

Part II

Draft Form of Contract

for

Construction of Landscaping of Canal Area
(Zone 3) in Dholera Special Investment Region,
Dholera

Dholera Industrial City Development Limited (DICDL)
6th Floor, Block No. 1 and 2, Udyog Bhavan,
Sector-11, 'GH-4' Circle, Gandhinagar – 382017
Gujarat, India

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Program Manager for New Cities (PMNC)



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Section 1. Standard Form of Contract

STANDARD FORM OF CONTRACT

CONTRACT FOR

Between

[Name of Employer]

[Name of Contractor]

[Date]

I Draft Form of Contract

Contract to undertake [name of assignment]

This CONTRACT (hereinafter called the “Contract”) is made on the [Date in words] day of the month of [month] [year in ‘yyyy’ format], by and between

The Dholera Industrial City Development Limited, a company incorporated under the Companies Act, 1956, having its Registered Office at 6th Floor, Block No. 1 and 2, Udyog Bhavan, Sector-11, ‘GH-4’ Circle, Gandhinagar – 382017 Gujarat, India, hereinafter referred to as the “Employer” which expression unless repugnant to context or meaning thereof shall include its successors, affiliates and assigns) of the First Part.

AND,

[Name of Contractor and registered address]

(Hereinafter called the “Contractor”) which expression unless repugnant to context or meaning thereof shall include its successors, affiliates and assigns) of the Second Part

WHEREAS

- a) The Employer has requested the Contractor to provide certain consulting services as defined in the General Conditions attached to this Contract (hereinafter called the “Services”);
- b) The Contractor, having represented to the Employer that they have the required professional skills, personnel and technical resources, have agreed to provide the services on the terms and conditions set forth in this Contract.

NOW THEREFORE the parties hereto hereby agree as follows:

- a) The following documents attached hereto shall be deemed to form an integral part of this Contract:
- b) The General Conditions of Contract (hereinafter called “GC”);
- c) The following Appendices:
 - Appendix A: Bill of Quantities (BOQ)
 - Appendix B: Copy of Letter of Award
 - Appendix C: Copy of letter of Award/ acceptance by Consultant
 - Appendix D: Specifications
 - Appendix E: Copy of Bank Guarantee for Performance Security and insurances
 - Appendix F: Response to queries and Addendum issued during bid processing
 - Appendix G: Correspondences

1. The mutual rights and obligations of the Employer and the Contractor shall be as set forth in the Contract; in particular:
 - a) The Contractor shall carry out the work in accordance with the provisions of the Contract; and
 - b) The Employer will make payments to the Contractor in accordance with the provisions of the Contract.
2. Priority of documents: The Parties expressly agree that in the event of any conflict, inconsistency or contradiction between any clauses forming part of the documents constituting the Contract, and more particularly mentioned in Clause 1 (of this contract) hereinabove, the documents shall be interpreted in the following order of precedence:
 - a) The provisions of this Contract shall override all provisions of other documents comprising the Contract.
 - b) the provisions of the GCC shall be subject to the Contract, but shall override all provisions of other documents comprising the Contract;
 - c) the Appendices shall subject to each of the Contract, and the GCC.
 - d) Any decision of the Employer in relation to the priority of documents shall be final and binding upon the Contractor.

IN WITNESS WHEREOF, the Parties hereto have caused this Contract to be signed in their respective names as of the day and year first above written.

FOR AND ON BEHALF OF DICDL

[Signature]

[Name]

[Designation]

FOR AND ON BEHALF OF CONTRACTOR

[Signature]

[Name]

[Designation]

Witness:

1. [Signature, name and address]

2. [Signature, name and address]

II General Conditions of Contract

1.1 Definitions

In the contract (as hereinafter defined) the following words and expression will have the meanings hereby assigned, to them:

- a. Approved/ Approval means approved in writing.
- b. Construction plant means all equipment, appliance or things of whatsoever nature required for the execution, completion or maintenance of the works or temporary works but do not include materials or other things intended to form or forming part of the permanent work.
- c. Contract means the contract Agreement entered between the Employer and Contractor. The instruction and information, general rules and direction for tenderers, terms and conditions of contract, specification, drawings, the schedules of quantities and tender prices, the formal agreement and all addenda (including corrigendum if any) and attachments related to the above, referred in the contract agreement shall constitute the contract.
- d. Contractor means the particular person, firm or Company or Group of firms or Companies or his designated representative with whom the contract has been made for executing the works and includes his legal successors.
- e. Day means a day from midnight to midnight.
- f. Defects liability period shall mean 24 (Twenty four) months from the certified date of completion. (The certified date of completion shall be in accordance with Clause – 1.43.).
- g. Drawings means the drawings referred to in the specifications, any modification of such drawings approved in writing and such other drawings as may from time to time be furnished or approved in writing by the Employer.
- h. Employer/ Owner mean Dholera Industrial City Development Ltd and include its legal successor.
- i. Employers Representative: Person/Agency appointed by the Employer to Discharge its Obligations under this Contracts.
- j. IS means Indian Standards, prescribed by the Bureau of Indian Standards
- k. Month means period from the beginning of a given date of a calendar month to the end of the preceding date of the next calendar month.
- l. Site means the lands and other places on, under, in or through which, the works are to be executed or carried out and any other lands or places provided by the owner for the purposes of the contract together with such other places as may be specifically designated in the contract or subsequently approved as forming part of site.

- m. Temporary Works means all temporary works of every kind required for the performance of the contract.
- n. Tendered Amount means the total tender amount indicated in the letter of acceptance of the tender.
- o. The expression “work” or “Works” where used in these conditions shall, unless, there be something in the subject or context repugnant or such construction be construed to mean the work, or the works contracted to be executed under or in virtue of contract, whether temporary or permanent, and whether original, altered, substituted or additional.
- p. Week means seven consecutive days.
- q. S.O.R. means schedule of rates.

1.2 Interpretations

Words imparting the singular only, also include the plural, he include she and vice a versa unless this is repugnant to the context. Wherever the term “Specification” is used apart from a specified standard specification, it shall mean the specification or plan prepared for a particular item as per the instruction to the Contractor in executing that item of works.

1.3 Language of Contract

All written matter and correspondence in connection with the Contract shall be in English.

1.4 Contract Document and Matters to be treated as Confidential

All documents, correspondence, decision and order concerning the contract shall be considered as confidential and/or restricted in nature by the Contractor and he shall not divulge or allow access to them by any unauthorized person.

1.5 Stamp Duty

The Stamp Duty for entering into agreement shall have to be paid by the Contractor.

1.6 Performance security

- a. The Contractor shall, for the performance of its obligations hereunder during the Construction Period, provide to the Employer, within 30 (Thirty) days of the date of issue, of letter accepting the tender, an irrevocable and unconditional guarantee from a Bank in the form set forth in Part II, section 2 Annexure I (the “**Performance Security**”) for an amount equal to 5% (Five Percent) of the Contract Price.
- b. In addition to the above, the Employer shall deduct security deposit from the intermediate bills i.e. the running account bills an amount at the rate of 5% (five percent) of the total amount of each bills, as a remaining Security Deposit subject to the condition that the total amount of such deductions shall not exceed 5%

(Five percent) of the Tendered amount put to Tender as mentioned in the letter of acceptance of the tender.

- c. The Bank Guarantee must remain valid for at least three months after the Defect Liability Period is over.
- d. Fifty percent (50%) of the Security Deposit less any amount due shall be returned to the contractor after completion of the Works as per clause no 1.43 and the remaining Fifty percent (50%) of the security deposit shall be returned only after three months of the defect liability period is over and subject to the Employer certifying that no liability is attached to the contractor.
- e. Additional security deposit shall be furnished by the bidder as decided by the Employer's authority at the time of entering into contract, if any.

1.7 Actions When Performance Security is forfeited

1.7.1 In any case, in which under any clause or clauses of this contract, the Contractor shall have rendered himself liable to pay compensation amounting to the whole of his security deposit (Whether paid in one sum or deducted by instalments) or in the case of abandonment of the work owing to serious illness or death of the Contractor or any other cause, the Employer's Representative on behalf of the Employer, shall have powers:

- a. To rescind the contract (of which rescission notice in writing to the Contractor under the hand of Employer's Representative shall be conclusive evidence) and in that case the security deposit of the Contractor shall stand forfeited and be absolutely at the disposal of the Employer.
- b. To employ labour paid by Employer and to supply materials to carry out work , or any part of the work, debiting the Contractor with the cost of the labour and the price of the materials (as to the correctness of which cost and price, the certificate of the Employer's Representative shall be final and conclusive against the Contractor) and crediting him with the value of the work done in all respects in the same manner and at the same rate as if it had been carried out by the contractor under the terms of this contract and in that case the certificate of the Employer's Representative to the value of the work done shall be final and conclusive against Contractor.
- c. To order that the work of the Contractor be measured up and to take such part thereof as shall be unexecuted out of hands, and to give it to another Contractor to complete, in which case any expenses which may be incurred in excess of the sum which would have been paid to the original Contractor if the whole work had been executed by him (as to the amount to which excess expenses the certificate in writing of the Employer's Representative shall be final and conclusive) shall be borne and paid by the original contractor and shall be deductible from any money due to him by the Employer under this contract from his security deposit or the proceeds of sale thereof or a sufficient part thereof.

- 1.7.2 In the event of any of the course being adopted as per clause 1.7.1 above by the Employer's Representative, the Contractor shall not claim to compensate for any loss sustained by him by reason of his having purchased or procured any materials, or made any advances on this account or with a view to the execution of the work or the performance of the contract and in case the contract shall be rescinded under the provision aforesaid, the Contractor shall not be entitled to recover or be paid any sum for any work thereof actually performed by him under this contract unless and until the Employer's Representative shall have certified in writing the performance of such work and the amount payable in respect thereof and shall only be entitled to be paid amount so certified.
- 1.7.3 If the Contractor is an individual or a proprietary concern and the individual or the proprietor dies than unless the accepting authority is satisfied that legal heirs or representatives of the individual Contractor or of proprietary concern, are capable of carrying out and complete the contract, as the accepting authority shall be entitled to cancel the contract, as to its uncompleted part by forfeiting the security deposit under clause 1.7.1(a) without Employer being in anyway liable to pay any compensation to the heirs of the deceased contractor on account of the cancellation of the contract. The decision of the Accepting Authority that the legal representatives of the deceased contractor cannot carry out and complete the contract shall be final and binding on the parties. In the event of such a cancellation, Employer shall not hold the heirs of the deceased Contractor liable for damages for not carrying out the work remaining incomplete as on the date of death of individual Contractor or the proprietor.
- 1.7.4 In any case in which any of powers conferred upon the Employer's Representative under clause 1.7.1 hereof shall have become exercisable and the same shall not have been exercised, the non-exercise thereof shall not constitute a waiver of any of the conditions hereof and such powers shall notwithstanding be exercisable at any future date.
- 1.7.5 In the event of the Employer's Representative taking action under clause 1.7.1 to 1.7.4 he may if so desires, take possession of all or any tools, plants, machineries, materials and stores in or upon the work or the site thereof or belonging to the Contractor or procured by him and intended to be used for the execution of the work or any part thereof, by paying or allowing for the same in account at the contract-rate or in case of contract rates not being applicable at such reasonable rates, as may be comparable with current market rates where ascertainable of similar articles and comparable condition, to be certified by the Employer's Representative. In the alternative the Employer's Representative may by notice, in writing to the Contractor or his clerk of the works. Foreman or other authorized agent require him to remove such tools, plants, machineries, materials or stores from the premises within a time to be specified in such notice and in the event of the Contractor failing to comply with any such requisitions, remove them at the Contractor's expenses or shall remove them by auction or private sale at the risk and cost of the Contractor in all respect, and the certificate of the Employer's Representative as to the expenses of any such removal and the amount of the proceeds shall be final and conclusive against the Contractor.

1.8 Setting Out

The Contractor shall establish at his cost reference points, reference lines and bench marks at suitable points as may be considered necessary by the Employer's Representative. The Contractor shall be responsible for the proper setting out of the works and the correctness of positions. Levels, dimensions and alignments of all parts of the work and for the provision of all necessary instrument, appliance and labour in connection therewith. If, at any time, during the progress of the work any errors, appear or arise in the positions, levels, dimensions or alignments of any part of the work, the contractor on being required to rectify such errors by the Employer's Representative shall rectify it at his own expense to the satisfaction of the Employer's Representative. The checking of and setting out of any line or level by the Employer's Representative or the representative shall not in any way relieve the contractor of his responsibilities for the correction of the error. The Contractor shall carefully protect and observe all bench marks, site nails, pegs and other things used in setting out of the work(s).

1.9 Progress Schedule

- a. The Contractor shall furnish to the Employer's Representative within one week micro level planning from the date of the order to start the work, the progress schedule in quadruplicate indicating the date of starting, the monthly progress expected to be achieved and the anticipated completion date of each major item of work to be done by him, also indicating dates of procurement and setting up the materials, plants and machinery. The schedule should include a statement of proposed general and detailed arrangements for carrying out works, and of item, order and manner in which it is proposed that these shall be executed. The schedule should be framed keeping in view the requirement of the terms and conditions and be such as in practice to the achievement towards completion of the work in the time limit and of the particular items on the dates specified in the contract and shall have the approval of the Employer's Representative. Further, the dates for the progress, indicated in the schedule shall be adhered to.
- b. The Employer's Representative shall have, at all times, the right, without in any way vitiating this contract forming grounds for any claim, to alter the order of the work or any part thereof and the Contractor shall after receiving such direction, proceed in the order directed. The Contractor shall also revise the progress schedule accordingly and submit four copies of the revised schedule to the Employer's Representative within seven days of the said Engineer's direction to alter the order of works.
- c. The Contractor shall furnish sufficient plant, equipment and labour and shall work such hours and shifts as may be necessary to maintain the progress of the works as per approved progress schedule. The working and shift hours shall comply with all the Employer's regulations in force and shall be such, as may be approved by the Employer's Representative and the same not be varied without the prior approval of Employer's Representative.
- d. The Contractor shall from time to time as may be required by the Employer's Representative, furnish the Employer's Representative with a statement in writing

of the arrangements he proposes to adopt for the execution of this contract and the Employer's Representative, may if he considers necessary at any time advice alteration in the same, which the Contractor shall adopt on notice thereof.

- e. The progress schedule(s) shall be in the form of progress chart, forms, statements and/ or reports prepared in latest version of Microsoft Project or Primavera as may be approved by the Employer's Representative.
- f. In case it is found necessary, at any stage to alter the schedule, the Contractor shall submit in good time a revised schedule incorporating necessary modifications proposed and get the same approved from the Employer's Representative.

Revised schedule shall not be operative without such acceptance in writing. The Employer's Representative is further empowered to ask for more detailed schedule or schedules say week by week, for any item or items and the Contractor shall supply the same as and when asked for. The approval of the progress-schedules by the Employer's Representative shall not relieve the contractor of any of his duties, responsibilities under the contract. The adoption of any modification in the schedule required by the Employer's Representative shall not entitle the Contractor to any extra payment. The contractor shall submit four copies showing the progress of work in the form of a chart etc. at periodical intervals as may be specified by the Employer's Representative.

1.10 Action when the progress of the work is unsatisfactory

If the progress of any particular portion of the work is unsatisfactory, the Employer's Representative shall, notwithstanding that the general progress of the work is satisfactory, in accordance with clause 1.56, be entitled to take action under clause 1.7.1(b) after giving the Contractor 10 days' notice in writing and the Contractor will have no claim what so ever for any compensation or loss sustained by him in owing to such action.

1.11 Commencement of work, Time for completion and extension of time

The contractor shall commence the work immediately upon the Signing of Contract Agreement and proceed in accordance with the time schedule furnished pursuant to Clause 1.9 and complete the work in all respects within 12 (Twelve) months from notification of award. If the contractor desires for an extension of time for completion of the work on the ground of his having been unavoidable hindered in its execution or any other ground, he shall apply in writing to the Employer's Representative before the expiry of the period stipulated in the tender or the expiry of 30 days from the date on which he was hindered whichever is earlier and the Employer may, if in their opinion, believes that there are reasonable grounds for granting the extension, grant such extension, as he thinks necessary or proper. The decision of the Employer in this matter shall be communicated to the Contractor by the Employer's Representative and shall be final.

1.12 Action where no specifications

1.12.1 In the case of any type of work for which there is no specifications, such work shall be carried out in accordance with the Employers specifications and in the event of there being no Employers specifications, then, in such case the work shall be carried out in all respects in accordance with the instructions, and requirements of the Employer's Representative.

1.12.2 Purpose of Drawings and specifications and conformance thereto shall be treated as under:

- a. The contract drawings read together with the contract specifications are intended to show and explain the manner of executing the work and to indicate the type or class of materials to be used.
- b. The work shall be carried out in accordance with the directions of the Employer's Representative in accordance with such further drawings, details and instructions as may be given by the Employer's Representative, from time to time.
- c. It shall be the responsibility of the contractor to promptly bring to the notice of the Employer's Representative any error or discrepancy in the contract documents and obtains his orders thereon. Only stated dimensions are to be taken and not those obtained from scaling the drawings. In case of any discrepancy between the description of an item in the Appendix-A and the specifications, the later shall prevail and in case any discrepancy between the specification and drawings, the drawings shall prevail. In case any feature of the work is not fully described and set forth in the item drawings and specification, the contractor shall forthwith apply to the Employer's Representative for further instructions, drawings or specifications.

1.12.3 Modifications

- a. The Employer's Representative may order modifications at any time before completion of the work. No modification shall be made unless so ordered in writing.
- b. For all modification, the Employer's Representative will issue revised plans.

1.12.4 Signed Drawings – No Authority to the contractor

Signed drawings alone shall not be deemed to be an order for the work unless it is entered in the agreement or schedule of drawings under proper attestation of the contractor and the Employer's Representative or unless it has been sent to the contractor by the Employer's Representative with a covering letter conforming that the drawings is an authority for the work under the contractor.

1.12.5 Copies of drawings and specifications

Copy of the typical modified or supplementary drawings and the specifications shall be furnished to the contractor.

1.13 Land required by the Contractor

The Contractor shall have to make his own arrangement for land required by him for his camp, workshops, labour camps, stock-piling of materials and machineries etc.

1.14 Entering Upon or Commencement of Work

The contractor shall not work upon or commence any portion of work except with the written authority and instruction of the Employer's Representative of the work, failing which the contractor shall have no claim to ask for measurement or payment for work.

1.15 Accesses to Site and Work

The Employer/ Employer's representative may, if he consider fit from time to time, enter upon any land(s), which may be in possession of the Contractor under this contract for the purpose of executing any work not included in this contract and may execute such work not included in this contract by agents or by other Contractor in his opinion and the Contractor shall, in accordance with the requirements of the Employer's Representative, afford all reasonable facilities for execution of the work including occupation of lands by structure or otherwise for any other Contractor employed by the Employer and his workmen or for the workmen of the Employer who may be employed in the execution on or near the site of the work not included in the contract or of any contract-in connection with or ancillary to the work and in default, the Contractor shall be liable to the Employer for any delay or expense incurred by reason of such default, provided always that if the exercise of these powers shall cause any damage to the construction, he may, within, fifteen days of such damage arising make statement of the same to the Employer's Representative who shall, from time to time, assess the value in his judgment of such damage and the Employer shall from time to time pay to the Contractor the amounts (if any) accepted as justified by the Employer's Representative.

1.16 Works to be executed under direction of Employer's Representative

All works to be executed under the Contract shall be executed under the direction of Employer's Representative and subject to approval in all respect of the Employer who shall be entitled to direct at what point or points and in what manner they are to be commenced and from time to time carried on.

1.17 Materials and Workmanship

1.17.1 Materials

- a. All materials, articles and workmanship shall be of the most suitable quality for the work. The unit rates quoted shall deem to have included procurement, transport, handling, storage etc.
- b. Equivalency of Standards and Codes

Wherever reference is made in the Contract to the respective standards and codes in accordance with which goods and materials are to be furnished, and works is

to be performed or tested, the provisions of the latest current edition or revision of the relevant standards and codes in effect shall apply, unless otherwise expressly set forth in the Contract. Where such standards and codes are national in character, or relate to a particular country or region, other authoritative standards which ensure an equal or higher quality than the standards and codes specified will be accepted subject to the Employer's Representative prior review and written approval. Differences between the standards specified and the proposed alternative standards must be fully described in writing by the Contractor and submitted to the Employer's Representative at least 30 days prior to the date when Contractor desires the Employer's Representative's approval. In the event the Employer's Representative determines that such deviations do not ensure equal or higher quality, the Contractor shall comply with the standards set forth in the contract documents.

- c. The Contractor shall without extra cost provide sample for the testing of materials and facilitate inspection of the works. The Employer's Representative shall have access at all times to the places of storage and to the places where materials are being manufacture or processed for use on the works under the Contract, to determine whether their manufacture and process are proceeding in accordance with the drawings and specifications.
- d. All materials, articles shall be specified and in accordance with the instructions of Employer's Representative.

