no hard lumps that would interfere with the even bedding of the stones. Before spreading the mortar, the sub-floor or base shall be cleaned of all dirt, set mortar scum or laitance and of loose materials by hacking and brought to original levels and then well wetted without forming pool of water on surfaces.

Fixing the stone slab/ tile:

Before laying, the stone shall be thoroughly wetted with clean water, neat cement grout (2.75 kg/ sqm.) of honey like consistency shall be spread on the mortar bed over as much areas as could be covered with the slabs within half an hour. The specified type of stone shall be laid on the neat cement float and shall be evenly and firmly bedded to the required level and slope in the mortar bed. Each stone shall be gently tapped with wooden mallet till it is firmly and properly bedded.

The motar and kota stone to be laid over pcc with a gap of 75 mm in all direction with a proper slope for drainage. So that grass can be planted in between the kota stone.

Curing

The work shall be kept well wetted with damp sand or water for seven days.

Polishing and cleaning

When the bedding and joints have completely set and attained required strength, the surface shall be machine polished to give smooth, even and true plane to the flooring. All flooring shall be thoroughly cleaned and handed over free from any mortar stains etc. Polishing shall be done as per relevant IS and IS-14223 (Specification for polished building stones).

11. Bedding Sand Course

The bedding sand shall consist of a clean well graded sand passing through 4.75mm sieve and suitable for concrete. The bedding . should be from either a single source or blended to achieve the following grading.

Bedding Sand Requirement

In Sieve Size	% Passed
9.52mm	100
4.75mm	95-100

2.36mm	80-100
1.18mm	60-100
600 Microns	25-60
300 Microns	10-30
150 Microns	5-15
75 Microns	0-10

- Contractor shall be responsible to ensure that single-sized, gap-graded sands or sands containing an excessive amount of fines or plastic fines are not used. The sand particles should preferably be sharp not rounded as sharp sand possess higher strength and resist the migration of sand from under the block to less frequently areas even though sharp sands are relatively more difficult to compact than rounded sands, the use of sharp sands is preferred for the more heavily trafficked driveways. The sand use for bedding shall be free of any deleterious soluble salts or other contaminants likely to cause efflorescence.
- The sand shall be of uniform moisture content and within 4% - 8% when spread and shall be protected against rain when stock piled prior to spreading. Saturated sand shall not be used. The bedding sand shall be spread loose in a uniform layer as per drawing. The compacted uniform thickness shall be of 45mm and within +/- 5mm thickness variation shall not be used to correct irregularities in the base course surface.
- The spread sand shall be carefully maintained in a loose dry condition and protected against pre-compaction both prior to and following screening. Any pre-compacted sand or screened sand left overnight shall be loosened before further laying of paving blocks take place.

  Sand shall be slightly screened in a loose condition to the predetermined depth only slightly ahead of the laying of paving unit.

12. Painting

SCOPE

These specifications cover the use of paints for the plastered and concrete surfaces. It also includes the painting of wood and metal surfaces.

GENERAL

The provisions of the latest revisions of the following IS : Codes shall form a part of this specification.

IS: 63	Whiting for Painting Ready mixed paint, brushing, grey filler, for Enamels, for use over primers.
IS: 426	Specification for paste filler for colour coats.
IS : 428	Specification for Distemper, Oil Emulsion, colour as required.
IS : 710	Marine Plywood

IS : 1200 (Part XIII)	Method of Measurement of Building & Civil Engg. Works - White Washing colour washing, distempering & other finishes.
IS : 1477 (Part I)	Code of practice for painting for ferrous metals in buildings Pretreatment.
IS : 1477 (Part II)	Code of practice for finishing of ferrous metals in building. Painting
IS : 2338 (Part I)	Code of practice for finishing of wood and wood based materials Operations and workmanship for finishing.
IS : 2338 (Part II)	Code of practice for finishing of wood and wood based materials, Schedule.
IS : 2395 (Part I)	Code of practice for painting concrete masonry and plaster surfaces. Operation & workmanship
IS : 2395 (Part II)	Code of practice for painting concrete, masonry and plaster surfaces. Schedule.
IS : 159	Specification for ready mixed paint, brushing, acid resistant.
IS : 2524 (Part I)	Code of practice for painting of non-ferrous metal in building Pre-treatment.
IS : 2524 (Part III)	Code of practice for painting of non-ferrous metal in building Painting.
IS : 3140	Code of practice for painting asbestos cement buildings.
IS : 5410	Specification for cement paints, colour as required.IS:15489-04 Specification for External Paint

Other IS Codes not specifically mentioned here, but pertaining to painting form part of these specifications.

MATERIALS

Materials shall strictly conform to the relevant IS: Specifications.

PLASTERED OR CONCRETE SURFACES

General

Wherever scaffolding is necessary, it shall be erected in such a way that as far as possible no part of scaffolding shall rest against the surface to be painted..

For painting on external surfaces secured double scaffolding to be used.

Where ladders are used, pieces of old gunny bags shall be tied at top and cotton to prevent scratches to the walls and floors. For painting of ceilings, proper stage scaffolding shall be erected, where necessary.

Preparation of surfaces

The surface shall be thoroughly cleaned off all dirt, dust, mortar dropping and other foreign matter, before paint is to be applied. New plaster surfaces shall be allowed to dry for at least 2 months, before applying paint. All unnecessary nails shall be removed. Pitting in plaster shall be made good with putty. The surface shall then be rubbed down again with a fine grade sand paper and made smooth.
The surface shall be allowed to dry thoroughly before the regular cost of paint is allowed.
The surface affected by mounds moss, fungi, algae lichens, efflorescence shall be treated in accordance with IS 2395 (Part I) before applying paint. The Adjoining surfaces/finishes shall be protected with either masking tape / plastic to avoid damages to other finishes.
The masking tape / plastic shall be removed without damaging the finishes.

WATER PROOF CEMENT PAINT

PREPARATION OF SURFACES

The surfaces shall be thoroughly wetted with clean water before the waterproof cement paint is applied.

PREPARATION OF PAINT

Portland cement paints are made readily by adding paint power to water and stirring to obtain a thick paste, which shall then be diluted to a brushable consistency. Generally equal volumes of paint powder and water make a satisfactory paint. In all cases the manufacturer's instructions shall be followed. The paint shall be mixed in such quantities as can be used up within an hour of mixing as otherwise the mixture will set and thicken, affecting flow and finish.
The lids of cement paint drums shall be kept tightly closed when not in use, as by exposure to atmosphere the cement paint rapidly air set due to its hydroscopic qualities.

APPLICATION OF PAINT

No painting shall be done when the paint is likely to be exposed to a temperature of below 7 degree within 48 hours after application.
When weather conditions are such as to cause the paint to dry rapidly, work shall be carried out in the shed as far as possible. This helps the proper hardening of the paint film by keeping the surface moist for a longer period.
To maintain a uniform mixture and to prevent segregation the paint shall be stirred frequently in the bucket.
For undercoated surfaces, the surface shall be treated with minimum two coats of water-proof cement paint. Not less than 24 hours shall be allowed between two coats and the second or subsequent coat shall not be started until the preceding coat has become sufficiently hard to resist marking by the brush being used. In hot dry weather the preceding coat shall be slightly moistened before applying the subsequent coat.
The finished surface shall be even and uniform in shade without patches, brush marks, paint drops, etc.
Cement paints shall be applied with a brush with relatively short stiff hog or fibre bristles. The paint shall be brushed in uniform thickness and shall be free of excessively heavy brush marks. The laps shall be well brushed out.

CURING

Painted surfaces shall be sprinkled with water two or three times a day. This shall do between coats and for at least two days following the final coat. The curing shall be started as soon as the paint has hardened so as not to be damaged by the sprinkling of water, say about 12 hours after its application.

PAINTING WOOD AND METAL SURFACES

GENERAL REQUIREMENT

The material required for the execution of painting work shall be obtained directly from approved manufacturers and brought to the site in maker's drums, with seals unbroken. All paints of low VOC shall conform to relevant Indian Standards as mentioned under sub-head "Material".

All materials not in actual use shall be kept properly protected. Lids of containers shall be kept closed and surface of paint in open or partially open containers covered with a thin layer of turpentine to prevent formation of skin. Materials, which have become stale or fat due to improper and long storage shall not be used. The paint shall be stirred thoroughly in its container before pouring into small containers. While applying also, the paint shall be continuously stirred in the smaller container. No left over paint shall be put back into stock tins. When not in use, the containers shall be kept properly closed.

If for any reason thinning is necessary, in case of ready mixed paint, the brand of thinner recommended by manufacturer shall be used.

Painting except the priming coat shall generally be taken in hand after all other builder's work is practically finished. The rooms shall be thoroughly swept out and the entire building cleaned up at least one day in advance of the paintwork being started. The surface to be painted shall be thoroughly cleaned and dusted. All rust, dirt scales, smoke and grease shall be thoroughly removed before painting is started.

No painting on exterior or other exposed parts of the work shall be carried out in wet, humid or otherwise unfavorable weather and all the surfaces must be thoroughly dry before painting work is started.

BRUSHING OF PAINT

The brushing operations are to be adjusted to the spreading capacity advised by the manufacturers of the particular paint. The painting shall be applied evenly and smoothly by means of crossing and laying off, the later in the direction of the grain of wood. The crossing and laying off consists of covering the area over with paint, brushing the surface hard for the first time over and then brushing alternatively in the opposite directions two to three times and then finally brushing lightly in a direction at right angles to the same. In this process, no brush marks shall be left after the laying off is finished. The full process of crossing and laying off will constitute out coat.

During painting, every time after the paint has been worked out of the brush bristles or after the brush has been unloaded, the bristles of the brush. (Which are drawn together due to the high surface tension) shall be opened up by striking the brush against a portion of the unpainted surface with the end of the bristles held at right angles to the surface, so that bristles thereafter will collect the correct amount of paint when dipped again into the paint container.

SPRAYING

Where so stipulated, the painting shall be done with spray. Spray machine used may be (a) high pressure (small air aperture) type or (b) a low-pressure (large air gap) type, depending on the nature and location of work to be carried out. Skilled and experienced workmen shall be employed for this class of work. Paints used shall be brought to the requisite consistency by adding a suitable thinner.

Spraying should be done only when dry conditions prevail. During spraying the spray gun shall be held perpendicular to the surface to be coated and shall be passed over the surface in a uniform sweeping motion. Different air pressures and fan adjustment shall be tried so as to obtain the best application with

the minimum wastage of paint. The air pressure shall not be kept too high as otherwise the paint will clog up and will be wasted.

Spots that are inaccessible to the spray pattern shall be touched up by brush after spraying.

At the end of the job, the spray gun shall be cleaned thoroughly so as to be free from dirt. Incorrect adjustments shall be set right, as otherwise they will result in variable spray patterns, runs, sags and uneven coats.

Each coat shall be allowed to dry completely and lightly rubbed with very fine grade of sand paper and loose particles brushed off before next coat is applied. Each coat shall vary slightly in shade and shall be got approved 'from the Engineer-in-charge before next coat is started.

Each coat except the last coat shall be lightly rubbed down with sand paper or fine pumice stone and cleaned off dust before the next coat is applied.

No hair marks from the brush or clogging of paint puddles in the corner panels, angles of mouldings, etc. shall be left on the works. In painting doors and windows, the putty round the glass panes shall also be painted but case shall be taken to see that no paint stains etc. are left on the glass. Tops of shutters and surfaces in similar hidden locations shall not be left out in painting.

In painting steel work, special care shall be taken while painting over bolts, nuts, rivets, overlaps etc.

The additional specifications for primer and other coats of paints shall be according to the detailed specifications under the respective headings.

BRUSHES AND CONTAINERS

After work, the brushes shall be completely cleaned off paint and linseed oil by rinsing with turpentine. After cleaning, brushes are wrapped in heavy paper or waterproof paper for storage. It is to be used the next day; it shall be hung in a thinner or linseed oil in a container. On no account shall brushes to be made to stand on bristles. A brush in which paint has dried up in ruined and shall on no account be used for painting work.

The containers, when not in use, shall be kept closed and free from air so that paint does not thicken and also shall be kept guarded from dust. When the paint has been used, the containers shall be washed with turpentine and wiped dry with soft clean cloth, before they can be used again.

WHITE WASHING

GENERAL

The item refers to whitewashing over old and new concrete, stone masonry brick plastered surfaces and asbestos cement sheets.

White wash shall be prepared from fresh burnt white stone lime or shell lime. This lime shall be of class type as per IS: 712. Surkhi lime or lime of equivalent quality may be used. The lime shall be dissolved in a tub with sufficient quality of water (about 4.5 liters/Kg. Of line) and the whole shall be thoroughly mixed and stirred until it attains the consistency of thin cream. The white wash shall be taken out in small quantities and strained through a clear course cloth. Alternatively with IS : 63 may also be used. Clean gum dissolved in hot water shall then be added in suitable proportion of 2 gm of gum Arabic to a little of lime or whiting to prevent the white-wash coming off easily when rubbed. Rice may be used instead of gum.

SCAFFOLDING

This may be double or single according to requirements. If ladders are used, pieces of old gunny bags or cloth rags shall be tied on their tops to avoid damage or scratches to the wall. Proper stage scaffolding shall be created when whitewashing ceiling. The contract shall be responsible for accidents if any taken place.

PREPARATION OF SURFACE

The surface shall be prepared by removing all mortar dropping and foreign matter and thoroughly cleaned with wire or fiber brush or other means as may be ordered by the Engineer to produce an approved clean and even surface. All loose pieces and the scales shall be scraped off and holes stopped with mortar. In case where the surface has been previously colour washed, the old colour wash must be entirely removed before the white-wash is applied. In the case of surface, which has once been white-washed, the old loose white-wash shall be broomed down. In case, the loose whitewash cannot be removed by brooming, the Engineer may order scraping of the surface.
After cleaning the surface as specified above, the unwanted nails shall be removed and all nail holes, cracks and crevices stopped with mortar similar in composition to the surface to be stopped. The mortar should be cured.

APPLICATION OF WHITE-WASH

On the surface so prepared, the whitewash shall be laid. Each coat shall be laid on with a brush. The first stroke of the brush shall be form the top downward, another from bottom upwards over the first stroke, and similarly, one stroke from the right and another from the left over the first brush before it dries. This will from one coat. Each coat must be allowed to dry and shall be subject to inspection before the next coat is applied. When dry, the surface shall show no signs of cracking. It shall present a smooth and uniform finish free from brush marks and it should not come off easily when rubbed with a finger.
No portion in the surface shall be left out initially, to be patched up later on.For new work, the white washed surface shall present a smooth and uniform finish.
For old work, patches and repairs shall be white washed first. Thereafter, the whole surface shall be white washed with the required number of coats.
Doors, windows, floors and other articles of furniture, etc. shall be protected from being splashed upon. Splashing and droppings, if any, shall be removed and the surfaces cleaned.
PREPARING THE SURFACE FOR WHITE WASH INCLUDING THE SCAFFOLDING

Appling the white wash in required number of coats as specified above and prior white washing of repaired patched.

ACRYLIC PAINTING TO EXTERNAL SURFACES

GENERAL
Acrylic weather shield paint of low VOC from the approved brand shall be applied over plastered surfaces as directed by the EIC.
Other specifications including preparation of surfaces, application of paint etc. shall conform to section 7.0 above and as directed by EIC. The primping coat, anti-fugal treatment, preparation of paint etc. shall be carried out as per manufacturer's specification /as directed by EIC. General
Acrylic weather shield paint shall be applied on surfaces which are liable to external condensation and are to be used generally on masonry or plastered surfaces. Suitable primer as per manufacturer shall be provided.

PAINT

Acrylic weather shield paint of approved brand and manufacture as per the required shade shall be used.

PREPARATION OF SURFACE

The surface shall be thoroughly cleaned of dust, old white or colour wash by washing and scrubbing. The surface shall then be allowed to dry for at least 48 hours. It shall then be sand papered to give a smooth and even surface. Any unevenness shall be made good by applying external putty mixed with water on the entire surface including filling up the undulation and then sand papering the same after it is dry.

APPLICATION

The number of coats shall be as stipulated in the item.
The paint will be applied in the usual manner with brush or roller.
The paint dries by evaporation of the water content and as soon as soon as the water has evaporated the film gets hard and the next coat can be applied. The time of drying varies from one hour on absorbent surfaces to 2 to 3 hours on non-absorbent surfaces.
The thinning of paint is to be done with water and not with turpentine.
Thinning with water will be particularly required for the undercoat, which is applied on the absorbent surface. The quantity of thinner to be added shall be as per manufacturer's instructions.
The surface on finishing shall present a flat velvety smooth finish. If necessary more coats will be applied till the surface presents a uniform appearance.

PRECAUTIONS
Old brushes if they are to be used with paints should be completely dried of turpentine or oil paints by washing in warm soap water.
Brushes should be quickly washed in water immediately after use and kept immersed in water during break periods to prevent the paint from hardening on the brush.
In the preparation of walls for painting, no oil base putties shall be used in filling cracks, holes etc it should be only the external putties.
Splashes on floors etc. shall be cleaned out without delay, as they will be difficult to remove after hardening.
Washing of surfaces treated with emulsion paints shall not be done within 3 to 4 weeks of application.

13. Floating Aerator:

Supply, installation, testing and commissioning of venturi jet aerator

Technical Data

Air Flow range (Q): 55 M3/hr

Oxigen Delivery power : 4.0 ~ 4.5 KG-02/hr
Maximum submergence level : 4 meter
Saturated with oxygen : 18 ppm
MOC: SS-304 Venturi, shaft,motor Body & Cast iron Motor housing
pumps available from 3.75Kw / 5.0 HP (Water field)
Current : 8 Amps , RPM : 2880

14. Rubber concrete and EBDM flooring:

36 mm thick **EPDM** or Ethylene Propylene Diene Monomer to be installed on smooth concrete or asphalt surface. The product comes in two layers one is a Black SBR under layer with adequate binder and 6 mm thick EPDM Top Layer line. The polymer content should be 18% minimum. The binder should be of PU with UV resistance quality.

TECHNICAL SPECIFICATIONS

(Science Equipment)

All play equipment shall be as per specification, of approved quality and procured from manufacturers approved by Owner.

Sl.No	Name of equipment	Specification
1	Loop The loop	Supply & installation of'LOOP THE LOOP' including fabrication, Painted with good quality PU coating with proper surface preparation, Packing loading unloading transportation to site fitting, Commissioning, demonstration with explanation board in one language English comprehensive A.M.C with spare parts for 1 Year with proper planning site visit & Design etc. complete.Concept: A wooden ball of 5" dia starts rolling in a guiding path and overcomes gravitational force at circular loops. The children can learn potential energy, kinetic energy and centrifugal force by playing with this ball. Technical specification:Overall height – 8'Overall Length – 9'Overall Width – 45"Ball rolling path – 10 mm M.S Rods etc.
2	Cylodial path	Supply & installation of 'CYCLODICAL PATH' including fabrication, Painted with good quality PU coating with proper surfacepreparation , Packing loading unloading transportation to site fitting, Commissioning, demonstration with explanationboard in one language English comprehensive A.M.C with spare parts for 1 Year with proper planning site visit & Design etc. complete. Concept:Gaining acceleration due to gravity is varied with two different shaped paths. Shortest path is achieved with the cycloidal curve. Technical specification of the gadget:Product Size:8'*2 1/2'Height:4' Fibre Path 8 Feet Long Fibre Path Thickness 4 Mm 4 Layer Fibre Mat 3/4"Gi Pipe Thickness 2mm thickness6" Plastic Ball 1"*1/4 Ms Flat etc.
3	Double Ended Cone	Supply & installation of 'DOUBLE ENDED CONE' including

		fabrication, Painted with good quality PU coating with proper surfacepreparation , Packing loading unloading transportation to site fitting, Commissioning, demonstration with explanationboard in one language English comprehensive A.M.C with spare parts for 1 Year with proper planning site visit & Design etc. complete. Concept: The equilibrium of any object is governed by the position of it's centre of gravity. This fascinating model explains it with fun. Technical specification of the gadget:Product Size:9'*4'Height:1.5' 1 ½ Gi Pipe Thickness 2mm, 1" Pipe B class ¾"Gi Pipe Thickness 2.5 Mm Thickness Cone Fabricated 16 Gauge Sheet with 1 1/4" B class pipe in center(100*100*125)mm Square block 6202 Bearing 42mm Dia 30 Length Ms Rod 1 No Shaft Surround Support 3" Gi Pipe Thickness 2.4 mm12mm Thick 10" Dia Round Plate 2 No , 1 1/4" * 1/4" MS angle 6208 collar with thrust bearing 16 Gauge Gi Sheet ¾ Gi Pipe B class1"Gi Pipe B class etc.
4	Angular Momentum	Supply & installation of 'ANGULAR MOMENTUM' including fabrication, Painted with good quality PU coating with proper surface preparation, Packing loading unloading transportation to site fitting, Commissioning, demonstration with explanation board in one language English comprehensive A.M.C with spare parts for 1 Year with proper planning site visit & Design etc. complete. Concept: Concentration of mass at rotating axis increases angular velocity and angular momentum is explained through this single seat merry go round. Technical specification of the gadget:Product Size:5' Dia Product Height :3' 6208z Ball Bearing 2 No, 51118 Thrust Bearing etc.
5	Mass and Intertia	Designing, Supply & installation of 'including fabrication, Painted MASS &INERTIA' with good quality PU coating with proper surface preparation, Packing loading unloading transportation to site fitting, Commissioning, demonstration with explanation board in one language English comprehensive A.M.C with spare parts for 1 Year with proper planning site visit & Design etc. complete. Concept: With three rotating disc of iron, aluminum, acrylic , the relationship between mass and inertia is illustrated. Technical specification of the gadget:Product length 6'*6"1feet Dia 12 Mm Thickness Ms Plate 1 No 1 Feet Dia 12 Mm Thickness Acrylic Plate 1 No1 Feet Dia 12 Mm Thickness Alluminium Plate 1 No 6204zz Ball Bearing 3 No etc.
6	Projectile Motion	Designing, Supply & installation of '' gadget including fabrication, Painte PROJECTILE d with good quality PU coating with proper surfacepreparation , Packing loading unloading transportation to site fitting, Commissioning, demonstration with explanationboard in one language English comprehensive A.M.C with spare parts for 1 Year with proper planning site visit & Design etc. complete. Concept: The law of trajectory is explained with the fun of

		playing with a water jet.Technical specification of the gadget:Product length – 5'`Height – 3'Water jet mechanism rotated with handle.The set- up to be supported with proper fixing for optimum operational feasibility etc.
7	Planetory motion	Designing, Supply & installation of 'PLANETARY MOTION' including fabrication, Painted with good quality PU coating with proper surface preparation, Packing loading unloading transportation to site fitting, Commissioning, demonstration with explanation board in one language English comprehensive A.M.C with spare parts for 1 Year with proper planning site visit & Design etc. complete. Concept:The Planets revolve at higher pace nearer to the sun and slower when its farther from the Sun. This concept can be visualized Technical specification of the gadget:Product size: 4'*4' height 3' Fibre reinforced polymer made curved surface of size 4'X4' with a groove to allow a metal ball to roll, 1 1/2" GI pipe 2mm thick, 3/4" GI pipe B class, 1/2" GI pipe B class, 2 * 1/4 MS flat, 6mm MS round rod, 3/4 *1/4 MS flat, 30mm Steel ball etc.
8	Bell Tower	Designing, Supply & installation of 'BELL TOWER' including fabrication,Painted with good quality PU coating with proper surfacepreparation , Packing loading unloading transportation to site fitting, Commissioning, demonstration with explanationboard in one language English comprehensive A.M.C with spare parts for 1 Year with proper planning site visit & Design etc. complete. Concept: The vibrating material made up of various elements explains the relationship between frequency of sound and vibrating material density. Technical specification of the gadget:Product size: 5' X 3'height: 3'4mm iron rope small hammer 1 no bronze bell , 2" brass pipe, 2" SS pipe, 2" Bronze pipe, 2" PVC pipe, 2" MS pipe2" aluminium pipe,round wood 1 no 1 1/2" GI pipe 2mm thickness, 3 * 1/4 MS flat, etc.
9	Parabolic Dishes	PARABOLIC DISHES' Supply & installation of'including fabrication, Painted with good quality PU coating with proper surface preparation, Packing loading unloading transportation to site fitting, Commissioning, demonstration with explanation board in one language English comprehensive A.M.C with spare parts for 1 Year with proper planning site visit & Design etc. complete.Concept: Sounds waves can behave light light rays. They reflect, converge & diverge. A set two identical parabolic dishes explains it well. TECHNICAL SPECIFICATION:FRP Dish Diameter – 54" – 2 Nos Height – 6' Above G.L No of dishes – 2 2 Nos – Rods at focal point – 25 mm GI 'B' class etc.
10	Musical Tube	Supply & installation of 'MUSICAL TUBES' including fabrication, Painted with good quality PU coating with proper surfacepreparation , Packing loading unloading transportation to site fitting, Commissioning, demonstration

		with explanationboard in one language English comprehensive A.M.C with spare parts for 1 Year with proper planning site visit & Design etc. complete. Concept: The pitch of any vibrating material is inversely proportional to the length of the same. This basic concept used in string instruments is illustrated here. Technical specification of the gadget: product size: 9'*1' 2" GI pipe B class, 1 1/2" GI pipe 2mm thick, FRP guitar4mm iron rope, Small Hammer50mm OD seamless pipe, 4mm Plastic coated steel pipe etc.
11	Pinhole Camera	Designing, Supply & installation of 'PIN HOLE CAMERA' including fabrication, Painted with good quality PU coating with proper surface preparation, Packing loading unloading transportation to site fitting, Commissioning, demonstration with explanation board in one language English comprehensive A.M.C with spare parts for 1 Year with proper planning site visit & Design etc. complete. Concept: Inverted image gives us a straight idea about light ray's property when it is allowed through a pin- hole. Enjoy the scenery by rotating the camera all around. Technical specification of the gadget:product size: 2' X 2'1 "*1/8 ms Flat 14"*14" smoging mirror 1 no,Stainless Steel box with glass screen, MS bright rod, 6204 bearing mechanism for rotation etc.
12	Play with Mirrors	Designing, PLAY WITH MIRRORS' Supply &installation of 'including fabrication, Painted with good quality PU coating with proper surface preparation, Packing loading unloading transportation to site fitting, Commissioning, demonstration with explanationboard in one language English comprehensive A.M.C with spare parts for 1 Year with proper planning site visit & Design etc. complete. Concept: Enjoy funny images given by the property of reflection at concave, convex & plane mirrors.Technical specification of the gadget:Dimension – Length – 4' Height – 30"2FRP frame for mirror,Acrylic Mirror etc.
13	Ripple Tank	Supply & installation of 'RIPPLE TANK' including fabrication, Painted withgood quality PU coating with proper surface preparation, Packing loading unloading transportation to site fitting, Commissioning, demonstration with explanation board in one language English comprehensive A.M.C with spare parts for 1 Year with proper planning site visit & Design etc. complete. Concept:The newton's rings can be created with the set-up here. The clear fringes teach us refraction, interference & diffraction of waves. Technical specification of the gadget:Dimension In: l x b x h: 4 x 4 x 6. 25 m.m GI pipeand 32 X 32 X 6 m.m mild steel angle used for fabricating metal frame to support transparent glass and m.s rod to touch the water surface.
14	Gear, belt and Chain Drive	Designing, Supply & installation of 'GEAR, BELT & CHAIN DRIVE' including fabrication, Painted with good quality PU coating with proper surface preparation, Packing loading

		unloading transportation to site fitting, Commissioning, demonstration with explanation board in one language English comprehensive A.M.C with spare parts for 1 Year with proper planning site visit & Design etc. complete. Concept: Power transmitted from one axis to another is explained here with various mechanisms.Technical specification of the gadget: product size: 5 1/2' * 1/2'height :2'1" G pipe B class, 1 1/4 * 1/4 MS flat, 2 * 1/4 MS flat, Spur gear train 1 set, Pulsar chain and sprocket, 12" & 3" Pulley 51A belt, SS weld Mesh etc.
15	Inclined Plane	Supply & installation of'INCLINED PLANE' including fabrication, Painted with good quality PU coating with proper surface preparation, Packing loading unloading transportation to site fitting, Commissioning, demonstration with explanation board in one language English comprehensive A.M.C with spare parts for 1 Year with proper planning site visit & Design etc. complete.Concept: Three inclined planes with different inclinations with ground is fitted with a sliding mass. The sliding mass is tied with a rope and pulley system. The children has to lift the three weights one by one and find which is easier to lift. As the longest inclined with mild slope is easier to lift, children learn about the mechanical advantage of this system.TECHNICAL SPECIFICATION:Overall dimension: Height -8' width -8'. Length -10'.
16	Worm Wheel	Designing, Supply & installation of 'WORM WHEEL 'including fabrication, Painted with good quality PU coating with proper surface preparation, Packing loading unloading transportation to site fitting, Commissioning, demonstration with explanation board in one language English comprehensive A.M.C with spare parts for 1 Year with proper planning site visit & Design etc. complete. Concept: The mechanical advantage gained through a worm and wheel arrangement is self explanatory hereTechnical specification of the gadget: product size: 2 1/2' * 1/2'Height: 1.5' 10 kg weight 1 no, 4mm iron rope, 1 1/4 * 1/4 MS angle, Nylocast gear 4set, SS worm gear 4 set, SS collar, 6204 bearing, Cam meachanism for lifting weight1"gi pipe B class plastic handle etc.
17	Rain Gauge	Supply & installation of 'RAIN GAUGE' including fabrication, Painted with good quality PU coating with proper surface preparation, Packing loading unloading transportation to site fitting, Commissioning, demonstration with explanation board in one language English comprehensive A.M.C with spare parts for 1 Year with proper planning site visit & Design etc. complete. Concept: The standard meteorological non-recording type rain gauge is installed here for collecting everyday rainfall data. Technical specification of the gadget:product size: 1'dia height: 1.5'raingauge jar with cover Rain gauge jar fixed in cement block etc.