1.17.2 Workmanship

The Contractor shall execute the whole and every part of the work in substantial and workman-like manner and both as regards materials and in other respects in strict accordance with specifications. The Contractor shall also conform exactly, fully and faithfully to the design, drawings and instructions in writing for the work signed by the Employer's Representative.

The Contractor will be entitled to receive the certified copy of the accepted tender along with the work order free of cost and will also be entitled to receive, on request two sets of working drawings, according to the progress of work, as and when needed, free of cost.

1.17.3 Employment of Qualified Engineer

The contractor shall employ a full time technically qualified staff during the execution of this work. The engineers so employed for the work must have sufficient experience to handle the work independently. Such Engineers shall have to stay at the site of work and they shall not be entrusted with any other duty except of this work.

Even if the contractor or a partner of the contractor, firm is a graduate Civil Engineer, employment of adequate number of engineers will however be necessary for the execution of the work on site as may be decided by the Employer's Representative.

1.17.4 Work to be open for inspection - Contractor or Responsible Agent to be present

All works under or in course of execution or executed in pursuance of the contract shall, at all times be open for the inspections and supervision of the Employer's Representative and his sub-ordinate and the contractor shall, at all times during the usual working hours and all other times at which reasonable notice of the intimation of the Employer's Representative or his sub-ordinate to visit the works shall have been given to the Contractor, either himself be present to receive orders and instructions or have a responsible agent duly accredited in writing present for that purpose. Orders given to the Contractor's duly authorized agent shall be considered to have the same force and effect as if they had been given to the Contractor himself.

1.17.5 Notice to be given before work is covered up

The contractor shall give not less than five days' notice in writing to the Employer's Representative or his subordinate in charge of the work before covering up or otherwise placing beyond the reach of measurement any work in order that the same may be measured and correct dimensions thereof taken before the same is so covered up or placed beyond the reach of measurement, any work without the consent in writing of the Employer's Representative or his sub ordinate in charge of the work and if any work shall be covered up or placed beyond the reach of measurement without such notice having been given or consent obtained, the same shall be uncovered at the Contractor's expense and in default there of no, payment or allowance shall be made for such work or for the materials with which the same was executed.

1.17.6 Action and Compensation for Bad Work

If at any time before the expiry of Defects Liability period as detailed in clause 1.17.7, it shall appear to the Employer's Representative or his sub-ordinate in charge of the work, that any work has been executed with unsound, imperfect or unskilled workmanship or with materials of inferior quality or that any materials or articles provided by him for execution of the work are unsound., or of a quality inferior to that contracted for or are otherwise not in accordance with the contract, it shall be lawful for the Employer's Representative to intimate this fact in writing to the Contractor and then notwithstanding the fact that the work, materials or articles complained of may have been passed. Certified and paid for, the Contractor shall be bound forthwith to rectify, or remove and reconstruct the works so specified in whole or in part as the case may be required or if so required shall remove the materials or articles so specified and provide other proper and suitable materials or articles at his own charge and cost, and in the event of his failing to do so within a period to be specified by the Employer's Representative in the written intimation aforesaid, the Contractor shall be liable to pay compensation at the rate of one percent of the amount of the estimate of the rectification for every day not exceeding ten days during which the failure so continues and in the event of any such failure as aforesaid continuing beyond ten days, the Employer's Representative may rectify or remove and re-execute the work or remove and replace the materials complained as the case may be at the risk and expense in all respects of the Contractor. Should the Employer's Representative consider that any such inferior work or materials as described above may be accepted or made use of, it shall be within his discretion to

accept the same at such reduced rates as he may fix thereof. However, the contractor shall be responsible for normal maintenance of the work till the final bill for the work is prepared by the Employer.

1.17.7 Defect Liability Period

The contractor shall be responsible to make good and remedy at his own expense any defect which may develop or may be noticed before the period mentioned hereunder from the certified date of completion. The Employer's Representative shall give a notice in writing to the contractor about the defect and the Contractor shall make good the same within 15 days of receipt of the notice. In the case of failure on the part of the contractor, the Employer's Representative may rectify or remove or re-execute the work at the risk and cost of the Contractor. The Employer's Representative shall be entitled to appropriate the whole or any part of the amount of security deposit towards the expenses, if any, incurred by him in rectification, removal or re-execution. The Defects Liability period shall be 24 Months from the certified date of completion (The certified date of completion shall be as per clause 1.43)

1.18 Testing of Materials

- a. All materials before being utilized in works shall be inspected and tested, if found necessary, by the Employer's Representative or his representative. The nature of testing and periodical intervals at which such testing is to be done etc. shall be as per the latest editions of relevant IS Codes and determined by the Employer's Representative. The day-to-day and periodical tests to be carried out on materials mixes and placed concrete, mortar etc. shall be specified by the Employer's Representative from time to time and the Contractor shall provide free of cost all facilities towards collections of samples etc. unless otherwise specified. Labours for collecting samples and transportation of the samples to quality control authorities for test shall be provided free cost of by the contractor. Also electricity, fuel, water curing tank and stores etc. shall be provided free of cost by the contractors.
- b. The materials shall be tested at any place directed by the Employer's Representative. The Contractor shall obtain the test results from the concern authority and the results given by such authorities shall be considered to determine whether all materials, workmanship are of respective standard described in contract and in accordance with the instructions of the Employer's Representative. The Contractor's representatives shall, however, be given access to all operations and tests that may be carried out as aforesaid so that he may satisfy himself regarding the procedure and methods adopted. It shall then be the Contractor's responsibility to produce on the work, materials and finished item to the standard as determined by the laboratory tests or to take follow up action to rectify the quality.

All Testing charges shall, however, be borne by the Contractor.

- I. When the supply of the samples and the carrying out of such test at Contractor's cost is provided for or clearly intended in the Contract and is carried out either at the site of work or at place of manufacturer.

- II. When the supply of the samples and the carrying out of such tests is not provided for or clearly intended in the contract, but on testing the material is found defective and has to be rejected.
- III. Testing charges for testing of Cement, TMT bars, RCC pipes, M.S. pipes and all materials to be used in the works including cost of samples and its collection shall be borne by the Contractor.
- c. The Contractor shall, however, supply all materials, required for tests and also make good at his cost, materials, mixes and bore/ core hole with similar or other materials as may be directed by and to the satisfaction of the Employer's Representative.
- d. The Contractor shall make suitable arrangements to see that one of his representatives remains present at the time of taking samples and shall authenticate the facts. If the Contractor, fails to keep his representative present at site at the time of taking samples or fail to provide required labours and other equipment to collect the samples, the same shall be taken by the Employer, and the samples selected shall be considered as authentic. The cost incurred by the Employer when the Contractor fails to provide required men and materials for collecting samples and or their transport shall be recovered from the Contractor.

1.19 Quality Assurance

1.19.1 Assurance Programme

In addition to the testing procedure as laid down in clause -1.18 (Testing of Materials), the contractor shall submit a detailed field Quality Assurance Programme containing the overall quality management and procedures which he proposes to be followed during various phases of constructions as detailed in the relevant clause of the technical specifications of the contract and get it approved from the Employer's Representative within week after the letter of intent is issued. This shall include arrangements of testing apparatus/ instruments covering the requirements of items envisaged in the contract and details of the testing programme. The documents of Quality Assurance Programme shall generally cover but not limited to the following:-

- I. Contractor's organizational structure for the management and implementation of the quality assurance programme.
- II. Sources of various materials.
- III. Inspection and test procedure, both for material and their product and field activities.
- IV. System of handling storage and delivery of material.
- V. Laboratory testing facilities along with test of equipment's proposed to be installed along with a laboratory building plan.
- VI. System of preparation and maintenance of test records.

The Quality Assurance Programme shall also include the programme proposed to be followed by his sub-contractor. Contractor shall bear all cost / expenditure for implementation of provisions made under quality assurance clause.

1.19.2 Testing of Materials

All materials, before bringing to the site of work shall be inspected and tested by the Contractor. For testing, the contractor may set up his own laboratory at his own cost. The place (Laboratory) of testing should be got approved from Employer's Representative. Test results shall be furnished by the contractor to the Employer's Representative. The cost of all such testing shall be borne by the contractor.

After materials are brought to site, if necessary, Employer's Representative or his sub – ordinate shall test in accordance with relevant clauses of contract. In case of discrepancy in the Employer's and contractor's results, the Employer's result shall be final and binding to the contractor. Materials which test result does not conform to the standards and is not acceptable to the Employer's Representative, shall be rejected and removed from the site.

1.19.3 Testing Procedure

The Contractor shall carryout all sampling and testing in accordance with the relevant Indian Standard and / or International Standard or as stipulated in the contract, where no specific testing procedure is mentioned, the test shall be carried out as per the prevalent accepted engineering practice and direction of the Employer's Representative.

The Frequency of sampling and testing of all materials and products of construction shall be as mentioned in the technical specifications and relevant IS codes used in Practice. In case of discrepancy in the standards, the decision of the Employer's Representative will be final. In case due to changes in the codal provisions during course of execution if the acceptance criteria of the test gets changed, the Contractor shall have to follow the revised criteria of acceptance. The contractor shall not claim for any compensation as a result of rejection of his material or product of construction due to inferior quality on account of such changes. The testing frequencies set forth in different technical specification are the desirable minimum and Employer's Representative shall have a full authority to revise it as he finds necessary to satisfy himself that the quality of materials and the works together comply with appropriate specification requirement.

The ingredients of concrete got tested and approved by Employer's Representative in accordance with forgoing Para of this clause and clause 1.18 of this document.

1.19.4 The contractors shall have to use such materials which must fulfil the required qualities as per the specifications. The Employer is not going to compromise with the quality of the work in any case. The Employer may carry out in situ testing for the quality of earth, zoning of earthwork and other important components wherever required. The contractor will be held responsible for poor quality of work if the work is not done as per the specification.

1.20 List of Machinery to be brought and used on works by the Contractor

The Contractor shall furnish list of machinery immediately available with him for use on the work and which they propose to procure for the work.

1.21 Construction at existing utilities

1.21.1 Where the work to be performed under these specifications crosses or otherwise interferes with water, sewer, gas or oil pipelines, buried cable or other public or private utilities, the Contractor shall preserve and protect such utilities and shall perform such construction during the progress of the work so that no damage will result to either public or private interests till alternative arrangement for relocating such facilities are made. The term "Watercourses" included ditches, terraces, furrows or other features of surface irrigation systems

It shall be the responsibility of the Contractor to determine the actual locations of and make provision for all watercourses and utilities.

1.21.2 Before any watercourse or utility is taken out of service, permission shall be obtained from the Employer by the Contractor. The Contractor shall be liable for all damages that may result from failure to preserve and protect watercourses or utilities during the progress of the work and the Contractor shall indemnify and hold harmless the Employer from claims of whatsoever nature or kind arising out of or connected with damage to water courses or utilities encountered during Construction, damages resulting from disruption of service and injury to persons or damage to property resulting from the negligent, accidental or intentional breaching of watercourses or utilities.

1.21.3 If the Contractor does not maintain the existing watercourse and utilities in such condition that no damage will result to either public or private interests, the Employer will make the necessary repairs to be made and recover charges from the Contractor for such work.

1.21.4 Except as otherwise provided below, the cost of all work described in this paragraph, shall be included in the price bid in the schedule for relevant other items of work.

1.21.5 Where construction of new structures or modification of existing structures are required to render the watercourses or utilities operative beyond the period of the Contract, the Contractor shall notify the Employer's Representative so that the arrangements can be made with the owners for the construction of modifications required. When it is determined that such works are to be performed by the Contractor, and such item of work is not provided for in the schedule, the Contractor shall perform the necessary work in accordance with clause 1.35.

1.21.6 In case of watercourses and utilities in addition to those for which details are available with the Employer, all additional work required to be performed by the Contractor as a result of encountering the watercourse or utilities shall be performed in accordance with clause 1.35.

1.21.7 In case of forest, nursery or plantation near state highways and National highway for which details are available with the Employer, all care shall be taken by the

contractor to preserve the plantation during Construction. If the contractor does not take care to preserve the plantation, the Employer may recover the loss, to forest department, from the contractor.

1.22 Construction at Telephone and Power line Crossings

- 1.22.1 The details of telephone and power-line crossings are available with the office of the Employer's Representative. The concern authorities under agreement with the Employer will remove or raise these lines and relocate them permanently at other locations which will permit the Contractor to proceed with his construction operations without delay.
- 1.22.2 Equipment and vehicles shall not be operated where, it is possible to bring such equipment or vehicles or any part thereof within 5 meters of any high voltage line or installation unless Electricity company/Service provider, has been notified the line de-energized and grounded, and positive control measures taken to prevent points along the conductor will vary due to changing ambient and operating temperatures.
- 1.22.3 The Contractor shall notify Employer's Representative immediately when removal and/or raising and relocation of the utility are required so that he can proceed with construction of the M.S. Pipeline work and roadway relocation at that location in accordance with his sequence of operations. The Electricity company/Service provider, and Telephones Authorities under agreement with the Employer, will perform all work required before, during and after project work and road construction to remove, relocate, and maintain them in service at all times at no cost to the Contractor. The Contractor will not be required to perform any work for the crossings, but shall co-operate with The Electricity company/Service provider and Telephone Authorities so that they may perform the required work with as little interference from the Contractor's operations as is practicable.
- 1.22.4 If, for his convenience the Contractor wishes the Electricity company/Service provider, and Telephone Authorities to make temporary relocations or minor alterations at existing utility crossing, it will be the Contractor's responsibility to make arrangements with the Electricity company/Service provider, and Telephone Authorities for performing such work and the costs thereof shall be paid to the Electricity company/Service provider, and Telephone Authorities by the Contractor.
- 1.22.5 The Contractor shall provide for the utility crossings so that no damage will result there to.

1.23 Work during Night or on Sundays and Holidays

The work shall not be carried out during night or on Sunday and authorized holidays without the prior written consent of Employer's Representative. However, it will be allowed to be carried out the work during night, Sundays or authorized holidays subject to:

- a. The provisions of relevant labour laws being adhered to.
- b. Adequate lighting, supervision and safety measures established to the satisfaction of the Employer's Representative.

- c. The Construction programme given by the Contractor and agreed upon by the Employer's Representative envisages such working.
- d. If it is necessary or required to ensure the safety of work, protection of life, or to prevent loss or damage to property.

1.24 Maintaining Public Traffic

1.24.1 The Contractor shall make all necessary provisions including diversion for maintaining the flow of public traffic and conduct his operations so as to offer the least possible obstruction and inconvenience to public traffic. Temporary approaches to crossings or intersecting roads shall be provided and kept in good condition. Public traffic shall be permitted to cross over and pass through construction operations at all times with as little inconvenience and delays as possible and the Contractor shall, when so directed, provide and station competent flagman whose sole duties shall consist of directing and controlling the movement of public traffic either through or around the work operation shall be so conducted as to provide a reasonably smooth, even dustless and unobstructed passage for traffic at all times. Water shall be sprinkled as directed for the abatement of dust in connection with maintaining public traffic. The Contractor shall construct temporary connection of sufficient width for traffic between the existing road way and new construction where necessary. At any and all points along with the work where the nature of the construction operations in progress and the equipment and machinery in use are of such character as to endanger passing traffic, the Contractor shall provide such personnel as may be necessary to safeguard against accidents and avoid damage or injury to passing traffic. At night times, the Contractor should provide barricades around the portion of excavation and have some arrangement in form of posts, warning signboards etc. painted in fluorescent paint to see that the public traffic moves smoothly without any accident happening to moving traffic and if it is found conclusively that it was because of contractor's mistake in providing adequate arrangement, the contractor shall be responsible for the damage done and will have to compensate the aggrieved persons Employer will not be responsible for such accidents.

1.25 Local and Haul Roads

1.25.1 The Contractor shall acquaint himself with the existing public roads and construction road parallel to the Canal near the site of work. The Contractor may construct and maintain additional roads parallel to the Canal and additional roads as required at his expense. Maintenance of these roads including construction road (already constructed and / or to be constructed) shall be done by the Contractor at his own cost till completion of the entire work, under the scope of this contract. The construction roads used by the contractor of this work should be maintained by them with mutual understanding.

1.25.2 The Contractor's heavy construction traffic or tracked equipment's shall not travel on any public roads or bridges unless the Contractor has made arrangements with the authority concerned and approval of the Employer's Representative to such arrangements has been obtained.

1.25.3 The Contractor shall plan transportation of construction materials to work site in

such a way that road accidents are avoided.

- 1.25.4 The Contractor shall construct and maintain at his own cost all suitable temporary haul roads at the work site as may be found necessary by him for execution of the works. The location of all such haul roads and any subsequent modifications thereof shall be got approved by the Employer's Representative.
- 1.25.5 During the period of the Contract, the Employer and other Contractors employed by the Employer will be engaged on other works in the vicinity of the works covered by this contract, the contractor shall allow the Employer and other contractors free and reasonable use of all temporary haul roads except vital haul roads upon which the Contractor may impose restriction to prevent, interruptions to concrete hauling operations. Any such restrictions must be approved by the Employer's Representative.
- 1.25.6 Separate payment will not be made for the construction and maintenance of the temporary haul roads including any necessary special protections or strengthening required and all cost of such works shall be deemed to have included in the cost of the items included in the Appendix 'A'.

1.26 Electric Power

The contractor shall make his own arrangements for electric power supply at his own cost. The Employer shall not take any responsibility for power connection from Electricity Board. The Contractor shall provide and operate generating sets of suitable capacity at required locations at his own cost to meet with the situations arising out of interruptions of electric power supply either or short or long duration. The Contractor shall not raise any claim against the Employer for failure or stoppage of power supply for any reasons whatsoever. Demand charges and any other charges over and above energy charges as levied by the Electricity Company shall also be borne by the Contractor.

1.27 Other Contractors

- 1.27.1 When two or more Contractors are engaged on work in the same vicinity, they shall work together in a spirit of co-operation and accommodation. The Contractor shall not take or cause to be taken any steps or actions that may cause disruptions, discontent or disturbance to the works, labour and arrangements of other Contractor in the neighbouring project localities. In case of any difficulties amongst the Contractors, the Employer's Representative shall direct the manner in which each Contractor shall conduct his works so far as it does not affects the others.
- 1.27.2 It is possible that work at, or in the vicinity of the site of work will be performed by the Employer or by other Contractors engaged in work for the Employer during the Contract period. The Contractor shall without charge permit the Employer and such other Contractor's and other workmen to use the access facilities including roads, lighting installation and any other facilities constructed or acquired by the Contractor for use in the performance of the works till they are required to be maintained for the purpose of this work.

1.28 Ecological Balance

1.28.1 The Contractor shall maintain ecological balance by preventing deforestation, water pollution and defacing of natural landscape. The Contractor shall so conduct his construction operations as to prevent any unnecessary destruction, scarring or defacing of the natural surroundings in the vicinity of the work. In respect of ecological balance, Contractor shall observe the following instructions.

- a. Where unnecessary destruction, scarring, damage or defacing may occur as a result of the operations the same shall be repaired, replanted or otherwise corrected at the Contractor's expense. The Contractor shall adopt precautions when using explosives which will prevent scattering of rocks or other debris outside the work area. All work areas shall be smoothed and graded in a manner to conform to the natural appearance of the landscape as directed by the Employer's Representative.
- b. All trees and shrubbery which are not specifically required to be cleared or removed for construction purposes shall be preserved and shall be protected from any damage that may be caused by the Contractor's construction operations and equipment. The removal of trees or shrubs will be permitted only after prior approval of the Employer's Representative. Special care shall be exercised where trees or shrubs are exposed to injuries by construction equipment, blasting, excavating, dumping, chemical damage or other operation and the Contractor shall adequately protect such trees by use of protective barriers or other methods approved by the Employer's Representative. Trees shall not be used for anchorages. The Contractor shall be responsible for injuries to trees and shrubbery caused by his operations. The terms 'injury' shall include, without limitation, brushing scarring, tearing and breaking of roots trunks or branches. All injured trees and shrubs shall be restored as nearly as practicable without delay to their original condition at the Contractor's expenses.
- c. The Contractor's construction activities shall be performed by methods that will prevent entrance or accidental spillage of solid matter contaminants, debris and other objectionable pollutants and wastes into Canal. Such pollutants and wastes include earth and earth products, garbage, cement concrete, sewage effluent, industrial wastes, radio-active substances, mercury, oil and other petroleum products, aggregate processing, tailings much products, minerals, salts and thermal pollution. Pollutants and wastes shall be disposed off in a manner and at sites approved by the Employer's Representative.
- d. In the conduct of construction activities and operation of equipment's, the Contractor shall utilize such practicable methods and devices as are reasonably available to control, prevent and otherwise minimize air pollution.
- e. Excessive emission of dust into the atmosphere will not be permitted during the manufacture, handling and storage of concrete aggregate and the Contractor shall use such methods equipment as are necessary for collection and disposal or prevention of dust during these operations. The Contractor's method of storing and handling cement shall also include means of eliminating atmospheric discharge of dust. Equipment and vehicles that give objectionable emission of

exhaust gases shall not be operated. Burning of materials resulting from clearing of trees, brush, combustible construction materials and rubbish may be permitted only when atmospheric conditions for burning are considered favourable.

1.28.2 Separate payment will not be made for complying with provisions of this Clause and all costs shall be deemed to have been included in costs of items included in Appendix 'A'.

1.29 Contractors Liability for Damage and Imperfection after Completion Certificate

If the contractor or his workmen, or servant shall break, deface, injure or destroy any part of the work in question in / on which they may be working or any building, road, fence, enclosure or grass land or cultivated ground continuous to the premises on which the work or any part thereof is being executed or if any damage shall occur to the work from any cause whatever before completion of the work or before the completion of the Defect liability period whichever is later or damage occurred / caused due to normal flood or rain or if any imperfection become apparent in it within twelve months from grant of a certificate of completion, final or otherwise by the Employer's Representative the contractor shall make good the same at his own expenses or in default, the Employer's Representative may cause the same to be made good by other contractor and deduct the expenses (of which the certificate of the Employers' Representative shall be final) from any sums that may there after become due to the Contractor or from his security deposit or the proceeds of sale thereof or a sufficient portions thereof.

1.30 Liability of Contractor for Damage Done in or Out Side Work Area

Compensation for all damage done intentionally or unintentionally by Contractor's labours whether in or beyond limit of the Employer's property including any damage caused by the spreading of fire shall be estimated by the Employer's Representative, or such other officer as he may appoint and the estimates of the Employer's Representative, subject to the decision of the Employer, on appeal, shall be final and the Contractor shall be bound to pay the amount of the assessed compensation on demand, failing which the same will be recovered from the Contractor as damages in the manner as decided by the Employer's Representative and deducted from any sums that may be due or become due from the Employer to the Contractor or under this contract or otherwise.

The Contractor shall bear the expenses of defending any action or other legal proceeding that may be brought by any person for injury sustained by him owing to neglect of precautions to prevent the spread of the fire and he shall also pay the damages and cost that may be awarded by the Court in Consequence.

1.31 Liability of Contractor for Accidents to Persons

In addition to responsibilities and liabilities of the Contractor under workmen's Compensation Act given in clause 1.47 following shall also apply:

- a. On the occurrence of an accident, which results in death of workmen employed by the Contractor or which is as serious as is likely to result in death of any such workmen, the Contractor shall within 24 hours of happening of such accident(s),

intimate in writing to the Employer's Representative, the fact of such accident(s). The Contractor shall indemnify the Employer against all loss or damage sustained by the Employer resulting directly or indirectly from his failure to give intimation in the manner aforesaid including the penalties or fines, if any, payable by the Employer as a consequence of Employer's failure to give notice under the Workmen's Compensation Act or otherwise to conform to the provisions of the said Act regard to such accident(s).

- b. In the case of an accident, in respect of which compensation may become payable under workmen's Compensation Act, whether by the Contractor or by the Employer, it shall be lawful for the Employer's Representative to retain out of money due and payable to the Contractor such sum or sums of money as may, in the opinion of the Employer's Representative be sufficient to meet such a liability. The opinion of the Employer's Representative shall be final in regard to all matters arising under this Clause.

1.32 Liability of Contractor for Taking over Completed Portion of Work

In the event the Employer takes over portions of works as they are completed, the liability of the Contractor for those portions shall extend to a period of twenty four months from the actual date on which such portions of the works were taken over.

1.33 Indemnities

The Contractor shall indemnify the Employer against all actions, suits, claims and demands, through or made against the Employer in respect of work of this contract and against any loss or damage to Employer in consequence of any action or suit being brought against the Contractor for anything done or omitted to be done in execution of the work of this contract.

1.34 Variation of Quantities and Extra Items

The Employer's Representative shall have authority to make any alterations in the original specifications, drawings, designs and issue instructions that may appear to him to be necessary or advisable during the progress of the work and the Contractor shall be bound to carry out the work in accordance with any instructions in this connection which may be given to him in writing and signed by the Employer's Representative and such alteration shall not invalidate the contract and additional work which the Contractor may be directed to do in the manner specified as part of the work shall be carried out by the Contractor on the same conditions in all respects on which he agreed to do the work and rate as specified below. The quantities shown in the tender are approximate and no claim shall be entertained for quantities of work executed being less than those entered in the Tender.

1.35 Variation in Schedule of Quantities

1.35.1 Increase in Quantities

- a. If the quantity for any individual item increases by a quantity limited to 30 % of tender quantity, such quantity shall be executed only after written approval of the Employer's Representative and paid at tendered rate with price adjustment, if

applicable. The contractor shall not undertake any excess beyond 30% / extra work without written orders from the Employer's Representative and any violations to this shall lead to non-payment to the contractor.

- b. No payment shall be entertained for excess quantity, if any, beyond the 30% of the tendered quantity (that means total 130% of the tendered quantity) until such executed quantity and the rates thereof are correctly derived afresh with mutual agreement and approved by the Employer.

1.35.2 Decrease in Quantity

If the quantity for any individual item decreases by more than 30% of tender quantity, such quantity i.e. executed quantity shall be paid at tendered rate with price adjustment, if applicable.

1.35.3 Extra Item

Extra item of work shall not vitiate the contract. The contractor shall be bound to execute extra items of work as directed by Employer's Representative.

No payment shall be entertained for extra item until such executed quantity and the rates thereon are correctly derived and approved by the Employer.

The Contractor's quotation of costs for the Change of Scope/Extra Items shall be determined on the following principles:

- (a) the latest available edition of Gujarat State Schedule of Rates (GSSR) Published by R&B applicable to Ahmedabad will be adopted for the valuation of any works which are not already covered by the items included in Bill of Quantity. Payments for the Extra Items shall be made in INR only.
- (b) in the event that items are not covered in the GSSR, then the latest edition of the Gujarat Water Supply and Sewerage Board applicable for Ahmedabad and then the Delhi Schedule of Rates related to Ahmedabad Circle will be used in that order.
- (c) the market rates substantiated with 3 quotations, followed by work order and/ or Tax Invoice shall be considered only when the executed items are not covered under Price Schedule or the above referred schedule of rates. A fixed percentage of 15% shall be added to cover the Contractor's Overhead and Profit for the rates evaluated under this category (c).

1.36 Lumpsum in Estimates

When the estimate on which a tender is made includes lump sum in respect of part of the work, the Contractor shall be entitled to payment in respect of the items of work involved or the part of the work in question at the same rates as are payable under this contract for such items, or if the part of the work in question is not in the opinion of the Employer's Representative capable of measurement, the Employer's Representative at his discretion, pay the lump sum amount entered in the estimate and the certificate in writing of the Employer's Representative shall be final and

conclusive against the Contractor with regard to any sum or sums payable to him under the provisions of this clause.

1.37 Submission of Bills

1.37.1 The Contractor on submitting a monthly bill therefore, be entitled to receive payment proportionate to the part of the work then approved and at the rates quoted in Appendix – A and passed by the Employer’s Representative, whose certificate of such approval and passing of the sum so payable shall be final and conclusive against the Contractor.

All such intermediate payments shall be regarded as payments by way of advance against, the final payment only and not as payments for work actually done and completed and shall not preclude the Employer’s Representative from requiring bad, unsound, imperfect or unskilled work to be removed and taken away and reconstructed or re-erected, nor shall any such payments be considered as an admission of the due performance of the contract or any part thereof in any respect or the accruing of any claims, not shall it conclude, determine or affect in any way the power of Employer’s Representative as to the final settlement and adjustment of the accounts or otherwise or in any other way vary or affects the contract.

1.37.2 The rates for items of work shall be valid only when the item concerned is accepted as having been completed fully in accordance with the sanctioned specifications. In case where the items of work are accepted as not so completed, the Employer’s Representative may make payment on account of such items at such reduced rates as he may consider reasonable in preparation of running account or final account bill.

1.37.3 A bill shall be submitted by the contractor each month on or before the date fixed by the Employer’s Representative for all works executed in the previous month and the Employer’s Representative shall take or cause to be taken the requisite measurements for the purpose of having the same verified and the claim so far as it is admissible, shall be adjusted within fifteen days from the submission of the bill.

1.37.4 The Contractor shall submit all the bills on the printed forms to be had on application at the office of the Employer’s Representative. The charges to be made in the bills shall always be entered at the rates specified in the agreement or at the part / reduced rates subject to the approval by the Employer’s Representative in the case of items not completed/executed as per agreements.

1.37.5 Payment to the Contractor shall be made within 45 days of receipt of the invoice and certification of the work done by the Employer’s Representative in the approved format. However, the final bill payment shall be made on Completion of Completion of Works within 75 days of receipt of invoice by the Employer.

1.37.6 Amount due for recovery on other facilities as well as also for other services, water supply and electricity charges and for other expenditure, if any, incurred by the Employer on Contractor’s behalf on labours and materials which may become due from the Contractor as per the Contract as well as under any other laws prevailing which may become due, will be recovered from the payments to the Contractor, as and when due.

1.38 Price Adjustment

1.38.1 No Price Adjustment is applicable due to increase or decrease in input cost of the works.

1.38.2 Changes in cost due to legislation:

- a. If the law of any local or duly constituted authority, or the introduction of any such state statute, Ordinance, decree, law regulations or bye-law which causes additional or reduced cost to the contractor other than under the first two sub-clauses of the clause in the execution of the works, such additional or reduced cost shall be certified by the Employer's Representative after examining the records provided by the claimant and shall be paid by or credited to the Employer.
- b. Notwithstanding the foregoing such additional or reduced cost shall not be separately paid or credited if:
 - I. The same shall have been reflected in the indexing of any of the inputs to the price adjustment in accordance with the provision of this clause 1.38.
 - II. The same shall have been taken into account by any other clauses of the contract.

1.39 Deleted

1.40 Non-Refund of Quarry Fees and Royalties

The Contractor shall pay the royalty directly to the competent authority /local body as per rules and shall produce "No Due Certificate" from the Royalty Inspector having jurisdiction over the work site area to Employer's Representative. The royalty charges shall be borne by the contractor and shall not be refunded. The contractor shall produce 'no due certificate' once in a year as under:

- I. For time limit less than 1 year at the time of final bill and
- II. For time limit more than 1 year, after end of every year and at the time of final bill, otherwise the Employer's Representative shall deduct the royalty charges from the next running account bill at the prevailing rates.

1.41 Income Tax

Deduction will be made at source from the contractor's bill towards income Tax by the Employers as per prevailing rules of the Income Tax Authority.

1.42 VAT/ Service Tax/ Other Taxes/Local Taxes

1.42.1 The rate quoted by the Contractor shall be deemed to be inclusive of all Taxes prevailing as on 30 days prior to submission of bid where applicable on materials that have to be purchased for performance of the contract including completed items of work.

1.42.2 All Taxes leviable for the work (including material component) under the Contract

shall be borne by the Contractor and it shall not be reimbursed by the Employer.

1.42.3 If the Contractor is assesses of VAT/ Service Tax/Other State Taxes/ Local Taxes/GST he should produce valid VAT/ Service Tax/Other State Taxes / Local Taxes/GST clearance certificate before the payment of the final bill, otherwise the final payment to the Contractor shall be withheld. The contractor even after completion of the work and final payment have been made to him will be liable to pay any VAT/ Service Tax/ Other State Taxes/ Local Taxes liability and The Employer shall not be responsible for any VAT/ Service Tax/Other State Taxes / Local Taxes/GST liability of the contractor.

1.42.4 Deleted

1.42.5 Difference of payment due to any upward revision of GST Taxes (Except on those components whose price rise is fully compensated as per Clause No. 4.38, Price Adjustment) during the period of contract shall be borne by the Employer. Such tax shall be paid by the Contractor and it will be reimbursed by the Employer upon production and verification of proof of payment. Similarly, in the event of reduction GST on any or all materials purchased by the Contractor for completion of the work under contract, the Contractor shall pass on this benefit to the Employer. For above purpose, the Contractor shall produce a certificate from their auditor/ Chartered Accountants/ Tax consultants giving year wise details of purchases, along with the proof. The Employer will reimburse or deduct as the case may be such amount, after scrutiny of the claim at the time of final payment of the bill.

1.43 Completion Certificate of Work and Final Payment

As soon as the work is completed, in all respect as specified in the contract document the Contractor shall give a notice of such completion to the Employer's Representative and on receipt of such notice, the Employer's Representative shall inspect the work, and if he is satisfied that the work is completed in all respects then:

- I. The final measurements shall be recorded within 30 days from the date of physical completion of the work and the final bill shall be submitted by the contractor within 45 days from the date of recording final measurements, otherwise the Employer's Representative's certificate of the measurements and of the total amount payable for the work shall be final and binding on all parties.
- II. The completion certificate shall be issued within one months from the date of final measurements subject to the Contractor fulfilling his obligations as provided in the contract and subject to the work being complete in all respects. When separate periods of completion have been specified for items or groups of items, the Employer's Representative shall issue separate completion certificate for such items or groups of items.

No certificate of completion shall be issued, nor shall the work be considered to be completed till the Contractor shall have removed from the premises, on which the work has been executed, all scaffoldings, sheds and surplus materials, except such as are required for rectification of defects, rubbish and all huts and sanitary arrangements required for his workmen on the site in connection with the execution of the work, as shall have been created by the Contractor for the workmen and

cleared all dirt from all parts of building(s) in, upon or about which the work has been executed or of which he may have/ had possession for the purpose of the execution thereof and cleared floors, gutters, and drains, cased doors and sashes oiled lock and fastenings, labelled keys clearly and handed them over to the Employer's Representative or his representative and made the whole premises fit for immediate occupation or use to the satisfaction of the Employer's Representative. If the Contractor fails to comply with any of aforesaid requirements of these on or before the date of completion of the works, the Employer's Representative may, at the expense of the Contractor, fulfil such requirements and dispose of the scaffolding or surplus materials and rubbish etc. as he thinks fit and the Contractor shall have no claim in respect of any such scaffolding or surplus materials except for any sum actually realized by the sale thereof less the cost of fulfilling the requirements and any other amount that may be due from the Contractor. If the expense of fulfilling such requirements is more than the amount realized on such disposal as aforesaid, the Contractor shall forthwith, on demand, pay such excess. The Employer's Representative shall also have the rights to adjust the amount of excess against any amounts that may be payable to the Contractors. No Payment shall be entertained in the intervening period of last R.A. Bill and before the pre-audit of the final bill and before excess / extra item approved by the Employer.

1.44 Errors, Omissions and Discrepancies

1.44.1 The several documents forming the contract are essential parts of the contract and a requirement occurring in one is as binding as through occurring in all they are intended to be mutually explanatory and complementary and to describe and provide for a complete work. In the event of any discrepancy in the several documents forming the contract or in any one document, the following order of precedence should apply.

- I. Between the written description of the item in the Appendix-A or written dimensions on the drawing and the corresponding one in the specifications, the later shall apply.
- II. Figured dimensions shall supersede scaled dimensions. The drawing on a large scale shall take precedence over those on smaller scale.
- III. Drawing issued as construction drawings from time to time shall supersede the corresponding drawings previously issued.

In the case of defective description or ambiguity, the Employers representative is entitled to issue further instructions directing in what manner the work is to be carried out. The contractor shall point out any apparent error or omission in the tender documents while submitting the tender and particularly while signing the contract. The contractor cannot take any advantage of any apparent error or omission in the tender document and if the contractor fails to bring out the apparent error or omission to the notice of the Employer in writing, he shall have no right to claim which may arise due to such error or omission subsequently and the decision of the Employer in this regard shall be final and binding to the contractor.

1.44.2 Typographical error leading to absurdity shall be ignored and correct technical, financial and legal meaning of such errors shall be considered.

1.45 Old Curiosities

In the event of discovery by the contractor or his employees during the progress of work, of any gold, silver, oil or other minerals of any description and precious stones, treasures, coins, antiques, relic, fossil or other articles or value of interest whether geological, archaeological or any other such treasure and other things shall be deemed to be the absolute property of the Employer and the contractor shall duly preserve the same to the satisfaction of the Employer's Representative, from time to time and deliver the same to such persons as the Employer's Representative may appoint.

The Contractor shall take all reasonable precautions to prevent his workmen or any other person from removing or damaging any such articles or things, immediately after the discovery there of and before removal acquaint the Employer's Representative with such discovery and carry out his order for the disposal of the same.

1.46 Safety Provisions

1.46.1 The Contractor in his operations shall arrange for the safety measure as required inclusive of the provisions in the latest safety manual published by the Central Water and Power Commission, New Delhi (January-1962 edition Reprinted in November 1986) In case the Contractor fails to make such arrangements, the Employer's Representatives shall be entitled to cause them to be provided and to recover the costs there of from the Contractor.

1.46.2 For failure to comply with the provisions of the Safety Manual the Contractor shall, without prejudice to any other liabilities, pay to the Employer a sum not exceeding Rupees one thousand per day for each day default.

1.47 Labour Compensation under the Workman's Compensation Act

a. The contractor shall be responsible for and shall pay any compensation to his workmen payable under the workmen's compensation Act 1923 (VIII of 1923) (hereinafter called the said Act) for injuries causes to the workmen. If such compensation is paid by Employer as principle employer under sub-section (1) of section 12 of the said Act, on behalf of the Contractor, it shall be recoverable by the Employer from the Contractor under sub-section (2) of the said section. Such compensation shall be recovered in the manner as decided by the Employer's Representative.

b. The Contractor shall be responsible for and shall pay the expenses of providing medical aid to any workmen who may suffer a body injury as a result of an accident. If such expenses are incurred by Employer, the same shall be recoverable from the Contractor forthwith and be deducted without prejudice to any other remedy of Employer from any amount due or that may become due to the Contractor.

c. The Contractor shall provide all necessary personal safety equipment and first aid apparatus available for the use of the persons employed on the site and shall

maintain the same in suitable condition for immediate use at any time and shall comply with the following regulations in connection therewith:

- I. The workers shall be required to use the equipment so provided by the Contractor and the Contractor shall take adequate steps to ensure proper use of the equipment by those concerned;
 - II. When work is carried out in proximity of any place where there is risk of drowning, all necessary steps shall be taken for the prompt rescue of any person in danger;
 - III. Adequate provision shall be made for prompt first aid treatment of all injuries likely to be sustained during the course of the work.
- d. Employment of famine or other labour. The Contractor shall employ any famine, convict or other labour of particular kind or class, if ordered in writing to do so by the Employer's Representative.
- e. Details of labourers employed
- I. The contractor shall not employ in connection with the works any person who has not completed his Eighteen (18) years of age.
 - II. The Contractor shall furnish to the Employer's Representative information about various categories of labours employed by him in the form and at such interval as may be specified.
 - III. The contractor shall in respect of labour employed by him comply with or cause to be complied with the provisions of the various labour laws and rules and regulations as applicable to them in regard to all matters provided therein and shall identify the Employer in respect of all claims that may be made against the Employer for non-compliance thereof by the Contractor.
- f. Notwithstanding, anything contained herein the Employer's Representative may take such action as may be necessary for compliance of the various labour laws and recover the costs thereof from the Contractor.
- I. In the event of the Contractor committing a default or breach any of the provisions of the labour laws and rules and regulations applicable, the Contractor shall, without prejudice to any other liability under the Act, pay to Employer a sum not exceeding Rupees one thousand per day for each of the defaults subject to a maximum of one percent of the tendered amount.
- g. The Contractor should, as far as possible, obtain his requirement of labours, skilled and unskilled, from the nearest Employment Exchanges so as to utilize the local employment potential. If there are no local Employment Exchanges or such Exchanges are not able to provide the required labour locally, suitable available labours should be utilised to the maximum extent possible. The contractor shall have to engage local labour and person seeking employment where available on normal rate.

h. Fair Wages

- I. If a Contractor fails to pay within '7' (Seven) days to any the labour(s)/worker(s) the minimum wages prescribed by the Government under the minimum wages Act 1948 as in force from time to time, the Employer's Representative shall be at liberty to deduct the amount payable by the contractor to the labour/worker from his (Contractor's) bills or deposit(s) after making due inquiries and establishing claims of the labour(s)/worker(s).
 - II. The Contractor shall not be entitled to any payment of compensation on account of any loss that the Contractor may have to incur on account of the action as aforesaid. Before the action as aforesaid, is enforced, a notice in writing to the Contractor shall be issued by the Employer's Representative to pay the wages as per Minimum wages Act in force at the relevant time. If Contractor does not act as aforesaid within seven days then the action contemplated as above shall be taken against him.
- i. Local labour on normal rates. The contractor shall have to engage local and person seeking employment where available on normal rates.