18	Humidity Metre	Supply & installation of 'HUMITIDY METER' including fabrication, Painted with good quality PU coating with proper surface preparation, Packing loading unloading transportation to site fitting, Commissioning, demonstration with explanation board in one language English comprehensive A.M.C with spare parts for 1 Year with proper planning site visit & Design etc. complete. Concept: The percentage of humidity present in the atmospheric air can be noted here. Technical specification of the gadget: product size: 1' X 1' panel height : 2'humidity meter 1no FRP panel for Meter, Post 1" GI pipe B class 1 1/4 * 1/4 M angle etc.
19	Wind Shock	Supply & installation of 'WIND SOCK (3 SOCKS PROVIDED) including fabrication, Painted with good quality PU coating with proper surface preparation, Packing loading unloading transportation to site fitting, Commissioning, demonstration with explanation board in one language English comprehensive A.M.C with spare parts for 1 Year with proper planning site visit & Design etc. complete. Concept: Instantaneous direction of wind flow can be noted down here. A seasonal record can be obtained about wind direction for a specific period.Technical specification of the gadget:product size:2'*1' product height : 15' 1 ½ gi pipe thickness 2.5mm, 15" dia ms round plate, 10" dia ms round plate, 1 1/4 * 1/4 ms angle, 12mm ms round rod wind sock cloth , 2mm square rod 6202z ball bearing 1 no 1 ¼ gi pipe thickness 2mm etc.
20	Maxima & Minima Thermo Metre	Supply & installation of 'MAXIMA, MINIMA THERMOMETER' including fabrication, Painted with good quality PU coating with proper surface preparation, Packing loading unloading transportation to site fitting, Commissioning, demonstration with explanation board in one language English comprehensive A.M.C with spare parts for 1 Year with proper planning site visit & Design etc. complete. Concept: Important meteorological data like a day's maximum and minimum temperatures can be noted down here.Technical specification of the gadget: product size: 2' X 2'height: 2' Thermometer 1no FRP panel for Meter, Post 2" GI pipe B class 11/4 * 1/4 M angle etc.
21	Plank's Law	Designing, Supply & installation of 'PLANK'S LAW' including fabrication, Painted with good quality PU coating with proper surface preparation, Packing loading unloading transportation to site fitting, Commissioning, demonstration with explanation board in one language English comprehensive A.M.C with spare parts for 1 Year with proper planning site visit & Design etc. complete. Concept: Black body radiation is explained with simple arrangement.Technical specification of the gadget: PRODUCT SIZE:5' DIA HEIGHT :2' 16 GAUGE GI SHEET 6 NO 13"*13" 12MM SQUARE ROD, 1" GI pipe 2mm thick, 9" MS round plate, 2" GI pipe B class, 3" MS hollow ball etc.

22	Solar Water Heatre	Designing, Supply & installation of 'SOLAR WATER HEATER' including fabrication, Painted with good quality PU coating with proper surface preparation, Packing loading unloading transportation to site fitting, Commissioning, demonstration with explanation board in one language English comprehensive A.M.C with spare parts for 1 Year with proper planning site visit & Design etc. complete. Concept: The benefit of non conventional energy resources is explained with working model of solar water heater. Technical specification of the gadget: : l x b x h : 5'*5'*8 1/2'1 1/2" GI pipe 2mm thick, 1 1/4" GI pipe 2mm thick, 1/2" GI pipe B class, Brass valve, Tap, Solar panel, SS weld mesh, 25 ltr Plastic can etc.
23	World Time(Cylinder type)	Designing, Supply & installation of 'World Time (Cylinder Type)' including fabrication, Painted with good quality PU coating with proper surface preparation, Packing loading unloading transportation to site fitting, Commissioning, demonstration with explanation board in one language English comprehensive A.M.C with spare parts for 1 Year with proper planning site visit & Design etc. complete. Concept:The change in local time for every country, with reference to the latitude of that country, is explained here.Technical specification of the gadget:Shape - Sphere,colour - Multi colour,Dimensions - 3' DIA. 5' HIGH. Fibre glass made globe with 3D embossed countries Different time zone zones, geographical facts, Knowledge about eastern countries and western countries are taught in this model.
24	DNA model	Supply & installation of 'DNA MODEL' including fabrication, Painted with good quality PU coating with proper surface preparation, Packing loading unloading transportation to site fitting, Commissioning, demonstration with explanation board in one language English comprehensive A.M.C with spare parts for 1 Year with proper planning site visit & Design etc. complete. Concept: The component of dna chain is explained here with labeling of anennine ,thayamine ,cytocin, guanine Technical specification of the gadget: product size:28"dia height :8' 1 ½ gi pipe thickness2mm 10mm rod 2.5" dummy 3" dummy a10 no,t 10 no,g 10no,c 10no,p 32,s 32 no aluminium sticker etc.
25	Periodic Table	Designing, Supply & installation of 'PERIODIC TABLE' including fabrication, Painted with good quality PU coating with proper surface preparation, Packing loading unloading transportation to site fitting, Commissioning, demonstration with explanation board in one language English comprehensive A.M.C with spare parts for 1 Year with proper planning site visit & Design etc. complete. Concept:All elements are introduced with their symbol. Atomic weight, atomic number and crystalline structure of each element can be learnt. Technical specification of the gadget:Overall dimension – 5' long: 5' high. Main frame made up of 40 m.mgalvanized iron pipe.

26	Cystal Structure	Designing, Supply & installation of 'CRYSTAL STRUCTURE'including fabrication, Painted with good quality PU coating with proper surface preparation, Packing loading unloading transportation to site fitting, Commissioning, demonstration with explanation board in one language English comprehensive A.M.C with spare parts for 1 Year with proper planning site visit & Design etc. complete. Concept: The array of crystal structure for sodium chloride is explained with three dimensional. Technical specification of the gadget: PRODUCT size:(27"*27") - 3nos height :3'hollow ball, 1/2" GI pipe, 9" dia MS round plate, 3 cubic crystal structures, Simple cubic structure of Nacl, Face centered cubic, Body centered cubic structure etc.
27	Parabolic Reflector	Designing, Supply & installation of 'PARABOLIC REFLECTOR' including fabrication, Painted with good quality PU coating with proper surface preparation, Packing loading unloading transportation to site fitting, Commissioning, demonstration with explanation board in one language English comprehensive A.M.C with spare parts for 1 Year with proper planning site visit & Design etc. complete. Concept: The rolling ball hits the parabola and always directed to the focal point. The property of parabola is explained here. Technical specification of the gadget: product size: 3'*4.5' height :3' 16 gauge gi sheet 1"*1" ms square tube 1 1/4"gi pipe thickness 2 mm, 1 * 1 MS square tube, 1 1/4 * 1/4 MS flat bouncing ball, 4" MS pipe, 4" GI pipe, 16 gauge GI sheet etc.
28	Pythagoras Theorm	Supply & installation of 'PYTHAGORAS THEOREM' including fabrication, Painted with good quality PU coating with proper surfacepreparation , Packing loading unloading transportation to site fitting, Commissioning, demonstration with explanationboard in one language English comprehensive A.M.C with spare parts for 1 Year with proper planning site visit & Design etc. complete. Concept: The famous pythagoras theorem is explained with area of the sides of a triangle made up of removable cubes Technical specification ofthe gadget: Dimension In: l x b : 2 1/2'x 2 1/2'2 * 1/4 MS flat, plastic cubes with acrylic knob, FRP Pythgoras theorem concept model etc.
29	Vortex	Designing, Supply & installation of 'VORTEX' including fabrication, Painted with good quality PU coating with proper surface preparation, Packing loading unloading transportation to site fitting, Commissioning, demonstration with explanation board in one language English comprehensive A.M.C with spare parts for 1 Year with proper planning site visit & Design etc. complete. Concept: The rotating fluid subjected to centrifugal force creating funnel shaped formation like tornado. Technical specification of the gadget: product size:3' * 3' height 21/2' 1 1/2" GI pipe, 3/4" GI pipe, 1 1/4 *1/4 angle, 4 * 1/4 MS flat, 2 * 2 MS square tube, 1 * 1/4 MS flat, 12mm thick Acrylic

		cylinder, 25mm thick Acrylic plate, UCF 205 Bearing, 6004 bearing etc.
30	Anti Gravity Loop	Supply & installation of 'Antigravity LOOP' including fabrication, Painted with good quality PU coating with proper surface preparation, Packing loading unloading transportation to site fitting, Commissioning, demonstration with explanation board in one language English comprehensive A.M.C with spare parts for 1 Year with proper planning site visit & Design etc. complete.Concept: A wooden ball of 5" dia starts rolling in a guiding path and overcomes gravitational force at circular loops. The children can learn potential energy, kinetic energy and centrifugal force by playing with this ball. Technical specification:Overall height – 8'Overall Length – 9'Overall Width – 45"Ball rolling path – 10 mm M.S Rods etc.
31	Gravity Ball	Designing, Supply & installation of 'GRAVITY BALL' including fabrication, Painted with good quality PU coating with proper surface preparation, Packing loading unloading transportation to site fitting, Commissioning, demonstration with explanation board in one language English comprehensive A.M.C with spare parts for 1 Year with proper planning site visit & Design etc. complete.Concept: Rate of change of velocity can be viewed by allowing a ball to roll here. Technical specification of the gadget:Dimension In : l x b x h : 5 x 7 x 7
32	Centrifugal Force	Supply & installation of 'CENTRIFUGAL FORCE' including fabrication, Painted with good quality PU coating with proper surface preparation, Packing loading unloading transportation to site fitting, Commissioning, demonstration with explanation board in one language English comprehensive A.M.C with spare parts for 1 Year with proper planning site visit & Design etc. complete. Concept: The pseudo force acting in circular feltier. Technical specification of the gadget: Dia - 72",Ht - 30" etc.
33	Vedic Math	Designing, Supply & installation of 'VEDIC MATH' including fabrication, Painted with good quality PU coating with proper surface preparation, Packing loading unloading transportation to site fitting, Commissioning, demonstration with explanation board in one language English comprehensive A.M.C with spare parts for 1 Year with proper planning site visit & Design etc. complete. Concept:To visually explain the third "sutra" which is for the multiplication of any two digit numbers. Technical specification of the gadget:Height: Height: 3 feet, Length: 3 feet, Width: 3 feet Finished with good quality PU finish, The exhibit teaches the sutra "UrdhvaTriyagbaham" i.e. to multiply any two digit numbers. Fabricated with FRP, MS Angles and GI Pipes.
34	Veins in Your Body	Designing, Supply & installation of 'VEINS IN YOUR BODY' including fabrication, Painted with good quality PU coating with proper surface preparation, Packing loading unloading transportation to site fitting, Commissioning, demonstration

		with explanation board in one language English comprehensive A.M.C with spare parts for 1 Year with proper planning site visit & Design etc. complete. Concept:A representation of the blood flow through the human body explaining the major veins and arteries in the human body. The veins and arteries can be represented by the transparent plastic tubes with led strips inside it to represent the blood flow.. Technical specification of the gadget:Height: 5 feet, Length: 3 feet, Width: 3 feet Fabricated with high quality plastic, the exhibit represents the blood flow in the veins. Supported in a metallic stand fabricated using GI pipes and MS angles, the major veins and arteries will be highlighted.
35	Wind mill	Designing, Supply & installation of 'WIND MILL' including fabrication, Painted with good quality PU coating with proper surface preparation, Packing loading unloading transportation to site fitting, Commissioning, demonstration with explanation board in one language English comprehensive A.M.C with spare parts for 1 Year with proper planning site visit & Design etc. complete. Concept:A pseudo working model of the windmill explaining it history; its application for water pumping, flour making and electricity generation. Technical specification of the gadget:Height: 5 feet, Length: 9 feet, Width: 3 feet A miniature working model of Windmills with their applications explained in irrigation, food production and electricity generation. Fabricated with good quality FRP, GI Sheet, GI Pipes and MS Angles.
36	hydro turbine	Designing, Supply & installation of 'HYDRO TURBINE' including fabrication, Painted with good quality PU coating with proper surface preparation, Packing loading unloading transportation to site fitting, Commissioning, demonstration with explanation board in one language English comprehensive A.M.C with spare parts for 1 Year with proper planning site visit & Design etc. complete. Concept:Scaled working model ofthe three types of turbine: Tangential flow, Radial flow and Axial Flow turbine. Technical specification of the gadget:Height: Height: 4 feet, Length: 9 feet, Width: 3 feet A scaled model of the three types of turbines fabricated with good quality FRP and metal. Encased in metallic casing fabricated with GI sheets and Polycarbonate boards. The turbines and other piping systems will be mounted on a metallic stand made of GI pipes, FRP and MS angles.
37	Thermal Power plant	Designing, Supply & installation of 'THERMAL POWER PLANT' including fabrication, Painted with good quality PU coating with proper surface preparation, Packing loading unloading transportation to site fitting, Commissioning, demonstration with explanation board in one language English comprehensive A.M.C with spare parts for 1 Year with proper planning site visit & Design etc. complete. Concept:A pseudo working model of the thermal power plant

		which explains the cycle in the electricity generation. Visitors will be able to see the steam generation, electricity generation and recycling. Technical specification of the gadget:Height: 4 feet, Length: 9 feet, Width: 9 feet Fabricated with good quality PVC, Plywood, Foam board, the miniature model of the thermal power plant demonstrates the conversion of the mechanical energy to electrical energy.
38	Rainwater harvesting system	Designing, Supply & installation of 'RAINWATER HARVESTING' including fabrication, Painted with good quality PU coating with proper surface preparation, Packing loading unloading transportation to site fitting, Commissioning, demonstration with explanation board in one language English comprehensive A.M.C with spare parts for 1 Year with proper planning site visit & Design etc. complete. Concept:A still model of the various rain water harvesting systems existing in the country. Technical specification of the gadget:Height: 3 feet, Length: 9 feet, Width: 9 feet A miniature still model of the rain water harvesting systems existing in the country. Fabricated using Plywood and quality foam board.
39	Submarine	Designing, Supply & installation of 'SUBMARINE' including fabrication, Painted with good quality PU coating with proper surface preparation, Packing loading unloading transportation to site fitting, Commissioning, demonstration with explanation board in one language English comprehensive A.M.C with spare parts for 1 Year with proper planning site visit & Design etc. complete. Concept:A mini submarine body chassis with a room space to accommodate 3 children. The Shape resembling that of an original submarine. Housing a revolving periscope and an audio signal system.. Technical specification of the gadget:Height: 4 feet, Length: 10 feet, Width: 3 feet Finished with good quality PU Paint, The submarine model will be made with metal frame with a capacity to house 3 children at a time. The submarine will have a revolving periscope and audio monitoring system with explanation board which explains the different functions of the submarine.
40	Boat Engine	Designing, Supply & installation of 'BOAT ENGINE' including fabrication, Painted with good quality PU coating with proper surface preparation, Packing loading unloading transportation to site fitting, Commissioning, demonstration with explanation board in one language English comprehensive A.M.C with spare parts for 1 Year with proper planning site visit & Design etc. complete. ConceptA cut section of a boat engine explaining the different parts and functions of the engine.. Technical specification of the gadget:Height: 4 feet, Length: 2 feet, Width: 2 feetFinished with good quality PU paint, the exhibit shows the cut section of the boat engine supported by a metallic stand made or MS angles and GI Pipes..

41	Solar Tree	Designing, Supply & installation of 'SOLAR TREE' including fabrication, Painted with good quality PU coating with proper surface preparation, Packing loading unloading transportation to site fitting, Commissioning, demonstration with explanation board in one language English comprehensive A.M.C with spare parts for 1 Year with proper planning site visit & Design etc. complete. ConceptA smaller version of this tree structure.Should have electricity storing capacity with DC to AC converter and a plug point board. Technical specification of the gadget:Height: 10 feet, Diameter: 10 feet Finished with good quality PU paint, Solar Panels aesthetically arranged in a manner which represents the branches and leaves of a tree, supported by a central stem made of GI Pipes and MS Angle Frames. The tree will have a battery to store the electricity produced.

TECHNICAL SPECIFICATIONS

(LandscapeWorks)

1.1 General

The works shall be performed conforming to the Indian Standard codes, P.H.D &P.W.D. specifications of the State Government. Wherever such specifications are not available, CPWD specifications, relevant references, manuals etc. shall be followed as directed by Owner.

For Horticulture and landscaping works OPWD Schedule of Rates, Analysis of Rate and Specifications (Horticulture & Landscaping) shall be followed.

1.2 General Specifications

Part-I: Entire area of the garden is mainly distributed as,

(a) Hardscape

The landscape area involves pathways of precast paver block grass paver and hota stone flooring etc.

(b) Softscape

The balance area that is covered under Softscape (lawn development, shrubbery, trees, small and medium palms, specimen shrubs, etc.)

The entire area is mildly rolling more or less flat and to be cleared of all debris, rock pieces, stumps, weeds, roots etc. thoroughly.

The area will be properly graded in a slope of 1:100 from the as per availability of SWD to facilitate drainage of rain water into the drain of the adjoining road.

Contractor to maintain the site slope as per the survey levels. Slope prepared for all finished surfaces shall be in a fashion to flow all storm water collected towards the nearest SWD available.

As per the plan, marking will be given on the land showing Hardscape area path under paver block, EPDM flooring and the rest area marked for Softscape area.

The area under Hardscape will be taken up under civil work. The balance area under Softscape will be treated by trenching, rough dressing, flooding with water, uprooting weeds, stumps etc. Operations involved in landscaping, procurement of manures, staking, digging of pits etc, measurements, rates, qualities of materials will be in accordance to the principles as laid out in Sub-head 2.0 of CPWD Analysis, 2016, Horticulture and Landscaping.

Irrigation Layout based on type of irrigation system finalized to be prepared and detailed at the later stages based on the survey drawings and availability of existing water source. Layout to be submitted for approval of Engineer in charge, and based on the approval, irrigation system shall be installed by contractor at site.

Part-II: Species to be planted:-

As specified in drawing

1.3 Horticulture Work

Horticultural operations shall be started on ground previously levelled and dressed to required formation levels and slopes.

In case where unsuitable soil is met with, it shall be either removed or, replaced or it shall be covered over to a thickness decided by the Engineer-in-charge with good earth.

In the course of excavation or trenching during horticultural operations, any walls, foundations, etc. met with shall not be dismantled without pre-measurement and prior to the written permission of the Engineer-in-charge.

1.4 Trenching in Ordinary soil

Trenching is done in order to loosen the soil, turn over the top layer containing weeds etc. and to bring up the lower layer of good earth to form a proper medium for grassing, regrassing, hedging and shrubbery.

Trenching shall be done to the depth ordered by the Engineer-in-charge. The depth is generally 30 cm for grassing and 60 cm for re-grassing in good soil.

The trenched ground shall, after rough dress, be flooded with water by making small kiaries to enable the soil to settle down. Any local depression unevenness etc. shall be made good by dressing and/or filling with good soil.

Weeds or other vegetation which appear on the ground are then uprooted and removed and disposed off and paid.

1.5 Trenching

Trenching shall consist of the following operations:

1. The whole plot shall be divided into narrow rectangular strips of about 1.5 m width or as directed by the Engineer-in-Charge.
2. These strips shall be sub-divided lengthwise into about 1 m long sections. Such sections shall be excavated serially and excavated soil deposited in the adjacent section preceding it.
3. In excavating and depositing care shall be taken that the top soil with all previous plant growth including roots, get buried in the bottom layer of trenched area, the dead plants so buried

incidentally being formed into humus.

4. The excavated soil shall be straight away dumped into the adjoining sections so that double handling otherwise involved in dumping the excavated stuff outside and in back filling in the trenches with leads is practically eliminated.

1.6 Good Earth

The earth shall be stacked at site in stacks not less than 50 cm high and of volume not less than 3.0 cum.

1.7 Oil Cake

Neem/Castor: The cake shall be free from grit and any other foreign matter. It should be un-decorticated and pulverized. The material shall be packed in old serviceable gunny bags of 50 kg capacity approximately. The weight of gunny bag shall be deducted @1 kg per bag and payment shall be made for net quantity. The quality of cake should be got approved by the Engineer-in-charge before supply.

1.8 Supply and Stacking of Sludge

It shall be transported to the site in lorries with efficient arrangement to prevents pilling en-route. It shall be stacked at site. Each stack shall not be less than 50cm height and volume not less than 3cum.

1.9 Rough Dressing Of The Trenched Ground

Rough dressing of the area shall include making kiaries for flooding.

The trenched ground shall be leveled and rough dressed and if there are any hollows and depressions resulting from subsidence which cannot be so leveled, these shall be filled properly with earth brought from outside to bring the depressed surface to the level of the adjoining land and to remove discontinuity of slope and then rough dressed again. The supply and spreading of soil in such depressions is payable separately.

In rough dressing, the soil at the surface and for 75mm depth below shall be broken down to particle size not more than 10 mm in any direction.

1.10 Uprooting Weeds from Trenched Areas

After 10 days and within 15 days of flooding the rough dressed trenched ground with water, the weeds appearing on the ground shall be rooted out carefully and the rubbish disposed off as directed by the Engineer-in-charge.

1.11 Fine Dressing the Ground

Slight unevenness, ups, and down sand shallow depressions resulting from the settlement of the flooded ground, in drying and from the subsequent weeding operations, shall be removed by fine dressing the surface to the formation levels of the adjoining land as directed by the Engineer-in-charge, and by adding suitable quantities of good earth brought from outside, if necessary.

1.12 Spreading Good Earth

Good earth shall be removed from stacks by head load and spread evenly over the surface to the thickness ordered by the Engineer-in-charge. It shall be spread with a twisting motion to avoid segregation and to ensure that spreading is uniform over the entire area.

1.13 Spreading Sludge/Manure

Good earth shall be thoroughly mixed with sludge or manure in specified proportion as described in the item or as directed by the Engineer-in-Charge. The mixing shall be spread to the thickness ordered by the Engineer-in-Charge.

1.14 Mixing of Good Earth and Sludge/Manure

The stacked earth shall, before mixing be broken down top particle of sizes not exceeding 6mm in any direction. Good earth shall be thoroughly mixed with sludge or manure in specified proportion as described in the item or as directed by the Engineer-in-charge.

1.15 Grassing with Select Grass No.1

The area from where the grass roots are to be obtained shall be specified by the Engineer-in- Charge at the time of execution of the work and no royalty shall be charged on this account from the contractor. Grass is to be arranged by contractor (cost of grass to be paid separately).

The soil shall be suitably moistened and then the operation of planting grass shall be commenced. The grass shall be dibbled at 10 cm, 7.5 cm, 5 cm apart in any direction or other spacing as described in the item. Dead grass and weeded shall not be planted. The contractor shall be responsible for watering and maintenance of levels and the lawn for 30 days or till the grass forms a thick lawn free from weeded and fit for moving whichever is later. Generally planting in other direction at 15 cm, 10 cm, spacing is done in the case of large open spaces, at 7.5 cm spacing in residential lawn and at 5cm spacing for Tennis Court and sports ground lawn. Rates are including cost of labour and material (grass shall be paid separately.)

During the maintenance period, any irregularities arising in ground levels due to water in accumulation due to trampling by labour, or due to cattle traying thereon, shall be constantly made up to the proper levels with earth as available or brought from outside as necessary, Constant watch shall be maintained to ensure that dead patches are replanted and weeds are removed.

1.16 Renovation of Lawns

The area shall be first weeded out of all undesirable growth. The entire grass shall be scrapped without damaging roots and level of the grounds. Slight irregularities in surface shall be leveled off and the area shall then be for ked so as to aerate the roots of the grass without, however up-rooting them.