1.48 Labour Reports

The contractor shall submit the following reports to the Employer's Representative:

- I. A daily report in the form as may be prescribed of the strength of labour both skilled and unskilled employed by him on the work(s). The Contractor shall increase or decrease the strength both skilled and unskilled, if directed by the Employer's Representative. The submission of such report shall not, however relieve the Contractor of his responsibilities and duties regarding progress or any other obligations under the contract.
- II. A classified weekly return in the prescribed form of the number of person employed on the works during the preceding week.
- III. A weekly medical report in the prescribed form showing the health of the Contractor's camp, the number of person ill or incapacitated and the nature of their illness.
- IV. A report of any accident, which may have occurred to be sent within 24 hours of the occurrence.

1.49 Deleted

1.50 Employment of Scarcity Labour

If Government declares a state of scarcity or famine to exist in any village situated within 16 kilometres of the work, the Contractor shall employ upon such parts of the works, as are suitable for unskilled labour, any person, certified to him by the Employer's Representative or by any persons to whom, the Employer's Representative may have delegated this duty in writing to be in need of relief and shall be bound to pay to such persons, wages not below the minimum which

Government may have fixed in this behalf. Any dispute which may arise in connection with the implementation of the Clause shall be decided by the Employer's Representative whose decision shall be final and binding on the contractor.

1.51 Insurance

1.51.1 The Contractor shall secure and maintain throughout the duration of this Contract insurance of such types and in such amounts as may be necessary to protect himself against all the usual hazards or risks or loss. The form and limits of such insurance and the company together with the under writing thereof in each case, shall be such as will be acceptable to the Employer but, regardless of such acceptance, it shall be the responsibility of the contractor to maintain adequate insurance at all-time at least to cover:

- I. Workmen's compensation in accordance with the law in force from time to time.
- II. Third party liability including Employer's personnel on duty with a cover of minimum Rs. 5 lac for each person in case of fatal accident/permanent disability.
- III. All plant and equipment of the Contractor hypothecated to the Employer and all Employers material and machinery handed over to the contractor till they are properly installed.
- IV. Failure of the Contractor to maintain adequate insurance coverage shall not relieve him of any contractual responsibility.

1.51.2 Attested copies of certificate or policies of insurance shall be filed with the Employer prior to starting any construction work on this contract. The certificates shall state that fifty days advance written notice will be given to the Employer before any policy covered thereby is changed, cancelled or expired.

1.52 Camp Regulations

1.52.1 Huts

The Contractor shall build a sufficient number of huts on a suitable plot of land for the use of the labours according to the following specifications:

- I. Deleted.
- II. A good site shall be selected; high ground removed from jungle but well provided with trees shall be chosen wherever it is available. The neighbourhood of rank jungle, grass or weeds should particularly be avoided. Camp should not be established close to large cutting of earth-work.
- III. The lines of huts shall have open spaces of at least 10 m between rows. When good natural site cannot be procured, particular attention should be given to the drainage.

IV. There should be no over-crowding floor spaces at the rates of 2.8 square meter per head shall be provided. Care should be taken to see that the huts are kept clean and in good order.

V. The contractor must find out land for the hut and if he wants Employer land, he should apply for it and pay assessment for it.

1.52.2 Drinking Water

The Contractor shall, as far as possible, provide an adequate supply of chlorinated pure potable drinking water for the use of labours. This provision shall be at the rate of not less than 45 litres per head.

1.52.3 Deleted

1.52.4 Deleted

1.52.5 Drainage

The Contractor shall make sufficient arrangement for draining away the sewage water as well as water from the bathing and washing places and shall dispose of this waste water in such a way as not to cause nuisance. The Contractor would put malarial oil once in a week in stagnant water round about the residence.

1.52.6 Medical Facilities

The Contractor shall engage a medical officer with a travelling dispensary for a camp having 500 or more persons if there is no Government or other private dispensary situated within 6 Km from the camp.

1.52.7 Conservancy and Cleanliness

The Contractor shall provide the necessary staff for effecting the satisfactory conservancy and cleanliness of the camp to the satisfaction of the Employer's Representative.

1.52.8 Health Provisions

The District Health Officer of the District or the Deputy Director of Health Services shall be consulted before opening a labour camp and his instructions on matters, such as water supply, sanitary convenience, camp-site, accommodation and food supply shall be followed by the Contractor.

1.52.9 Deleted.

1.52.10 Rest Rooms

a. In every place wherein contract labour is required to halt at night in connection with the contract works and in which employment of contract is likely to continue for three months or more, the Contractor shall provide and maintain rest rooms or other suitable alternative accommodation within fifteen days of the

coming in to force of the rules in the case of existing establishment, and within fifteen days of the employment of contract labour in new establishment.

- b. If the amenity referred to in sub rule is not provided by the Contractor within the period prescribed, the principal employer shall provide the same within a period of fifteen days of the expiry of the period laid down in the sub-rule.
- c. Separate rooms shall be provided for women employees.
- d. Effective and suitable provision shall be made in every room for securing and maintaining adequate ventilation for the circulation of fresh air and there shall also be provided and maintained sufficient and suitable natural or artificial lighting.
- e. The rest room or other suitable alternative accommodation shall be of such dimension so as to provide at least floor area of 1.1 sq.mt. for each person making use of rest room.
- f. The rest room or rooms or other suitable alternative accommodation shall be so constructed so as to afford adequate protection against heat, wind, rain and shall have smooth, hard and impervious surface.
- g. The rest room or other suitable alternative accommodation shall at a convenient distance from the establishment and shall have adequate supply of wholesome drinking water.

1.52.11 Canteen Facilities

- a. In every establishment of contract work and where in work regarding the employment of contract labour is likely to continue for six months and where in contract labour numbering one hundred or more ordinarily employed, the adequate canteen facilities shall be provided by the contractor for the use of such contract labour within sixty days of the date of coming in to force of the rules in the case of existing establishment and within 30 days of the commencement of the employment of contract labour in the case of new establishment.
- b. Deleted.
- c. The canteen shall be maintained by the Contractor.

1.53 Observance of Laws, Local Regulations

The Contractor shall conform to all laws of the land and regulations and bye- laws of any local authority and of any water or electricity supply companies with whose system the structure is proposed to be constructed. He shall before making any variations from the drawings or specifications that may be necessitated for so conforming, give to the Employer's Representative a written notice, specifying the variations proposed to be made and the reasons for the Contractor does not receive such instructions within seven days, he shall proceed with the work conforming to the provisions, regulations or bye laws in question and any variation in the drawing or specifications so necessitated shall be dealt with under the clause 1.35. The Contractor shall give notices required by the said Acts, regulations or bye-laws and

bear the required fees in connection therewith. He shall also ensure that no attachments are made against materials for works related to the Contracts. The Contractor shall protect and indemnify the Employer against all claims or liabilities arising from or based on the violation of such laws, ordinances regulations, bye-laws, decrees or attachments by him or by his employees. The contractor shall also notify Employer in case any other unforeseen permit / NOC required to carry out the work.

1.54 Force Majeure

1.54.1 Neither party shall be liable to the other for any loss or damage occasioned / caused by or arising out of act of God and in particular "Unprecedented floods", volcanic eruption, earthquake or other convulsion of nature and other acts, such as but not restricted to invasion, the act of foreign countries, hostilities or war like operations before or after declaration of war rebellion military or usurped power (but excluding strikes and lockouts) which prevent performance of the contract and which could not have been foreseen or avoided by a prudent person.

Note: "Unprecedented flood" means the flood crossing the highest observed flood level which is on the available record.

1.54.2 If any loss of damage happens to the works, or any part thereof, or materials or plant for incorporation therein, during the period for which the contractor is responsible for the care thereof, from any cause whatsoever, other than the risk defined in the clause 1.54.1 as above, the Contractor shall at his own cost, rectify such loss of damage so that the permanent works conform in every respect with the provisions of the contract to the satisfaction of the Engineer-in-Charge.

1.55 No Compensation for Delay in Availability of Land

No Compensation shall be allowed for any delay caused in execution of the work on account of delay in making available the full site of land at a time.

1.56 Liquidated Damages

a. The time allowed as stipulated in the Tender for carrying out the work is 12 (Twelve) months and it shall be strictly observed by the Contractor and reckoned from the date on which the order to commence work is given to the Contractor. The work throughout the stipulated period of the contract shall be proceeded with all due diligence (time being deemed to be the essence of the contract on the part of the Contractor). To ensure good progress during the execution of the work, the Contractor shall be bound in all cases to complete the work as under:-

I. 40% of the work and completion of _____ within 6 (Six) months.

II. 100% of the work within 12 (twelve) months.

b. In the event of the Contractor failing to comply with the condition, stipulated in para (a) above he shall be liable to pay as liquidated damage an amount equal to point one percent (0.1%) of the contract per day of delay up to the date of

Completion subject to the maximum amount of Ten percent (10%) of Tendered Amount.

- c. The penalty levied due to non-completion of work at intermediate milestones will be refunded if the entire work is completed within the specified time limit to the satisfaction of the Employer's Representative. No interest shall be payable on the amount so refunded.
- d. Failure in completion of work in stipulated time limit shall be sufficient cause for termination of Contract and forfeiture of security deposit.

1.57 No Compensation for Delay in the Execution of Work Due to Water Pools

No compensation shall be allowed for any delay in execution of the work on account of water standing in borrow pits / borrow area, work site or compartment. The rates are inclusive of hard or cracked soil, excavation in mud, subsoil water or water standing in borrow-pits / borrow area and no claim for an extra rate shall be entertained unless otherwise expressly specified.

1.58 No Compensation for Change or Restriction of Works

If at any time after the execution of the Contract documents, the Employer's Representative shall for any reason whatsoever, required the whole or part of the work as specified in the tender be stopped for any period or shall not require the whole or part of work to be carried by the contractor, he shall give notice in writing stating the fact to the contractor who shall there upon suspend or stop the work totally or partially as the case may be. In such case except provided hereunder the contractor shall have no claim to any payment or compensation whatsoever except as provided hereunder. on account of any profit or advantage which he might in consequence of the full amount of work not having been carried out on account of the any loss that he may put to on account of material purchased or agreed to be purchased or for unemployment of labour recruited by him. He also shall not have any claim for compensation by reason of any alternation having been made in the original specifications, drawings, designs and instructions which may involve any curtailment of the work as originally contemplated.

- a. During the period of suspension, the contractor shall not remove any plant or equipment from the site and any part of the work without prior written consent of the Employer's Representative.
- b. The contractor shall not be entitled for loss of expected profit from such work.

1.59 Claims

The Contractor shall not be entitled to any claim/claims from the Employer on any account unless where allowed by the condition of this contract. In such cases, the Contractor shall have to submit a claim in writing to the Employer's Representative within one month on the cause of such claim occurring. All claims arising as a dispute of any kind out of the contract shall be governed by clause 1.60.

1.60 Arbitration

If any dispute or difference of any kind whatsoever arises between the parties in connection with or arising out of or relating to or under this Contract, the parties shall promptly and in good faith negotiate with a view to its amicable resolution and settlement. In the event no amicable resolution or settlement is reached within a period of thirty (30) days from the date on which the above-mentioned dispute or difference arose, such dispute or difference shall be finally settled by arbitration. The arbitral tribunal shall consist of a sole arbitrator appointed by mutual agreement of the parties. In case of failure of the parties to mutually agree on the name of a sole arbitrator, the arbitral tribunal shall consist of three arbitrators. Each party shall appoint one arbitrator and the two arbitrators so appointed shall jointly appoint the third arbitrator. The seat of arbitration shall be Gandhinagar, Gujarat and the arbitration shall be conducted in the English language. The Arbitration and Conciliation Act, 1996 shall govern the arbitral proceedings. The award rendered by the arbitral tribunal shall be final and binding on the parties.

1.61 Rescinding of Contract in Case of Subletting Contract or Contractor Becomes Insolvent

The entire contract shall not be assigned or sublet. The Employer may allow subletting the part or portion of the work not exceeding up to 40% (Forty percentages) of Tender cost, if the sub-contractor satisfies the requirement of the work to be sublet. If the Contractor shall assign or sublet his contract or attempt to do so or become insolvent or commence any proceedings to get himself adjudicated and insolvent or make any compromise with his creditors, or attempt to do so, the Employer's Representative may by notice in writing, rescind the contract. Also if any bribe, gratuity, gift, loan, perquisite, reward or advantage, pecuniary or otherwise, shall either directly or indirectly be given, promised or offered by the Contractor or any of his servants or agents to any public officer or person in the employment of Employer in any way relating to his office or employment or if any such officer or person shall become in any way directly or indirectly interested in the contract, the Employer's Representative may thereupon by notice in writing rescind the contract. In the event of contract being rescinded, the security deposit of the Contractor shall thereupon stand forfeited and be absolutely at the disposal of Employer and the same consequence shall ensue as if the Contract had been rescinded under clause 1.7 hereof and in addition the Contractor shall not be entitled to recover or be paid for any work thereof actually performed under the contract.

1.62 Deleted

1.63 Change in Constitution of Firm to be notified

In the case of a Tender by firm partnership or limited company, any change in its constitution shall be forthwith notified by the Contractor to the Employer's Representative for his information.

1.64 Mobilization Advance

- a. The Employer shall make an interest bearing advance payment @ Bank Rate + 5% per annum (the "Advance Payment"), equal in amount to 10 (ten) percent of the Contract Price, for mobilisation expenses and for acquisition of equipment. The Advance Payment shall be made in two installments. The first installment shall be an amount equal to 5% (Five percent) of the Contract Price, and the second installment shall be equal to 5% (five percent) of the Contract Price. Here the Bank Rate means the Repo rate of interest announced by the Reserve Bank of India for all its lending operations on the Base Date that is 28 days before the Bid submission date. The Contractor may apply to the Employer for the first installment of the Advance Payment at any time after the commencement date and signing of Contract Agreement, against an irrevocable and unconditional guarantee from a Scheduled Bank for an amount equivalent to 110% (one hundred and ten per cent) of such installment, substantially in the form provided, to remain effective till the complete and full repayment thereof.
- b. At any time after 30 (thirty) days from the commencement Date, the Contractor may apply for the second installment of the Advance Payment against an irrevocable and unconditional guarantee from a Scheduled Bank for an amount equivalent to 110% (one hundred and ten per cent) of such installment,

substantially in the form provided, to remain effective till the complete and full repayment thereof.

- c. The first and second installments shall be paid by the Employer to the Contractor within 15 (fifteen) days of the receipt of its respective requests.
- d. The recovery of all Advances shall commence when 20% of the original Contract Price of the work has been paid, and it will be completed by the time 80% of the original contract value has been paid or by the time of original Completion Date whichever is earlier.

1.65 Termination

1.65.1 By the Employer: The Employer may terminate this Contract, by not less than thirty (30) days' written notice of termination to the Contractor, to be given after the occurrence of any of the events specified in this clause:

- I. if the Contractor do not remedy a failure in the performance of their obligations under the Contract, within a period of thirty (30) days', after being notified or within such further period as the Employer may have subsequently approved in writing;
- II. within thirty (30) days, if the Contractor become insolvent or bankrupt;
- III. if, as the result of Force Majeure, the Contractor are unable to perform a material portion of the Services for a period of not less than sixty (60) days;
- IV. within thirty (30) days, if the Contractor fails to comply with any final decision reached as a result of arbitration proceedings pursuant to relevant clauses hereof;
- V. within thirty (30) days, if the Contractor, in the judgment of the Employer has engaged in Corrupt or Fraudulent Practices in competing for or in executing the Contract;
- VI. if the Employer, in its sole discretion and for any reason whatsoever, within a period of thirty (30) days' decides to terminate this Contract.

1.65.2 By the Contractor: The Contractor may terminate this Contract, by not less than thirty (30) day's' written notice to the Employer, such notice to be given after the occurrence of the events specified in this clause:

- I. if the Employer fails to pay any money due to the Contractor pursuant to this Contract and not subject to dispute pursuant to relevant clauses hereof within forty-five (45) days after receiving written notice from the Contractor that such payment is overdue; or
- II. if, as the result of Force Majeure, the Contractor are unable to perform a material portion of the work for a period of not less than sixty (60) days.

1.65.3 Cessation of Rights and Obligations: Upon termination of this Contract pursuant to actual Termination, or upon expiration of this Contract pursuant to relevant clause

hereof, all rights and obligations of the Parties hereunder shall cease, except (i) such rights and obligations as may have accrued on the date of termination or expiration, (ii) the obligation of confidentiality set forth in relevant clause hereof, (iii) the Contractor's obligation to permit inspection, copying and auditing of their accounts and records (iv) the rights of indemnity of the Employer v) any right which a Party may have under the Applicable Law.

1.65.4 Cessation of Services: Upon termination of this Contract by notice of either Party to the other pursuant to relevant clauses hereof, the Contractor shall, immediately upon dispatch or receipt of such notice, take all necessary steps to bring the Services to a close in a prompt and orderly manner and shall make every reasonable effort to keep expenditures for this purpose to a minimum. With respect to the work done by the Contractor and equipment and materials furnished by the Employer, the Contractor shall handover all project documents under procedure described in this contract.

1.65.5 Payment upon termination: Upon termination of this Contract, the Employer will make the following payments to the Contractor:

I. Payment pursuant to satisfactorily performed work prior to the effective date of termination.

1.65.6 Disputes about Events of Termination: If either Party disputes Termination of the contract under relevant clauses hereof, such Party may, within forty-five (45) days after receipt of notice of termination from the other Party, refer the matter to arbitration under relevant clauses hereof, and this Contract shall not be terminated on account of such event except in accordance with the terms of any resulting arbitral award.

Section 2. Appendices

Appendix A – Bill of Quantities

- Annexure 1

Appendix B – Form of Bank Guarantee

Annexure I – Performance Security

Employer.....,
Gandhinagar, Gujarat

WHEREAS:

_____ [name and address of Contractor] (hereinafter called “the Contractor”) and [name and address of the EMPLOYER], (“the EMPLOYER”) have entered into an agreement (the “Agreement”) for “[Name of the work]_”

- (A) [Name of the work], subject to and in accordance with the provisions of the Agreement.
- (B) The Agreement requires the Contractor to furnish a Performance Security for due and faithful performance of its obligations, under and in accordance with the Agreement, during the Construction Period and Defects Liability Period (as defined in the Agreement) in a sum of Rs. Crore (Rupees Crore) (the “Guarantee Amount”).
- (C) 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 and under and in accordance with the Agreement, and agrees and undertakes to pay to the Employer, 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 EMPLOYER shall claim, without the EMPLOYER 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 EMPLOYER, under the hand of an officer not below the rank of [.....of EMPLOYER], 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 Agreement shall be conclusive, final and binding on the Bank. The Bank further agrees that the EMPLOYER 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 Agreement and its decision that the Contractor is in default shall be final, and binding on the Bank, notwithstanding any difference between the EMPLOYER 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 EMPLOYER 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 EMPLOYER to proceed against the Contractor before presenting to the Bank its demand under this Guarantee.
5. The EMPLOYER 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 Agreement 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 Agreement or to postpone for any time, and from time to time, any of the rights and powers exercisable by the EMPLOYER against the Contractor, and either to enforce or forbear from enforcing any of the terms and conditions contained in the Agreement and/or the securities available to the EMPLOYER, and the Bank shall not be released from its liability and obligation under these presents by any exercise by the EMPLOYER 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 EMPLOYER 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 EMPLOYER in respect of or relating to the Agreement or for the fulfillment, compliance and/or performance of all or any of the obligations of the Contractor under the Agreement.
7. Notwithstanding anything contained herein before, 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 EMPLOYER on the Bank under this Guarantee all rights of the EMPLOYER under this Guarantee shall be forfeited and the Bank shall be relieved from its liabilities hereunder.
8. The Performance Security shall cease to be in force and effect 60 (sixty) days after the end of the Defects Liability Period as set forth in Clauses 1.1
9. The Bank undertakes not to revoke this Guarantee during its currency, except with the previous express consent of the EMPLOYER 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 envelope containing the notice was posted and a certificate signed by an officer of the EMPLOYER 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 end **** month in the year ***** or until it is released earlier by the EMPLOYER pursuant to the provisions of the Agreement.

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)

NOTES:

- (i) The bank guarantee should contain the name, designation and code number of the officer(s) signing the guarantee.
- (ii) The address, telephone number and other details of the head office of the Bank as well as of issuing branch should be mentioned on the covering letter of issuing branch.

Annexure II – Form for Guarantee for Advance Payment

.....
.....EMPLOYER,
Gandhinagar, Gujarat

WHEREAS:

[name and address of Contractor] (hereinafter called “the Contractor”) has executed an agreement (hereinafter called the “Agreement”) with the [name and address of the EMPLOYER], (hereinafter called “the EMPLOYER”) for the “[Name of the work], subject to and in accordance with the provisions of the Agreement.

(A) in accordance with the Clause 1.64 of the Agreement the EMPLOYER shall make to the Contractor an interest bearing advance payment (hereinafter called “Advance Payment”) equal to 10% (ten per cent) of the contract price for mobilization expenses and acquisition of equipment; and that the Advance Payment shall be made in subject to the Contractor furnishing an irrevocable and unconditional guarantee by a scheduled bank for an amount equal to the 110% amount of each instalment to remain effective till the complete and full repayment of the instalment of the Advance Payment as security for compliance with its obligations in accordance with the Agreement; and the amount of instalment of the Advance Payment is Rs. **** cr. (Rupees ***** crore) (the “Guarantee Amount”).

(B) We,through our branch at (the “Bank”) have agreed to furnish this bank guarantee (hereinafter called the “Guarantee”) for the Guarantee Amount.

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 repayment on time of the aforesaid instalment of the Advance Payment under and in accordance with the Agreement, and agrees and undertakes to pay to the EMPLOYER, 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 EMPLOYER shall claim, without the EMPLOYER 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 EMPLOYER, under the hand of an officer not below the rank of [.....of EMPLOYER], that the Contractor has committed default in the due and faithful performance of all or any of its obligations for the repayment of the instalment of the Advance Payment under and in accordance with the Agreement shall be conclusive, final and binding on the Bank. The Bank further agrees that the EMPLOYER 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 Agreement and its decision that the Contractor is in default shall be final, and binding on the Bank, notwithstanding any difference between the EMPLOYER 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 EMPLOYER 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 EMPLOYER to proceed against the Contractor before presenting to the Bank its demand under this Guarantee.
5. The EMPLOYER 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 Advance Payment or to extend the time or period of its repayment or to postpone for any time, and from time to time, any of the rights and powers exercisable by the EMPLOYER against the Contractor, and either to enforce or forbear from enforcing any of the terms and conditions contained in the Agreement and/or the securities available to the EMPLOYER, and the Bank shall not be released from its liability and obligation under these presents by any exercise by the EMPLOYER 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 EMPLOYER 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 EMPLOYER in respect of or relating to the Advance Payment.
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 EMPLOYER on the Bank under this Guarantee all rights of the EMPLOYER 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 90 (ninety) days after the end of the one year from the date of payment of the installment of the Advance Payment, as set forth in Clause 19.2 of the Agreement.
9. The Bank undertakes not to revoke this Guarantee during its currency, except with the previous express consent of the EMPLOYER 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 envelope containing the notice was posted and a certificate signed by an officer of the EMPLOYER 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 end **** month in the year ***** or until it is released earlier by the EMPLOYER pursuant to the provisions of the Agreement.

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)

NOTES:

- (i) The bank guarantee should contain the name, designation and code number of the officer(s) signing the guarantee.
- (ii) The address, telephone number and other details of the head office of the Bank as well as of issuing branch should be mentioned on the covering letter of issuing branch.

Section 3. Scope of Work and Technical Specifications

A. Scope of Work

1.0 Project Introduction

The Activation Area within the Dholera Special Investment Region (DSIR) is envisaged to trigger developmental activities in DSIR and attract local and global investments. The Activation Area lies within the TP2E with a portion in TP4, spread across an area of approximately 22.5sqkm. The Activation Area has approximately 58kms of roads and has an optimum mix of land uses with the largest being industrial.

The Canal is a 5.95km long unlined channel with a bottom width ranging from 58m to 88m, and a weir at the eastern end. The Canal runs through the Activation Area for a distance of 3.1km. It is intersected by three vehicular roads which cross the canal. The canal will function as a reservoir to collect and hold the storm water from the entire Activation Area. There are 8.5m width of space on south side of the canal and north side width ranging from 24m to 8.5m on top of the bund, which is to be developed as the Canal Park. There are thus a total of 05 parks. These parks are interconnected for pedestrians to walk from one park to the other at grade. In addition, there are larger community or neighbourhood parks along the canal.

The Canal Park is divided into 5 zones. The first zone is the Terracotta Park, inspired by the historic settlement of Lothal which lies in close proximity to the site. The Maritime Park showcases the association with ships and ocean trade through various elements. The third zone is the Silk Route, highlighting the trading of silk and Diamonds in the Gujarat region. The Industrial Park reflects the strong manufacturing industry base that exists in the DSIR Region and the whole of Gujarat; and finally the Eco Park demonstrates the future endeavours that the region envisions to undertake using renewable sources of energy, sustainable systems and recognizing the importance of urban farming in creating sustainable cities.

The five park zones are briefly explained further, herein below as follows

Zone 1: Terracota Park

This zone is inspired by the ancient city of Lothal, which is about 35 kms away from the DSIR Region. The rectilinear geometries, the brick plinths, the earthenware, handicrafts and xeriscapes all contribute to the conception of the Zone 1 of the Canal Park.

Zone 2: Maritime Park

This zone is inspired by the ancient and current ship building tradition and the trade that revolved around it. While shaping the landscape for this zone, the design takes inspiration from materials used in ship-building. Various elements of ships, like wood, steel (in corten form), and mast tensiles are used in this zone of the canal park. The geometries are mostly linear in this park which emphasise directionality and movement of ships.

Zone 3: Silk route Park

This zone is inspired by some of the most valuable traded commodities out of Gujarat; Silk, Textiles & Diamonds. Celebrating the sophistication of these materials, the aspects of reflectivity, transparency, fluidity and colorfulness are explored in the landscape of this zone.

Zone 4: Industrial Park

Various types of manufacturing and petro-chemical companies exist and are a significant part of industry in Gujarat. The landscape proposed is fluid like colourful patterns observed on water surface, in our case the canal. These are represented as landscape forms with colorful seasonal flowers providing opportunities for annual flower shows. Flowing pathways, grassed picnic mounds and flowering trees and metallic sculptures within the landscape contribute towards an enhanced experience within Zone 4 of the Canal Park.

Zone 5: Eco Park

Last and the final zone of the Canal Park is the Eco Park which emphasises the power of sustainable solutions for the development of our future cities, of which DSIR is a part of. The overarching theme of going “Back to Nature” inspires us to design landscape for this park in such a way there is awareness amongst the residents about the importance of urban farming, renewable resources of energy and being sensitive towards nature. Our proposal reflects the merging of the urban aspects & nature and shows the linkages between rainwater harvesting & irrigation, about composting and organic food production.

This document is specifically for development of Zone 3 (Silk Route Park) only and should read in conjunction with Zone 3 only.

2.0 Scope of Work

The work includes, undertaking all tasks with best practice and professional manner. The Scope of Works entails providing labor, materials, equipment, tools and resources and all other elements that may not be described but are required to fulfill the tasks and provide professional services but not limited to the following, surveying/execution of civil works/ hardscape/softscape/water features/irrigation/lighting/ wayfinding signages/ maintenance for project works /artwork installations/ Multi-disciplinary co-ordination with other contractors & designated project team members required for the successful completion of the project while following and complying with all the relevant applicable statutory norms, codes & best practices of the construction industry. In case of non-performance of project works by the contractor in any form of the covenants and conditions in this contract by the contractor, the Employer/ Employer’s authorized representative shall as per clauses mentioned in this contract have power to annul, rescind, cancel or terminate the contract by notifying in writing to the contractor that it has done so and hence this contract shall absolutely stand annulled, rescind, cancelled or terminated on account of this non-performance. The contractor is assumed to have undertaken the necessary site inspection and confirmed to have reviewed the BOQ, before quoting the price. The fees/charges quoted for the work/services as per schedule of items of

work/services as stipulated shall be binding and deemed to have included all the charges, taxes and or expenses including the submission of any shop drawings for approval, documents and all actions etc. as stipulated in this document. The decision of Employer/ Employer's authorized representative in this regard shall be final and binding.

The key tasks include but not limited to

- Undertake all required sub surface investigations, applicable soil, water, SBC tests and conduct all the necessary surveys prior to start of work.
- Thoroughly review the entire drawing set and all information available before start of works, understand the design, drawings & details completely.
- Highlight and bring to the notice of the Employer's authorized representative about any unintentional gaps, omissions, mismatch, errors within the drawing set and any other information provided.
- Prepare & submit all shop drawings required for the project, including making prototypes where required for approval, satisfactory to the Employer/ Employer's authorized representative prior to commencing work;
- Supply and install all paving stone for courtyard and patios as per plans and specifications including any necessary minor sub grading, filter material and all sand and gravel base, compacted to a minimum of 95% proctor density;
- Carry out the minor final grading as required to complete all hard and soft landscaping works;
- Supply and install all specified planting materials including turf, trees and shrubs, all to the satisfaction of the Employer/ Employer's authorized representative.
- Ensure that all planting materials delivered to the site are healthy, well-watered and prime specimens, all to the satisfaction of the Employer/ Employer's authorized representative. Any plantings found to be distressed shall not be planted and shall to be removed for the project site;
- Provide all necessary maintenance, including fertilizing and watering of lawn and plantings for an adequate period not less than 30 days following substantial completion of all landscaping as certified by the Employer/ Employer's authorized representative;
- To execute the civil Works according to the instructions of the Employer/ Employer's authorized representative.
- To Monitor the progress of the works by comparing the actual progress with the approved programme of the works and to recommend to the Employer/ Employer's authorized representative, the appropriate measures to be taken, in case the works are behind schedule;
- To Arrange and take part to regular site progress meetings by liaising with the Employer/ Employer's authorized representatives;
- Copies of the progress reports referred to above must be submitted to the Employer/ Employer's authorized representative identified in the contract. The progress reports must be written in English.
- To record minutes of meetings, including all site visits ;
- To ensure effective execution of the technical and contractual aspects for smooth progress and successful completion of the landscape works;

- To carry out any other task related to the Direction and Supervision of the landscape works as may be requested by the Employer/ Employer's authorized representative within the terms listed in this document

3.0 Phasing

The project phasing is as clarified in the preceding documents. The Employer/ Employer's authorized representative, reserves the right to change/ modify, amend any or all provisions of this document during the course of the contract duration and project lifecycle.

4.0 Stages of Work

The stages of work encompass reviewing the working drawings, specification documents and making the necessary site inspections with regards to all hard & soft landscape works for the project.

5.0 Hard Landscape Works

For the purpose of this proposal, "hard landscape works" means but not limited to the following:

- Design, selection and specification of paving materials for the project, including structural bases for both pedestrian & vehicular surfaces.
- Verify the layout of landscape elements by marking these & setting out on site before the start of works including but not limited to walls, fences, screens and any other landscape structures.
- Providing and layout of landscape light fittings, connecting with the trunk infrastructure electrical supply system
- Providing, installing and laying out of all landscape plumbing fittings, connecting with the trunk infrastructure system
- Providing, installing and laying out of the irrigation system, connecting with the trunk infrastructure
- Providing, installing and laying out of water features, including the related mechanical systems.
- Providing, installing and laying out landscape furniture, including benches, trash receptacles, bike stands, signage, and play equipment.
- Providing, installing and laying out drainage fittings for at-grade hard paved and planted landscape areas. Coordinate for the placement of fittings. Underground pipework and off-site connections are also the responsibility of the contractor.
- To ensure, provide, install, co-ordinate for all necessary conduits, sleeves for MEP works within the project area prior to the construction, casting of any civil works.
- The detailed landscape technical specifications to be followed for all project works are as listed in the Annexure -I

6.0 Soft Landscape Works

For the purposes of this proposal, "soft landscape works" means but not limited to the following:

- Provide, supply & install the planting works as per the specifications listed within the drawings and supporting project documents , for all plant materials like trees, shrubs, ground cover, grasses, bamboo, palms, cycads, seasonals, annuals, including provision of soils, soil additives, gypsum, nutrients, manure, coco peat, coconut husk, perlite etc and other such items that maybe required for the successful establishment of the planting works and maintaining them for a mutually acceptable period as discussed with the Employer/ Employer's authorized representative.
- The detailed landscape technical specifications to be followed for softscapes works are as listed in the Annexure -II

7.0 Obligations

During continuance of the Contract, the Contractor and shall abide at all times by all existing labour enactments and rules made thereunder, regulations, notifications and bye laws of State or Central Government or local authority and any other labour law (including rules), regulations, bye laws that may be passed or notification that may be issued under any labour law in future either by the State or the Central Government or the local authority. The Contractor shall keep the Employer/ Employer's authorized representative indemnified in case any action is taken against the Employer/ Employer's authorized representative by the competent authority on account of contravention by the Contractor of any of the provisions of any Act or rules made thereunder, regulations or notifications including amendments. If the Employer/ Employer's authorized representative is caused to pay or reimburse, such amounts as may be necessary to cause or observe, or for non-observance of the provisions stipulated in the notifications/bye laws/acts/rules/regulations including amendments, if any, on the part of the Contractor, the Employer/ Employer's authorized representative shall also have right to recover from the Contractor any sum required or estimated to be required for making good the loss or damage suffered by the Employer/ Employer's authorized representative.

B. Technical Specifications

1. General Landscape Requirement (Hardscape)

1.1. Project Details

1.1.1. General Description

Proposed landscape design focusses on landscape interventions which encourage more of physical activities for all age groups alongwith passive spaces for cultural and social diversity.

Interventions such as paving material, seating, street furniture, play equipment and planting palette are basic components

1.2. Purpose of Specification

The hardscape specification defines the requirements and gives guidance for implementation and maintenance of the hard landscape works.

1.3. Scope of Specification

The specification describes the general requirements for hard landscape elements in the landscape works. The works under this section include but are not limited to the following:

- **EARTHWORKS**
Ground works general, protection of existing trees, site clearance, excavation, placing, ground shaping, grading and compacting earth fill, installation of geotextile and earth reinforcement. Earthworks exclude slope protection, compaction and reinforcement;
- **CIVIL WORKS (MASONRY WORKS –BRICK & STONE; CONCRETE WORK)**
The general requirements for brick and stone masonry to Engineer’s concrete structure for external wall surfaces, also all allied works including all materials, labour, curing, scaffolding, tools etc. ;
- **WOOD & BAMBOO WORK**
Section includes relevant information related to material availability, treatment & preservation, application in different landscape elements with respect to technical information and relevant drawings and documents;
- **METAL WORK**
The general requirements of metal work for different landscape structures and furniture in coordination with structural consultant;
- **KERBS AND EDGES**
Section includes application of work for kerbs, edges etc, as well as all allied works;
- **PAVING**
Section includes application of work for surface finishes to walkways, paths etc

as well as all allied works;

- **WALL FINISH**
The general requirements for stone masonry and wall cladding to Engineer's concrete structure for external wall surfaces, also all allied works including all materials, labour, curing, scaffolding, tools etc. ;
- **LANDSCAPE FEATURES & SITE FURNITURE**
All landscape features as per landscape package .
- **PAINTING**
All paints and coating on floors, walls, landscape structures and all allied works;

1.4. List of relevant drawings and document

This specification to be read in conjunction with:

- Landscape Drawing Package submitted by CONSULTANT/ EMPLOYER'S AUTHORIZED REPRESENTATIVE;
- Bills of Quantities as prepared by appointed Quantity Surveyor;
- Relevant Indian Standards as listed in Annexure;
Note: If work item is not included in Indian Standards, appointed contractor should refer to relevant international standard (BS or equivalent). This should be approved by Employer's representative prior to commencing any works on site;
- Other documents – any documents not included above but relevant to the tender process. These should be provided/made available to Contractor by the Employer/ Employer's representative if applicable.

1.5. Terminologies

In the Specification and other Documents forming part of the Contract, the following expressions and words shall, unless the context otherwise requires, have the meaning hereby respectively assigned to them:

"Approved" or "approval"	means approved by or approval of, the Employer's Representative
"Submitted" or "submit"	means submitted to or submit to the Employer's Representative in writing prior to commencing works
"Accepted" or acceptance"	means accepted by or acceptance of, the Employer's Representative
"As shown on Drawings"	means all works required to conform with the intent shown on the landscape drawings whether or not specifically described in these

documents/drawings but are necessary for the full and satisfactory completion of the Contract Works

"As required"

means as required to satisfactory standard match the description in the Specification and other Documents forming part of the Contract

1.6. Site Management

1.6.1. General

Prior to site handover to the Landscape Contractor, Landscape Contractor should prepare and get written approvals of Site Management Plan.

After the handover of the site to the Landscape Contractor, site preparation measures have to be taken up before the commencement of work.

1.6.2. Site Management Plan

- a) Plan to be prepared by Contractor and approved by the Employer/ Employer's representative prior to handover of the site.
- b) Plan should be followed during Construction
- c) Plan should comply with all relevant statutory regulations as well as Health and safety requirements (as per "*Section 1.6.3. Health and Safety*", of this Specification)
- d) Plan should include and detail the following items;
 - Detailed information on site preparation measures to be taken up before commencement of works as well as during the works and maintenance period;
 - Clear site arrangement layout for temporary structures, storage, water, electricity supply, vehicular circulation and parking areas etc.
 - Method statements on how site management will be carried out;
 - Details of management structure and responsibilities, with clearly stated points of contact;
 - Communication procedure within site team;
 - Procedures for informing other contractors and employees of site management issues;
 - Procedures for communications between the project team, other contractors and site operatives;
 - Procedures for keeping the records of site queries, obtained approvals, tests, any documentation that affects the site works etc.
 - Storage of the materials and equipment on site;
 - Any additional information required by statutory regulations.

1.6.3. Health and Safety

General

- a) The safe completion of the works is a primary aim of the contract. All works should be executed in compliance with all applicable statutory requirements.

Below listed are general requirements and items, contractor should take care of and provide in respect to Health and Safety on site.

- b) Contractor should always liaise with Employer's Health and Safety Representative during pre-construction, construction and post construction/maintenance stage of work.
- c) Employer's Health and Safety Representative responsibilities should include the following;
 - Advise and assist the Employer, Contractor and Consultants involved in project with their Health and Safety duties,
 - Notify details of the project to respective Health and Safety authorities,
 - Co-ordinate health and safety aspects of construction work and co-operate with others involved with the project,
 - facilitate good communication between the Employer, designers and contractors,
 - liaise with the principal contractor regarding ongoing work,
 - identify, collect and pass on pre-construction information,
 - Prepare/update the health and safety file on a weekly basis.

Health and Safety Plan

- a) Health and Safety Plan to be submitted by Contractor to the Employer/ Employer's representative for written approval;
- b) Following items should be included as part of the plan:
 - Method statements on how risks from hazards identified in pre-construction information and other hazards identified by the Contractor will be addressed,
 - Details of management structure and responsibilities, with clearly stated point of contact in case of emergency,
 - Arrangements for issuing health and safety directions,
 - Selection procedures for ensuring competency of other contractors,
 - Procedures for informing other contractors and employees of health and safety hazards,
 - Procedures for communications between the project team, other contractors and site operatives,
 - Arrangements for coordination and cooperation between contractors,
 - Procedures for carrying out risk assessments and for managing and controlling the risks,
 - Emergency procedures including those for fire prevention and escape,
 - Arrangements for ensuring that all accidents, illness and dangerous occurrences are recorded,
 - Arrangements for welfare facilities,
 - Procedures for ensuring that all persons on site have all the required safety gear and have received relevant health and safety information and training,
 - Arrangements for ensuring that all visitors to site receive the required safety gear and training prior to entering the site,
 - Arrangements for consulting with and taking views of people on site,
 - Arrangements for preparing site rules and drawing them to the attention of the those affected and ensuring their compliance,

- Monitoring procedures to ensure compliance with site rules, health and safety standards and statutory requirements.
- c) In addition, all statutory health and safety requirements should be included as part of the Health and Safety Plan.

1.6.4. Environmental Management

- a) Noise control
 - Comply with local regulations and minimise the noise level where possible.
- b) Pollution
 - Protect the site, the Works and the general environment including the atmosphere, land, streams and waterways against pollution. If pollution occurs inform immediately, including to the appropriate authorities and provide relevant information.
- c) Nuisance
 - Prevent nuisance from smoke, dust, rubbish, vermin and other causes. Prevent hazardous build-up on site, in excavations and to surrounding areas and roads,
- d) No dumping of material in the surrounding areas is permitted.
 - Asbestos containing materials
 - Report immediately any suspected materials discovered during execution of the Works. Agree methods for safe removal or encapsulation.
- e) Fire prevention
 - Prevent personal injury or death, and damage to the Works or other property from fire. Comply with local statutory fire regulations.
- f) Burning on site
 - Burning on site **NOT** permitted.

1.7. Moisture

- a) Prevent from wetness and dampness where this may cause damage to the works.
- b) Contaminated materials
 - Where instructed to remove material affected by contamination from the site, minimize the risk of infecting other parts of the site.
- c) Waste
 - Waste includes rubbish, debris, spoil, containers and surplus material. Keep site and works clean and tidy,
- d) Remove waste frequently and dispose off site in a manner approved by Waste Regulation Authority and as per Waste Management Plan.