Specified quantity of sludge or manure shall than be spread uniformly with wooden straight edge (phatti) as directed by the Engineer-in-charge. The area shall then be slightly sprinkled with water to facilitate proper integration of the manure or sludge with the soil and later flooded. The contractor shall be responsible for watering, proper maintenance and tending of the lawn for 30 days or till the grass forms a lawn fit for mowing, whichever is later.

During the above operations, all undesirable growths shall be constantly weeded out and all rubbish removed and disposed off as directed by the Engineer-in-Charge.

1.17 Uprooting Rank Vegetation, Weeds and Preparing the Ground for Planting 'Select Grass No.1'

Initially the area shall be dug up to a depth of 30 cm. and weeds and rank vegetarian with roots removed thereon by repeated forking. The whole area then shall be retrenched to a depth of 60 cm in the same manner as described in 1.5.

Clods of excavated earth shall then be broken upto the size not more than 75 mm in any direction.

The area shall then be flooded with water and after 10 days and within 15 days of flooding, weeds shall be uprooted carefully.

The rubbish arising from the above operations shall be removed and disposed off in a manner directed by the Engineer-in-charge, away from the site. The earth shall then be rough dressed and fine dressed.

1.18 Excavation and Trenching for Preparation of Beds for Hedge and Shrubbery

Beds for hedges and shrubbery are generally prepared to width of 60 cm. to 125 cm. and 2 to4 meters respectively.

The beds shall first be excavated to a depth of 60cm. and the excavated soil shall be stacked on the sides of the beds. The surface of the excavated bed shall then be trenched to a further depth of 30 cm, in order to loosen the soil, in the manner described in 1.5.

No flooding will be done at this stage but the top surface shall be rough dressed and leveled. The excavated soil from the top 60 cm depth of the bed stacked at the site shall then be thoroughly mixed with sludge over manner in the proportion 8:1 by ratio or other proportion described in the item.

The mixed earth and manure shall be refilled over the trenched bed, leveled neatly and profusely flooded so that the water reaches even the bottom most layers of the trenched depth of the bed.

The surface after full subsidence shall again be refilled with the earth and manure mixture, watered and allowed to settle and finally fine dressed to the level of 50mm to 75mm below the adjoining ground or as directed by the Engineer-in-Charge.

Surplus earth if any, shall be disposed off as directed by the Engineer-in-charge. Any surplus earth if removed beyond initially lead shall be paid separately. Stones, bricks bats and other foreign matter if met with during excavation or trenching shall be removed and stacked within initially lead & lift, such material as is declared unserviceable by the Engineer-in-charge shall be disposed by spreading and levelling at designated places. If disposed outside the initial lead & lift, then the transport for the extra leads will be paid for separately.

If a large proportion of material unsuitable for the hedging and shrubbery operations is met with and earth from outsides is required to be brought in for mixing with manure and filling, the supply and stacking of such earth will be paid for separately.

1.19 Digging Holes for Planting Trees

In ordinary soil, including refilling earth after mixing with oil cake, manure and watering.

Holes of circular shape in ordinary soil shall be excavated to the dimensions described in the items and excavate soil broken to clods of size not exceeding 75 mm in any direction, shall be stacked outside the hole, stones, brick bats, unsuitable earth and other rubbish, all roots and other undesirable growth met with during excavation shall be separated out and unserviceable material removed from the size as directed. Useful material, if any, shall be stacked properly and separately. Good earth in quantities as required to replace such discarded stuff shall be brought and stacked at site by the contractor which shall be paid for separately.

The tree holes shall be manure with powdered Neem/Castor oil cake at the specified rate along with farm yard manure over sludge shall be uniformly mixed with the excavated soil after the manure has been broken down to powder, (size of particle not be exceeded 6 mm in any direction) in the specified proportion, the mixture shall be filled into the hole up to the level of adjoining ground and then profusely watered and enable the soil to subside the refilled soil shall then be dressed evenly with its surface about

50 to 75mm below the adjoining ground level or as directed by the Engineer-in-charge.

1.20 In Soil other than Ordinary Soil

Where holes are dug in (a) Hard soil (b) Ordinary rock or (c) Hard rock, the above soils occurring independently over in conjunction with each other and /or ordinary soil in any hole, the different excavated soil shall be stacked separately. Excavation in hard rock shall be carried out by chiseling only. The stack measurement of ordinary rock and hard rock shall be reduced by 50% and of soil by 20% to arrive at the excavated volume. This excavation shall be paid for as extra over the rate for holes dug in ordinary soil above, at rate appropriate to particular soil concerned.

Sufficient quantity of good soil to replace the solid volume of stones, brick bats, unsuitable earth and other rubbish, all roots and other undesirable growth, ordinary and hard stacks shall be brought and stacked at site but the supply and stacking of such shall be paid for separately.

The useless excavated stuff shall be disposed off by spreading at places as ordered by the Engineer-in-charge. If such places are outside initially leads, carriage for the extra lead shall be paid for separately.

The ordinary soil excavated from the hole and the earth brought from outside shall then be mixed with manure screened through sieve of IS designation 16 mm in the proportion specified in the description of the item and filled with the pit and the same watered and finally dressed.

1.21 Filling Mixture of Earth & Sludge Over Manure

The separately specified earth and sludge shall be broken down to particles of size not exceeding 6mm in any directions before mixing.

Good earth shall be thoroughly mixed with sludge over manure in specified proportions as directed by Officer-in-Charge. During the process of preparing the mixture as above, trenches shall be flooded with water and leveled.

LIST OF APPROVED MAKES/BRANDS OF MATERIALS

Sr.No.	Details of Materials / Equipment	Manufacturer's Name
1.	Plant material	Reputed Nursery or nurseries (Shall be approved by Landscape architect & PMC)
2.	Tiles	Kajaria, somany, Jhonson or equivalent as approved by the Engineer in charge
3	Ordinary Portland Cement	Konark, ACC, Ultratech
4	White Cement	Birla, J.K

5	Coarse Sand	As Per IS 383(Latest Edition) From Approved Quality
6	Fine Sand	As Per IS 383(Latest Edition) From Approved Quality
7	Stone Aggregate	As Per IS 383(Latest Edition) From Approved Quality
8	Reinforcement Steel-T.M.T.	Bhusan , Sail, Jindal
9	Stainless Steel Sections	Jindal Steel Or Approved Equivalent
10	Anchor Fasteners/ Couplers	Hilti, Canon
11	Block Board, Ply Wood	Century (3626045), Duro,V.I.Ply, Jyoti Ply
12	Epoxy	Fosroc Or Approved Equivalent
13	Epoxy Grout	BAL(6407272) Or Approved Equivalent
14	Penetrating Sealer(Aquamix)	Pristine(6405480) Or Approved Equivalent
15	Polish Protector(Aquamix)	Pristine(6405480) Or Approved Equivalent
16	Putty	Shalimar Or Approved Equivalent
17	Fire Sealent	Navair (6491167) Or Approved Equivalent
18	Paints/Polish	ICI, Berger, Asian
19	Pigment	Sudershan Chemicals, TATA Pigments
20	Integral Water Proofing	Pidilite Or Approved Equivalent
21	Bio Toilet	Suvidha, Tata Nestin
22	EPDM flooring	Nasecs, Catline
23	Science Equippments	Websports, Ankedyne
24	Fountain	Supreme Pools, Premier pools and Landscape
25	uPVC pipe	Atral, Supreme, Phinolex, Oriplast

Note: The contractor shall produce all samples including natural stones, before procurement of the materials, for approval of the employer.

The above list is indicative. Contractor may go for other equivalent make/brand having same or better specification on approval of employer.

In respect of materials for which approved makes are not specified above, those shall be decided by employer as per samples approved.

WATER SUPPLY AND LANDSCAING IRRIGATION

1. Scope of Work

The scope of works includes design of water supply system, supply, installation, testing and commissioning of the system.

Following are the scope:

- Sinking and development of bore well
- Yield test
- Installation of all pumping, electrical and piping works
- Laying of pipe line works for different utilities
- Laying of irrigation network along with sprinkler system
- Installation of underground /overhead water tanks
- Installation of water transfer/booster pumps as required

2. LIST OF SUBMISSIONS

- Network layout, sizing calculation, material data sheet
- Yield test result of bore well, water level

3. Specification for tube well

- Type of drilling method – As per nature of formation below the ground the best suitable drilling methods are either Direct or Reverse rotary method.
- As per expected presence of good quality of groundwater the casing assembly of PVC casing pipe (Schedule-80) (8" Diameter) plain & strainer pipes may be lowered in the tube well.
- The annular space between wall of the bore & casing assembly, should be filled by well sorted "Pea Gravel".
- The development of tube well to be recommended first by high capacity air compressor (Min. 300 cfm / 150 psi as per IS - 2800 part II) followed by an over pumping unit.
- Additional gravel should be filled, after completion of development.
- The tube well shall be sealed at top, by Cement sealing, preferably up to 1 m depth, to prevent percolation of surface run-off in the tube well.
- The litho-logs obtained from the tube well to be collected & preserved at every 3 m interval for further study & record.
- The submersible pump set related to expected discharge, water level, yield & total head, to be recommended for installation in the tube well.
- The tube well should be plugged at bottom by "bail plug" & at top by "well cap".
- The pump set should be of approved make, confirming to IS specifications, suitable for 415 volts, 3 phase, 50 cycles AC supply.
- The pump set shall be lowered by required diameter suitable to the pump, threaded GI pipes, which shall be connected by sockets. Flat MS flanges may be applied at joints for additional support.
- A steel rope may also be used for connection of pump, along with GI pipes, for additional support.

TECHNICAL SPECIFICATION

FOR

IRRIGATION WORKS

SCOPE OF WORK

The scope of work under this shall include, but not limited to,

a) Supply, installation and commissioning of the pressurized irrigation system

b) Supply, installation and commissioning of all items included in the scope of works as described below (but not limited to):

i) Disc Filter
ii) All pump, piping, valves and associated fittings
iii) Sprinklers/Drippers/laterals
iv) Irrigation control system
v) All wiring and associated fittings.

c) Execution of Civil, Mechanical, Electrical, Instrumentation and Piping work as specified including Engineering, Supply, Fabrication, Erection, Installation and Commissioning of Landscape Irrigation system.

d) Regardless of the items, quantities or description contained in the drawings, or specification, it is the contractor's responsibility to ensure the proper functioning of Irrigation system.

e) The detailed Irrigation drawings and documents shall be prepared covering all the items

f) Training about automized items to the ASCL Operation and Maintenance staff for period of one month.

g) Operation and Maintenance of Irrigation system till the issue of Completion Certificate.

DESIGN INTENT

a) The design intent of this irrigation system is to supply sufficient irrigation water to the landscape area.
b) Landscape areas will be watered using automized drip and sprinkler irrigation systems and in some place with hose pipe from Quick coupling valves, where it is not feasible to installed irrigation systems.

Deliverables

Hard and Soft copies of the following deliverables shall be submitted

a) O & M manuals
b) As Built drawings (3 sets of Hard copies + one set of soft copy)
c) Catalogues for Spare parts
d) Test certificate of major equipment.
e) Warranty certificate of all major items.
f) Weekly progress reports during Construction stage.

1 PUMP

A. SUBMERSIBLE VERTICAL PUMPS

PUMP

- The pump shall conform to IS 8034: 2000 amended up to date.
- The pump shall be submersible bore well type directly coupled to submersible electric motor with built in anti-thrust bearing. The pump set shall be complete with suction strainer, anti-thrust streamlined non return valve and submersible type copper conductor cable of suitable size.
- Inlet passage of the suction casing shall be designed reduce entry losses and strainer shall be provided in suction casing to restrain large solids entering the pump. For submersible type cables, clamping arrangement and cable guard shall be provided on pump casing.
- Each metallic impeller shall be dynamically balanced to Grade G 6.3 of IS 11723.
- The pump characteristic shall be non overloading type to ensure trouble free operation in the entire operating rang

ELECTRIC MOTOR

a) The submersible motor shall conform to IS 9283. The electric motor shall be three phase squirrel cage, water filled submersible type.
b) The motor shall be suitable for operation on 415V (3 phase), 50 Hz electric supply with required RPM capable of delivering the rated output with
   i) The terminal voltage differing from its rated value by not more than +6% and -15%
   ii) The frequency differing from its rated value by not more than 3% or
   iii) Any combination of b) and ii).
c) Motor shall be capable of running continuously at a B. H. P. (brake horse power) not less than 10% in excess of that absorbed by pump set under any operating conditions.
d) Starting current for the motor shall be limited to 6 times the full load current.
e) Motor shall have minimum starting torque of 140% FLT and maximum starting torque 200% FLT. It shall have 100% FLT during running condition.
f) Contractor shall submit the motor details including manufacturer's guarantee for efficiency and P.F. at full load, no load, 3/4 load, 1/2 load.

MATERIAL OF CONSTRUCTION

The material of construction shall be suitable for application and site conditions. The material of construction shall be as follows:

Sr.	Component	Material of Construction
1.	Pump bowl	High graded CI
2.	Impeller	Bronze Gr LTB2 / 20% Glass filled Noryl
3.	Diffuser	20% Glass filled Noryl
4.	Stage casing	High graded CI
5.	Motor casing	SS 304
6.	Pump shaft	SS 410
7.	Motor shaft	SS 410
8.	Bearing bush	Bronze IS 318 Gr LTB 2,3,4,5
9.	Base	Cast iron / Brass
10.	Fasteners	SS 304
	Strainers	SS 304

TESTING

Each pump-motor set shall be factory tested at manufacturer's works as per I.S. 8034 to determine following characteristics covering the full operating range.
-Head- Discharge curve
-Efficiency curve
-Dynamic balancing of rotor, impeller

CERTIFICATES

Contractor shall furnish:
Performance characteristic curves.
Catalogue of pump set and details of pump and its motor.
Manufacturing test certificate, Guarantee card and list of parts for the pump sets.
Operation and maintenance manuals for the pump set.
Drawings showing cross sections of pumps, mounting arrangements, list of materials and necessary curves along with their offer.
In the event of any pump failing to meet the specified requirement of pump set it shall be modified and retested until the requirements are fulfilled. The inspections and testing of the pump set are at contractors cost.

B. SUBMERSIBLE OPEN WELL PUMPS

DESIGN REQUIREMENTS:

Pump shall be submersible open well monobloc type.

The pump shall be capable of delivering the required flow rate for both continuous and intermittent operations, at the specified operating conditions. The pump shall be designed to have minimum maintenance and easy accessibility to all components.

Flow rate versus head curve shall have stable and continuously rising characteristics towards the shut-off with the highest at shut off. In case of unstable (dropping) characteristics the duty point shall be well away from the unstable region. Besides the actual flow rate versus head curve, curves for minimum and maximum impeller diameters shall also be shown.

Pumps of a particular category shall be identical and shall be suitable for single as well as parallel operation with equal load division at any point in between the maximum and minimum system resistance. Components of identical pumps shall be inter-changeable.

Pumps shall run smooth without undue noise and vibration. Noise level produced individually or collectively shall not exceed 85 dB (A) measured at a distance of 1.0 metres from the source in any direction. The overall vibration level shall be as per zones A and B of ISO 10816-1.

The power rating of the pump driver shall be the larger of the following considering the frequency variation:

The maximum power required from zero discharge to run-out discharge at site climatic condition.
110% of the power required at any operating point in between the maximum and minimum system resistance curves for any combinations of pumping.
115% of the power required at the design point.

The critical speed of the pump shall be not less than 130% of the normal operating speed of the pump.

The pump set shall be capable of withstanding the accidental rotation in reverse direction. The direction of rotation shall be clockwise viewed from the drive end.

CONSTRUCTION FEATURES

Pump casing shall be of robust construction. The pump suction casing between the pump and motor shall be guarded by a perforated strainer to prevent the entry of any suspended materials in the water.

Closed Impeller shall be equipped with seal rings on their hubs.

The impeller shall be statically and dynamically balanced. Pump bearings shall be water - lubricated and protected against ingress of sand and other suspended particles.

In case of open impeller, the pump shall be designed to take care of the additional thrust produced.

Double Mechanical seals shall be provided to protect the motor from ingress of water along the shaft. The preliminary and secondary seals shall be oil-lubricated with tungsten carbide or silicon-carbide faces and they should be equipped with an electrical monitoring system for seal failure detection.

Motor shall be directly coupled to the pump shaft and shall be a hollow shaft motor with thrust bearings capable of taking thrust load developed by the pump and the dead weight of the shaft and impeller.

In addition to accessories which will listed by vendor in data sheet, any other accessories required for safe and efficient operation of pump shall be provided.

INDUCTION MOTOR FOR SUBMERSIBLE PUMPS

The submersible motor shall confirm to IS: 9283:2013

PERFORMANCE AND CHARACTERISTICS

Motors shall be capable of giving rated output without reduction in the expected life span when operated continuously under varying voltage and frequency supply conditions.

Motor shall be of oil-filled or oil-lubricated or water-filled type. Pressure equalising diaphragm and sand guards with seals shall be provided to prevent the outside water and sand entering the motor

The starting current of motor shall not exceed 200% of rated full load current for star/delta starting and 600% of rated full load current for DOL starting, under any circumstances.

Motors shall be suitable for full voltage direct-on-line starting or star-delta starting.

Motors shall be capable of starting and accelerating the load with the applicable method of starting, without exceeding acceptable winding temperatures, when the supply voltage is in the range 85% of the rated motor voltage to maximum permissible voltage.

The locked rotor current of the motor shall not exceed 600% of full load current (subject to tolerance as per the applicable standard).

Motors shall be designed to withstand 120% of rated speed for two minutes without any mechanical damage, in either direction of rotation.

The motor vibrations shall be within the limits specified in applicable standard unless otherwise specified for the driven equipment.

Except as mentioned herein, the guaranteed performances of the motor shall be met with tolerances specified in applicable standard (IS: 9283:2013).

The stator winding shall be made from high conductivity annealed copper conductor; PVC insulated winding wires conforming to IS 8783 for wet type motors. The stator winding shall be of high conductivity annealed copper enamelled insulated wires confirming to IS 4800 for dry type motors.

2 SUBMERSIBLE CABLE

The cable shall be PVC insulated and PVC sheathed, flexible, 3 core flat type. The size of the conductor shall be adequate for continuous use under water service. The submersible cable shall conform to IS 9283. The cable gland shall be properly sealed to prevent entry of pumped liquid into the motor. Suitable cable guards and supporting clamps for cable shall be provided.

The cable shall be terminated above ground level in a local terminal box with facility for terminating cable. The local terminal box with outlets for incoming and outgoing cables shall be in pump vendor's scope.

The size of the conductor and length of cable should be suitably selected so that the voltage drop at motor terminals does not exceed 3 percent of the rated voltage.

3 EARTHING

Earthing of the motor shall be done in accordance with the relevant provisions of IS: 3043:1987. For fixed installation, earthing connection may be made to discharge pipe clamp.

4 INSULATION

Any joints in the motor insulation such as at coil connections or between slot and end winding sections shall have strength equivalent to that of the slot sections of the coil.
The insulation shall be given tropical and fungicidal treatment for successful operation of the motor in hot, humid and tropical climate. The tropical sing treatment shall be as per the applicable standard.

5 TEMPERATURE RISE

The temperature-rise test of the motor shall be taken with the motor coupled to the suitable pump to give the full load output of the motor. When the various temperatures are stabilized, the set is stopped and the temperature-rise of the stator winding by the resistance method shall not exceed 35°C at rated voltage and 45°C at 85% of the rated voltage. During the test, the temperature of the cooling water may not exceed 45°C. As the cable resistance will also be substantial, it is necessary that while calculating the temperature rise by resistance method, due care is taken to account for the correct hot and cold resistance of windings.

6 CONSTRUCTION FEATURES OF MOTOR

The motor shall be suitable for continuous use in fully or partially submerged condition. A built-in cooling system if required shall be provided to allow the motor to operate continuously at its rated output regardless of whether the electric motor is submerged or not by providing either external or internal cooling arrangement.

7 TESTS AND INSPECTION

Hydro-test pressure on casing shall be 1.5 times maximum discharge head or twice differential head whichever is higher. Maximum discharge head is defined as the sum of the shut-off head and maximum suction head. Unless otherwise stated, the hydrostatic tests on the casing shall be conducted for a minimum duration of 30 minutes.

The pumps shall be tested in accordance with HIS, ISO 9906 and IS 5120, at rated speed at manufacturer's works to measure capacity, total head, efficiency and power. The negative tolerance on efficiency shall be limited to 2.5% and not 5% as indicated in IS 5120. These tests shall form the basis for acceptance of pumps except for vibration and noise. The pumps shall be tested over the range covering from shut-off head to the maximum flow. The duration of the test shall be minimum one (1) hour. Minimum five (5) readings approximately equidistant shall be taken for plotting the performance curves.

After installation, the pumps shall be subjected to testing at site also. If the site performance is found not to meet the requirements regarding vibration and noise as specified. The equipment shall be rectified or replaced by the vendor, at no extra cost to the purchaser.

8 PERFORMANCE GUARANTEE

Performance parameters to be guaranteed by the vendor. Pump or any portion thereof is liable for rejection, if it fails to give any of the guaranteed performance parameters.

9 PENALTY:

If guaranteed efficiencies are not achieved during the test, client shall have the right to reject the pump or right to accept the equipment with lower efficiencies & shall have right to charge penalty for that.

10 DRAWINGS

The following drawings shall be submitted by the BIDDER along with their proposal.

1. Preliminary outline dimensional drawing showing details of pump set, installation details, civil foundation, clearances, minimum submergence, etc.

2. Performance curves for capacity vs total head, efficiency, and input to motor. The capacity range shall be zero flow to run out flow.

3. Typical cross sectional drawing showing constructional details.

11 MATERIALS OF CONSTRUCTION

Unless otherwise specified in Data Sheet, the Material of Construction for the pumps shall be as follows:

Sr.No	Component	Material of construction
1.	Casing	Cast Iron IS:210 Gr. FG 220

2.	Impeller	SS ASTM A351 CF8M
3.	Shaft	SS ASTM A276 TYPE 410
4.	Shaft sleeve	Bronze
5.	Motor body	Cast Iron
6.	Sealing	Mechanical seal

PVC PIPES AND FITTINGS

A. Pipes

The pipes shall be round and shall be supplied in straight lengths with socketed ends. The internal and external surfaces of pipes shall be smooth, clean, and free from grooving & other defects. The ends shall be cleanly cut and square with the axis of the pipe. The pipes shall be designed by external diameter and shall conform to IS: 4985. The pipes shall be of Class-III ; 6 kg/cm2 pressure rating.

B. Fittings

Fittings shall be injection Moulded and shall be 10 kg/cm^2 pressure rating and conform to Indian Standard.

PIPE WORK

1. The acceptable class of pipes shall be is 4985:2000 PVC pipe

2. The laying, jointing, thrust blocking and testing shall be performed to the pipe as per manufacturer's recommendations. If there be any conflict with this specification; the contractors will notify the employer's representative for resolving it at site.

3. Mainline - Pipes will be solvent weld jointed supplied in standard 6 meter lengths. All fittings will be solvent weld jointed as per manufacturer or as per Indian standard.

4. Sub-mains and laterals
   a. Pipe will be solvent weld jointed supplied in standard 6 meter lengths.
   b. PVC fittings upstream of the sub-main /isolation valve will be at pressure rating 50% greater than the pipe rating.
   c. Pipe ends should be cut square and shaving removed
   d. All joints will be primed and left to cure for one hour undisturbed

5. Laying of pipe work.

a. Pipes will be laid in the routes and sizes as indicated on the drawings. In the case where multiple pipes or electrical conduits are laid in the same trench, they must be located side by side, not crossing each other or stacked one upon the other. Minimum 50 mm gap shall be maintained between two pipelines, when two or more pipelines laid in the same trench.
b. All pipe laying and jointing will be performed in situ in the trench on the prepared bedding; not assembled above ground and placed in the trench at a later stage.
c. At the end of each day's work, all open ends of pipework and conduit will be plugged and staked to prevent entry of vermin, dirt, water or moisture and movement of the pipe.
d. Where pipe is required to pass over or under drainage pipe, the Contractor is to ensure a minimum clearance of 50 mm between the irrigation pipe and the drainage pipe.

6. Crossings

Electrical Cables

a. High voltage cables
A separate PVC electrical conduit will be installed for the high voltage cables. The high voltage cables must not share a conduit with low voltage cables
b. Low voltage cables
This conduit must be separated by minimum 300 mm from the high voltage conduit (if any).
c. Conduit
The size of the conduit will allow easy pulling of cables. So the minimum size of conduit used will be 25 mm. if the number of cables increased to 7 then go for 40 mm conduit. If the conduit is exposed to sunlight in any place, it will be UV resistant.

Road crossing

a. Pressure pipe
Where the pipe work goes under a road, the contractor will install:
i) U-PVC pipe sleeve of sufficient diameter to allow easy installation of the PVC pipe.
ii) GI pipe of equivalent internal diameter to the PVC pipe.
b. Depth
The minimum depth of the sleeve and conduits will be 600 mm measured to the top of the sleeve.
c. Ends of sleeve and conduits
These will be clearly marked above ground for ease of future location.

Pathways & internal maintenance road crossings

a. Pressure pipe
Where the pipe work goes under pathways, the contractor will install uPVC pipe sleeve of sufficient diameter to allow easy installation of the PVC pipe.
b. Depth
The top the pipe and conduits will be a minimum 450 mm below the base of the pathways.

7. **Trench Work**

a. Mixing of soil layers
When the depth of the trench extends through different soil structures (e.g., sand capping, topsoil, clay, and native earth), the contractor will:
i) Remove each layer and place it separately on the surfaces.
ii) Refill the trench to restore the original layers of soil.
iii) Mixing of the different soil layers is not limited.

b. Mainline excavation

i) Trenching for mainlines will be performed by hand digging only

ii) The depth of trench for mainline shall be minimum 600 mm from the finish ground level.

iii) The material removed whilst digging will be placed no closer than 300 mm to the top edge of the completed trench and there will be a minimum of loose soil left in the bottom of the trench prior to pipe laying.

c. Sub-main/Lateral line excavation

i) Trenching for lateral lines will be performed by hand digging or by backhoe with a maximum bucket width of 300 mm, to minimize disturbance to the surrounding area.

ii) The depth of trench for sub mainline shall be minimum 450 mm from the finish ground level.

iii) These trenches will be straight with the bed level and graded.

d. Back Filling

i) Where trench work encounters unsuitable bedding material such as hard clay, rock, shale, loose stones, excessive tree roots, etc. a 100 mm bed of sand or loam will be placed below pipe in the trench prior to pipe laying.

ii) This policy will apply to back filling of all trenches, where the pipe will be covered with 100 mm of sand or loam to prevent similar debris coming in contact with the pipe or control cables. Under no circumstances will construction debris of any kind be included in any back fill material.

iii) Allowances should be made for back filling during the heat of the day to minimize the effects of thermal expansion and contraction on pipe already laid.

iv) Trenches will be back filled on the same day as they are excavated. i.e. trenched will not be excavated until required. This is to prevent flooding of trenches and floatation of pipes.

e. Compaction

i) Compaction should take place only after suitable bedding and back filling has been completed to the satisfaction of the Employer's Representative.

ii) Compaction can be achieved by either:

- plate compaction in layers not exceeding 300 mm
- wheel rolling with a suitable vehicle after 450 mm of cover is provided

iii) Regardless of which method is used, it will remain the Contractor's responsibility to ensure reinstatement of trench subsidence during both the contract and the defects liability period.

f. Fixing & Staking

The Fixing & staking of the mainline, valve and controller will be done by the contractor subject to approval by the Employer's Representative.