1.8. Preservation of Existing Features, Vegetation & Services

- a) All existing features identified as to be retained by Employer's representative should be dealt with in accordance with the below listed procedures.
- b) Existing features include hard landscape structures as well as trees and other feature soft landscape elements.
- c) Hard landscape elements which have been identified as important element by the Employer shall be protected from all on going site works.
- d) No structural elements should be removed / relocated without written permission of Employer's representative.

- e) All protected elements should be clearly identified and labelled, site team should be aware of all the items to be protected.
- f) No existing trees should be cut/pruned without written permission of the Employer's representative/PM;
- g) All works shall be carried out in coordination with experienced horticulturalist;
- h) All works to trees shall be in accordance with relevant local standards;

1.8.1. Guidelines for Trees to be removed

- a) Any existing trees identified as "to be removed" or any dead trees:
 - Contractor shall cut and fell, as close to the ground as possible;
 - Trunks to be cut to convenient lengths;
 - Root stumps to be removed to a minimum depth of 800mm below ground level;
 - Any debris or material that comes from the above works shall be utilised in accordance with Waste Management Plan.

1.8.2. Guidelines for Trees to be retained

- a) All retained trees should be clearly identified "TO BE RETAINED" and information signs should be displayed on site in prominent positions at each entrance;
- b) All retained trees shall be marked by visible, durable tags, lettered to tree number or symbol (if any) on the drawings.
- c) Trees should be fenced off the works area if possible, in all cases tree trunk and roots should be protected from site works;
- d) Protected area should be in a shape of a circle around each tree with radius of 3m, measured from tree trunk.
- e) Do not allow for soil compaction under the tree;
- f) Do not store any materials or site equipment under or near the trees.
- g) Do not allow for any vehicles to be parked near retained trees or to pass under the trees;
- h) Prevent damage to tree bark; do not attach any items to trees.
- i) Do not expose tree roots;
- j) When works under the tree:
 - Do not add or remove topsoil within the drip line of trees, do not fill against tree trunks even temporarily;
 - Open excavation under tree canopy should be carried for as short period as possible. If exposing roots unnecessary temporarily line with polyethylene sheet to reduce evaporation;
 - Use only hand methods to locate, expose, and cleanly remove the soil around roots on the line of excavation. Root systems should be preserved intact.
 - When it is necessary to cut the roots bigger than 25mm diameter, make sure the cutting does not disturb remaining root system. Cut should be smooth with no ragged edges. Clean cut surface should be immediately treated with bituminous fungicidal sealant.

1.8.3. Guidelines for Existing Services

- a) Special precautions shall be taken by the Contractor to avoid damage to existing sewerage pipes, storm water drains, and pipes, storm water grids, and inlets, manholes, valve casings, water pipes and taps, fire hydrants, irrigation pipes and equipment, cables, completed landscaping works, telephone and light poles, vegetation and other services.
- b) Where manholes, valve castings and other services have to be adjusted to fit in with the construction work or for any other reason, the Employer's Representative shall be notified with 14 days' notice, so that the necessary arrangements can be made. Manholes, valve casings, meter casings, fire hydrants etc., shall always be easy to reach and visible.

1.8.4. Protection of Existing Property

- a) The Contractor shall take all necessary precautions against damage that might occur to any person, animal, building, structure, services, vegetation, vehicles etc.
- b) Enough warning signs, railings, lighting etc. shall be placed around excavations, obstacles, and heaps.
- c) Foot bridges, shall be placed over trenches, where necessary for the convenience of the public.
- d) Construction activity is to be limited to pre-designated areas and with the prior approval of the Employer's representative.

Scope of Specification for Potable, Recycle, Sewage and Storm Water Drainage

2. Potable Water Supply Network

2.1 Background

The potable water is coming from the Water Treatment Plant (WTP) from TP1 to the potable water Master Balancing Reservoir (MBR-P) located within the TP2E area. Then the potable water is pumped from the MBR-P to the Elevated service reservoirs (ESRs) within the TP2E area. The distribution network from the ESRs will serve to the different plots. The ESRs are planned based on different water supply zones and topography.

2.2 Potable Water Distribution Mains from ESR to Main line of Canal Park

There will be potable main line on both sides of canal park. Total approximate length of canal main shall be 6348 m. The Layout drawing of potable water rising main from ESR to Canal Park is given in Section 3, B (Technical Specifications), IV - Drawings. The contractor shall coordinate with “Design and Construction of Roads and Services of Activation Area in Dholera Special Investment Region, Dholera on EPC basis” contractor during the construction of potable main lines.

The scope for this item includes designing, providing, supplying, lowering, laying and jointing of pipes & valves, bulk flow water meters including all specials, excavation, shoring, shuttering, backfilling, bedding, construction of thrust blocks, valve chambers and water meter chambers and other necessary structures and fixtures for the potable water mains. The scope of services includes supply of water for hydraulic testing and carrying out hydraulic test for main.

The tentative details of Potable water mains are as follows:

Table 1: Tentative Details of Potable Water Main

S. No.	Description	Value	Length m(Tentative)
1	Pipe diameter	50 mm	Zone 1 – 1660 Zone 2 – 1452 Zone 3 – 1120 Zone 4 – 1624 Zone 5 – 494
2	Pipe material	HDPE(PE -100/ PN 6.0) as per IS spec No 4984/1995	

Details of Visual Branding for Potable Water Supply are specified at Section 3, B (Technical Specifications), IV -Drawings.

3. Recycled Water Supply Network

3.1 Background

The recycled water is tertiary treated of wastewater from STP and CETP of TP2E area. Recycled water is conveyed to the recycled water Master balancing reservoir (MBR-R1 & MBR-R2) located in TP2E area. Then recycled water is pumped from MBR (R-1 & R-2) to Recycled Water Elevated service reservoirs (ESRs) within the TP2E area - each Elevated service reservoir catering to separate recycled water supply zones.

From ESR, the recycled water shall be supplied at Plot Level Connection of Canal park for Toilet Flushing, Gardening etc.

The layout drawing of recycled water rising main from ESR to Canal Park are given in Section 3, B (Technical Specifications), IV -Drawings.

The scope for this item includes Designing, providing, supplying, lowering, laying and jointing of pipes & valves, bulk flow water meters including all specials, excavation, shoring, shuttering, backfilling, bedding, construction of valve chambers and water meter chambers (Details of Visual Branding for Chamber's Covers are specified at Section 3, B (Technical Specifications), IV -Drawings) and other necessary structures and fixtures for the recycled water rising mains. The scope of services includes supply of water for hydraulic testing and carrying out hydraulic test for rising main.

The scope also includes Drip Irrigation system for both North & South Sides of canal includes Designing, providing, supplying, lowering, laying and jointing of pipes & valves, Sprinklers etc.

The tentative details of Recycled water rising mains are as follows:

Table 2: Tentative Details of Main Line

S. No.	Description	Value
1	Pipe diameter	63 mm - 110 mm
2	Pipe material	HDPE (PE -100/ PN 6.0) as per IS 4984/1995
3	Pipe Length	6852 rmt

Table 3: Recycled Water MAIN LINE DETAILS

Sr. No.	LOCATION	Zone Number	Length of 63 mm Pipe (South Side of Canal)	Length of 110 mm Pipe (North Side of Canal)
1	CANAL PARK	Z1	590 m	590 m
2		Z2	726 m	726m
3		Z3	560 m	560 m
4		Z4	862 m	862 m
5		Z5	798m	578 m
	Total		3536	3316

Note: The lengths mentioned above are tentative lengths.

The recycled water from the nearest tapping point shall be tapped and supplied into Canal Park Area. Contractor has to design the complete recycled water network for Canal Park.

The implementation limit for this distribution system will start from the nearest recycled water tapping point until the ferule point of Canal Park network.

The Layout drawing for Recycled water network for Canal Park is given in Section 3, B (Technical Specifications), IV - Drawings.

4. Sewerage Network

4.1 Background

The Sewerage system is planned for the domestic sewage from toilets located in various canal parks area.

4.2 Sewerage Network & Manholes

The sewerage network will collect the sewage from toilets of Canal Park and convey it to the manhole of sewage line passing nearby.

Contractor has to design the complete network system for Canal park.

The implementation limit of this network will be from the toilets located in Canal Park to Nearby Manhole of sewage line (by gravity system). The Layout drawing for sewerage network for Canal Park is given in Section 3, B (Technical Specifications), IV -Drawings.

The scope for this item includes designing of the gravity sewer system, providing, supplying, lowering, laying and jointing of sewer including excavation, shoring, shuttering, backfilling, and bedding of pipes for domestic sewage collection. The scope of services includes hydraulic testing and carrying out hydraulic test for network and manholes.

The tentative details of the sewerage network system are as follows:

Table 4: Sewerage Network

Sr. No.	Description	Value
1	Sewer diameter	110 mm
2	Sewer Pipe material	HDPE (PE -100/ PN 6.0) as per IS 4984/1995
3	Total length of sewage network	1.85 km for Canal Park (Tentative)

Table 5: Sewage zone

Sr. No.	LOCATION	Zone Number	Pipe Length of 110 mm dia (Tentative)m
1	CANAL PARK	Z1	275 m
2		Z2	325 m
3		Z3	375 m
4		Z4	375 m
5		Z5	500 m
	Total		1850 m

The scope for Manholes includes designing and constructing Sewer manholes as per the type design in RCC and outside plastering in C.M. 1:3, necessary coping in RCC, fixing D.I. / C.I. Steps or Lugs, providing and fixing manhole frames and covers over

manholes etc. complete, , including all civil works like excavation, backfilling, RCC works etc. The typical Manhole details drawing are given in Section 3, B (Technical Specifications), IV - Drawings.

Table 6: Sewerage Manholes

Manhole Details	Nos./ Details (Tentative)
RCC Manholes	Canal Park – 74 Zone 1 = 11 Zone 2 = 12 Zone 3 = 15 Zone 4 = 15 Zone 5 = 21
Distance	@ 30 m c/c and at Junctions, Bend, change of alignment etc.
Depth of invert of manholes	1.2m to 6.0m

Details of Visual Branding for Manhole's Covers are specified at Section 3, B (Technical Specifications), IV -Drawings.

5. Storm Water Drainage Network

The Storm water generated from Canal Park shall be taken to Main junction either by Pipe or by Road Gradient. Contractor has to design the complete storm water drainage network for Canal Park and shall be disposed either in nearby Storm water Manhole or shall be directly disposed in Canal in Canal Park.

Drainage system for the Project roads, Project Area and adjacent areas shall be based on following parameters.

- a) Minimum cover shall be maintained below the finished ground level as per CPHEEO latest manual.
- b) All the drains draining area less than 200 hectares are designed for return period of 1 in 1.6 years (Annual Maximum Series - AMS) and checked for return period of 1 in 2.6 years (AMS). Under checking condition, pressure development of about 1 meter is allowed (elevation of hydraulic grade line above crown level).

5.1 SW Drains HDPE Pipe Conduits

SW drain pipe details are as per table given below;

Table 7: Storm water Network

Sr. No.	Description	Value
1	Storm water drain diameter	315 mm
2	Sewer Pipe material	HDPE (PE -100/ PN 6.0) as per IS 4984/1995
3	Total length of sewage network	7.291 km for Canal Park (Tentative)

Table 8: Storm water zone

Sr. No.	LOCATION	Zone Number	Pipe Dia - 315 MM (Tentative)
1	CANAL PARK	Z1	1771 m
2		Z2	1395 m
3		Z3	1095 m
4		Z4	1595 m
5		Z5	1435 m
	Total		7291

The scope for above works includes designing, laying & jointing of HDPE Pipes with other necessary structures e.g. catch pits, inlets, chambers, covers, inlet grating etc. Manholes with SFRC cover shall be provided at convenient locations but not more than 30m intervals for maintenance of drains.

Details of Visual Branding for Manhole's / Chamber's Covers are specified at Section 3, B (Technical Specifications), IV -Drawings..

Storm water generated from zones should be drained through a special gradient arrangement into the canal as detailed out in the design.

6. Power Infrastructure

6.0 SCOPE:

- (i) These General Specifications indicate the requirements and precautions to be taken during the execution of External Electrical Installation works to ensure efficient, safe, economical and practical use of materials and equipment including prevention of risks and fire hazards.
- (ii) This Chapter covers the general commercial requirements applicable to this works contracts for Electrical Installation works.

6.1 RELATED DOCUMENTS:

- (i) These General Specifications shall be read in conjunction with the standard conditions of contract contained in other parts of the document and their correction slips, the tender specifications, schedule of quantities, drawings and other documents in the tender papers connected with this work.

6.2 WORKS INCLUDED IN THIS SECTION:

- (i) Providing & fixing of receiving equipment's.
- (ii) Providing & fixing of LT cables.
- (iii) An adequate equipment grounding system.
- (iv) Providing, Installation & testing/ commissioning of Feeder pillars etc.
- (v) All other systems as per BOQ.

6.3 INTERPRETATION OF AGREEMENT:

In the interpretation of the agreement, the order of descending importance for any ambiguity or discrepancy shall be as follows:-

- (i) Schedule of Quantities read with Technical Specifications.
- (ii) Special Conditions
- (iii) Drawings
- (iv) I.S.I. Codes/National Electrical Code/ latest CPWD Specifications/ B.S.S. / or any other International Standard.
- (v) Clauses of Contract.
- (vi) General Directions

- (vii) Sound Engineering practice.

Note: In case of difference between (i), (ii) & (iii) above, the stringent amongst all shall be followed.

6.4 DRAWINGS:

6.4.1 CONTRACT DRAWINGS:

Contract drawings are basic but shall be closely followed as actual construction permits. Any deviations made shall be in conformity with the services drawings. Shop drawings shall be submitted by the contractor and got approved from the employers. Drawings shall take precedence over contract or other services drawings as to all dimensions. Any deviations in drawings will be brought to Employer notice before work is executed on site. Contractor shall verify all dimensions at site and bring to the notice of the Employer any or all discrepancy or deviations noticed.

6.4.2 DETAILED WORKING DRAWINGS:

Detailed working drawings and detail drawings on the basis of which actual work is to be proceeded will be furnished to the contractor by the Employer.

6.4.3 PREPARATION OF SHOP AND FABRICATION DRAWINGS:

All shop and fabrication drawings shall be prepared by Contractor based on the Employer's drawing and got approved from the Employer. No extra payment shall be admissible to the contractor on this account.

6.4.4 SHOP DRAWING, MAINTENANCE MANUALS Etc.

On the award of the work, the contractor shall immediately proceed with the preparation of detailed shop drawings, detailing the equipment that are to be installed and the ancillary works that art to be carried out. Six sets of all such working drawings shall be submitted to the Employer for their approval to ensure that the works will be carried out in accordance with the specifications and drawings, including such changes as may have been mutually agreed upon. The basic drawings shall be received by the Employer for his approval.

- 6.4.5 Any drawing issued by the Employer for the work are the property of the Employer and shall not be lent, reproduced or used on any works other than intended without the written permission of the Employer.

6.5 After completion of the work the contractor shall submit one original on R.T.F & five prints of as built drawings along with 3 Nos. Compact disc containing the same before the certificate of completion is issued to him. These drawing would include;

- a) The location of all the equipment supplied & erected by the contractor.
- b) Cable routes clearly indicating the sizes & number of cables.

- c) Earthing layout - indicating the type of earth station & size of earth conductor.
- d) Wiring diagram of L.T. Panels.
- e) Feeder pillars locations etc. layouts.
- f) Complete single line diagram
- g) Any other information the Employer may deem fit.

6.6 APPROVALS:

- 6.6.1 The contractor shall obtain all information relating to local regulations, Bye-Laws, sanction and release of electrical connection, application of any and all laws relating to his work or profession and his having to execute work as required. No additional claims shall be admissible on this account.

6.7 CODE REQUIREMENTS:

All work shall be done in accordance with the Institute of Electrical Engineers / I.S. Code amended up to date/ Indian Electricity Rules.

6.8 MATERIALS:

All materials to be used in this work be new and bear the Employer label of approval.

6.9 RATES:

- 6.9.1 The work shall be treated as on works contract basis and the rates tendered shall be for complete items of work inclusive of all taxes (including works contract tax, if any), duties, and levies etc. and all charges for items contingent to the work, such as, packing, forwarding, insurance, freight and delivery at site for the materials to be supplied by the contractor, watch and ward of all materials for the Internal E.I. work at site etc.

- 6.9.2 Prices quoted shall be firm.

6.10 COMPLETENESS OF TENDER:

All sundry fittings, assemblies, accessories, hardware items, foundation bolts, termination lugs for electrical connections as required, and all other sundry items which are useful and necessary for proper assembly and efficient working of the various components of the work shall be deemed to have been included in the tender, whether such items are specifically mentioned in the tender documents or not.

6.11 WORKS TO BE DONE BY THE CONTRACTOR:

- 6.11.1 Unless and otherwise mentioned in the tender documents, the following works shall be done by the contractor, and therefore their cost shall be deemed to be included in their tendered cost:-
- 6.11.2 Cutting and making good all damages caused during installation and restoring the same to their original finish.
- 6.11.3 Painting at site of all exposed metal surfaces of the installation other than pre-painted items like fittings, fans, switchgear/ distribution gear items, etc. Damages to finished surfaces of these items while handling and erection, shall however be rectified to the satisfaction of the Employer.
- 6.11.4 Temporary shed if required over the storage space and locking arrangement thereof, and watch and ward of the materials and completed installation till completion of the work.
- 6.11.5 Testing and commissioning of completed installation.

6.12 TOOLS FOR HANDLING AND ERECTION:

All tools and tackles required for handling of equipment and materials at site of work as well as for their assembly and erection and also necessary test instruments shall be the responsibility of the contractor.

6.13 CARE OF THE BUILDING:

Care shall be taken by the contractor to avoid damage to the any buildings during execution of his part of the work. He shall be responsible for repairing all damages and restoring the same to their original finish at his cost. He shall also remove at his cost all unwanted and waste materials arising out of his work from the site.

SPECIFICATION FOR PANEL SWITCHBOARD

1. SCOPE

This Specification covers the requirements for the design, construction,, assembly, mechanical installation and testing of a Main Low Voltage switchboard:

The Specification shall be read in conjunction with the accompanying Annexure and the Principal's drawings listed therein.

The Low Voltage Switchboard shall be with aluminium bus bars, indoor type, free standing, with Plinth, floor mounting type, extensible on either side.

2. STANDARDS:

The design, manufacture & testing of the various items are covered by the following standards:

IS 8623 – 1977	:	Factory built assemblies.
IS 4237 - 1967	:	General requirement for Switchgear and Control gear for voltages not exceeding 1000V.
IS 2147 - 1962	:	Degree of protection provided by enclosure for low voltage switchgear and Control gear.
IS 3619 - 1966) IS 6005 - 1970)	:	Phosphate treatment.
IS 5 - 1978	:	Colour for ready mixed paints & enamels.
IS 5082 - 1969	:	Wrought aluminium for electrical purpose.
BS - 162	:	Clearance & creepage for bus systems.
IS 375 - 1963 IS 5578 - 1970	:	Marking arrangement for busbar/cable.
IS 4237 - 1967	:	Clearances & Creepages for Part I & II devices.
IS 6875	:	Push buttons & related control switches including control contactors.
IS 9224 Part I & Part II – 1973	:	HRC Fuses.

IS 2516 Part I & II – 1979/IEC-60947-1&2 :Alternating current circuit breakers (ACB).

II Sec. I – 1977 : Voltage not exceeding 1000V AC or 1200V DC.

IS 3231 - 1965 : Protective relays.

IS 3156 - 1965 : Voltage transformers.

IS 2705 - 1981 : Current transformers.

IS 1248 - 1968 : Elect. indicating instruments.

3. SPECIFICATIONS:

Rated System : AC nominal system voltage 230/400 with the tolerance of ± 10 percent as given in IS 12360 upto date.

Rated insulation level : 660V rms.

HV withstand level : 6 kV for power circuit.
(for 1 min). : 4kV for control circuit

Horizontal bus bar rating. / Drawings. : As indicated in B.O.Q.

Rated short time : Up to 50kA rms for 1 sec. 110kA Rating of H.Bus & peak (36MVA).
V. Bus.

Degrees of Protection : IP65

4 CONSTRUCTION:

The standard Panel shall contain a basic frame assembly reinforced with formed sheet steel profiles and cross members. Sheet steel partitions shall be bolted to this frame to form the full structure. Basic structure is made out of minimum 14 S.W.G (2 mm. thick) sheet steel. The load bearing members are made out of 14 S.W.G. and non-load member items are out of 16 S.W.G. (1.6 mm.) sheet steel. All sheet steel shall be cold rolled. The frame and the mounting assemblies should be Aluzinc coated.