The contractor will supply the stakes as follows:

a. Each will be 1 m long.

b. The top of the stake will be flanged to make it highly visible from a distance of 200 m to prevent damage from machinery.

Different colour flags if required will be used for

- Quick Coupling valves
- Mainline
- Controller

8. **Thrust Blocks**

Mainline concrete thrust blocks will be placed on all fittings that are subject to unbalanced thrust forces created by pressure and fluid movement. That is, at all mainline bends, tees, reductions, expansion, caps, isolation valves etc. Excavation of the thrust bearing surfaces will be at right angles to the line of thrust and located in either solid, undisturbed soil or soil which has been compacted specifically for that

purpose. In case of bigger pipes (80 mm dia and above), thrust blocks of cement concrete 1:2:4 (1 cement: 2 coarse sand: 4 graded stone aggregate of 20 mm nominal size) shall be constructed on all bends. The thrust blocks must have cured for 24 hours before pressure testing.

FILTER

The filters to be used on this system shall be to suit the nominated total flow rate. The filter is to have a maximum 1 mtr pressure loss across it. The Contractor is to provide full details and operating characteristics of the filter he intends to use on this system including pressure loss and backwash water requirements for approval by the Employer's Representative. Filter element shall be with mesh of 100 micro size and economical element with high filtration efficiency. Maximum operating pressure 10 kg/sq.cm.

AIR VALVES

Air Valves will be double acting air/vacuum release valves. These valves will be isolated from the mainline by gate valve. Air valves will be installed so that they are a minimum 100 mm and a maximum 200 mm below grade.

QUICK COUPLING VALVES (QCV)

These will be 20mm (3/4") quick coupling valves. Each QCV will be securely attached to a solid stake to prevent rotation. 20 mm (3/4") plastic coupler keys and swivel hose elbows will also be provided by the contractor to enable use of the QCV's.
The QCV shall have a thermoplastic locking cover. The cover shall be able to opened with suitable locking key. The valve body construction shall be one/ two piece type. The valve body & coupler key shall be made from cast red brass. The seat disc plunger shall be spring loaded to maintain the valve in closed position at zero inlet pressure. The QCV shall be able withstand 10 bar pressure.

ISOLATION VALVES

Isolation Valves:

a. Mainline isolation points will be achieved by installing PVC ball valves at designated locations. These valves will be housed in valve boxes.
b. The valve handle will be located within 150 mm from the top of the valve box for ease of operation.

VALVE BOXES

Valve Boxes

All valve boxes will be with a green colour lid or an approved equivalent, fitted with bolted down lids. All valve pits will be constructed of bricks. There will be no contact between the pipe and the valve box or valve pit. Solenoid valves, isolating valves, flush valves and quick couplers shall be installed in an access box of sufficient size to permit ready removal of the valve inner assemblies without removing the box from the ground. Valve numbers and station numbers must be clearly marked inside and outside to the box with a permanent paint or by using plastic tags. Valve boxes and covers shall be green in colour. Valve box covers shall locking type, secured with a 3/8-inch stainless steel bolt, washer and nut. The valve box & cover shall be able to sustain a load up to 650 kg. All gravel used in valve boxes shall be washed crushed gravel of approximately ¾ inch size. No pea gravel shall be used.

SWING JOINT

All swing joint (articulated) risers are to be swing joint risers or an approved equivalent with O ring sealing for the threaded joints. The length of all swing joint risers will be 300 mm or as per site requirement.

SPRINKLERS

The sprinkler will be gear driven /spray type as per requirement.

a) All gear driven drivers will be bottom/side connected to the lateral pipe work via swing joint or pipe with necessary fittings.
b) Each sprinkler will be initially installed as per lawn or shrub height at the site with the top parallel to the grade but 75 mm to 100 mm above.
c) Each sprinkler will be enveloped in a compacted sand bed and sand surround to enable easier resetting of the sprinkler height. The sand surround will be 100 mm diameter. The sand will be compacted to prevent subsidence.

POP-UP SPRINKLER

a) The sprinkler shall be of the gear-driven rotary type or rotary spray type, capable of covering 5 to 12 m spacing range 2 to 3.5 m kg/cm^2. The sprinkler shall include a set of five (5) interchangeable nozzles.
b) The sprinkler shall be available in an adjustable part-circle configuration. The adjustable part-circle unit shall be minutely adjustable from 0° to 360°or 70° to 360°. The adjustable unit shall be adjustable in all phases of installation, i.e., before installation, after installation (static), and after installation while in operation. The pop-up versions of the sprinkler shall have a ratcheting riser assembly for final arc orientation.
c) The sprinkler shall have a 102 mm, 152 mm, or 305 mm pop-up stroke. The pop-up sprinkler shall be available with a drain check valve to prevent low head drainage, and be capable of checking up to 7 feet of elevation change. If the elevation exceeds 2.1 m, use check valve.
d) The sprinkler shall have an exposed surface diameter after installation of 30 mm. The sprinkler shall have a 12.5 mm or 20 mm inlet. The sprinkler shall be serviceable after installation by unscrewing the body cap, removing the riser assembly, and extracting the inlet filter screen.
e) The body and riser of the sprinkler shall be constructed of noncorrosive, heavy-duty A.B.S. plastic. The sprinkler shall carry a minimum of two-year warranty.
f) All sprinklers shell be covered by pipe sleeve of suitable size to protect it from lawn mower.

POP-UP SPRAYS AND ROTOR CONNECTION

a) The flexible connection between the irrigation sprays/rotors and the sub-main shall be via. Swing joint of U.V. stabilized, class 5, LDPE (Low Density Polyethylene pipe) pipe, manufactured to BS 1972/67 - 3287. All Swing joints shall have size, class, manufacturers name and standard printed on it.
b) Service saddle of class 5 or Compression fittings shall be used for pipe connection to the sprays/rotor. The fittings shall have the body, locking ring, thrust collar and internal barb manufactured from master batch U.V. stabilized polyethylene. The locking ring shall be manufactured from acetylic resin and the rubber seal material. The fitting shall have a pressure rating of 10 bar and shall secure the pipe with an external locking ring plus an internal push fit barbed adapter.

PRESSURE COMPENSATING DRIPPER LINE (IN-LINE)

The drip line shall be brown in colour. The dripper line shall have pressure compensating emitters welded to the inside surface at selected intervals. The pressure compensating dripper shall consist of "dual regulation" utilizing both turbulent flow labyrinth and EPDM diaphragm. The dripper shall be continuously self-cleaning and should have an inlet filter capable of being cleaned by flushing the line. Pressure compensation shall be between 0.5 kg/cm^2 to 4 kg/cm^2. The coefficient of manufacturing variability must be less than 0.04 as determined by the vendor. The dripper line must be warranted against solar damage for 10 years. The dripper line shall be able to be installed with the dripper in any orientation. Temperatures to 60°C shall not affect dripper flow rate. The dripper shall have a large "water path" outlet that acts as a mechanical barrier to root intrusion. The drip line shall be of 16mm diameter and dripper flow rates of 3.5 lph. Pressure compensating dripper line spacing shall be 300 or 450 mm depending on the planting pattern.

VALVES

All valves (ball, gate, globe, check, safety) shall be of gun metal or PVC as suitable for the particular service. All valves shall be of the particular duty and design. Valves shall either be of screwed type or flanged type, with suitable flanges and noncorrosive bolts and gaskets. Tail pieces shall be supplied along with valves. Gate, globe and check valves shall conform to Indian Standard IS: 776 and non-return valves and swing check type reflux to IS: 5312. Sluice valves, where specified shall be flanged sluice valves of cast iron body. The spindle, valve seat and wedge nuts shall be gunmetal. They shall generally have non rising spindle and shall be of the particular duty and design. The valves shall be supplied with suitable flanges, non-corrosive bolts and asbestos fiber gaskets. Sluice valves shall conform to Indian standard IS: 780 and IS: 2906. Ball valves shall be of openable type. It shall have a pressure rating of minimum 10 Kg/Cm^2.

a. Electric Control Solenoid Valve

The valve body and bonnet shall be constructed of heavy duty glass reinforced nylon body and internal parts shall be stainless steel diaphragm shall be nylon reinforced nitrile rubber. Solenoid coil shall be encapsulated in moulded epoxy. Normally closed diaphragm type, slow opening and closing. Should be rated 24V-50Hz -2 watts. Maximum pressure rating shall be not less than 15 kg/sq.cm. BSP inlet/outlet, solenoid plunger shall incorporate self-flushing type stainless or internal filter. Provision for manual open/close and flow control stem with cross handle for regulating the flow. All valves shall be provided between 0.5 – 7 kg/sq.cm (within an accuracy of ±0.35) kg/cm^2 regardless of upstream pressure. The pressure regulator shall be with a calibrated dial for dry setting of the outlet pressure.
The valve shall be capable for pressure regulating electrical and manual mode operation using external and internal bleeds. The valve shall be inline or angle configuration as per the requirements. The valve construction shall be such as to provide for all internal parts to be removable from the top of the valve without disturbing the valve installation. Only Moulded uPVC/Brass fittings shall be used with solenoid valve assemblies.

b. Pressure Reducing Valve

Each pressure reducing valve set shall be complete with pressure reducing or pressure regulating valve, isolating valves, pressure gauges on inlet and outlet, pressure relief valve on outlet and filter on inlet. Each pressure reducing valve shall contain loading neoprene diaphragm and a full floating, self-aligning, ignition resistant seat and shall be of the single stage, pressure reduction type with provision for manually adjusting the delivery pressure. The valve shall fail safe to the low pressure. Valves shall be capable of operating and maintaining automatically the respective delivery pressure and flow rates and shall not be liable to creep. Valves shall also be capable of maintaining the pre-set downstream

pressure under static condition. The filter on each inlet to a pressure reducing valve shall be of replaceable porous sintered metal type.

GARDEN HOSE

The garden hose shall be superior quality flexible PVC hose with polyester yarn reinforcement which shall give the extra strength & resistance in twisting and stretching. The pipe shall have high gloss finish and good visibility. It shall have good cold and warm resistance. The burst pressure shall be 35 bars. The hose shall be supplied with the hose reel.

PIPE SLEEVES

Pipe sleeves, next larger diameter than pipes shall be provided wherever pipes pass through walls & slabs and annular space filled with fiberglass & finished with retainer rings. All pipes shall be accurately cut to the required sizes in accordance with relevant BIS codes and burrs removed before laying. Open ends of the pipe shall be closed as the pipe is installed to avoid entrance of foreign matter.

POINT OF CONNECTION

Tapping point will be provided at the site by project team and should be utilized for section wise irrigation system installation as shown in the layout. Only one point of connections (POC) would be made using Clamp saddles so as to minimize excavation at various places in view of depth of existing Mainline (0.6 Meters). Submain line of 63, 50 or 40mm would start from POC after valve installation. Irrigation programs of all valves should be coordinated with flow and pressure availability.

IRRIGATION CONTROL SYSTEM

The system will be controlled by the outdoor type single stations battery operated Irrigation Controller. The controller will be installed inside the valve box. All necessary fittings like battery, cables & connectors should be installed as per standard & as per instruction of owner requirements.

i) All electrical connections will be performed by licensed electrical personnel.

ii) All cabling be in accordance with the relevant statutory authority requirements.

a. Low Voltage (solenoid) control cables
The cables running from irrigation controller sectional valve will comply with the following:
- They will be PVC sheathed.
- There will be a spare active cable run along the length of each common cable.
- A 1m loop of cable will be left at each solenoid to facilitate future valve maintenance.
- Cables joint will only be accepted at each solenoid valve.
- The only acceptable method of joining cables will using connectors used in Landscape Irrigation work.

b. Installation of Cables
- All cables will be tested for continuity before installation with a mega-ohm.
- This test will repeated after the cables have been installed in the ground but before back filling.
- The cables must not be connected to any other electrical equipment while they are being tested.
- All tests will be carried out by the contractor and approved by the Employer’s Representative.

TESTING PROCEDURES

a. Adjustment of the system:
The contractor will adjust the various components of the irrigation system to ensure the overall operation of the system is efficient.

b. Static pressure test
A static test of two hours at 1.5 times the working pressure of the mainline (but no higher than the pressure rating of the pipe) will be performed if required at the completion of the tapping band installation stage of each section of the mainline.
During the period of the static test, the pressure will not drop by more than 0.25 kg/sq.cm
All isolation valves and thrust blocks must be in place and cured for the mandatory period of time. Air valves, quick coupling and lateral valve assemblies must be completed and the lines thoroughly flushed and primed prior for testing. There will be no permissible leaks at any point in the system. All tests will be carried out by the contractor and approved by the Owner's Representative.

COMMISSIONING

The commissioning of irrigation controller system will be carried out by the manufacturer's representative in conjunction with and approved by the Owner's Representative.
The commissioning will include, at the time of hand over, a demonstration of all sections and individual elements pertaining to the operation of the irrigation system.

HAND OVER

Before hand over, the Contractor shall ensure the following;
In addition to the static pressure test or commissioning, the completed system must be operated without fault for at least one week prior to hand over.
Should any major leaks occur during this period, the static pressure test procedure will be repeated once the problem has been rectified. If the system is repaired, then it must operate for at least one week without fault prior to hand over being accepted. In lieu of an official hand over, any works properly tested, commissioned (if applicable) and used by the Owner for at least one week without fault will be deemed as handed over.

QUALITY

All the equipment's, to be supplied under this contract, has to be as per the list of Approved Makes or the experienced manufacturer. The equipment of only those manufacturers, who have sufficient proven experience of manufacturing the respective equipment of similar capacity, shall be considered.
The respective equipment should have been manufactured, supplied on at least 5 installations, commissioned successfully and should be running satisfactorily since at least last 5 years continuously.

WARRANTY

Comply with the requirements of each type of Equipment and specification mentioned elsewhere in this document. Warrant all components to be free of defects in materials or workmanship for 12 months from date of satisfactory completion of performance test.

Individual warranties by component manufacturer in lieu of single source responsibility by the main Equipment manufacturer shall not be acceptable.

Items which fail during the warranty period, excluding expendable items, shall be replaced without cost to the Owner / Employer. Provide manufacturer's guarantee and warranty certificates prior to equipment start-up.

DATA SHEETS

SUBMERSIBLE PUMPSET

Sr.No	Particulars	Unit	Bidder to indicate
1.	Designation	-	
2.	Number offered	-	
3.	Tag numbers	-	
4.	Pump make and model number	-	
5.	Type of pump	-	
6.	Design capacity	m3/hr	
7.	Total head	MLC	
8.	Shut- off head	MLC	
9.	Hydrostatic test pressure	Kg/cm2(g)	
10.	Efficiency at duty point	%	
11.	NPSH required	MLC	
12.	Pump speed	RPM	
13.	Pump bkw	kW	
14.	Minimum continous flow	m3/hr	
15.	Maximum allowable size of solids	mm	

16.	Installation	-	
17.	Method of lubrication	-	
18.	Type of impeller	-	
19.	Type of coupling	-	
20.	Type and make of seal	-	
21.	Type and make of bearing	-	
22.	Discharge pipe orientation	-	
23.	Suction nozzle size	-	
24.	Discharge nozzle size	-	
25.	Power input to motor at duty point	kW	
26.	Motor make and model number	-	
27.	Motor type	-	
28.	Motor rating	kW	
29.	Motor speed	RPM	
30.	Motor efficiency	%	
31.	Class of insulation	-	
32.	Starting current	A	
33.	Degree of protection		
34.	Cable size	C x mm2	
35.	Weight of pump, driver and cables	Kg	

36.	Accessories	-	
37.	Performance guarantee		
37.1	Capacity	m3/hr	
37.2	Differential head	MLC	
37.3	Power consumption	kW	

GATE VALVES

Sr. No.	Particulars	Unit	Bidders Data
1.0	Make	-	
2.0	Material	-	
3.0	Pressure Rating	Kg/cm^2	
4.0	Class	-	
5.0	Size	mm	

NON RETURN VALVES

Sr. No.	Particulars	Unit	Bidders Data
1	**General**	-	
1.1	Make	-	
1.2	Type	-	
1.3	Applicable standard	-	
2	**Size ,Location & quantity**	-	

2.1	Pressure Rating	Kg/cm^2	
3	**Material of Construction**	-	
3.1	Body, disc, bonnet	-	
3.2	'O' ring	-	
3.3	Nuts	-	
3.4	Bolts	-	
4	**Hydro Test Pressure**	-	
4.1	Body	Kg/cm^2	
4.2	Seat	Kg/cm^2	

BALL VALVES

Sr. No.	Particulars	Unit	Bidders Data
1	**General**	-	
1.1	Make	-	
1.2	Type	-	
2	**Material of Construction**		
2.1	Body & body connector	-	
2.2	Ball	-	
2.3	Seat	-	
2.4	Stem	-	
2.5	Body Seal	-	

2.6	Stem seal	-	
3	**Design parameters**		
3.1	Size	mm	
3.2	Rating	Kg/cm^2	
4	**Testing**		
4.1	Shell	Kg/cm^2	
4.2	Seat	Kg/cm^2	

QUICK COUPLER VALVE

Sl. No.	**Particulars**	**Unit**	**Bidder to indicate**
1.	Manufacturer	-	
2.	Size	mm	
3.	Material of Valve Body	-	
4.	Material of the Cover	-	
5.	Material of the Cover Key	-	
6.	Max. Design Pressure	Kg/cm^2	

Sl. No.	Particulars	Unit	Bidder to indicate
1.	Manufacturer	-	
2.	Size	mm	
3.	Material of Pipe	-	
4.	Reinforcement Method Used	-	
5.	Colour of the Pipe	-	
6.	Burst Pressure	Kg/cm^2	

GARDEN HOSE

VALVE BOX

Sl.no.	Particulars	Unit	Bidder to indicate
1.	Manufacturer	-	
2.	Size	mm	
3.	Material of Body & Cover	-	
4.	Colour of the Box	-	
5.	Max. Sustainable load	N	
6.	Cover Locking facility	-	

PREFERRED VENDOR LIST

SL NO	Equipment	Manufacturer
1.	Submersible open well monobloc pumps	Kirloskar / Crompton / Laxmi
2.	PVC pipes & fittings	Jain / Finolex / Supreme
3.	Gate valves	Leader / Zoloto / Kirloskar Brothers Ltd
4.	Gunmetal Valves (Sluice & Check)	Zoloto / Sant / Leader

5.	Solenoid valve	Rainbird / Toro / Hunter
6.	Ball valves	Chemtech Industrial valves P. Ltd /
		G M Engineers / Hawa Engineers Ltd
7.	QCV, Key, Swivel elbow	Jain / Rainbird / Harit
8.	Sprinklers	Rainbird / Toro / Hunter
9.	Drip line & Drippers	Rainbird / Hunter
10.	Irrigation controller	Rainbird / Toro
11.	Garden Hose Pipes	Rainbird / Jain Irrigation / B.S.Hydro-pneumatic
12.	Valve/Surface Box	Rainbird / Jain Irrigation / Hunter
13.	Cables	Finolex / Polycab

TECHNICAL SPECIFICATION OF ELECTRICAL WORKS

1.0 SCOPE OF WORK

1.1 The scope of work covers the design, detailed engineering, preparation of construction drawing, manufacture, acceptance testing at manufacturer's works or at any accredited agency, supply, packing, forwarding and delivery from manufacturer's works/ place of storage to erection site including transit insurance, unloading, storage at site, moving from place of storage to place of installation, assembly, cleaning/ lubricating, touch up painting, erection, testing, commissioning, performance demonstration & O&M for 5 years and handing over of the following systems/ equipment on Item rate basis of the Identified Science park for Rourkela Smart City Limited (RSCL).

The scope of work broadly includes;

1.1.1 Power supply for the science park shall be through LT side of the proposed substation for the Science Centre under separate project being taken up by Science Dept.

1.1.2 Illumination of Landscape area.

1.1.3 Illumination of Proposed Pathways/ Walkways.

1.1.4 Illumination of Garden area and Trees.

1.1.5 Illumination of Indoor area like toilet blocks, guard rooms, Kitchen etc.

1.1.6 Main Distribution Board with Inbuilt Capacitor(Indoor), Outdoor Lighting Feeder pillar, Indoor 2+4way SPN MCB DB and Junction Box for power supply distribution.

1.1.7 Point Wiring for indoor lighting points like toilet blocks, guard room, Kitchen etc.

1.1.8 LV Power and Control Cabling System.

1.1.9 Civil works including Foundation for the LT Panels, lighting poles, luminaires, etc.

1.1.10 Earthing System.

1.1.11 Construction Power supply arrangement.

1.1.12 Liaison with Govt. Authorities for power supply arrangement and other necessary statutory approvals.

1.2 CONTRACTOR shall ensure that design of equipment shall be as per specification requirements.

1.3 CONTRACTOR shall submit Quality Assurance Plan within 15 days after finalization of order. The QAP shall be discussed between RSCL and the CONTRACTOR before the QAP is finalized.

1.4 The CONTRACTOR shall carry out detailed engineering including schematic lighting solution and prepare construction purpose drawings to make its own estimate of ratings & quantities in accordance with the design criteria provided in the technical specification and data sheets, for entire system including illumination system, electrical equipment, cabling system, earthing, and civil works required for completion of works.

1.5 The above drawings with plans, elevations, sections or any details (as required) shall be submitted

to RSCL or its representative for approval.

1.6 3D rendered views of the proposed illumination plans shall be provided for approval for the entire project before supply and execution of the same.

1.7 Light fixtures selected by the CONTRACTOR shall be submitted to RSCL for approval.

1.8 The CONTRACTOR shall submit detailed electrical load calculation, sizing calculation of electrical equipment and explanation on how the fixtures identified are energy efficient before supply and execution of work.

1.9 CONTRACTOR shall take due care of the site Seismic conditions while designing all equipment/ components used in lighting and electrical systems covered in this specification. CONTRACTOR shall furnish list of design parameters considered in design to fulfill the above requirement.

1.10 Design and detailed engineering of the materials procured by CONTRACTOR is included in scope. CONTRACTOR shall submit each document/ calculations of system which is included in scope to RSCL or its representative for final review/ approval. All design documents/ calculations prepared by CONTRACTOR shall be duly signed by CONTRACTOR and stamped. Documents submitted without fulfillment of this requirement will not be considered as a submission and will be rejected.

1.11 Design documents/ calculations prepared by Sub-CONTRACTOR shall be approved by CONTRACTOR and stamped copy of approval along with no-deviation sheet from Sub-CONTRACTOR shall be submitted by the CONTRACTOR to RSCL or its representative for final review/ approval. Documents submitted without fulfillment of this requirement will not be considered as a submission and will be rejected.

1.12 Expert or manufacturer supervision for Sub-CONTRACTOR supplied material shall be provided by BIDDER and included in offer.

1.13 CONTRACTOR shall be solely responsible for any shortages or damages in transit for his supply scope, handling and/ or in storage of any materials and erection of the equipment, supply of erection tools at site. CONTRACTOR shall ensure that it will not affect any activity or project schedule. Any demurrage, wharf age and other such charges claimed by the transporters, railways etc. shall be to the account of the CONTRACTOR.

1.14 Obtaining approval including load sanction/ load release from TPWOCL shall be in the scope of CONTRACTOR. All the statutory fees for the above approvals shall be borne by RSCL. Such payments shall be reimbursed to the CONTRACTOR upon submission of stamped receipts to the RSCL. The approvals will include consent for commencement of work and obtaining permission to charge/commission.

1.15 All the cost towards liaison with statutory Bodies for seeking all necessary statutory approvals and other activities involving Govt. Agencies viz., drawing approval, testing and commissioning et. shall be borne by the CONTRACTOR.

1.16 The CONTRACTOR shall also liaison with Govt. Bodies if required like TPWOCL, PWD, CEIG, RMC etc. for obtaining required permission to work.

1.17 CONTRACTOR’s scope shall also include all civil works and structural works required for installation of all electrical equipment/ systems such as equipment foundations, Pole foundations and all excavation and backfilling works including those for lighting, earthing, cabling systems etc.

1.18 BIDDER should visit site and get ascertained regarding the complete scope of work before submission of Bid.

1.19 This specification is the minimum requirement and should be read in conjunction with relevant latest specifications, requirements, rules and regulations of the Local Authority. Any additional requirements as per Local Authority or latest Standards shall be considered by BIDDER

1.20 All SAFETY considerations in design and manufacturing for safe operation & maintenance and safe practices during installation at site shall be in the scope of the CONTRACTOR. Cost towards accomplishing the same shall be included in the BID price and no extra claim shall be entertained later.

1.21 Equipment furnished/ supplied under this scope of works shall be complete in every respect with all mountings, fittings, fixtures, and standard accessories normally provided with such equipment and / or needed for erection, completion and safe operation of the equipment as required by applicable codes though they may not have been specifically detailed in the Technical Specification. Materials and component not specifically stated in the specification but which are necessary for commissioning and satisfactory operation shall be deemed to be included in the scope of specification and shall be supplied without any extra cost. All similar standard components/ parts of similar standard equipment provided shall be inter-changeable with one another.

1.22 The CONTRACTOR shall be responsible for the selection and design of appropriate equipment to provide the best co-ordinated performance of the entire system. The design of various components, sub-assemblies and assemblies shall be so done that it facilitates easy field assembly and maintenance.

1.23 The material supplied by the CONTRACTOR shall be subject to approval of the designated Authorities of RSCL. Samples of the Supply material under the scope of works shall be inspected by RSCL or their representatives either at site or at Manufacturer's works and approve them for supply and execution. Notwithstanding any approval/ instruction given otherwise, if the RSCL, during random check up, finds any nonconformance with the quality of material supplied by the CONTRACTOR with respect to the technical specifications, RSCL shall have the Authority to reject the entire lot/ batch of that particular material and ask to replace without any cost and time impact to RSCL.

1.24 During the construction at site, it shall be the CONTRACTOR's responsibility to take care of the safety and security of its person and material at site. The CONTRACTOR shall be self-reliant with all the requirements including tools and tackles for digging, filling, erecting, lifting, etc. and consumables required for construction like electricity and water at his own cost.

1.25 The CONTRACTOR shall carryout the installations in a safe and responsible manner without any inconvenience or danger to public. The CONTRACTOR shall take care not to damage any public/ private property by mistake or by intention during the course of work with its actions and shall be well insured to compensate the owner in case any such incidence happens.

1.26 CONTRACTOR shall plan and carry out all supply, installation, testing and commissioning of the entire electrical system conforming to the approved drawing, technical specification and good engineering practices.

1.27 Even if all components of a system included in this specification are not explicitly identified and/ or listed herein, these shall be supplied under this contract to ensure completeness of the system and facilitate proper operation and easy maintenance. Any and all other works not indicated above

but necessary/ required to complete the job in all aspects, are included in the CONTRACTOR's scope.

1.28 RSCL reserves the right to issue addendum to the technical specification to indicate modification/ changes in the requirements, if so required at a later date.

2.0 DESIGN CONCEPT

2.1 The design concept of lighting system as a whole is based on providing visually and aesthetically improved illumination; providing safe, reliable & stable power and efficient performance of electrical system.

2.2 The design standard described herein is in accordance with latest BIS standards and National Lighting Code 2010.

2.3 The design standards described herein are generally in compliance with the Central Electricity Authority Regulations 2010, latest Indian Standards, State Electricity board standards and code of practices already established in the country.

2.4 The design ambient temperature for all electrical equipment shall be 45°C.

3.0 POWER DISTRIBUTION ARRANGEMENT

3.1 The power supply for the Science park shall be through LT side of the proposed substation for the Science Centre under separate project being taken up by Science Dept.

3.2 Tariff metering is to be provided as per the latest guidelines and specification of the TPWOCL.

3.3 All power supply arrangement up to tariff meters is considered in the Contractor Scope.

3.4 The main LT panel with inbuilt Capacitor are installed to provide 415V to Outdoor Lighting Feeder pillar, Indoor LDB and motor etc. Outdoor Lighting Feeder pillar shall cater to the landscape lighting, Pathways & Garden area lighting, etc with 4P MCB + RCCB incoming and 4P MCB & DP MCB outgoings. The panel shall comprise of digital ammeters, digital voltmeters, R,Y,B, ON, OFF indication lamps for the incoming. The panel shall have astronomical timer with the landscaping lighting feeders being controlled from the same.

3.5 Cabling system shall comprise of 1.1 kV grade, XLPE insulated, multi-stranded Al/ Cu, GI round wire/ flat strip armoured power cable. All the Cables shall be laid buried underground at minimum depth of 750mm from FGL.

3.6 Separate and individual power cable of 1.1 kV grade, XLPE/ PVC insulated, multi-stranded Al/ Cu, GI round wire/ flat strip armoured is to be provided for illumination of Pathway lighting and landscape lighting. The size of the cable provided shall not be less than 4 Sq mm. Al.

3.7 Internal point wiring is to be done as per Odisha PWD building norms.

3.8 The size of the cable provided shall not be less than 2.5 Sq mm, Cu for small lights like down lighters, step lights, bulk heads etc.

3.9 Three-way Junction boxes of IP67 has been considered for the distribution of the power to the load points. Separate junction boxes to be provided for supplying load to Garden area lighting, tree lighting, uplighters, wall lighting, indoor lighting.

4.0 DESIGN CRITERIA

4.1 ILLUMINATION SYSTEM

4.1.1 Latest version of related IS Standards and National Lighting Code 2010 (NLC) shall be referred for designing Illumination for different areas.

4.1.2 Lighting design shall be performed using DiaLux Software version 4.12 or its latest version.

4.1.3 The illumination shall be designed creatively for enhancement and improvement of the look and feel of the various elements of the project area aesthetically and visually. This criteria for such illumination cannot be defined in terms of standard values or factors as specified in the standards for all elements however certain elements like pathway / walkway, Riverfront area etc shall be designed as per required standards as specified.

4.1.4 While designing the lighting system major principles of designs to be followed are as follows

(a) Lighting Lux Level.

(b) Luminance Distribution.

(c) Direction of Incidence of Light and Shadow effect.

(d) Free Public movement.

(e) Hazard free space for Visitors and Pedestrians.

(f) Daytime Appearance of the Installation - It is very important to ensure that the luminaire positions determined for night time lighting are aesthetically appropriate and do not spoil the view of the site during the day.

(g) Glare - It is necessary to eliminate direct and/or reflected glare which could disturb visitors and pedestrians.

(h) Accessibility for Maintenance - For periodical maintenance, lamp replacement, cleaning of luminaires and readjustment of disturbed luminaires should be as easy as possible. Care shall be taken during the designing stage to make the installation accessible and ensure easy handling of luminaires.

(i) No Light Pollution including the Night sky.

4.1.5 Lighting Design

(a) Following factors shall be considered while arriving at the utilization factor to determine the number of fixtures for each area.

(i) Maintenance Factor

a. Indoor Area Lighting with LED Luminaire: :0.8

b. Outdoor Area Lighting with LED Luminaire: : 0.8

(ii) Uniformity factor shall be considered as per National Lighting code 2010.

(iii) The illumination levels given in below table shall be considered for the illumination of the respective area.

Table 1: LUX Requirement

Sr. No.	Area	Illumination Level (Lux) - Average values
1	Internal Roads/ Entry-Exit points	15 Lux
2	Kiosk / Vending shops	250 Lux
3	Toilet Block/ Public Toilet	100 Lux
4	Admin Office/ Ticket & Information Counter	200 Lux

(b) The proposed lighting fixtures for the development is as indicated in the table below:

Sr No.	Type of fixture	Typical Fixture	Place
1	LED Post Top Fixture 45W IP 65 aluminum spigot housing LED Post Top. Philips BGP161LED2300/WW PSU 220-240V 7043 IN LED or equivalent.		Walkways & Pathways as per design intent
2	Philips make WT201C LED 40S L 120, IP65 luminaire Indoor luminaire, 40 W, 6500K, Polycarbonate Housing		For Kitchen & Cafeteria
3	12 W LED Bulbs		For Toilet block

Sr No.	Type of fixture	Typical Fixture	Place
4	LED Focus Light - 25W mini LED flood light, CRI > 80, IP66, IK07 Gray pure polyester powder coated, Pressure die-cast aluminium housing for efficient thermal management, sturdiness & excellent corrosion resistance & High quality toughened glass in clear finish for uniform light distribution. Philips make BCP400 LED05 P CW PSU GR S1 or equivalent		For Tree & Trellis
5	LED Step Light- 6-7W LED Step Light, IP 66, IK 07 made up Pressure die-cast aluminium housing for sturdiness, excellent corrosion resistant and efficient thermal management grey finish, CRI > 80, CCT 3000K Havells make RADIANTNEOFT07WLED830SASYMBOPC or equivalent		For OAT Area
6	LED Bollard- 8-9W with inbuilt driver, Minimum lumen output of 500 lumens, CCT of 6500K, CRI > 70, IP65, IK-10. Havells make LYCUSSPS15WLED730PSYMBOTG or equivalent		For Green pathway

Note: Pictures are indicative and taken from internet / vendor catalogues.

4.1.6 Selection Of Luminaries-

(a) Selection of the luminaries for Landscape lighting shall be done on the basis of specifications provided in Datasheet.

(b) CONTRACTOR shall submit the detail lighting plan and take prior approval from RSCL or its representative after award of contract.

(c) CONTRACTOR shall provide better options for lighting concept and LED luminaries with optimized cost.

4.2 CABLE SIZING

4.2.1 The CONTRACTOR shall ensure that cable and wires associated with the power distribution and

control systems, point wiring and all other installations throughout the Works are adequately rated for their use. Following main aspects shall also be considered while deciding the final size of the cables

a) Supply voltage and frequency.

b) All cables shall be selected to carry the corresponding full load current under site conditions.

c) Route length and disposition of cables.

d) Maximum allowable temperature rise under normal full load condition based on the material of cable insulation (XLPE/ PVC).

e) For Cables emerging from LTDB, fault clearing time shall be considered as 0.5 second.

f) For Cables emerging from MCCB / MCB outgoing, fault clearing time shall be considered as 0.01 second.

g) CONTRACTOR shall note that, the above fault clearing times are minimum to be considered & fault clearing time shall be according to Power system.

h) Appropriate de-rating factors as per cable manufacturer's catalogue and enlisted below shall be considered for sizing the cable:

- Ambient Air Temperature (minimum 45º C).
- Ambient ground temperature (minimum 40º C to be considered)
- Laid in Air / ducts/ directly in ground etc.
- Depth of cable burial (minimum 750 mm for LT)
- Thermal Resistivity of Soil (minimum 150ºC Cm/ W to be considered)
- No. of cables in a group-touching each other or separated by a distance
- Any other de-ration factors as applicable & as per Manufacturer's catalog.

i) The number of light fixture controlled by a single feeder pillar outgoing circuit shall be limited based on the voltage drop at the farthest light fixture. The cumulative voltage drop at that point shall not exceed by 5%.

j) Cables up to & including 4.0 sq.mm shall be Cu multi-stranded conductor with galvanized steel round wire armoured & balance cables shall be Al multi-stranded conductor with galvanized steel round wire/ flat strip armoured.

k) Control cables shall be Cu multi-stranded conductor with galvanized steel round wire/ flat strip armoured. For multi core cables above 7 cores, minimum two spare cores shall be considered.

4.3 PANEL SIZING

4.3.1 Rating shall be suitable for carrying full load current of the equipment.

4.3.2 It shall be suitable for short circuit rating for 1sec duration.

4.3.3 The bus-bars shall be sized considering the following criteria:

I. Sleeves made of insulating material on all bus bars.

II. Design ambient temperature 45 Deg C.

III. Final temperature of the bus-bars complying with requirements of IS 8623-1993(Reaffirmed 2004) & IEC 60947-2007-Amd 2014.

IV. Bus bars being inside the panel; De- ration for enclosure and ventilation.

V. Bus bar suitability for carrying rated current continuously.

VI. Configuration of bus bars and Proximity effect.

VII. The main bus shall be designed based on the load rating as well as the actual fault level for specified duration at the location of the Panel/ board with 10% tolerance.

VIII. Earth bus of the panel shall be sized suitable for the above fault level for the same duration.

4.4 FAULT LEVEL CALCULATIONS

Fault level at the secondary of the transformer and at 415V LT panels shall be calculated based on the transformer rating and impedances of transformer and connecting cables.

4.5 EARTHING SYSTEM

4.5.1 The safety earthing shall be on the basis of following codes and standards

- IS 3043 -2018; Code of practice for Safety Earthing.
- CEA guidelines - 2010

4.5.2 The fault levels considered shall be as follows:

System	Fault level in kA
a) 415V System	*25 kA for 1 sec

(*) CONTRACTOR to design on the basis of actual impedance & adequacy calculations for sufficiency of earth conductor size shall be provided.

4.5.3 Following factors shall be considered for sizing the earthing conductor:

- Design Ambient Temperature : 45°C

- Allowable temperature rise of steel welded joints : 500°C
- Fault Clearing Time : 1 Sec
- Overall earthing resistance : ≤ 1 Ohms

4.6 CIVIL DESIGN

4.6.1 All the Civil foundation design shall be suitable for the Seismic requirement of Rourkela as per latest IS as the city of Rourkela falls in the Seismic Zone-II.

4.6.2 The design shall be considering the maximum wind speed as per IS 875-1987(Reaffirmed 1997).

4.6.3 Proposed flood light pole foundation shall be designed according to condition of soil post soil test.

4.6.4 The Grade of concrete to be used shall not be less than design Mix M30 and grade of reinforcement steel shall be Fe 500.

4.6.5 80mm (ID) DWC HDPE Pipe of appropriate length shall be embedded to draw the cable from the power cable.

4.6.6 Minimum requirement for Civil Foundations for the Lighting Pole of height 6 m are as follows;

(a) Depth of the foundation considered is 1200 mm minimum.

(b) Plan dimensions of footing considered is 900mm x 900mm having depth D=200 mm Minimum.

(c) Steel in foundation base in both directions considered is T 10 @ 150 mm c/c.

(d) Size of base plate considered is 250 mm X 250 mm having thickness 12 mm.

(e) Four anchor bolts of 16mm dia and 700 mm total length.

(f) Grade of concrete to be used considered is M20 (1:1.5:3) and grade of reinforcement steel considered is Fe 500 or Fe415.

(g) 40mm DWC HDPE Pipe of 1m length shall be embedded to draw the cable.

(h) This foundation design of pole will be applicable for all types of soils i.e. soft soil, medium soil and hard soil.

(i) 40mm DWC HDPE Pipe of 1m length shall be embedded to draw the cable from the power cable.

5.0 TECHNICAL SPECIFICATION

5.1 LIGHTING LUMINARIES

5.1.1 Applicable Standard

Standard for LED Luminaries

Sr. No.	Brief Title	IS/IEC Code
1.	Testing procedure of photometric testing for LED luminaires	LM 79
2.	Testing procedure on the lifespan of LEDs	LM 80
3.	National Lighting Code	SP72-2007
4.	Method of Measurement of Lumen Maintenance of Solid State Light (LED) Sources	IS:16105-2012
5.	Method of Electrical and Photometric Measurements of Solid-State Lighting (LED) Products	IS:16106-2012
6.	Limits of Harmonic Current Emissions	IS 14700-3-2-2008
7.	DC or AC supplied electronic control gear for LED modules performance requirements	IEC 62384-2006
8.	Lamp control gear: particular requirements for DC or AC supplied electronic control gear for LED modules	IEC 61347-2-13-2014
9.	Environmental Testing: Test Z- AD: composite temperature/ humidity cyclic test	IEC 60068-2-38-2009
10.	Electro Magnetic compatibility (EMC)- Limits for Harmonic current emission-– (equipment input current ≤ 16 A per phase)	IEC 61000-3-2-2018
11.	EMC Immunity requirement	IEC 61547-2009
12.	LED modules for general Lighting-Safety requirements	IEC 62031-2018
13.	Classification of degree of protections provided by enclosures (IP Codes)	IEC 60529-1989,Amd 2013
14.	Fixed general purpose luminaries	IEC 60598-2-1-1979
15.	General Lighting - LEDs and LED modules – Terms and Definitions	IS:16101-2012 / IEC TS 62504-2011
16.	LED Modules for General Lighting Part 1 Safety Requirements	IS:16103(Part1)-2012

17.	LED Modules for General Lighting Part 2 Performance Requirements	IS:16103(Part2)-2012
18.	Safety of Lamp Control Gear, Part 2 Particular Requirements Section 13 D.C. or A.C. Supplied Electronic Control gear for Led Modules	IS:15885(Part2/Sec13)-2012

5.1.2 Environmental Conditions

The average atmospheric condition during the year is mentioned below. The equipment shall be designed to work in such environmental conditions:

(a) Maximum ambient air temperature: 45° C

(b) Minimum ambient air temperature: 5° C

(c) Max. Relative humidity: 90%

(d) Atmosphere: Dusty and Humid

(e) The equipment shall be suitable to sustain and work in the humid and dusty atmosphere of Rourkela.

5.1.3 Luminary/Fixture Description

(a) All Luminaires shall be UL/CE/BIS certified, robust & sturdy, manufactured out of Quality raw material/ inputs with proper Quality checks at each step designated to last long in the kind of application they are selected to work.

(b) All selected Luminaires shall be minimum IP65 protected except indoor luminaires and certified for IK 07.

(c) All RGB luminaires shall be manufactured from well binned LEDs to provide and maintain same Colour consistency over long duration of operations.

(d) The Luminaires shall offer Flicker free output for long duration.

(e) All Luminaires shall be Suitable to operate at auto-switching input voltage for 100 – 240 VAC, 50 Hz power supply with the tolerances as mentioned in the data sheet.

(f) The luminaire light output (lumen) shall be constant and shall be able to withstand allowable supply source voltage variations/ fluctuations, spikes.

(g) The entire fixture shall consume rated wattage as per data sheet maximum at full output.

(h) The LED luminaries shall be single, self-contained device with integral electronic control gear, without requiring on-site assembly for installation.

(i) Fixture shall have lens options.

(j) All the Luminaire shall be complete with necessary accessories & mounting arrangements.

(k) The Luminaries shall have housing as mentioned in datasheet.

(l) The LED system should be digitally driven using noise-shaping pulse width modulation (PWM) techniques and use integral and differential nonlinear control.

(m) LED fixture shall merge line voltage with control data and deliver them to the fixture over a single standard cable from the power and data interface to ensure minimum cabling work to aesthetic and safety purpose.

(n) A microprocessor-controlled SSL driver shall be provided that efficiently and accurately will condition and manage power output to LED systems directly from line voltage.

(o) The Luminaries Housing shall be suitable for termination of 4C X 2.5 sqmm copper conductor PVC insulated flexible Cable with Double Compression Cable Glands

(p) All the connecting wires inside the Luminaire shall be low smoke halogen free, fire retardant cable.

(q) Luminaires should conform to the IS standards for Safety & Performance and test certificates as per IS 16107-2012 should be provided by the manufacturer. In case of luminaires are imported, the CONTRACTOR shall conform to test parameters as per equivalent standards.

(r) The electrical component of the LED and LED driver must be suitably enclosed in sealed unit to function in environment conditions mentioned earlier.

(s) Design of the thermal management shall be done in such a way that it shall not affect the properties of the diffuser.

(t) All LED fixtures shall undergo a minimum 24-hour burn-in test during manufacturing.

(u) The LED fixture shall be operated at constant and carefully regulated current levels. LEDs shall not be designed to be driven beyond their specified nominal voltage and current.

(v) High-power LED fixtures shall be thermally protected using metal core board, gap pad, and/or internal monitoring firmware thermal management techniques.

(w) LED fixture housing shall be designed to transfer heat from the LED board to the outside environment.

(x) The equipment should be compliant to IEC 60598-1, IEC 62031 and IEC/ PAS 62612 depending on the type of luminary.

(y) All the material used in the luminaries shall not contain any toxic material and fire retardant confirming to relevant standards.

(z) The control gear shall comply to the provisions of IEC 61347-2-13-2014, IEC 62031-2018 and IEC 62384-2006 as appropriate.

(aa) LED luminaries, should conform to the various National / International standards for safety & performance. Manufacturer should provide test reports as per LM 79 & LM80. The test report from NABL accredited laboratory shall be submitted along with the technical proposal/ Bid for LED as well as Luminaires.

(bb) Outdoor LED fixtures shall meet lumen maintenance standards as per LM-80, pass water ingress testing, and pass general endurance testing.

(cc) All hardwired connections to LED fixture shall be reverse-polarity protected and shall provide high-voltage protection in the event that connections are reversed or shorted during installation.

(dd) In Rourkela the switching surges are expected in the power supply system. Appropriate surge protection shall be provided by the CONTRACTOR for all the Luminaires offered by it. Such protections can either be provided centrally at the Feeder Pillar or at each individual luminaire level or a combination of both, as may be decided by the

CONTRACTOR. No claim for failure of Luminaires, on account of voltage surges other than Lightning surges, will be considered.

(ee) The Luminaires shall be suitable for operation within the input supply voltage range specified. The driver of the light should be able to sense and cut-off power to the light in case of phase-to-phase/ 440 V fault. No claim in this regard shall be considered.

(ff) The lighting fixtures offered shall comply with the data sheet.

(gg) The luminaire shall have a warranty period of 5 years.

(hh) The CONTRACTOR shall develop and submit as built drawings of entire electrical system and operational manuals for all the fixtures installed to RSCL or its representative after the completion of work.

(ii) All Luminaries under CONTRACTOR's supply scope shall be guaranteed against quality (including any component failure and deterioration/appearance of corrosion symptoms. This shall also cover any fading (reduction)/ deterioration of reflector coating). In such case the defective luminaire shall be replaced without any cost. In case identical defects are observed on more than 5% of particular type of luminaire (installed quantity), then the complete lot of supplied/ installed luminaires of similar type shall be replaced free of charge).

(jj) Offer shall include comprehensive technical details of the luminaires being offered. The details must be sufficient to take in to consideration maximizing of energy efficiency and minimizing overall power consumption.

5.2 DECORATIVE LIGHT POLE

(a) The Product should be designed for the specific climatic and environmental conditions of the region to ensure full durability and safety throughout its designed life.

(b) Poles shall be designed to withstand the maximum wind speed as per IS 875-1987(Reaffirmed1997). The top loading i.e. area and the weight of fixtures are to be considered to calculate maximum deflection of the pole and the same shall meet the requirement of BS EN 40-3-3:2013.

(c) The pole shaft shall have octagonal cross section and shall be continuously tapered with single longitudinal welding. There shall not be any circumferential welding of the pole shaft. The welding of the pole shaft shall be done by Submerged Welding process.

(d) All decorative pole shafts shall be provided with the rigid flange plate of suitable thickness with provision for fixing minimum 4 foundation bolts of size not less than M24. The base plate shall be fillet welded to the pole shaft at two locations i.e. from inside and outside.

(e) All poles shall be decorative type.

(f) The materials of the pole as follows:

- Pole - Conforming to grade S355J0,
- Base Plate: - Fe 410 Conforming to IS 226-1975(Reaffirmed1983)/ IS 2062-2011,
- Foundation Bolts: - 6.8 Gr. as per IS 1367-2002,
- Ring Type Bracket
- Pole Sections: - The Octagonal Poles shall be in single piece with single longitudinal welding joint,
- Galvanization: - The poles shall be hot dip galvanized as per IS 2629-1985 (Reaffirmed1994) / IS 2633-1986 (Reaffirmed2006) / IS 4759-1996 (Reaffirmed2006) standards with average coating thickness of 65 micron. The galvanizing shall be done in single dipping. The zinc Ingot raw material shall be 99.99% pure and procured from reliable sources with Quality Test Certificates.

(g) The pole manufacturing & galvanizing unit shall be ISO 9001: 2000 & ISO 14001 certified to ensure consistent quality & environmental protection.

(h) The poles shall have integrated Junction box with openable door of adequate size at the elevation of 750 mm from the base plate. The door shall be hinged type with mechanical interlock, dust proof, weather proof and vandal resistant and shall ensure safety of inside connections and components. The door shall be flush with the exterior surface and shall have suitable locking arrangement. The pole shall be adequately strengthened at the location of the door to compensate for the loss in section.

(i) The door of the Junction Box shall permit clear access to the components inside viz., termination strips, connectors, MCBs, cables etc. There shall also be suitable arrangement for the purpose of earthing.

(j) For Light poles four-way connectors shall be provided along with Slide lock suitable for connecting 1.1 kV grade, minimum 4 core X10 sqmm AL cable. It shall also inhouse DP MCB's of suitable size, 2.5 sqmm connectors for looping with 2.5 sqmm Copper wires for connecting to the luminaries through 1.1 kV grade, 3 core X 2.5 mm² PVC insulated copper conductor flexible un-armoured Cable from the terminal block to the fixture within the pole. All the cables laid through the pipe shall be without any joint. The final sizes of cable shall be selected based on the voltage drop limitation.

(k) Two nos. Earth Buss shall be provided at the bottom of the pole (diagonally opposite) suitable for connecting 25X6 mm GI/ CU earth strip or 8 SWG wire for earthing of the poles. Similar Earth Buss suitable for connecting 4 sqmm copper wire shall be provided on the control plate inside the Junction Box for earthing of the electrical components.

(l) Two nos. 40mm DWC HDPE pipe sleeves of suitable length shall be provided through the foundation upto the Junction Box for entry of power cable.

(m) Earthing of 5 set of pole shall be carried out with one dedicated earth electrode. The earth electrode shall be GI pipe electrode as recommended in the latest version of IS 3043-2018. The earth electrode shall be connected with GI strips to the two distinct earth bosses on the pole. Poles of each set shall be inter connected with minimum 8 SWG GI wire.

(n) Aesthetic appearance - All the grooves and carvings of the pole unit shall be free from any kind of distortion for a pleasing aesthetic appearance.

(o) The Poles shall be bolted on a pre-cast foundation with a set of foundation bolts of size not less than M24 for greater rigidity.

(p) All the material/equipment/accessories shall be supplied with manufacturer's test certificates.

(q) BIDDER shall submit the Proposed Product Catalogue, Detail Data sheet, spare parts list and drawing of Pole & accessories along with the BID for each product quoted.

(r) BIDDER shall arrange for all the tools and equipment's.

(s) Concrete foundations shall be provided for all the light poles as per design criteria mentioned for Civil work above.

5.3 DISTRIBUTION BOARDS

5.3.1 Applicable Standards:

The design, manufacture and performance of equipment shall conform to the latest standards specified below,

Sr. No.	Brief Title	IS/IEC Code
1.	Metal Enclosed Switchgear	IS 3427-1997 (Reaffirmed2002)
2.	Miniature Circuit Breakers	IS 8828-1996 (Reaffirmed2006)
3.	Low Voltage Fuses	IS 13703-1993 (Reaffirmed2004)
4.	Control Switches & Push button	IS 6857-1972
5.	Current Transformer	IS 2705-1992 (Reaffirmed 2002)
6.	Voltage Transformer	IS 3156-1992 (Reaffirmed 2002)
7.	Indicating instruments	IS 1248-2003

5.3.2 MDB, LT Outdoor Lighting Feeder Pillar shall be Outdoor type, Steel Support/foundation mounting, Weatherproof, double door, single front, compartmentalized enclosure with locking facilities.

5.3.3 Feeder Pillars (FP) shall be Outdoor type, Steel Support/foundation mounting, Weatherproof, double door, single front, compartmentalized enclosure with locking facilities.

5.3.4 Feeder Pillars (FP) shall be made of Galvanised sheet steel enclosure. All the feeder pillars shall be Outdoor type with permanent rain canopy and shall be dust, damp and vermin proof. All feeder pillars shall conform impact resistance of IK7 and above and shall be minimum IP55.

5.3.5 Feeder Pillars (FP) and LDB shall be provided with compartmentalized enclosure. One separate compartment shall be for Incomer, incoming cable and Busbar. One separate compartment for outgoing MCB's. One separate compartment for outgoing terminals and cables.

5.3.6 Feeder Pillars (FP) and LDB shall be of sheet steel enclosed and shall be fully dust and vermin proof, with canopy. The sheet steel used shall be cold rolled and min 2 mm thick. The gland plate shall be min 2mm thick.

5.3.7 The fabricated enclosure shall not have any welds or bolt heads apparent from outside. All fabrication work like cutting, drilling, punching, shearing & welding etc. related to the enclosure shall be complete before proceeding to 7 tank process. The fabricated body shall be thoroughly cleaned and treated by chemical agents as required to produce a smooth surface free of scales, grease and rust.

5.3.8 The LT Panel (MDB) shall consist of Incoming Four Pole (FP) MCCB with Thermal magnetic OL, SC and E/F release, phase indicating lamps. Metering shall be done as per TPWOCL specification.

5.3.9 The LT Feeder Pillar shall consist of Incoming Four Pole (FP) MCB + FP 30mA RCCB with Thermal magnetic OL, SC and E/F release, phase indicating lamps. However, the Outgoing shall have at least 5 numbers FP MCB. The panel shall comprise of Copper bus bar with the incomer having digital ammeter, digital voltmeter, indication lamps, selector switches.