The pretreatment process shall involve de-greasing, rinsing, de-scaling, rinsing, de-rusting, rinsing, phosphating, rinsing & passivation. After this, it shall be spray finished with a primer, oven dried and spray painted with finish paint, 2 coats wet on wet. Then it shall be baked in oven to achieve a uniform, smooth and tough film. The standard shade offered shall be light grey shade 631 semi gloss as per IS: 5. The painting shall be with synthetic enamel stoving grade to a final overall dry film

thickness of 40 microns. Stoving grade to a final overall dry film

The Panel design shall be of single front cubicle with horizontal bus bars mounted at top, extensible on either side. The breaker, instruments and aux. equipments shall be accessible from front. The cable terminations shall be accessible from the rear side.

5. MINIATURE CIRCUIT BREAKERS (MCB)

- 5.1 The MCBs shall be of the completely moulded design suitable for operation at 240/415 Volts 50 Hz, single phase/ 3-phase and neutral system. MCBs shall be quick make and break type conforming to relevant standards. Housing shall be heat resistant and have high impact strength. MCBs shall be flush mounting type and shall be provided with trip free manual operating lever with True Contact Position - ON/ OFF indications.
- 5.2 MCBs shall be provided with magnetic thermal releases for over current and short circuit protection.
- 5.3 MCBs shall have quick make and break non-welding self wiping silver alloy contacts rated for 10 kA short circuit at 230/ 415 volts in accordance with IEC 60898 and IS : 8828 - 1996 as per the schedule & the drawing both on the manual and automatic operation. The MCB shall conform to Class 3 Energy Limitation. Each pole on the breaker shall be provided with inverse time thermal over load and instantaneous over current tripping elements, with trip-free mechanism. In case of multi-pole breakers, the tripping must be on all the poles and operating handle shall be common.
- 5.4 Breakers must conform to IEC 60898 with facility for locking using padlock with hasp in OFF position. Copper Pressure clamp terminals for stranded/solid conductor insertion are acceptable up to 10-sqmm size and for higher ratings; the terminals shall be suitably shrouded.
- 5.5 MCB shall have a minimum life expectancy of 20,000 operations.
- 5.6 MCB shall not have any line load bias.
- 5.7 They shall have Trip free mechanism.
- 5.8 They shall have Dual Termination facility on both sides to either connect cable or bus bar.
- 5.9 They shall have True contact position indicator with provision for a Label holder.
- 5.10 **RCBO**
 - 5.10.1 RCBOs are devices which feature an integrated overcurrent protection unit for overload and short-circuit protection in addition to protection against residual currents. Another version in this device group is the residual current unit (RC unit). The customer can then mount the miniature circuit breaker versions suitable for a particular application (characteristic, rated current, switching capacity) on these RC units. Once assembled, these devices perform the same functions as an RCBO. The

RC unit provides residual-current detection but has no contacts of its own; in the event of a fault, it trips the miniature circuit breaker which opens the contacts and interrupts the circuit.

5.10.2 RCBO Type AC , Type A and Type F Residual current operated circuit breakers with overcurrent protection (RCBOs) include residual current detection and overcurrent protection in one device and thus enable a combination of electric-shock protection, fire protection and line protection in one device. The use of RCBOs has a series of advantages: • Each circuit is assigned its own RCBO: If the device is tripped due to a residual current, only the affected circuit is disconnected. This is done in the same way as it has been for years when the miniature circuit-breaker exclusively assigned to a circuit trips due to overcurrent. • Due to division of the circuits, the user profits from increased operational safety and equipment availability because leakage currents produced by electronic equipment, such as parts of power supply systems, for operating reasons do not add up to produce non-permissible values and exceed the tripping value of the RCCB. • Planning is simplified in that demand factors as in the case of loads on residual current operated circuit breakers do not have to be taken into account. The RCBO protects itself against overload. • In the event of a fault, all poles are disconnected from the power supply. All live parts are thus reliably disconnected from the supply and troubleshooting is simplified.

5.10.3 Installation with RCBOs contains an example of a future-oriented installation, which meets all the requirements of the installation regulations and planning stipulations. Each individual socket-outlet circuit now has its own RCBO, which provides complete fault, fire and line protection as well as additional protection against direct contact. In the event of a fault, only the affected circuit is disconnected from the supply. The use of Type F RCBOs is recommended for washing machine, dryer and dishwasher circuits. In the event of a fault in such appliances, currents with frequencies other than 50 Hz can occur for which Type A RCBOs are not designed. In order to obtain increased safety against inadvertent disconnection from the supply, e.g. due to lightning over voltages, the use of a super resistant RCBO, Type K, is recommended for protection of socket outlet circuits for refrigerators and freezers. If RCBOs with a rated residual current of 30 mA or less are used, the additional protection and fault protection can be provided with the same RCBO. The RCBO must be installed at the beginning of the circuit to be protected. Figure 9: Example of an installation with RCBOs

LS kW/h RCBO Socket outlet circuit 1 Socket outlet circuit 1 Bath/ outdoors Washing machine Microwave ovens Dishwashers Dryer Refrigerator/ freezer, kitchen Cooker Lighting 1 Lighting 2 FI/LS Type A FI/LS Type A FI/LS Type A FI/LS Type F FI/LS Type A FI/LS Type F FI/LS Type F FI/LS K Type A 26

As an option, a selective RCCB with $I_{\Delta n} = 300 \text{ mA}$ can be connected upstream of the entire installation. This RCCB protects installations with branches against faults and fire. If the stipulations of DIN 18015-2:2000-08 and RAL RG 678:2004-09 are taken as the basis for the same extent of equipment and for the same living area, the additional space required in the circuit distribution board when the recommended RCBOs are used is only slightly more than the space required in an installation with separate RCCBs and miniature circuit breakers.

6. BUSBAR SYSTEM:

6.1 HORIZONTAL BUSBAR:

The horizontal bus bars shall be located at the top/ bottom/ center bus bar compartment. The bus bars shall be of electrical grade, high conductivity aluminium sections of required ratings/ as per BOQ.

6.2 VERTICAL BUSBAR:

The vertical bus bar shall also be made from high conductivity electrical grade aluminium sections, the rating and size shall depend upon the total rating of all feeders in the column considering the diversity factors 0.9.

All the bus bars shall be provided with black heat shrinkable sleeving with R.Y.B phase identification at regular intervals.

6.3 NEUTRAL BUS:

It shall run parallel to horizontal and vertical bus bars. Standard neutral bus bar size is half the size of main bus bar.

6.4 CONTROL BUSBAR:

Control bus of 60A and 415V, if required, shall be provided at top in the front portion. These shall be supported with insulator at required interval.

6.5 EARTH BUS:

25x5 mm for other panel boards for connection to project earth at either end.

6.6 BUS JOINTS:

Joining between bus bars shall be by using rigid or flexible bus links.

6.7 BUS BAR SUPPORTS:

Both horizontal and vertical bus bars shall be supported at uniform intervals on high impact, anti-tracking, non-hygroscopic, arc resistant, flame retardant, self extinguishing GRP (Glass reinforced plastics), insulators. These insulators shall be type tested for short circuit withstands capacity.

6.8 MODULES:

6.8.1 OUTGOING FEEDERS:

The outgoing feeders shall be as indicated in B.O.Q. / Drawing. Irrespective of the panel depths, the panels shall be coupled front flush. Each outgoing feeder shall have the provision for Cable/bus duct connection from the bottom/top.

7. CONTROL WIRING:

All control wiring shall be done as a standard, using 1.5sq.mm. Multi stranded PVC insulated FRLS copper wires. These shall be black in color for AC and grey in color for DC. The C.T. connections shall be done using 2.5 sq. mm. Multi stranded PVC insulated copper wires of red color.

The outgoing control wires shall be terminated from the equipment terminals to control terminal block in cable chamber. Whenever required PVC channels shall be used for wire routing. On either ends of these wires self-locking yellow ferrules with black letters shall be provided. Multi stranded wire termination shall be provided with crimping type lugs.

8. INTER-MODULE WIRING:

The control wiring between modules located in the same vertical section shall be connected at the respective terminal blocks/ terminals. These shall be routed through the cable duct in PVC wire channels.

Inter connections between adjacent cubicle in the same shipping sections shall be done in a similar way.

9. CURRENT TRANSFORMERS:

Current transformer meant for metering & protection shall be mounted on the bus links either on the incoming side or outgoing side as the case may be. They shall be wired and terminated suitably for external connection.

10. INDICATING INSTRUMENTS & METERS

Electrical indicating instruments shall be flush mounted digital type having min. 96 mm square dial.

11. CONTROL AND SELECTOR SWITCHES

Control and instrument switches shall be of the rotary type and shall be provided with properly designated plate. Control switches shall have momentary contacts spring return to centre with pistol grip handle. Instrument and selector switches shall have stay put contacts.

12. PUSH BUTTONS

All push buttons shall be of push to actuate type having 2 `NO' and 2 `NC' self reset contacts. They shall be provided with designation plates, engraved with their functions. Push button contacts shall be rated for 10 amps at 415V A.C. and 0.6 Amp. Inductive breaking at 220V D.C.

13. INDICATING LAMPS

Indicating lamps shall be of the LED type. Color of lens shall be as per enclosed drawing/ data sheet.

CABLES

1. MEDIUM AND LOW PRESSURE:

Cables should be steel armoured XLPE type with fire retardant compound Aluminium / copper conductor conforming to the quality as specified in the schedule of work. All cables, accessories and other materials should conform to IS Specification amended up to date IS: 7098 (part-1). The jointing in any of the cables not permitted.

2. LAYING OF CABLES:

All cables shall be laid as per C.P.W.D GENERAL SPECIFICATIONS FOR ELECTRICAL WORKS (PART-II EXTERNAL) - 1974 with all upto date amendments & latest.

All cables shall be tested as per C.P.W.D GENERAL SPECIFICATIONS FOR ELECTRICAL WORKS (PART-II EXTERNAL) - 1974 with all upto date amendments & latest.

3 TESTING THE CABLES:

1) Prior to laying the cables, the following test shall be carried out:

a) Insulation between phases and between phase and earth for each length of cable before termination.

2) On completion of cable laying work, the following tests shall be conducted in the presence of the Engineer-in-charge.

a) Insulation resistance test (sectional and overall)

b) Continuity resistance test.

c) Sheathing continuity test.

d) Earth test.

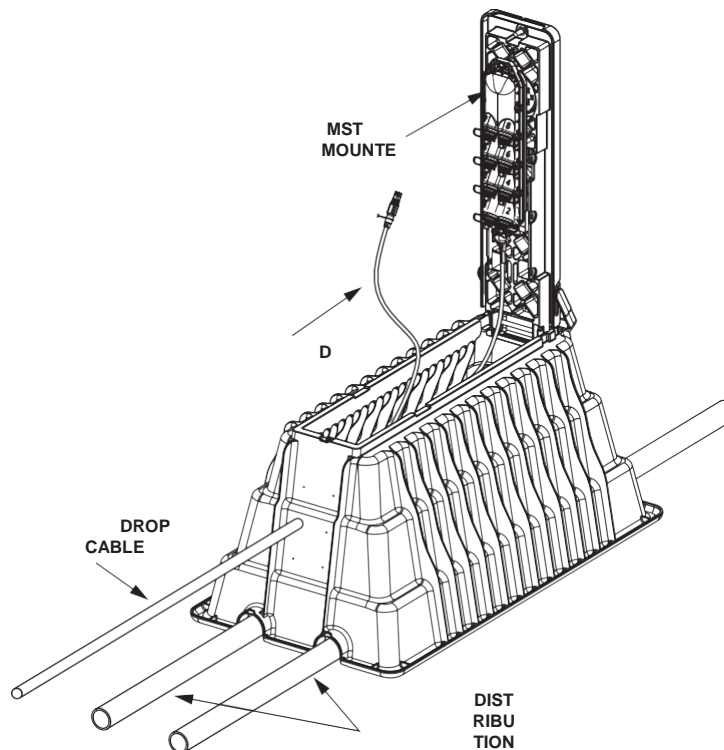
All tests shall be carried out in accordance with relevant Indian standard code of practice and Electricity rules. The contractor shall provide necessary instruments, equipments and labour for conducting the above tests and shall bear all expenses in connection with such tests.

HANDHOLES

1 Hand-Hole Enclosure

The hand-hole enclosure, is an Outside Plant (OSP), molded-plastic, below- ground mounting system. Access to the interior of the enclosure is through a rectangular opening located on top of the enclosure. The opening is fitted with a hinged cover that locks in a vertical upright position when opened. The hand hole mounts on the underside of the cover and the cable slack is stored in the compartment below. Opening the cover swings up and out of the enclosure for above-ground access. Cable rings (optional) within the enclosure provide cable management for distribution and drop cable slack.

The hand-hole enclosure is open at the bottom and must be mounted on compacted fill material for support. Cutouts in the bottom edge of the enclosure allow the enclosure to be placed over 2.5-inch (outside diameter) distribution cable conduit. Tie points are provided for securing the distribution cable conduit to the enclosure. Entry/exit points for drop cables are marked on the ends of the enclosure. A hole must be drilled into the enclosure at each selected drop cable entry/exit point. A drop cable conduit clamp kit (accessory) is available for securing drop cable conduit to the enclosure at the selected entry/exit point.



1.1 Installation Overview

Installation of the hand-hole enclosure involves the following main tasks:

Hand-Hole Enclosure Installation – Installing the hand-hole enclosure consists of digging a hole for the enclosure, installing an aggregate support base, installing the distribution cable conduit, and placing the enclosure in the hole. If armored distribution cable will be installed, a grounding system must also be installed.

Distribution Cable Splicing – The distribution cable must be spliced to the system cable at a separate splice enclosure. Use locally approved practices and procedures for splicing..

Drop Cable Installation and Connection – The drop cables must be routed into the enclosure and some slack stored.

Site Restoration - The enclosure cover must be closed and secured, the area around the enclosure must be backfilled, and the landscaping restored.

2 INSTALLING THE HAND-HOLE ENCLOSURE

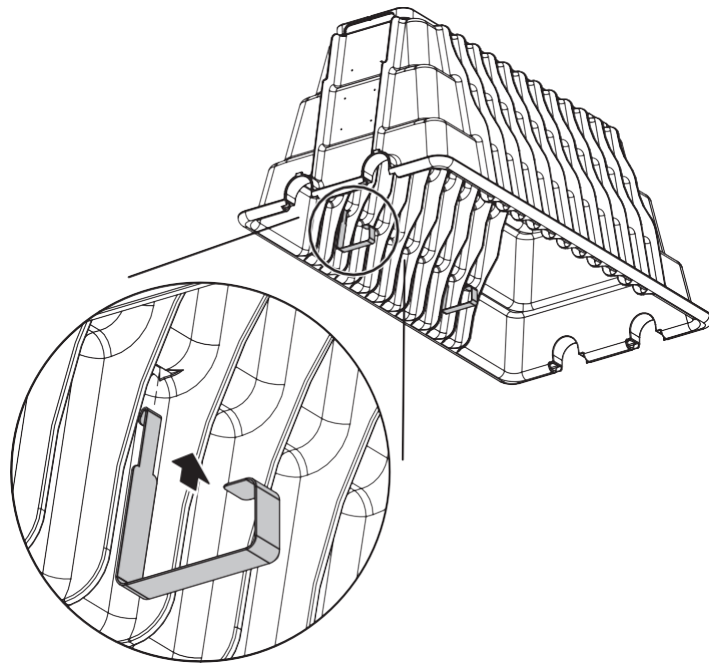
This section provides instructions for installing the cable management brackets, excavating and preparing the hole required for the hand-hole enclosure, placing the enclosure in the hole, installing the grounding system (if required), and installing the distribution cable conduit.

2.1 General Installation Recommendations

The site chosen for the installation must conform to all local codes and any permits required must be obtained prior to the start of installation. The location must be accessible and must not expose the worker to possible safety hazards. In addition, the enclosure should not be located in a place where it is likely to be damaged. The enclosure should be installed directly in line with the trench that was used for the distribution cable conduit.

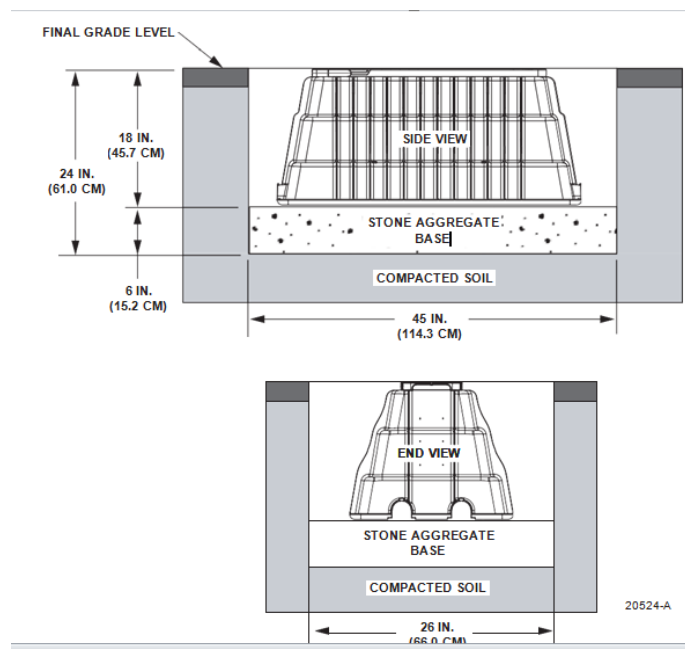
2.2 Cable Management Bracket Installation (Option)

Install the four cable management brackets (if included with the enclosure) as shown in [Figure 3](#). The cable management brackets are used for storing distribution and drop cable slack.



2.3 Excavation

The excavation must be deep enough to provide a fill base that will maintain stability for the enclosure and mounted within it. There must be room for 6 inches (15.25 cm) of compacted aggregate fill below the enclosure. Excavate a rectangular hole for the enclosure as shown in Figure . Fill the bottom of the hole with stone aggregate, tamping it as it is filled to build a 6 inch (15.25 cm) layer with a level surface. The stone aggregate will provide a stable base to support the enclosure.



ELECTROLYTIC MAINTENANCE FREE EARTHING

The effective earthing connection surface should be smooth & free from paints and oxide coatings

MAINTENANCE FREE EARTHING

A. General

1. Self-contained ground electrode(s) using electrolytically enhanced grounding where specifically indicated on the drawings.
2. The electrode shall operate by hygroscopic ally extracting moisture from the atmosphere to activate the electrolytic process
3. Electrode shall be 100% self-activating, sealed and maintenance free. No additions of chemical or water solutions required
4. To achieve specific earth resistance, contact manufacturer for engineering and applications support

B. Technical Specifications

Table 9:Types & Technical Specifications (Long Life Maintenance Free Earthing Solution)

Soil	Warranty (years)	Current Capacity	Electrode Details			TF Qty (Bags)	Test Well Cover
			Length (feet)	Outer Dia. (inch)	Thickness (mm)		
Non Rocky	30	1kA/9Sec	10	2	2	3	Polyplastic

1. The specifications with performance warranty and technical spec details shown in the tables.
2. The ground rod shall be filled from the factory with non-hazardous metallic salts to form the electrolytic process and enhance the grounding performance.
3. Ground rod shall be a minimum of ten feet long. TerraDyne® Model # TG-10S or TRIPODE –Cu-50-3 may be used.

OR

Selection of models depends on the user choice.

4. A Solid Tinned AWG Cu ground cable shall be exothermically welded to the side of the rod for conductor connection OR 40x5mm OR 50x5mm OR 100x150x6mm used for conductor connection.
5. For Rocky or excavation condition are poor Model # TerraDyne TG-10L may be used with same Dia and Thickness. Only the difference in this model is L shaped with 36” vertical riser (shape) and rest in horizontal shape.

OR

6. The Crowfoot Bar earthing systems used for is one of the best alternate of Maintenance Free Earthing in the Rocky area.

7. A Solid Tinned AWG Cu ground cable/50x5mm copper plate shall be exothermically welded to the side of the rod for conductor connection

C. Protective Test Well

1. Polyplastic well for non-traffic applications. Includes bolt down flush cover with “breather ports.” TerraDyne® Model #910

–OR–

2. Fiberlyte well for traffic and industrial applications. Wheel loading 4.5 Tons. TerraDyne® Model #FL8-TB

D. Environment Friendly Backfill Material

1. Non-corrosive, electrically conductive and ground enhancing backfill. TerraFill® Model # TF-50. TerraFill /TRIPODE FILL will lower the contact resistance to earth by up to 63 % when used in conjunction with copper grounding equipment.