5.3.10 The LT panel (MDB) shall have cable entry at the bottom suitable for terminating double compression glands for minimum 1 Run of 3.5 C X 50 sq.mm Aluminum conductor, XLPE insulated armoured cable at the incoming terminal. The LT Feeder Pillar shall have cable entry at the bottom suitable for terminating double compression glands for minimum 1 Run of 3.5 C X 16 sq.mm Aluminum conductor, XLPE insulated armoured cable at the incoming terminal and minimum 5 Runs of 4 core 10 sq.mm. Aluminum conductor, XLPE insulated armoured cable at the outgoing terminal.

5.3.11 The Indoor LDB shall be a 2+4way 240V MCB DB comprising of Incoming of 1 no DP RCBO, phase indicating lamps and the Outgoing shall have at least 6 nos DP MCBs. It shall have cable entry at the bottom suitable for terminating double compression glands for minimum 1 Runs of 3 C X 10 sq.mm Copper conductor, XLPE insulated armoured cable at the incoming terminal and minimum 6 Runs of 2 core 4 sq.mm. Copper conductor, XLPE insulated armoured cable at the outgoing terminal.

5.3.12 There shall be balance distribution of load among the panels. Load on each circuit shall be equally distributed.

5.3.13 All MCCB/MCBs/ RCBOs/RCCBs shall be comply with the relevant IS and IEC standards. It shall be current limiting type and shall provide a cut off in, < 10 ms for prospective currents during

faults. It shall be provided with fixed thermal overload, short circuit and earth fault release as appropriate. The breaking capacity of the MCB shall be 10KA for 1 sec.

5.3.14 Both the doors shall have panel type lock with keys in duplicate as per the requirements of the RSCL.

5.3.15 LT panel (MDB) provided shall be of uniform height and shall be mounted/wall at Floor in electrical room (Indoor). All the LTDB and outdoor panels provided shall be of uniform height and shall be mounted with the bottom of the panel at minimum 500mm above the Finished Ground or Floor level as the case may be supported with metal structure and foundations.

5.3.16 A danger notice board written in English, Hindi and Odia shall be made of 2mm thick GI plate and shall be provided on the front door of the feeder pillar.

5.3.17 The power and control components are as listed below;

- Copper bus bar with SMC support insulators shall be provided for power distribution within the feeder pillar. The size of phase and neutral shall be equal.
- All connecting power & control wiring shall be carried out with stranded copper conductor PVC insulted wires. Minimum size of control wiring shall be 1.5 sq. mm and power wiring shall be 4 sq. mm.
- An Aluminium / GI Earth bus shall be run at the bottom of the Feeder Pillar which shall be connected to the earth leads at the two extreme ends for connecting the GI earthing strip from the electrode.

5.3.18 The LTDBs and outdoor panels shall be mounted on prefabricated Galvanised Steel Support structure duly fastened with a concrete foundation with M20 concrete suitable to sustain the local geological conditions, seismic conditions and max wind speed requirements.

5.3.19 Painting:

(a) All sheet steel work shall be paint through 7 tank electrostatic powder coating process in accordance with the required procedure and with the applicable standards. The DB enclosures shall be powder coated with shade as per RAL-7032.

(b) The final finished thickness of paint film on sheet steel enclosure shall not be less than 80 microns. Finished painted appearance of equipment shall present an aesthetically pleasing appearance, free from dents and uneven surfaces.

5.3.20 Earthing

(a) Al/ GI earth bus bars of adequate size shall be provided for the entire length of the panel. The framework of the enclosure shall be connected to this earth bus. Provisions shall be made for connection form this earth bus to the main earthing bus bar coming from the earth pit on both sides of the DBs.

(b) The earth continuity conductor of each incoming and outgoing feeder shall be connected to this earth bus bar. The armour of cables shall be properly connected with earthing clamp and the clamp shall be ultimately bonded with the earth bus bar.

5.3.21 Cable Entry:

(a) The DBs shall have provisions of cable entry from bottom. The removable cable gland plate shall be provided to make entry dust and vermin proof.

(b) The DBs shall have provisions for fixing the multi-core cable glands.

(c) The cable glands support plates shall be 3 mm thick.

(d) Cable entries to the DBs shall be from the bottom unless otherwise specified. Cable gland shall be double compression screwed type and made of brass.

5.3.22 Molded Case Circuit Breakers (MCCB)

(a) The MCCBs shall conform to IEC 60947 & the latest applicable standards.

(b) All MCCBs shall be of fixed type unless otherwise specified in the specifications elsewhere.

(c) MCCBs shall be of four pole with neutral construction arranged for simultaneous four/ three-pole manual closing and opening and for automatic instantaneous tripping on short circuit.

(d) The ON, OFF and TRIP positions of the MCCB shall be clearly indicated by using LED indications.

(e) MCCBs shall be with ICS = ICU = 100%

(f) MCCB shall be capable of withstanding the thermal stresses caused by overloads and the mechanical stresses caused by the peak short circuit current of value associated with the switch gear rating.

(g) All the MCCBs shall be of current limiting type and shall provide a cut off in 4-8 milli seconds for prospective currents during faults.

(h) All the MCCBs shall be provided with rotary operating handle with door interlock.

(i) MCCB terminals shall be shrouded and designed to receive cable lugs for cable sizes relevant to circuit ratings.

(j) All MCCBs shall be provided with additional 2 NO + 2 NC contacts, exclusively for Purchaser’s use.

5.3.23 Power & Control Wiring Connections:

(a) Terminals for both incoming and outgoing cable connections shall be suitable for 1.1kV grade Al/ Cu conductor XLPE armoured cable and shall be suitable for connections of solder less sockets for the cable size.

(b) Both control and power terminals shall be properly shrouded. Power terminals shall be of stud type.

(c) 20 % spare terminals shall be provided on each terminal block. Sufficient terminals shall be provided on each terminal block so that not more than one out going wire is connected to per terminal.

(d) Suitable barriers of enclosures shall preferably separate terminals strips for power and control from each other.

(e) Wiring inside the modules for power, control, protection and instruments etc shall be done with use of 1.1 kV grade, multi stranded Cu, PVC FRLS wiring.

(f) Wires for connection to the door shall be flexible. All conductors shall be crimped with solder less sockets at the ends before connections are made to the terminals.

(g) Particular care shall be taken to ensure that the layout of wirings is neat and orderly. Identification ferrules shall be filled to all the wirings terminations for ease of identification and to facilitate checking and testing.

(h) Washers shall be used for all Copper and Aluminum connections.

(i) Final wiring diagram of power and control circuit with ferrule nos shall be submitted along with the DBs as one of the documents against the contract.

5.3.24 Terminals:

(a) The outgoing terminals and neutral shall be brought to a cable alley suitably located and accessible from the panel front.

(b) The current transformer for instruments metering shall be mounted on the disconnecting type terminal blocks. No direct connection of incoming or outgoing cables to internal components of the distribution board is permitted; only one conductor may be connected in one terminal.

5.3.25 Current Transformers:

(a) Current transformers shall be of cast resin type. Insulation Class shall be Class 'E' or better.

(b) Unless otherwise specified, the minimum performance requirement of current transformers is as follows:

- Measuring CTs -Burden as per requirement with 20% buffer, accuracy class 1.0.
- Current transformer (CT) shall have polarity markings indelibly marked on each transformer and at the lead terminations at the associated terminal block
- CT shall be able to withstand the thermal and mechanical stresses resulting from the maximum short circuit current
- Test links shall be provided in both secondary leads of the CTs to easily carry out current and phase angle measurement tests.
- Identification labels giving type, ratio, output and serial numbers shall be provided.

5.3.26 Indicating Lamps shall be, Clustered LED type and of low watt consumption.

5.3.27 Junction Box

(a) 3 way junction boxes with terminals shall be provided for branching and terminating lighting cables when required for Landscape area lighting.

(b) The junction boxes shall be dust and vermin proof and shall be made up of Thermoplastic with removable cover plate, two earthing terminals each with nut, bolt and washer. Boxes shall be additionally weather proof. The Junction Box shall have ingress protection of IP67.

(c) The boxes shall have provision for wall, column, pole or structure mounting or buried underground and shall be provided with cable/conduit entry knock outs, terminal blocks, as required.

(d) The terminal blocks, with specified number of terminals, shall be mounted securely on brackets welded to the back sheet of the box. The terminals shall be 1100 V, grade, one piece construction complete with terminals, insulation barriers, galvanised nuts, bolts and washers and provided with identification strips of PVC. The terminals shall be made of Copper alloy and shall be of box clamp type.

5.4 CABLING SYSTEM

5.4.1 All the LV Power cables shall be 1100V grade, multi-stranded, Al / Copper conductor, XLPE insulated, extruded inner & outer PVC sheath compound type ST2 and galvanized steel strip armoured cables.

5.4.2 All cables shall conform to IS 7098 –Part I-1988 (Reaffirmed 2003) and all armouring shall confirm to latest version of IS: 3975-1999.

5.4.3 For all LT power and control cables, double compression glands with aluminium lugs for Aluminium cables and tinned Copper lugs for Copper cables shall be used in indoor and outdoor application.

5.4.4 The termination shall be inclusive of miscellaneous items such as clamps, cleats, cable tags, cable markers etc.

5.4.5 In general cable installation works shall be carried out in accordance with IS 1255 – 1983 (Reaffirmed 1996).

5.4.6 For Underground cables, all cables shall be laid in HDPE and DWC pipes laid by excavation. The top of the pipe shall be at least 1000mm below the finished ground level. There should not be any joints between two lighting fixtures.

5.4.7 Separate cables shall be provided for Pathway lighting, tree lighting and area lighting. The cables shall be laid in HDPE pipe of size not less than 40 mm by excavation 750mm below finished ground level.

5.4.8 The Cables for Pathway/ Walkway lighting shall be laid in the Conduit.

5.4.9 LTDB incoming cables shall be provided in Double walled corrugated pipes (DWC) of size not less

than 110 mm by excavation 750mm below finished ground level.

5.4.10 Cables within the Landscape area shall be laid buried in DWC pipe not less than 40mm dia. The cables shall be looped between the fixtures with the help of Junction box.

5.4.11 Cable Glands

(a) Double compression type cable glands with rubber hoods shall be used for the termination of all the power and control cables. Cable glands shall be brass casting, machine finished and Nickel-plated to avoid corrosion and oxidation. Rubber components used in cable gland shall be of neoprene.

(b) For single core cables, gland shall be with brass ring.

(c) Cable glands shall be with metric threads.

(d) Cable glands shall be conical (& not flange type).

(e) All glands shall be provided with rubber hoots.

5.4.12 Cable Lugs

(a) Cable lugs shall be of tinned Copper, solder less crimping type for Cu cables & Al lugs for the Al cables.

(b) The current rating of the lugs shall be same as that of the respective cable conductors.

(c) Ring type cable terminations shall be used.

(d) Insulated lugs are not acceptable for any cable terminations.

(e) Bi-metal strip/ Bi-metallic lug shall be used whenever two different metals are to be connected together.

(f) Fork terminals shall be used for luminaries& decorative switch/ socket. Pin terminals may be acceptable during execution only in case other terminals/ lugs cannot be accommodated.

(g) Reducer / wire pin terminals shall be avoided for MCB terminations. MCB terminations shall be with ‘long palm terminals.

(h) All terminations in Feeder Pillars / enclosure for earthing & neutral busbars / terminals shall be with ring type terminals.

(i) All earthing terminations shall be with ring type lugs only.

(j) All control & interlock cable terminations shall be with ring type lugs.

(k) Anticorrosion/ anti-oxidation compounds shall be used for crimping lugs. This shall especially be ensured for Al cable terminations & any bimetallic terminations (Cu cable termination using tinned Copper lugs).

5.4.13 If termination is done with crimping tool employing crimping die then forming dies shall be used to make the sector shaped conductor into a round conductor before crimping the lugs on the conductor. The lug must not be crimped directly on the sector conductor. Before crimping the lug, the conductor shall be thoroughly cleaned and special jelly applied over it to prevent further oxidation.

5.4.14 Point Wiring

(a) Point wiring work shall include the, PVC conduit, joints, connectors, conduit accessories, FRLS PVC insulated stranded copper conductor wires and earthing wires, pull boxes, ceiling rose, clamps, cleats, hardware, accessories, anchor fasteners, modular switch boards with cover plates, switches, sockets, box, blank plates, receptacles and all other necessary accessories as per specifications etc.

(b) Wiring shall be done in wire colour codes. Colour code of wire for Phases, Neutral and Earth shall be separate. The necessary connector if found required for looping of wires from one switchboard to another switchboard shall be included in the scope.

(c) Lighting fixtures and toilet exhaust fans shall be grouped on the single circuit wherever required. However, separate circuits shall be used for receptacles wiring.

(d) Wires of the different phases shall not be laid in the same conduit.

(e) Switchboard shall be recessed mounted.

(f) The switch boxes, receptacle boxes etc. shall be made up of 16 SWG sheet steel.

(g) The wire and cable indicated below for distribution of the power are the minimum requirement. The CONTRACTOR shall arrive at the actual size based of the design criteria mentioned above.

(h) Point wiring in the Shops, Electrical room, Admin office, Ticket & information centre and Public Toilet block shall be done as per the following points,

- Point Wiring for the luminaries from the DB to the switchboard and from the switchboard to the luminaries shall be done with 750V grade min 2.5 Sq.mm (2Nos.-Ph.+N) & 1.5 Sq.mm (for earthing of socket) PVC insulated, multistrand Cu conductor flexible wires running through 25mm inner dia.1.6mm thick, black stove enamelled painted PVC conduit running concealed/exposed in false ceiling and concealed on brick wall

- Point Wiring for the 6A Raw power socket from the DB shall be done with 750V grade 2.5 Sq.mm (2Nos.-Ph.+N) & 1.5 Sq.mm (for earthing of luminaire) FRLS PVC insulated, multistrand Cu conductor flexible wires running through 25mm inner dia.1.6mm thick

black stove enamelled painted PVC conduit running concealed/exposed in false ceiling and concealed on brick wall.

5.5 EARTHING SYSTEM

5.5.1 Applicable Standard:

The general design shall be on the basis of following codes and standards (their latest amendments) in line with design criteria & specification requirements.

(a) IS 3043-2018 –Code of practice for Safety Earthing

(b) Central Electricity Authority (CEA) Regulations – 2010

(c) National Building Code 2016

The maximum values of earth fault current for the design of the earthing system shall be calculated as per the design criteria.

5.5.2 The design basis for designing earthing conductor is indicated under design criteria for electrical system.

5.5.3 GI Pipe electrodes shall be provided for all the equipment and system earthing.

5.5.4 The earth plate shall be buried in specifically prepared earth pit 3 mtr. below ground with alternate layers of charcoal and salt, 40 NB GI pipe with funnel with a wire mesh for watering and bricks masonry block CI Cover complete as per IS 3043-2018 with necessary length of double Copper earth flat bolted with lug to the plate complete connected to the transformer neutral with end socket as per direction and duly tested by earth tester conforming to IS as per drawing and specifications complete with 600 x 600 x 3.15 mm Copper earth plate or as specified by CEIG.

5.5.5 Earth electrodes shall be of heavy duty galvanized mild steel pipe of not be less than 40 mm NB or as specified by CEIG. The earth electrode shall be complete with alternate layers of charcoal/ coke, salt and Black cotton soil; GI pipe with meshed funnel for watering; brick masonry block and CI Cover, with necessary test link conforming to IS 3043-2018 or as specified by CEIG.

5.5.6 The minimum spacing between two adjacent earthing pits shall not be less than 3000mm and shall be kept 1500 mm away from footings of the structure.

5.5.7 Earthing chamber shall be of RCC/ brick chamber of 600 mm x 600 mm, with hinged cast Iron chequered cover plates. The covers shall have holes for handling. Earthing pits (chambers) shall be painted Green and the earth-pit number shall be marked on it.

5.5.8 Two separate earth pit shall be provided to outdoor feeder pillars with earth flat. Size of the flat shall be determined with respect to fault level.

5.5.9 GI Pipe electrodes shall be provided 1 No. for every consecutive 5 light poles and stone column lights as per IS 3043 - 2018 or better. Electrode shall be connected to the equipment by two runs of GI strip laid in HDPE/ DWC pipes. Size of the flat shall be determined with respect to fault level. Minimum 8 SWG wire looping shall be done for the group of 5 light poles/stone column lights.

5.5.10 Minimum 8 SWG GI wire shall be carried along with the cable in the HDPE pipe laid for

distributing power to the landscape area.

5.5.11 Wherever earthing conductor passes through HDPE pipe, sleeves shall be provided. Both ends of the sleeve shall be sealed to prevent the passage of water through the sleeves.

6.0 MAKE LIST

Sr. No	Description	Approved Make
1	Decorative Lighting Pole	Bajaj/ Philips/ Valmont/ Neozone/ transrail or Equivalent
2	LED Chip	Cree, Osram, Nichia, Philips Lumileds or Equivalent
3	Lighting Fixtures	Philips/ Ligman/ Wipro/ Bajaj/ Havells/Lighting Technology or Equivalent
4	Cable	KEI/ POLYCAB / Universal / RPG/ Equivalent
5	Gland/Lugs	As per OPWD Approved list or Dowells, Commet, Connectwell or Equivalent
6	Earthing Material	As per OPWD Approved list
7	MCCB , MCB, RCCB, RCBO and other Switchgears	Schneider, Siemens, ABB. L&T, MDS, Hager, Havells, C&S or Equivalent
8	Time Switch	L&T GIC, Siemens, Schneider, Legrand, Hager, ABB, Havells, C&S or Equivalent
9	Energy meter, MFM	L&T (Quasar) or Equivalent
10	Contactor and other switchgears	L&T, Siemens, Schneider, ABB or Equivalent
11	HDPE/ DWC Pipe	Astral, Duraline, Alcorr or Equivalent
12	Junction Box	Hensel or Equivalent
13	LT Panels	As per OPWD Approved list

Note:-

(i) RSCL shall decide the above makes of the materials. The CONTRACTOR has to comply with the approved makes given in the tender document.

(ii) The CONTRACTOR shall offer the equipment of makes mentioned above. Other makes are subjected to Client approval before procurement.

(iii) Samples from all the approved makes shall be offered for selection.

7.0 LIST OF DRAWING AND DOCUMENTS

7.1 Following list of the documents and drawings shall be submitted to RSCL or its representative with Bid documents

(a) SLD of Power distribution

(b) Lighting Design & Calculations (Dialux IES Files shall be provided along with PDF)

(c) Bill of quantity of identified fixtures.

(d) UL/CE/BIS certification of selected luminaries.

(e) Test report of luminaries as per LM79 & LM80.

(f) NABL accredited test report of luminaries.

7.2 Following list of the documents and drawings shall be submitted to RSCL or its representative after award of contract,

7.3 **Calculations**

(a) Electrical Load List and demand Calculations

(b) Earthing Calculations for Electrical System

(c) Cable schedule with Sizing Calculations

(d) Lighting Calculations (Dialux IES Files shall be provided along with PDF)

7.4 **For Light fixtures and luminaries**

(a) Illumination Concept for each element

(b) Lighting Calculations for each Area - Dialux calculations, visualizations and glare control lumen maintenance. (Software Files shall be provided along with PDF)

(c) Type of Fittings, Soft Copy of Catalogues, Data Sheet, Polar Diagrams, Cone Diagrams, IES Files of the luminaries should be submitted

(d) Pictorial formations / digital renders themes/ Views from all angles and close ups using 3D software.

(e) Lighting layout of area as per application.

(f) Rendered view of identified fixtures.

(g) Bill of Quantities.

(h) UL/CE/BIS certification of selected luminaries.

(i) Test report of luminaries as per LM79 & L80.

(j) NABL accredited test report of luminaries.

7.5 **For Electrical equipment**

(a) Single Line Diagram for Power Distribution

(b) Equipment Sizing calculations.

(c) Cable layout, Earthing layout.

(d) Bill of Quantities

7.6 **MDB/LTDB/ Outdoor Panel/ LDB**

(a) GA Drawing

(b) Type test Certificate for Short Circuit withstand capacity

(c) Type test certificate for IP protection

(d) Door open view of Distribution boards

(e) Data sheet of major Equipments

(f) Wiring Diagram

(g) Bill of Quantities

(h) Makes Of Components offered

(i) Foundation drawings and supporting arrangement drawing

7.7 **Octagonal Poles**

(a) GA Drawing

(b) Type test Certificates

(c) Foundation drawings

7.8 **Construction Drawings of the following**

(a) Cable schedule

(b) Circuit distribution scheme

(c) Cable routing drawing

(d) Equipment Layout

(e) Power Distribution Scheme

(f) Switch Board Schedule

(g) Point Wiring Drawing for Lighting and power

(h) General arrangement of equipment Layout of the shops / rooms/ Landscape area/ Pathways/ Walkways.

8.0 DATA SHEET

a) For Indoor Luminaries-

Parameters	Requirements / Value
Type	LED Luminaries complete with all accessories for recess / surface / pendant mounting
Rated Voltage	240V
Operating Voltage Range	220-240 volt AC.
Frequency	50±3 Hz
Driver Type	Constant Current based Electronic Driver
Housing Material	Metallic CRCA Powder Coated Body/Extruded aluminum frame
Mounting	Recess/Surface Mounted
Optics	Symmetric
System Power Efficiency	≥ 85%
Operating Temperature Range	-20 Deg C to + 50 Deg C
Operating Humidity	10% to 90% RH
System efficacy	≥110 Lm/Watt
LED chip Efficacy	LM80 report, to be submitted.
LED Drive Current	>350 – <750 mA
Leakage Current	As per IEC 60598
LED Wattage	>1Watt & <3 Watt
Power Factor	≥0.95
Colour Rendering Index	≥70
Rated Minimum LED Life	50,000 Burning Hours
Driver Life	>50000 Burning Hours

Maximum temperature rise for the Driver	≤ 30 Deg C from ambient
Heat Sink Temperature	≤ 15 Deg C from ambient
Total Harmonics Distortion (THD)	<10%;
IP Protection	IP 20
IK protection for Optic Cover	>IK05
Minimum Surge Protection	>3kV
Protection Required in Driver Module	
Short Circuit	Yes; Constant current limit mode.
Over Voltage	Yes;
Over Temperature	Yes; Auto Shut Off.
Under Voltage	Yes;
String Open Protection	Yes;

b) For Post top Luminaries-

Parameters	Requirement
Type	LED Luminaries complete with all accessories for Pathway and Walkway Lighting
CCT	Minimum 3000K
Ingress Protection	IP65
Impact protection	IK07
Mounting	Pole top entry suitable for Luminaire mounting
Rated voltage	220-240V AC
Wattage	Not more than 45 W
Lumen O/P	≥85 Im/watt
CRI (typical)	70 (nominal)
Power factor	>0.95
Operating Voltage Range	140 V — 270 V at 50Hz (+/- 5%)
Working temperature	0 to +45 degree Centigrade

Housing Material	Die-Cast aluminium housing
Diffuser Material	Polycarbonate
Lifetime	50000 hrs @ L70 50 Degree C
Surge Protection	Minimum 5kV
Mandatory Certification	Luminaire should be UL/cUL/FCC/Class A/CE/PSE/BIS certified.
Mandatory test reports	LM-79,LM80
Image	

c) For Step Light Luminaries-

Sr. No.	Parameter	Requirement / Value
1	Type	LED Step Light Luminaires complete with all accessories for OAT and Children Area Lighting (6-7 Watt)
2	LED Chip Make	Nichia, Philip Lumiled, Osram, CREE
3	Rated Voltage	230-240 V
4	Expected Frequency	50 Hz +/- 3%
5	Operating Voltage Range	140 V to 270 V
6	Power Factor	> 0.90
7	Operating Temperature Range	- 10 Deg C to + 45 Deg C
8	Working Humidity	10% - 95% RH
9	LED wattage	>1Watt & <3 Watt
10	LED Driver Current	>=350 mA<750 mA
11	Driver Type	SMPS based Constant Current Electronic Driver
12	Driver Efficiency	> 85%
13	Luminaire IP Protection	IP66 or more
14	Min Surge protection required for luminaires	2.5kV
15	Rated Minimum LED Luminaire Life (L70)	35000 Burning Hours
16	CRI	>80

Sr. No.	Parameter	Requirement / Value
17	System Efficacy	Minimum 25 lm/W
18	Lumen Output	Minimum 180 lumens
19	Colour Temperature	3000K
20	Luminaire Housing	Pressure Die Cast Aluminium Housing
21	Diffuser	Clear Polycarbonate Cover
22	IK protection of Optic Cover	Not less than IK07
23	Wires used Inside Luminaries	Cu conductor, low smoke halogen free, fire retardant cable
24	Luminaire Picture	

d) For Focus Light Luminaries-

Sr. No.	Parameter	Requirement / Value
1	Type	LED Focus Light Luminaires complete with all accessories for Tree Up-Lighting (25 Watt)
2	LED Chip Make	Nichia, Philip Lumiled, Osram, CREE
3	Rated Voltage	230-240 V
4	Expected Frequency	50 Hz +/- 3%
5	Operating Voltage Range	140 V to 270 V
6	Power Factor	> 0.90
7	Operating Temperature Range	- 10 Deg C to + 50 Deg C
8	Working Humidity	10% - 95% RH
9	LED wattage	>1Watt & <3 Watt
10	LED Driver Current	>=350 mA<750 mA
11	Driver Type	SMPS based Constant Current Electronic Driver
12	Driver Efficiency	> 85%
13	Luminaire IP Protection	IP66 or more
14	Min Surge protection required for luminaires	4kV

Sr. No.	Parameter	Requirement / Value
15	Rated Minimum LED Luminaire Life (L70)	35000 Burning Hours
16	CRI	>70
17	Efficacy of Luminaries	Minimum 120 lm/W
18	Lumen Output	Minimum 2000 lumens
19	Colour Temperature	3000K
20	Luminaire Housing	Pressure Die Cast Aluminium Housing
21	Diffuser	High Quality Toughened Glass Clear Finish
22	IK protection of Optic Cover	Not less than IK07
23	Wires used Inside Luminaries	Cu conductor, low smoke halogen free, fire retardant cable
24	Luminaire Picture	

e) For Bollard Light Luminaries-

Sr. No.	Parameter	Requirement / Value
1	Type	LED Bollard Light Luminaires complete with all accessories for Pathway Lighting (8-9 Watt)
2	LED Chip Make	Nichia, Philip Lumiled, Osram, CREE
3	Rated Voltage	230-240 V
4	Expected Frequency	50 Hz +/- 3%
5	Operating Voltage Range	140 V to 270 V
6	Power Factor	> 0.90
7	Operating Temperature Range	- 10 Deg C to + 50 Deg C
8	Working Humidity	10% - 95% RH
9	LED wattage	>1Watt & <3 Watt
10	LED Driver Current	>=350 mA<750 mA
11	Driver Type	SMPS based Constant Current Electronic Driver
12	Driver Efficiency	> 85%
13	Luminaire IP Protection	IP65 or more

Sr. No.	Parameter	Requirement / Value
14	Min Surge protection required for luminaires	4kV
15	Rated Minimum LED Luminaire Life (L70)	50000 Burning Hours
16	CRI	>80
17	Efficacy of Luminaries	Minimum 100 lm/W
18	Lumen Output	Minimum 500 lumens
19	Colour Temperature	6500K
20	Luminaire Housing	Pressure Die Cast Aluminium Housing
21	Diffuser	Polycarbonate Diffuser
22	IK protection of Optic Cover	Not less than IK10
23	Wires used Inside Luminaries	Cu conductor, low smoke halogen free, fire retardant cable
24	Luminaire Picture	

f) For Batten Light Luminaries-

Sr. No.	Parameter	Requirement / Value
1	System Lumen	4K lm
2	System Power	40W
3	Length (mm)	4ft
4	System efficacy	>120 lm/W
5	Optical Cover	Diffuser
6	Power Factor	0.95
7	CCT	CW (6500K); NW (4000K)
8	CRI, SDCM	CRI >80, SDCM <5
9	Operating Temperature	Ta: 0-45ºC
10	IP Rating	IP20
11	Classification	Class 1
12	Input voltage	Fixed output; 140-270V, 50/ 60 Hz
13	Housing	CRCA
14	Lifetime (hrs.)	50,000 @L70B50
15	Serviceability	Class B
16	Driver	Fixed output/DALI/ PoE/SR
17	Dimensions	44 X 51 X 585(2 ft), 44 X 51 X 1157 (4ft, without Sensor) 44 X 51 X 1221 (4ft, with Sensors)
18	Mounting	Surfaced; Suspended (Symmetric/ Asymmetric)

Sr. No.	Parameter	Requirement / Value
19	Luminaire Picture	

9.0 PRE COMMISSONING TESTS ON ELECTRICAL SYSTEM EQUIPMENT TO BE CARRIED OUT AFTER INSTALLATION:

10.1 PRE-COMMISSION TESTS: Pre-commissioning tests in the specification requirements for various equipment but not limited to following shall be carried out by CONTRACTOR in presence of Purchaser/ Purchaser's representative. Commissioning shall be carried out only after obtaining satisfactory results, acceptable to Purchaser/ Purchaser's representative.

10.2 **LT Distribution Boards**:

(a) IR Values of power & control circuits.

(b) Interlocks circuits

(c) Indication / Panel space heater circuit

10.3 Power and Control Cables:

(a) IR Values

10.4 **Lighting System:**

(a) Visual inspection for operating problems

(b) System activation -burning in the lamps for 100 Hrs

(c) Measuring light level & reflectance.

10.5 **Earthing System:**

(a) Earthing resistance of each electrode.

(b) Overall earthing resistance of the system for a group which is interconnected.

SCOPE OF SERVICES FOR OPERATION AND MAINTENANCE (O&M)

1.1 SCOPE OF SERVICES

Scope of works includes Operation and maintenance of the entire developed area for a period of two years. However at end of each year, the employer will review and if felt necessary can foreclose the O&M period.

The entire operation and maintenance is classified into two categories based on the payment terms. One is fixed maintenance as per the detailed scope work mentioned in this chapter for which payment will be made as mentioned in the payment terms on regular basis. Another is variable maintenance. For this contractor will be reimbursed based on actual consumptions, Such as electricity bills , fuels cost for operation of DG set if any etc with due approval of Engineer – In-Charge and RSCL. For variable components employer will give in writing to the contractor of such list of works which is to be carried out under this head.

The operation activity includes basically operation of the installed facilities such as lighting works, water supply system.

The price for O&M bill shall include supply of all tools, tackles, maintenance spares, consumables as required, for the successful operation. The scope shall include but not limited to the following items:

i. Operation and Maintenance including Landscape, Hardscape, Softscape, Architectural and Civil, Electrical, Mechanical and all allied works.

ii. Repairs; Refurbishments & Replacement required during O&M period for satisfactory performance.

iii. Proper maintenance of all equipment installed

iv. Maintenance activities and consumables required to run the installed facilities and other elements shall be recorded and reports of the same are to be submitted for the approval of the employer. These reports shall contain sufficient appropriate and adequate data to make the records meaningful and amenable to analysis for evaluating the performance of the Contractor as well as to help in O&M decisions.

v. Security of the campus and contents therein shall be Contractor's responsibility.

vi. The Contractor shall be responsible for cleaning of the Project Area. At all times the installed equipment and Project Area shall be kept clean and in order.

vii. The records maintained by the Contractor shall be produced periodically to the Employer for proper monitoring. The Employer's remarks shall be attended to on next submission. Consolidated summary

reports shall be furnished to the Employer monthly, quarterly and yearly containing generalised salient features.

viii. The Contractor shall also maintain history sheets of overhauling, maintenance, replacement of all the important electrical and mechanical equipment.

1.2 GENERAL OBLIGATION

The Contractor shall operate and maintain the Project Area under this contract for the period specified in this contract.

The Contractor will submit a detailed operation and maintenance plan for approval of employer. All operation and maintenance activities shall be carried out strictly in accordance with the approved plan.

The services shall include but not be limited to the following items:

a) Training for the O&M staff designated by the Employer.

b) Generation and maintenance of periodic reports.

1.3 OPERATION

1.3.1 Operational Services

The Contractor shall operate the complete Project Area and associated services on a continuous 24-hour basis.

If it is determined that the facility is not capable of meeting the design parameters for any reason beyond the Contractor's control and not attributable to him, the Contractor shall determine the specific cause of failure/ abnormality in the functioning and report to the Employer and seek his directives on the necessary corrective action to be taken/adopted.

The Contractor shall keep the records for power consumption in the format prescribed by the Employer.

The Contractor at his own expense shall arrange tools and equipment for housekeeping and Safety & Security of project assets.

1.3.2 Manpower

The Contractor shall provide experienced technical staff and labour necessary to operate and maintain the project assets properly, safely and efficiently on a continuous 24 hour basis for the full term of the O&M period. While doing so due consideration shall be given to the labour laws in force.

The qualification and capability of Contractor's personnel shall be appropriate for the tasks they are assigned to perform. The staff provided shall be fully trained in the operation of the works before being given responsibility.

The contractor shall propose in his tender a staff management structure for the operation and maintenance of works.

The minimum manpower requirement shall be as given in Table – 1 below.

Table – 1

Sl. No.	Position	Minimum Qualification	Experience in Years	Proposed Minimum No. of Posts
1.	Electrician Technician	ITI (Elec.)	3	2
2.	Gardener / Mali	-	3	5
3	Sweeper			3
4.	Security Staff	Class 8 Pass	--	3
5	Plumber/MTS	ITI	3	1

The Contractor shall provide all secretarial support, printing and publishing services, office furniture and office supplies as per Employer's requirement. It shall also ensure that all labour welfare laws and regulations are followed, including weekly rests, rotation of duties

The O&M personnel shall be dedicated solely to the specified duties and responsibilities. Adequate supports staff shall be provided by the Contractor as per the requirement.

The Contractor shall include in his cost medical and accident insurance expenses of all the staff employed by him along with all provisions of the labour welfare acts prescribed from time to time by

the State and Central Government. Adequate insurance cover shall also be maintained during O&M period for all short-term employees, as well as casual, temporary employees and visitors.

Employer is not liable for any situation arising due to any accident/mishap of any nature.

1.3.3 Safety

The Contractor shall be responsible for safety of his staff during O&M of the Project Area and shall procure, provide and maintain all safety equipment necessary for satisfactory O&M such as gasmasks, gloves, boots, mats etc.,

1. The Contractor shall adopt safety procedures at all times at work.
2. The Contractor shall emphasize site safety including adoption of
   (a) Safe working procedures
   (b) Cleanliness and care of the premises as a whole
   (c) Accident and hazardous conditions prevention and reporting.

The Contractor shall impart safety training to all members at regular intervals, especially for inexperienced crew.

The Contractor shall provide Notice boards and display boards at appropriate locations detailing precautions to be taken by O&M personnel to work in conformity to regulations and procedures and by the visitors to the Project Area.

The Contractor shall notify the employer's representative immediately if any accident occurs whether on-site or off site in which Contractor is directly involved and results in any injury to any person, whether directly concerned with the site or a third party. Such initial notification may be verbal and shall be followed by a comprehensive report within 24 hours of the accident.

1.3.4 Reporting

The Contractor shall prepare consolidated daily reports, weekly and monthly reports on operation and maintenance activities and submit to the Employer. The daily reports are to be submitted within first working hour of the next day. The monthly reports shall be submitted on the first day of the next month and within two working hours with monthly record data to Employer.

Overall reporting formats shall be approved by Employer and may have to be modified from time to time as required and approved by Employer. Contractor may have to prepare and submit additional

reports on particular matters and incidents as and when required by the Employer for each significant occurrence.

1.4 TRAINING

1.4.1 General

a) The Contractor shall be responsible for instruction and training of all his personnel in all aspects of Plant operation and maintenance till the end of the operation and maintenance period. The Contractor shall also be responsible for training personnel designated by the Employer who will operate the Plant at the expiry of the contract.

The Contractor will make available for this purpose competent staff and as well as propose schedule information that may be necessary for effective execution of the training programs.

The training shall be organised as stated below:

Basic technical training education to be carried out during the final stages of the execution of work of the contract through literature, manuals, handouts demonstration at site, etc.

b) By the end of this training period these personnel should be able to carry out their respective duties efficiently under the supervision of Engineer-In-Charges and supervisory staff of the Employer.

The Contractor shall provide at his cost all local transportation, literature, computers, CDs and other related hardware and stationery to be used by trainers and trainees during the training period.

c) Towards end of O&M contract period, training shall be conducted once again to Employer's personnel or their authorized personnel. This training shall be for duration of 30 working days.

Operation and Maintenance Requirements:

1. Gardening and Landscaping

The Contractor shall prepare Operation and Maintenance plan to ensure long term health of the plants with good horticultural practices which will help to enhance amenity value of site, to help in nature conservation, to create new habitats, maximize wildlife value of the site.

Special emphasize to be given at visually important location such as entrances and gardens so that the planted groups will give good visual display

Maintenance of Soft Landscape elements such as Ornamental Shrub and Herbaceous, Trees, Hedgerow Planting.etc should be carried considering above mentioned aspects

Maintenance operations should also be refined over the life of the development to suit changes in growing needs of plant stock and improvements in equipment and horticultural aids.

Following important points shall be considered as a part of Operation and Maintenance requirements:

1.1 Establishment and Maintenance Programme:

As part of the contract, and to ensure successful establishment, the Contractor is to be responsible for the maintenance of all hard and soft landscape components during Maintenance period. The Contractor is responsible for, but not be limited to: the following maintenance tasks:

Ensure early establishment and healthy growth of all newly planted trees;

i. Establish and encourage a well-formed structure
ii. Ensure health and structure to mature trees;
iii. Watering plants as necessary (with particular attention to trees) to aid establishment during the early years after planting;
iv. Keeping planting areas generally free from weeds. At all times planted areas shall be kept clear of all litter and debris and the Contractor shall ensure that all paths are swept clean of debris. Soil and weeds are to be removed from hard surfaces
v. Leave the works in a clean tidy condition and after any maintenance operations;
vi. Appropriate herbicides will be used to control weed growth, in line with standard horticultural practice;
vii. General pruning and trimming as required ensuring footways, signs etc. are not obscured;
viii. All plants are to be encouraged to grow to their natural shape unless stated otherwise;

ix. Fertilizing of planting;

x. Replacing plants that fail where required;

1.2 Landscape Maintenance and Management:

Thinning of planting where required to allow healthy future growth

1. Standards of Workmanship:

The landscape maintenance is to be carried out to a high standard subject to the following

i. The contractor shall supply appropriately skilled and experienced operatives for the type and quality of the work and be familiar with this Maintenance manual. The contractor shall supply a suitable experienced and qualified supervisor, who shall attend the site at each and every visit.

ii. All operations necessary shall be carried out without unreasonable noise and disturbance. The landscape maintenance contractor will ensure that the works themselves do not cause inconvenience or danger to the users of the site.

1.3 Failure of Plant Material :

i. The Contractor shall replace, at his own expense, any tree, transplant, specimen plant, shrub or herbaceous material which has died or has not developed full foliage throughout its branches during Maintenance period . Replacements shall take place as early as possible during the planting season following the original planting period.

ii. All replacement plant material shall conform to the original Specification unless otherwise agreed in writing between the Contractor and the Employer.

iii. The Contractor shall make good at his own expense all necessary repairs to levels grassed areas and paving required because of plant replacements.

a. Soft Landscape Elements

General

a. **Cleaning & Upkeepment:** This pertains to general cleanliness wherein the entire garden and wooded area has to be kept neat & clean and under presentable condition throughout the contract period. This includes keeping the garden/ wooded areas free from any unwanted plants/grasses, papers, dry leaves, polythenes, mucks, stones or debris etc.

b. **Disposal of the Garden wastes:** The waste materials like cut grasses, dry leaves dry out plant materials etc. has to be properly disposed off and shall required to be dumped in suitable places for decomposition. The waste materials like cut grasses, dry leaves dry out plant materials etc. has to be properly disposed off and shall required to be dumped in suitable places for decomposition

c. **Mowing of grasses:** Mowing or cutting of the grass to be carried out regularly or as when required by keeping the height of the grass approx. not more than 2.5cm above the soil surface throughout the contract period.

d. **Watering:** Providing regular and continuous watering in adequate quantities to plantation and lawn areas including pot plants, seasonal flower beds from the water source points given inside garden area by client for the proper growth and development of all plants, seasonal plants, lawn grasses etc. throughout the contract period.

e. **Manureing of Plants:** Supply and application of manures to all plants, grasses, Rose plants, pot plants, seasonal flower beds in adequate quantity with well rotten cow dung manures or compost /as per the size and requirement of the plants twice in a year preferably once before the onset of monsoon and second during winter season.

f. **Application of Fertilizers & Other Nutrients:** Supply and application of DAP, MOP, Neem Oil Cake, Bone Meal, Oil Cake, Rally Meal etc twice in a year to all plants, Rose plants, lawn area including potted plants as per the need along with the cow dung manures.

g. **Termite Control:** Supply and application of anti-termite chemicals like Methyl Parathion or Chlopyriphos dust or Prorate 10G/ Thimet or its equivalent substitute to control termite infestations. Flooding of Chloropyriphos in the lawn area or plant basin with adequate water is also advisable to control severe termite infestation.

h. **Pests Control:** Supply and application of insecticides/pesticides for pest control measures during the incidence of pests/insects infestation or as and when required by applying suitable pesticides in appropriate proportion.

i. **Disease Control:** Supply and application of fungicides/ bactericides etc. for diseases control measures during the incidence of disease attack in plants or as and when required by applying suitable fungicides/ bactericides in appropriate proportion.

j. **Weed Control:** De-weeding of all unwanted plants throughout the garden area at regular interval or as and when required with the help of suitable tools so as to keep the entire area free of weeds.

k. **Intercultural operations:** Intercultural operations like hoeing and weeding to be carried out with the help of suitable tools as and when required for proper aeration by loosening the soil and drying it for few days followed by watering.

l. **Pruning & Trimming:** Pruning and trimming of plants to be carried out at regular interval or as when required to keep all plants like shrubs, hedges, Rose plants, ground covers etc. under desired shape and size.

m. **Training:** Regular training of plants to be carried out for giving plants and hedges desired shape and structure.

n. **Top Dressing of Lawn Grasses:** Mixture consisting of materials namely sweet earth, fine river sand, Cow dung or sludge manure, DAP, Neem Oil and Methyl Parathion are to be prepared and spread in the grassing area after mowing of grass once in a year preferably during winter season or as and when required followed by adequate watering to boost the growth of grasses.

o. **Application of Urea:** Supply and application of Urea in lawn areas as and when required as additional nutrition and for quick growth and greening of grasses.

p. **Growing of Seasonal Flowering Plants:** Supply and growing of seasonal flowering plants of different varieties by maintaining colour harmony in the earmarked or specified flower beds and in earthen pots inside garden premises for different flowering seasons.

q. **Maintenance of Pot Plants:** Raising of adequate numbers of pot plants for decoration purposes and maintaining them under healthy condition during the entire maintenance period including re-potting, intercultural operations, manureing, watering and keeping it under clean and aesthetic condition.

r. **Plantation Work:** New plantation if required arises due absence of proper maintenance/ watering.

s. **Security** : Provisioning of security personnel at entry, exist and inside the premises

b. <u>Ornamental Shrubs and Herbaceous:</u>

i. When planting shrubs ensure that all soil on sides and bottom of the pit are loose;
ii. Maintain healthy, vigorous shrub planting;
iii. Lightly clip over plants where required. Cut back flowering shoots after flowering;
iv. Water as necessary to secure healthy establishment and to avoid the need for replacement due to dry periods
v. Remove suckers, dead, discoloured, weak or damaged stems, cut back any stems obstructing paths etc. Prune to reduce size if suppressing adjoining species;
vi. Species specific pruning at appropriate time of year to promote healthy growth and species Specific shape and form. Ensure nursery's recommendations are followed for each particular species. Remove dead flowers to encourage repeat blooming;
vii. Ornamental grasses shall be cut back annually in spring before, or just as new growth appears to within 100-150mm of the soil level. Dead, dying or broken flower stalks to be trimmed off. If the centre of a clump dies out then it shall be dug up, divided and the healthy portion replanted. If the plant becomes too large it shall be divided into more manageable clumps and replanted;
viii. Apply a slow release fertiliser in spring;
ix. Fallen leaves and clippings are not to accumulate and shall be collected and removed from site;
x. Weed planting beds by the most appropriate means either by hand, mechanical and chemical use;
xi. Replace any failures of plants within the establishment period with immediate effect with the same species and size

c.Trees

i. Water as necessary to secure healthy establishment and to avoid the need for replacement due to dry periods (less than 30mm rainfall at the end of four week period);
ii. Inspect trees regularly for stem wounds, pests and diseases and treat early;
Prune dead, dying, crossing, rubbing and damaged branches and encourage new leader as necessary;
iii. Check aeration pipes regularly and clear debris as necessary;
iv. Fallen leaves are not to accumulate and shall be collected and removed from site;
v. Apply a slow release fertiliser in spring;
vi. Control rabbits or other mammalian pests. The contractor will submit a method statement for the approval of the Employer and Ecologist;
vii. Replace any failures of plants within the establishment period with immediate effect with the same species and size.

d. Surface Materials and Street Furniture

i. Mud, silt and debris is to be removed from all surface gutters and channels;
ii. Drainage gullies are to have traps emptied and flushed clean as required to prevent obstructions
iii. Any repairs to the hard surfacing is to be in accordance with the original paving specification;
iv. Fences and enclosures are to be maintained and inspected monthly and appropriate repairs undertaken as necessary;
v. Graffiti removal is to be carried out as soon as damage has been noticed. Method of removal is to be either air abrasion or chemical poultice, depending upon surface and is to be carried out in line with good practice
vi. Regular monthly maintenance inspections are to be undertaken of surface treatments for litter, debris and leaf removal (or snow clearance and de-icing in winter months) and repair defects when necessary;
vii. Inspect street furniture each month and maintain or repair in accordance with manufacturers' recommendations, taking out of commission dangerous or inoperable elements until repair works are complete;

e.Process for Monitoring and Review:

The Maintenance plan shall be reviewed periodically in consultation with Employer.

to fulfil the design and maintenance objectives during the maintenance period .

The review process is to ensure that the aims and objectives of the scheme are being achieved and maintenance operations should be refined over the period to respond to industry standards improvements and incorporating any additional operations required.

1.4 Annual Maintenance Operations Schedule

This table lists the key routine operations required during the Maintenance period after practical completion of the soft landscape treatments and should be used as a guide to timings of specific operations. The maintenance contractor should be prepared to undertake maintenance tasks as required throughout the maintenance period to satisfy objectives at the direction of the management organization.

General operations: (Monthly checklist)

Description	Remarks
1. Weed control (Daily if required, in Summer)	
a) Watering (all areas)	
b) Pest and disease control	
c) Pest and disease control	
d) Replanting operations	
e) Remove litter and debris	
f) Fertiliser and manure application	
g) Replacement planting (all plant types) As required	
2. Shrub & Ground Cover	
a) Inspections	
b) Groundcover Shrubs Trimming	
c) Shrubs Pruning Varies to suit species	
3. Trees	
a) Inspection	

Description	Remarks
b) Pruning and remedial work	

Note: This list is not definitive list, additional operations maybe be required and to be incorporated in consultation with Employer during Maintenance period

Before start of work, the Contractor shall submit Maintenance plan for review and approval of the Employer. Any required changes shall be incorporated in Maintenance plan. Employer reserves the right to impose penalty for failure of Contractor to carry out Maintenance as per approved Maintenance manual and as per Employers Requirements.

2. Electrical Works

All necessary repairs, maintenance, overhaul, replacements etc. shall be made during the O&M to maintain the Project Area at the status of formal handing over. At the end of O&M period the Project Area shall be handed over to the Employer in fully functional and new condition except normal wear and tear.

The scope shall include but not limited to the following items:

O&M shall be initiated from the next day of the issue of the completion certificate by RSCL.

The CONTRACTOR shall be responsible for up-keeping/maintaining/ repair/ replacement, comprehensively, of all the Luminaires, LT panels, cable and earthing systems during the tenure of the contract.

- During the Contract period, if any hardware needs to be replaced, the same will be replaced with same or better OEM and with same or higher configuration free of cost.
- The manpower and accessories required for O&M shall be provided by CONTRACTOR during relevant contract period.CONTRACTOR shall maintain a service team to take action immediately. The service team shall comprise of One Supervisor, One Electrician and one helper. The contractor shall be responsible for arranging replacement of manpower in case any of the team member is absent during the O & M period.
- The CONTRACTOR shall make provision for adequate number of minimum 3m high Self-Supporting Ladder with anti-skid pads at the footings along with sets of all the required tools and instruments, duly calibrated from NABL Accredited Laboratory, to meet the maintenance requirements as per service benchmark.
- The Non -availability of incoming power supply from WESCO shall be intimated by CONTRACTOR

within 24 hours. CONTRACTOR shall coordinate with WESCO on behalf of RSCL and RSCL shall facilitate as and when required to expedite the response.

- Any failure of luminaire due to lack of earthing, SPD, connector and loose connections shall be replaced by CONTRACTOR free of cost.
- The CONTRACTOR shall take adequate insurance to cover themselves for the cost of O&M during the tenure of the contract including the ones due to theft.
- All the electrical parameters and illuminance level shall be monitored with calibrated Power Analyzer and Lux meter and documented for records and analysis at regular interval – Minimum Twice annually.
- **Electricity charges and Connectivity charges shall be paid by Contractor to WESCO and reimbursed on actuals by RSCL.**
- All the necessary modifications that are required to be carried out for the efficient working of the system and minimise the breakdowns and issues shall be carried out by CONTRACTOR from time to time at its own cost.
- CONTRACTOR shall develop training material for the RSCL technicians, impart them training from time to time as may be decided by the RSCL.
- All the responsibilities related to replacement of LED fixtures / cables / other accessories shall be borne by CONTRACTOR in respect of cost, managing the technical problems and other related aspect during the tenure of the project.

B Service Level Benchmark

A service Level Benchmark for evaluating the performance of the CONTRACTOR shall consist of the following;

a. Resources – The CONTRACTOR shall maintain O&M team, tools and calibrated measuring and verification instruments as specified from the day one of the contract

b. System Uptime – The CONTRACTOR shall maintain sufficient resources and achieve minimum uptime of 95% on yearly basis (year period to be decided by RSCL) for the entire system, excluding the period of non-availability of power supply. The Uptime percentage shall be calculated based on the following formula;

Uptime % = (1-Downtime Hrs/Total Operational Hrs)*100

Total Operational Hrs is calculated based on lamp Burning Hrs per day - 12 Hrs.

Downtime Hrs = No of Operational Hrs. the Lamp is unavailable for operation from the time of Logging the Request by the consumer till the Request is closed in the system by the CONTRACTOR.

In Case the CONTRACTOR is not able to maintain the Uptime of the luminaires for Two Consecutive years, RSCL may consider termination of the Contract.

c. Energy Consumption – The energy consumed by the lamp shall not exceed more than as committed in the design report. CONTRACTOR shall guarantee the total energy consumption of the system for all the luminaires with respect to its design offered. The same shall be monitored and reported on regular basis as decided by RSCL. Any excess energy charges more than the guaranteed consumption shall be recovered from the CONTRACTOR. Any action required for mitigating the excess energy consumption may be immediately be taken up by the CONTRACTOR with the information to RSCL.

d. Lux Level – CONTRACTOR shall guarantee the Lux level based on Design output and offered Luminaire for each luminaire. There shall not be any reduction of the Lux level during the entire tenure of the contract period beyond the allowable depreciation curve. Illuminance of all luminaire shall be monitored regularly and reported to RSCL by measuring the Lux Levels of the Sample LED Luminaires from all the LOTs / Batches atleast once a year. Any reduction in the lux level shall be immediately investigated and corrective action shall be taken with information to RSCL.

In case a reduction in the Lux levels are established, all the Luminaires of the same LOT/ Batch offered in the project shall be investigated and rectified/ replaced if found faulty by the CONTRACTOR at its own cost within a period of time as may be agreed by RSCL.

3. Mechanical Works

Contractor's liability under operation and maintenance period

a. General:

1. It shall be the responsibility of contractor to ensure that the level of maintenance is immaculate, and quality of the works is consistent.
2. Contractor hereby covenants, represents and warrants to the client as under:
   i. It shall provide the services in strict compliance with all applicable laws and in accordance with all applicable permits, licenses and consents;
   ii. It shall not do or cause any act or omission that may affect the reputation or goodwill of the client.
   iii. The Services rendered shall be by persons employed or supervised by it;
   iv. It shall respond to any query related to the services within seven working days of receiving the same from the client.
   v. It shall have sufficient experience, qualification, resources and competent personnel to render the Services as stipulated herein;

vi. It shall render the Services during O&M period to the best of its skill and ability and in a competent, diligent and professional manner and in accordance with the provisions of this tender document;

vii. It shall faithfully and diligently perform those duties and exercise such powers consistent with it which are from time to time necessary in connection with proper O&M activities during the period.

viii. It shall comply and adhere with all lawful and reasonable directions of the client.

3. Contractor shall handle the works with utmost care and shall ensure that all the equipment and material required to run are all the time in best conditions.

4. Contractor agrees to indemnify and keep indemnified the client, its employees and agents from and against any action, liability, penalty, prosecution, notices, fines, investigation, cost, charges, expenses, damages or claim of whatsoever nature arising out of or resulting from any act attributable to contractor involving

i. any loss, damage, destruction or injury to any property whether real or personal of the client.

ii. any breach of the covenants herein contained or wrongful representations and warranties made by contractor

iii. any wilful misconduct or gross negligence in providing the Services.

5. If at any time during the tenure of the O& M period, contractor is unable to provide quality service and is not responsive to the requests and notices of the client to improve or continue work, the client reserves the right to get the work completed at the risk and cost of contractor and contractor shall, in addition, indemnify the client for the loss suffered by the client as a result of its failure to proceed with the Services.

6. The staff deployed by contractor on the property of the client shall be permitted to enter the property after they obtain the prescribed entry pass for the purpose of identification by the officer-in charge of the client. The personnel shall display this card, produce it on demand by the security personnel and the personnel/ contractor shall deliver all information and documents to the client whenever required by the client.

7. Contractor and/or any personnel deployed by contractor to the client shall be the employees of contractor and contractor shall accept sole liability for any personal injury to such personnel. Contractor shall be solely responsible for all the applicable labour laws compliances for the personnel deputed for providing the Services.

8. Contractor shall not assign or subcontract any part thereof to any third party without the written permission of the RSCL.

b. Conditions regarding taking over completed portion of work: -

During the progress of the work, completed portions of the work may be put to use by the Engineer-in-charge and the contractor shall remain fully responsible for maintenance of the work till the entire work covered by the contract is satisfactorily completed and a certificate of completion given by the Engineer in-charge. Maintenance of the work during the defect liability period shall be governed by the relevant clauses of conditions of contract.

c. Contractor liability for damages, defects during maintenance period

If the contractor or his working people or servants shall break, deface, injure or destroy any road, road kerb, fence, enclosure, water pipe, cables, drains, electric or telephone post or wires, trees, grass or grassland, or cultivated ground contiguous to the premises on which the work or any part is being executed, or if any damage shall happen to the work while in progress, from any cause whatever or if any defect, shrinkage or other faults appear in the work within twelve months after a certificate final or otherwise of its completion shall have been given by the Engineer-in-Charge as aforesaid arising out of defect or improper materials or workmanship the contractor shall upon receipt of a notice in writing on that behalf make the same good at his own expense or in default the Engineer-in-Charge cause the same to be made good by other workmen and deduct the expense from any sums that may be due or at any time thereafter may become due to the contractor, or from his security deposit or the proceeds of sale thereof or of a sufficient portion thereof. The security deposit of the contractor shall not be refunded before the expiry of 60 months after the issue of the certificate final or otherwise, of completion of work, or till the final bill has been prepared and passed whichever is later. Provided that in the case work, if in the opinion of the Engineer-in-Charge, half of the security deposit is sufficient, to meet all liabilities of the contractor under this contract, half of the security deposit will be refundable after 30 months and the remaining half after twelve months of the issue of the said certificate of completion or till the final bill has been prepared and passed whichever is later.

d. Safe keeping and maintenance of equipment

i. Safety, security, maintenance & insurance of the equipment and infrastructure at the site shall be responsibility of successful bidder during the implementation & maintenance of the project. Thereafter, it will be the responsibility of the concerned Department.

ii. The Bidder shall bear all the cost and expenses associated with onsite warranty and maintenance.

iii. No equipment shall be removed from the work site by the successful bidder without the concurrence of the department in writing including for purposes of replacement of spares, etc.

iv. All equipment once installed will not be taken away by the bidder in any case. RSCL has ownership rights on the entire infrastructure supplied and installed.

e. Maintenance of Fountains with landscape irrigation

Successful Bidder shall do the overall maintenance of fountains with landscape irrigation for that scope is including but not limited to following: -

1. Routine maintenance on daily basis, such that the performance of equipment, individually or collectively, is optimally at its best, as per initially commissioned deliverable and is in accordance with the contract.

2. Replacement of defective consumable during routine maintenance.
3. Successful Bidder will be responsible for maintenance or repair of any civil work including but not limited to collapse or leakage of pool, collapse of pump house or pump pit, theft or vandalism, natural deterioration and the actions of insects or animals.
4. Successful Bidder will be responsible for overall security of fountain or equipment installed therein and shall also be responsible for the results or liability of theft, damage or vandalism.

5. Successful Bidder will be liable for any direct or consequential loss or damage, injury or loss of life howsoever caused.
   a. Daily starting and stopping times and hours of operation.
   b. Supervisor and Authorized Officer to jointly sign the log book on weekly basis.
6. Successful Bidder shall supply Manpower (i.e. Technician/Operator/Gardener and Supervisor etc.at its own cost.
7. Successful Bidder shall provide each and every necessary Tools and Equipments to their Technician and Gardener required for the above maintenance at his own cost.

f. Spare parts:

While contractor shall maintain inventory of various consumables, type / quantity of which shall be derived based on the mortality rates of failure. No extra cost shall be payable to contractor in this regard.

g. Security of the site/material:

The Successful Bidder shall take all necessary measures to ensure security of the site, including exercising control over all persons and vehicles which are employed or engaged on the site or in connection with the Works or the other works comprising the Project and with the security arrangements applicable to any site within the Project. The contractor will have to ensure protecting the trees, plants, grass etc from damage up to maintenance period/handing over to RSCL. All works shall be executed strictly as per the OPWD specifications of the works and direction of Engineer-in-charge. Successful Bidder shall be responsible for any theft and shall make good at its own cost.

h. Operating and Maintenance Manuals

Contractor shall supply the as built drawings & operating and maintenance manuals by the dates stated in the document. If the Contractor does not supply the Drawings and/or manuals by the dates stated in the Contract data, or they do not receive the Engineer's approval, the Engineer shall withhold the amount stated in the Contract data from payments due to the Contractor.

4. Civil Works (Buildings)

The Contractor shall ensure that defects like dampness of walls, damage to RCC, brick work and plaster are rectified so that the building looks renovated and presentable

The Contractor shall carry out works of periodic maintenance like White washing, colour washing, distempering, painting etc. as frequency mentioned below:

SL No	Item	Priority
		Office Building
1	White Washing / Colour washing	1 year
2	Applying Dry Distemper	1 year
3	Painting with Plaster paint, Synthetic Enamel Paint, Oil Bond Distemper, Acrylic Paint, Acrylic Distemper	1 year
4	Painting External Surface with water proofing cement paint	1 year
5	Cleaning and Disinfecting of water storage /Distribution tanks water mains	6 months
6	Cleaning of toilets and public facilities	Daily

5. Road/Pavement/Paved areas/Pathway Works :

General

This section applies to carry out operation and maintenance of the facility in meeting its objective. The section pertains to the specifications of works including materials used for operation and maintenance, the workmanship, period for routine maintenance, specifications for the acceptable quality of works, maintenance of records, and responsibilities during operation and maintenance period.

Duties and Responsibilities

The Contractor shall operate and maintain the system on a regular and systematic basis, in compliance with designed / calculated operational index.

- The contractor shall manage system on day to day basis.
- The contractor shall ensure satisfactory operation and maintenance of the whole works.

Definition of Maintenance

Maintenance covers all the techniques and systems which, by means of regular monitoring of system, prevent problems, enable repairs to be carried out with the minimum disruption of the services.

Preventive Maintenance

Preventive maintenance consists of all the regular work carried out in order to sustain the conditions necessary or smooth operation of the system and to keep the system as close as possible to its original performance level.

Corrective or Remedial Maintenance

Corrective or remedial maintenance consists of all work needed to re-establish the conditions necessary for a system to operate properly subsequent to failure or deterioration of the system.

Maintenance work

The work consists of

- Inspection work that includes physical appearance, inspection to verify the system is in good condition or not.
- The inspection work shall be daily executed as a routine and /or regular inspection and shall be recorded each time. The evaluation on the collected data shall be immediately reviewed by the manager to instruct the staff member for operation on the same day and/or plan of detail inspection and/or make repair schedule accordingly.

Periodic works

(i) Monsoon repairs to paver blocks, slabs, attention to drains, rain water spouts.

(ii) External painting of grills/kerbs/medians, etc, and internal distempering, repairs roads within the project area as per the requirement and directions of Engineer-In-Charge.

(iii) Repairs to drains must be carried out during May to June except before monsoon

(iv) Road/ lane/ cycle track/signs/arrows marking shall be done periodically (as per the requirement and directions of Engineer-In-Charge)

Following repairs prior to onset of monsoon are essential:

1. Any faults in the electric installation, leakages, earthing, exposed wire ends, should be taken care of suitably, wiring, which is damaged or outlived, should be replaced.
2. Damaged sanitary lines should be replaced and choked lines cleared.
3. Proper drainage of the area should be ensured to avoid stagnation of rain water, in order to prevent malarial conditions. Any choked drains should be cleared properly.
4. Damaged Footpath, Hand rails, bollards, seating benches, sign boards, should be repaired/ replaced as per requirement.

6. Maintenance Requirements

(i) The Contractor shall, at all times maintain the Project in accordance with the provisions of this Agreement, Applicable Laws, Applicable Standers and Applicable Permits.

(ii) The Contractor shall repair or rectify any Defect or deficiency set forth in Contract Data of this Agreement within the time limit specified therein and any failure in this behalf shall constitute non-fulfilment of the Maintenance obligations by the Contractor. Upon occurrence of any breach hereunder, the Authority shall be entitled to effect reduction in monthly lump sum payment as set forth in payment schedule this Agreement, without prejudice to the rights of the Authority under this Agreement, including Termination thereof.

(iii) All Materials, works and construction operations shall conform to the OPWD. Where the specifications for a work are not given, Good Industry Practice shall be adopted.

Specify all the relevant documents

7.1 ***Repair/rectification of Defects and deficiencies***

The obligations of the Contractor in respect of Maintenance Requirements shall include repair and rectification of the Defects and deficiencies specified in Annex - I of this Para 7 Maintenance Requirements within the time limit set forth therein.

7.2 ***Other Defects and deficiencies***

In respect of any Defect or deficiency not specified in Annex - I of this Para 7 Maintenance Requirements, the Engineer-In-Charge may, in conformity with Good Industry Practice, specify the permissible limit of deviation or deterioration with reference to the Specifications and Standards, and any deviation or deterioration beyond the permissible limit shall be repaired or rectified by the Contractor within the time limit specified by the Engineer-In-Charge may,.

Extension of time limit

Notwithstanding anything to the contrary specified in this Para 7 Maintenance Requirements, if the nature and extent of any Defect or deficiency justifies more time for its repair or rectification than the time specified herein, the Contractor shall be entitled to additional time in conformity with Good Industry Practice. Such additional time shall be determined by the Engineer-In-Charge and conveyed to the Contractor and the Authority with reasons thereof.

Emergency repairs/restoration

Notwithstanding anything to the contrary contained in this Requirements, if any Defect, deficiency or deterioration in the Project poses a hazard to safety or risk of damage to property, the Contractor shall promptly take all reasonable measures for eliminating or minimizing such danger.

Daily inspection by the Contractor

The Contractor shall, through its engineer, undertake a daily visual inspection of the Project and maintain a record thereof in a register to be kept in such form and manner as the Engineer-In-Charge may specify. Such record shall be kept in safe custody of the Contractor and shall be open to inspection by the Authority and the Engineer-In-Charge at any time during office hours.

Pre-monsoon inspection / Post-monsoon inspection

The Contractor shall carry out a detailed pre-monsoon inspection of all bridges, culverts, Retaining wall, Electrical equipments/ system, ICT equipments, Buildings and drainage system, all other project assets before 1st June every year in accordance with the Standard guidelines contained in OPWD, Electrical, IT. Report of this inspection together with details of proposed maintenance works as required on the basis of this inspection shall be sent to the Authority's Engineer before the 10th June]every year. The Contractor shall complete the required repairs before the onset of the monsoon and send to the Engineer-In-Charge a compliance report. Post monsoon inspection shall be done by the [30th

September] and the inspection report together with details of any damages observed and proposed action to remedy the same shall be sent to the Engineer-In-Charge.

Repairs on account of natural calamities

All damages occurring to the Project on account of a Force Majeure Event or wilful default or neglect of the Authority shall be undertaken by the Authority at its own cost. The Authority may instruct the Contractor to undertake the repairs at the rates agreed between the Parties.

Annex – I

(7.Maintenance Requirements***)***

Repair/rectification of Defects and deficiencies

The Contractor shall repair and rectify the Defects and deficiencies specified in this Annex-I of Para *7.***Maintenance Requirements** within the time limit set forth in the table below.

Nature of Defect or deficiency		Time limit for repair/ rectification
Gardening and Landscaping		
(a)	**Carriageway and paved shoulders**	
(i)	Breach or blockade	Temporary restoration of visitor within 24 hours; permanent restoration within 15 (fifteen) days
(ii)	Pot holes	24 (twenty four) hours
(iii)	Any cracks in road surface	15 (fifteen) days
(iv)	Any depressions, rutting exceeding 10 mm in road surface	30 (thirty) days
(v)	Bleeding/skidding	7 (seven) days
(vi)	Any other defect/distress on the road	15 (fifteen) days
(vii)	Damage to pavement edges	15 (fifteen) days
(ix)	Removal of debris, dead animals	6 (six) hours
(b)	**Granular earth shoulders, side slopes, drains and culverts**	
(i)	Variation by more than 1 % in the prescribed slope of camber/cross fall (shall not be less than the camber on the main carriageway)	7 (seven) days

Nature of Defect or deficiency		Time limit for repair/ rectification
(ii)	Edge drop at shoulders exceeding 40 mm	7 (seven) days
(iii)	Variation by more than 15% in the prescribed side (embankment) slopes	30 (thirty) days
(iv)	Rain cuts/gullies in slope	7 (seven) days
(v)	Damage to or silting of culverts and side drains	7 (seven) days
(vi)	Desilting of drains	24 (twenty four) hours
(vii)	Railing, parapets, crash barriers	7 (seven) days (Restore immediately if causing safety hazard)
(c)	**Project site furniture including Project sign and pavement marking**	
(i)	Damage to shape or position, poor visibility or loss of retro- reflectivity	48 (forty eight) hours
(ii)	Repair of project side, railing, parapets, Retention wall, Boundary wall , Street Benches ,	As and when required/ Once every year
(iii)	Damage/missing to Project mark ups ,signs requiring replacement	7 (seven) days
(d)	**Trees and plantation**	
(i)	Replacement of death of Trees and plants	15 (days)
(ii)	Removal of fallen trees from pathway	4 (four) hours
(iii)	Deterioration in health of trees and bushes	Timely watering and treatment
(iv)	Trees and bushes requiring replacement	30 (thirty) days
(v)	Removal of vegetation affecting sight line and road structures	15 (fifteen) days
(e)	**Public Rest area**	
(i)	Cleaning of toilets	Every 4 (four) hours
(ii)	Defects in electrical, water and sanitary installations	24 (twenty four) hours

Nature of Defect or deficiency		Time limit for repair/ rectification
(f)	**Other Project Facilities and water pump**	
(i)	Damaged vehicles or debris on the road connecting to Riverfront	4 (four) hours
(ii)	Malfunctioning of the mobile crane	4 (four) hours

[Note: Where necessary, the Authority may modify the time limit for repair/rectification, or add to the nature of Defect or deficiency before issuing the bidding document, with the approval of the competent authority.]

7. Payment Reduction for Non-Compliance

1. ***Payment reduction for non-compliance with the Maintenance Requirements***

(i) Lump sum payments for maintenance shall be reduced in the case of non-compliance with the Maintenance Requirements set forth in Clause7 **Maintenance Requirements**.

(ii) Any deduction made on account of non-compliance with the Maintenance Requirements shall not be paid even after compliance subsequently. The deductions shall continue to be made every month until compliance is done.

(iii) The Engineer In-Charge shall calculate the amount of payment reduction on the basis of weightage in percentage assigned to non-conforming items as given in Paragraph 2.

2. ***Percentage reductions in lump sum payments on monthly basis***

(i) The following percentages shall govern the payment reduction:

S. No.	Item/Defect/Deficiency	Percentage
(a)	**Land Scape**	35%
(b)	**Civil**	25%
(c)	**Electrical**	20%
(d)	**Irrigation**	10%

S. No.	Item/Defect/Deficiency	Percentage
(f)	**Defects in Other Project Facilities**	5%
(g)	**Miscellaneous Items**	5%
(i)	Removal of dead animals, broken down/Damaged equipment's Sculptures, fallen trees, Park blockades or malfunctioning of equipments/things	50%
(ii)	Any other Defects in accordance with requirement.	50%

Note : **Payment deduction example:** Let Quarterly amount is "x". If landscape work not maintained as per requirement, then deduction amount will be 35% of "x".

(ii) The amount to be deducted from monthly lump-sum payment for non- compliance of particular item shall be calculated as under:

$$R = {}^{P}/_{100} \times (M1 \text{ or } M2) \times {}^{L1}/_{L}$$

Where,

P= Percentage of particular item/Defect/deficiency for deduction
M1= Monthly lump-sum payment in accordance above of this Schedule
M2= Monthly lump-sum payment in accordance above of this Schedule
L1= Non-complying length L = Total area of the project,
R= Reduction (the amount to be deducted for non-compliance for a particular item/Defect/deficiency

The total amount of reduction shall be arrived at by summation of reductions for such items/Defects/deficiency or non-compliance.

For any Defect in a part of one Sqm, the non-conforming length shall be taken as one Sqm.

PROCEDURE UNDER E-TENDERING

INSTRUCTIONS TO APPLICANTS

DEFINITIONS:

a) Tender portal: The e-Procurement Portal of Government of Odisha introduced for the process of e-Tendering which can be accessed on https://www.tendersodisha.gov.in.
b) Use of valid Digital Signature Certificate of appropriate class (Class II or class III) issued from registered certifying authorities (CA) as stipulated by Controller of Certifying Authorities (CCA), Government of India such as n- Code, Sify, TCS, MTNL, e-Mudhra is mandatory for all users.
c) For all purpose, the server time displayed in the e-Procurement portal shall be the time to be followed by all the users.
Words in capital and not defined in this document shall have the same meaning as in the Request for Proposal ("BID").

1. PARTICIPATION IN BID:

1.1 PORTAL REGISTRATION:

The Contractor/Bidder intending to participate in the bid is required to register in the portal using his/her active personal/official e-mail ID as his/her Login ID and attach his/her valid Digital signature certificate (DSC) to his/her unique Login ID. He / She has to submit the relevant information as asked for about the firm/contractor. The portal registration of the bidder/firm is to be authenticated by the State Procurement Cell after verification of original valid certificates/documents such as (i) PAN and (ii) Registration Certificate (RC) / VAT Clearance Certificate (for procurement of goods) /GST Certificate of the concerned bidder. The time period of validity in the portal is at par with validity of RC/ VAT Clearance/GST Certificate. Any change of information by the bidder is to be re authenticated by the State Procurement Cell. After successful authentication bidder can participate in the online bidding process.

1.2 Bidders participating through Joint Venture shall declare the authorized signatory through Memorandum of Understanding duly registered and enroll in the portal in the name and style of the Joint venture Company. It is mandatory that the DSC issued in the name of the authorised signatory is used in the portal. For participating in the tender, the authorized signatory holding Power of Attorney shall be the Digital Signatory. In case the authorized signatory holding Power of Attorney and Digital Signatory are not the same, the bid shall be considered non-responsive.

1.3 Any third party/company/person under a service contract for operation of e- Procurement system in the State or his/their subsidiaries or their parent companies shall be ineligible to participate in the procurement process that are undertaken through the e-Procurement system irrespective of who operates the system.

2. LOGGING TO THE PORTAL:

The Contractor/Bidder is required to type his/her Login ID and password. The system will again ask to select the DSC and confirm it with the password of DSC as a second stage authentication. For each login, a user's DSC will be validated against its date of validity and also against the Certificate Revocation List (CRL) of respective CAs stored in system database. The system checks the unique Login ID, password and DSC combination and authenticates the login process for use of portal.

3. DOWNLOADING OF BID:
The bidder can download the tender of his choice and save it in his system and undertake the necessary preparatory work off-line and upload the completed tender at his convenience before the closing date and time of submission.

4. CLARIFICATION ON BID:

The bidder may ask question related to tender online in the e-procurement portal within the period of seeking clarification. The Officer inviting the bid /Procurement Officer-Publisher will clarify queries related to the tender.

5. PREPARATION & SUBMISSION OF BID

5.1 Detailed BID may be downloaded from Tender Portal for detail study and preparation of his bid and the Application may be submitted online following the instructions appearing on the screen.

5.2 The following shall be the form of various documents in the Application:

A. Only Electronic Form (to be uploaded on the Tender Portal)

(a) Power of Attorney for signing the Application
(b) If applicable, the Power of Attorney for Lead Member of JV;
(c) Copy of Memorandum of Understanding between JV partners, if applicable.
(d) Copy of Memorandum of Understanding with Associate, if applicable.
(e) Technical proposal as per format prescribed as per clause no 102 of BID
(f) Bid Security Declaration for validity of 180 day as mentioned in the Instruction to Bidder or as per DTCN
(g) Price Bid as per BOQ.
(h) Other documents as per requirement of BID.

5.3 The Applicant shall upload scanned copies of the documents as specified in 5.2(A) above on the Tender Portal in designated locations of Technical Proposal and Price Bid(BOQ) before 17:00 hours Indian Standard Time on the Application due date i.e. on 23.11.2021 (date to be specified).

5.4 It may be noted that the scanned copies can be prepared in file format i.e. PDF and/or JEPG only. The Applicants can upload a single file of size of 5 MB only but can upload multiple files.

5.5 The bidder shall log on to the portal with his /her DSC and more to the desired tender for up loading the documents in appropriate place one by one simultaneously checking the documents.

5.6 Bids cannot be submitted after due date and time. The bids once submitted cannot be viewed, retrieved or corrected. The Bidder should ensure correctness of the bid prior to uploading and take print out of the system generated summary of submission to confirm successful uploading of bid.

The bids cannot be opened even by the OIT or the Procurement Officer Publisher/ opener before the due date and time of opening.

5.7 Each process in the e-procurement is time stamped and the system can detect the time of log in of each user including the Bidder.

5.8 The Bidder should ensure clarity/legibility of the document uploaded by him to the portal.

5.9 The system shall require all the mandatory forms and fields filled up by the contractor during the process of submission of the bid/tender

5.10 The bidder should check the system generated confirmation statement on the status of the submission.

5.11 The Bidder should upload sufficiently ahead of the bid closure time to avoid traffic rush and failure in the network.

5.12 The tender inviting officer is not responsible for any failure, malfunction or breakdown of the electronic system used during the e-procurement process.

5.13 The Bidder is required to upload documents related to his eligibility criteria and qualification information and Price Bid(BOQ) duly filled in.

5.14 The Bidder will not be able to submit his bid after expire of the date and time of submission of bid (server time). The date and time of bid submission shall remain unaltered even if the specified date for the submission of bids declared as a holiday for the Officer Inviting the Bid.

6. SIGNING OF BID:

The 'online bidder' shall digitally sign on all statements, documents, certificates uploaded by him, owning responsibility for their correctness /authenticity as per IT ACT 2000. If any of the information furnished by the bidder is found to be false / fabricated / bogus, his EMD/ Bid Security shall stand forfeited & his name shall be recommended for blocking of portal registration and the bidder is liable to be blacklisted.

7. SECURITY OF BID SUBMISSION:

7.1 All bid uploaded by the Bidder to the portal will be encrypted.

7.2 The encrypted Bid can only be decrypted / opened by the authorized openers on or after the due date and time.

8. RESUBMISSION AND WITHDRAWAL OF BIDS:

8.1 Resubmission of bid by the bidders for any number of times before the final date and time of submission is allowed.

8.2 Resubmission of bid shall require uploading of all documents including price bid a fresh.

8.3 If the bidder fails to submit his modified bids within the pre-defined time of receipt, the system shall consider only the last bid submitted.

8.4 The bidder should avoid submission of bid at the last moment to avoid system failure or malfunction of internet or traffic jam or power failure etc.

8.5 The Bidder can withdraw his bid before the closure date and time of receipt of the bid by uploading scanned copy of a letter addressing to the Procurement Officer Publisher (Officer Inviting Tender) citing reasons for withdrawal. The system shall not allow any withdrawal after expiry of the closure time of the bid.

9 OPENING OF THE BID:

9.1 Bid opening date and time is specified during tender creation or can be extended through corrigendum. Bids cannot be opened before the specified date & time.

9.2 All bid openers have to log-on to the portal to decrypt the bid submitted by the bidders.

9.3 The bidders & guest users can view the summary of opening of bids from any system. Contractors are not required to be present during the bid opening at the opening location if they so desire.

9.4 In the event of the specified date of bid opening being declared a holiday for the Officer inviting the Bid, the bids will be opened at the appointed time on the next working day.

9.5 Combined bid security for more than one work is not acceptable.

10. EVALUATION OF BIDS:

10.1 All the opened bids shall be downloaded and printed for taking up evaluation.

The officer authorized to open the tender shall sign and number on each page of the documents downloaded and furnish a certificate that "the documents as available in the portal containing--- nos of pages".

10.2 The bidder may be asked in writing/ online to clarify on the uploaded documents provided in the Technical Bid, if necessary, with respect to any doubts or illegible documents. The officer inviting tender may ask for any other document of historical nature during Technical evaluation of the tender. Provided in all such cases, furnishing of any document in no way alters the Bidder's price bid. Non submission of legible documents may render the bid non-responsive.

10.3 The bidders will respond in not more than 7 days of issue of the clarification letter, failing which the bid of the bidder will be evaluated on its own merit.

10.4 The Technical evaluation of all the bids shall be carried out as per information furnished by Bidders.

10.5 The Procurement Officer-Evaluators; will evaluate bid and finalize list of responsive bidders.

10.6 The financial bids of the technically responsive bidders shall be opened on the due date of opening. The Procurement Officer-Openers shall log on to the system in sequence and open the financial bids.

10.7 The Financial Bid will be opened on the notified date & time in the presence of bidders or their authorised representative who wish to be present.

10.8 At the time of opening of "Price Bid(BOQ)", bidders whose technical bids were found responsive and qualified will be opened.

10.9 The responsive bidders' name, bid prices will be announced.

10.10 Procurement Officer-Openers shall sign on each page of the downloaded Price Bid(BOQ).

10.11 Bidder can witness the principal activities and view the documents/summary reports for that particular work by logging on to the portal with his DSC from anywhere.

10.12 System provides an option to Procurement Officer Publisher for reconsidering the rejected bid with the approval of concern Chief Engineer / Head of Department.

10.13 The L-1 bidder shall have to produce the original documents in support of the scanned copies and statements uploaded in the portal within 5 days of opening of price bid.

DISCLAIMER

The Applicant must read all the instructions in the BID and submit the same accordingly