E. Excavation

1. Bore a hole into the earth (minimum diameter 6"). Hole should be bored to allow installed unit to be as close to vertical as possible
2. A 14" hole must be provided for the cover box.
3. Depth of hole must be 6" deeper than the vertical length of the system.
4. Top vent ports must be left open to the atmosphere for continuous air circulation by using the protective test well provided.
5. Plate Type Earthing (Cu/GI), Crow Foot Earthing and Cu Claded rod earthing, the mixing procedure of Backfill will be same as like in the electrolytic Earthing.

F. Installation

1. Remove sealing tapes from the bottom of unit only. Tapes must be saved and made available to the electrical inspector to verify removal and proper installation. Do NOT remove the green and white “Bury to Here” marker from the top of the unit.
2. Position the unit in the hole. Use green and white “Bury to Here” marker as a guide to depth in which unit shall be buried in TerraFill®. Three bags of TerraFill® are included with each 10' electrode.
3. Pour TerraFill® around electrode in augured hole. Do not mound backfill past green and white marker.
4. Place box with cover over the top of the electrode so that the cover is at grade level. Use backfill to stabilize box around the electrode. This keeps the breather holes free of obstruction and debris. Top of box should not contact the top of the electrode.

5. Remove top sealing tape ONLY after backfill is complete. This prevents soil from blocking the vent ports.

Above installation must be taken place in presence of UL listed company.

G. Connection

1. Connect grounding conductor to ground rod pigtail exothermally.
2. Bury grounding conductor 30inch below grade

LIGHTING FIXTURES (LED)

All LED lighting fixtures shall be suitable for use on single Phase, 230 Volts, and 50 cycles AC supply system.

Fixtures shall be provided with heavy duty low loss open construction copper wound ballast, power factor improvement capacitor, lamp and starter holders and connector block. The control gear shall be rugged in construction and shall function without overheating over the entire length of its useful life. The starter shall be suitable for repeated switching operations without premature failure.

All fixtures shall be duly wired with appropriate size of copper conductor.

All wires/cables, when passing near a heat source within the fixture, shall be provided with an additional protective sleeve.

Suitable earthing terminal shall be provided.

The Fixture body made of Aluminium/ CRCA MS shall be duly precision fabricated, duly finished, pretreated and powder coated / Stove enameled. The body shall be so designed to ensure sufficient heat dissipation and avoid overheating of control gear.

All hardware shall be MS zinc Passivated and shall resist rusting. Locking nuts/ washers shall be provided wherever required to prevent accidental loosening.

All aluminium reflectors wherever provided shall be electrochemically brightened and anodized.

The optical system shall be designed for optimum light distribution.

The fixtures shall be complete with all accessories and shall be ready for use.

The provision of luminaries in various areas to be designed to achieve the illumination levels as per relevant standards and site requirement. The luminaries will be selected keeping in mind Aesthetics, location requirement, and ease of maintenance and energy conservation.

TESTING OF INSTALLATION

SCOPE

This section describes the details of tests to be conducted in the completed internal electrical installations, before commissioning.

1. GENERAL

1.1 Tests

On completion of installation, the following tests shall be carried out:-

- Insulation resistance test.
- Polarity test of switch.
- Earth continuity test.
- Earth electrode resistance test.

2. Witnessing of tests

Testing shall be carried out for the completed installations, in the presence of and to the satisfaction of the Employer by the contractor. All test results shall be recorded & submitted to the Employer.

3. Test instruments

All necessary test instruments for the tests shall be arranged by the contractor.

4. INSULATION RESISTANCE

- 4.1 The insulation resistance shall be measured by applying between earth and the whole system of conductors, or any section thereof with all MCB.s in place, and all switches closed, all lamps in position, or both poles of the installation otherwise electrically connected together, a direct current pressure of not less than twice the working pressure, provided it need not exceed 500 volts. Where the supply is derived from a polyphase A.C. system, the neutral pole of which is connected to earth either directly or through added resistance, the working pressure shall be deemed to be that which is maintained between the phase conductor and the neutral.
- 4.2 The insulation resistance shall also be measured between all the conductors connected to one pole, or phase conductor of the supply, and all the conductors connected to the neutral, or to the other pole, or phase conductors of the supply with all the lamps in position and switches in "off" position, and its value shall be not less than that specified.
- 4.3 The insulation resistance in megaohms measured as above shall not be less than 12.5 megaohms.
- 4.4 The term "outlet" includes every point along with every switch, except that a switch

combined with a socket outlet, appliance or lighting fitting is regarded as one outlet.

5. POLARITY TEST OF SWITCH

- 5.1 In a two wire installation, a test shall be made to verify that all the switches in every circuit have been fitted in the same conductor throughout, and such conductor shall be labeled or marked for connection to the phase conductor of the supply.
- 5.2 In a four wire installation, a test shall be made to verify that every non-linked single pole switch is fitted in a conductor which is labeled, or marked for connection to one of the phase conductors of the supply.
- 5.3 The installation shall be connected to the supply for testing. The terminals of all switches shall be tested by a test lamp, one lead of which is connected to the earth. Glowing of test lamp to its full brilliance, when the switch is in "on" position irrespective of appliance in position or not, shall indicate that the switch is connected to the right polarity.

6. TESTING OF EARTH CONTINUITY PATH

The earth continuity conductor, including metal conduits shall be tested for electric continuity. The electrical resistance of the same along with the earthing lead, but excluding any added resistance, or earth leakage circuit breaker, measured from the connection with the earth electrode to any point in the earth continuity conductor in the completed installation shall not exceed one ohm.

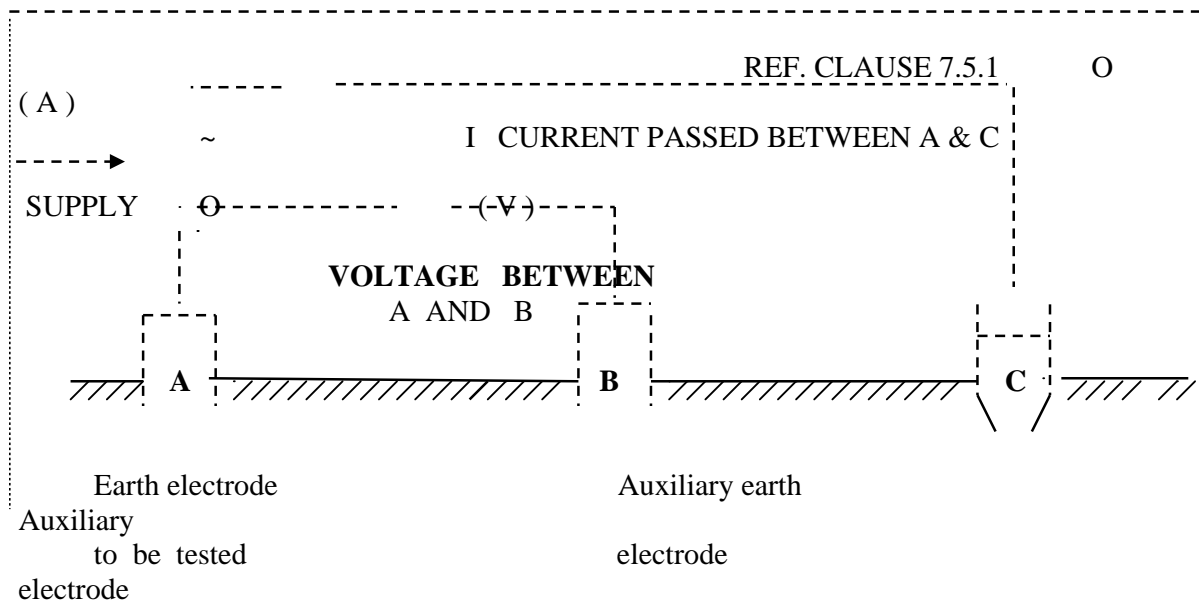
7. MEASUREMENT OF EARTH ELECTRODE RESISTANCE

- 7.1 Two auxiliary earth electrode, besides the test electrode, shall be placed at suitable distance from the test electrode (see figure). A measured current is passed between the electrode 'A' to be tested and an auxiliary current electrode 'C', and the potential difference between the electrode 'A' and auxiliary potential 'B' is measured. The resistance of the test electrode 'A' is then given by

$$R = \frac{V}{I}$$

Where,

- R - Resistance of the test electrode in ohms,
V - Reading of the voltmeter in volts.
I - Reading of the ammeter in amps.



7.2 Stray currents flowing in the soil may produce serious errors in the measurement of earth resistance. To eliminate this, hand driven generator shall be used.

If the frequency of the supply of hand driven generator coincides with the frequency of stray current, there will be wandering of instrument pointer. An increase or decrease of generator speed will cause this to disappear.

7.3 At the time of test, the test electrode shall be separated from the earthing system.

7.4 The auxiliary electrodes shall be of 13 mm dia meter mild steel rod driven upto 1 m into the ground.

7.5 All the three electrodes shall be so placed that they are independent of the resistance area of each other. If the test electrode is in the form of a rod, pipe or plate, the auxiliary current electrode 'C' shall be placed at least 30 m away from it, and the auxiliary potential electrode 'B' shall be placed mid-way between them.

7.6 Unless three consecutive readings of test electrode resistance agree, the test shall be repeated by increasing the distance between electrodes A and C upto 50 m, and each time placing the electrode B midway between them.

8. TEST CERTIFICATE

On completion of an electrical installation, a certificate shall be furnished by the contractor, countersigned by the certified supervisor under whose direct supervision the installation was carried out. This certificate shall be in the prescribed form per the standards in addition to the test certificate required by the local Electric Supply Authorities.

PUBLIC ADDRESS (PA) SYSTEM

- i. The Public Address System (PA) shall be capable of addressing citizens.
- ii. The proposed system shall contain an IP-based announcing control connected to the main command centre.
- iii. The system shall contain an IP based amplifier and uses PoE power which shall drive the speakers. The system shall also contain the control software which shall be used to control/ monitor all the components of the system which include Controller, Calling Station & keypad, Amplifier (Mixing & Booster).
- iv. It shall be able to broadcast messages across all PA systems or specific announcement could be made to a particular location supporting single zone / multi zone operations.
- v. The system shall also deliver pre-recorded messages to the loud speakers attached to them from CD/DVD Players & Pen drives for public announcements.
- vi. PA system's master controller shall have function keys for selecting the single location, group of locations or all locations, simple operation on broadcasting to any terminal or separated zones.
- vii. PA system's master controller should facilitate multiple MIC inputs and audio inputs.

Scope of Work:

The broad scope of work to be covered under this sub module will include the following, but is not limited to:

- The system deployed shall be IP based and have the capability to be managed and controlled from the command centre.
- Authority shall review and approve the proposed locations. MSI shall install the PA system on the approved locations.
- Should have the capability to control individual PAS i.e. to make an announcement at select location (1:1) and all locations (1: many) simultaneously.
- The PAS should also support both, Live and Recorded inputs and have minimum following capability
 - o Speaker: Minimum 2 speakers, To be used for Public Address System on single pole
 - o Connectivity: IP Based
 - o Integration : With VMS and Command and Control Centre
 - o Construction: Cast Iron Foundation and M.S. Pole, Sturdy Body for equipment
 - o Battery Internal Battery with different charging options (Solar/Mains)
 - o Power Automatic on/off operation
 - o Casing IP-66 rated housing for outdoor usage.

1 Speaker Features:

External Interface

NAC input	PTT Activation. 9–40 VDC, 17 mA Max.
Dry contact input	PTT Activation (alternative to NAC Input). 250ms < 1 K Ohms.
Audio input	100 VRMS, 70.7 VRMS, 25 VRMS or 1 VRMS selectable (100 VRMS and 70.7 VRMS require model HPSA-7100-V-KIT, which is sold separately)
Trouble outputs	Form C, dry contact. 2 Amps., 30VDC (resistive). Max. Trouble Signals (6) provided: AC, No Battery, Low Battery, Tamper, Amplifier Fault and Driver Fault.

General Specifications

Electronic cabinet dimensions	36" W x 48" H (60" with pedestals) x 12" D / 91.4 x 121.9 (152.4 with pedestals) x 30.5 cm
Electronic cabinet weight	110 lbs (not including batteries) / 49.9 kg; Total weight with batteries: 322 lbs / 146 kg
Horn dimensions	3' 2" W x 2' 1" H x 1' 4 7/16" D / 96.52 cm x 63.5 cm x 41.91 cm (2 horns with drivers, omni-directional)
Horn weight	52 lbs for each horn and driver kit (pair) / 23.6 kg
Horn material	Special aluminum alloy horn construction provides long service life without material fatigue
Battery weight	53 lbs each / 24 kg
Speaker wire	12–16 AWG stranded two-conductor jacketed cable. Non-shielded either twisted or non-twisted. UL/CSA/EU: approved for outdoor use. The distance of the cable length between the HPSA and each driver is limited to a maximum of 100 feet.
Wire size ratings	Speaker Lines: 12–16 AWG (limited to 14 AWG for connectors) AMB Lines: 12–22 AWG AC Mains: 10–16 AWG

Power (Including Standby)

Input voltage	120 to 240 VAC; 50 to 60 Hz Single-phase (Universal AC/Auto-switching)
Input current	3 Amps
Battery input voltage	40.8 - 55.4 VDC 48 Volts (nominal)
Operating voltage	~48 VDC
Standby time	72 hrs followed by 60 min continuous voice
Continuous signaling time	60 minutes (voice)
Battery charger	Universal AC Supply, 4 Amp maximum
Batteries	Four (4) deep cycle discharge AGM, SLA batteries. 65 AH each, connected in series
Amplifiers	
Amplifier	Class D
Frequency response	300 Hz to 7.2 kHz (Driver, typical); 20 Hz to 20 kHz

Total harmonic distortion	(Amp, typical) 0.1% THD+N Capable; 10% THD+N Max to achieve specified SPL levels
Efficiency	Greater than 90% at full load
Thermal protection	Yes
Short circuit protection	Yes, Auto Recovery
Driver impedance	11 Ohm (Typical)
Environment	
Operating temperature	-4° F to 140° F (-20° C to +60° C)
Electronic cabinet rating	NEMA 4X & IP66 & UL508 cabinet
Transient protection	Built-in lightning protection on mains, external interfaces, and speaker lines

2. IP amplifier & Microphone & Controlling software Features:

- IP network audio adapter built-in digital class-D 60, 120, 240 W
- Direct to receive internet audio source and transmit to 70V, 100V and low impedance loudspeakers.
- Non-dedicated network system solution.
- Could be installed anywhere of the LAN network.
- Desktop microphone type, with exquisite appetite, elegant craft and modern design.
- Full duplex two way communication from any point to another intercom system.
- Embed PC technology, built-in DSP and high speed industrial chip to ensure start time less than 1 second.
- With 3.4 inch LCD user-friendly human-machine interface.
- With numeric keys, functional keys to call any terminal, easy to operate.
- One button push to answer intercom system.
- Several paging capacity: zone paging, group paging, all zone paging, two way intercom.
- Compatible with Windows 2000, Windows XP and Windows 7 operation system
- Full duplex communication system software
- Compatible of network audio system and intercom two systems
- Standard TCP/IP communication protocol for industrial applications
- Parameters set up center and administrator management center
- Built-in decoder to transfer analog signal through sound card into digital
- Head of the network audio system
- Collect and delivery sound over the internet
- Built-in weekly timer to program over music or sound files to automatically broadcast to designated zone at pre-set time

1. IP-CCTV System:

1.1 Scope of Work:

These technical specifications cover the requirements for Designing, Engineering, Manufacturing, supplying, Delivering, Installing, Testing and Commissioning a CCTV Surveillance System for Elevate, Gurgaon.

The CCTV Surveillance System shall consist of the following elements:

- a) CCTV Cameras mounted in the critical areas.
- b) Network Video Recorder with inbuilt Multiplexers to merge all images from CCTV cameras for viewing on a single screen.

1.2 Standards:

All the CCTV products will be supplied and integrated end to end and shall be UL/EN Listed.

All the CCTV products shall be of the same manufacturer.

1.3 Closed Circuit Television (CCTV) Cameras:

The Closed Circuit Television System (CCTV system) shall provide an on-line display of video images on monitor. Cameras with suitable lenses shall be used to view specific areas of interest. The primary objective of implementing a CCTV system is to ensure effective surveillance of an area and also create a record for post event analysis.

All Cameras shall be of the specified (fixed or PAN/TILT/ZOOM) type and shall be of 1/3" / 1/4" CCD type Monochrome/colour using solid-state circuitry. The Cameras shall provide a minimum of 520 TV lines resolution. It shall be possible to use Varifocal lens 3-9 mm length. The complete unit shall be housed in a single mountable container with a base unit, both preferably made from injection moulded plastic. It shall be possible to adjust the camera head inside the housing so that it can be wall or ceiling mounted.

The camera shall deliver clear, high-resolution (H.264 1920x1080 picture without geometric distortion.

The Camera shall comply with the enclosed specifications

1.4 Lenses:

Lenses shall be fixed-focus / zoom lens type as specified.

Lens size shall always be chosen to correspond with the camera sensor size; lens size shall not be less than the size of the sensor.

The lenses chosen shall produce clear, well-focused, undistorted images. Lens surfaces shall be coated to eliminate flare

Fixed Focal-length Lenses: -

The focal lengths of fixed lenses shall be chosen to give adequate coverage of the target views. The choice for a scene in which a person is a significant feature e.g. at the end of an escalator, shall give an angle of view which results in the image of the person having a height of approximately 1/3 of the screen height or more.

A focusing ring shall allow accurate focusing to be achieved manually (in conjunction with the facility for movement of the sensor).

Table 10: CCTV details and specifications

3 MP Dome Camera with 40 Meter IR Illuminator			
S. No	Features	Specifications	Compliance
1	Form Factor	Dome	
2	Image Sensor	1/2.8" CMOS or better	
3	Day/ Night Operation	Yes with IR Cut Filter	
4	Minimum Illumination	Color 0.04 lux ,B/W 0.002 lux	
5	Lens	3 - 9 mm, P-Iris, Megapixel Lens with remote zoom and focus	
6	Electronic Shutter	1 ~ 1/10,000 s	
7	Image Resolution	3 MP or better	
8	Compression	H.264 , MJPEG	
9	Frame Rate and Resolution	H.264 3M (2048 X 1536) @25/30 fps , 2 MP (1920 X 1080) @ 50/60 FPS	
10	Simultaneous Stream	Minimum 2 streams should be configurable at 1920 X 1080 @ 25 fps simultaneously	
11	White Balance	Auto / Manual / ATW / One Push	
12	GOV Length	It should be possible to vary the GOV length in the camera setting .	
13	Noise Reduction	Digital Noise Reduction 2D / 3D DNR	
14	Zoom	3x optical Zoom , 10x Digital Zoom	
15	Digital PTZ	Camera should support digital PTZ	
16	Video Streams	Quad Stream supportable , All stream should be H.264	
17	Video quality view	Video compression type (H.264/MJPEG) and bit rate of each stream should be viewable on home screen	
18	Image Setting	Saturation, Brightness, Contrast, Sharpness, Hue adjustable	
19	Two way audio	Line in / Line Out	
20	Audio Compression	G.711 / G.726 / AAC / LPCM	
21	Iris	P iris	
22	Wide Dynamic Range	120 dB or better	

Construction of Landscaping of Canal Area (Zone 3) in Dholera Special Investment Region, Dholera

23	IR	Upto 40 mtr IR distance	
24	Alarm	1 x Input / 1 x output	
25	Edge Video Content Analytics	Camera should have in-built Edge Bases Analytics, Abandoned Object, Intrusion Detection, Tampering, Wrong Direction, Loitering Detection, Object Counting, Stopped Vehicle, Object Removal	
26	Storage backup on network failure	Camera should support network failure detection , Camera should have the capability to start the recording automatically on SD card in case of connectivity between camera and NVR/Storage device goes down	
27	Network Interface	RJ-45, 10/100Mbps Ethernet	
28	Edge Storage	Built in SD card slot with support upto 128 GB SD card	

29	Protocols	IPv4/v6, TCP/IP, UDP, RTP, RTSP, HTTP, HTTPS, ICMP, FTP, SMTP, DHCP, PPPoE, UPnP, IGMP, SNMP, QoS, ONVIF	
30	Text Overlay	Date & time, and a customer-specific text etc.	
31	Security	HTTPS / IP Filter / IEEE 802.1X	
32	Firmware Upgrade	The firmware upgrade shall be done though web interface,	
33	Video Output	1 X BNC	
34	Enclosure	IP 66 weather proof ,	
35	Vandal Resistant	IK 10	
36	Power	POE / 12 V DC /24 V AC	
37	Operating Temperature	-30 °C to 60 °C	
38	Operating Humidity	Humidity 10%–90% No Condensation	
39	Certification	UL, CE, FCC, RoHS	
40	ONVIF	ONVIF Profile S & G	
41	User accounts	20	
42	Supported Web Browser	Internet Explorer (7.0+) / Firefox / Safari	

3 MP Bullet Camera with 40 Meter IR Illuminator			
S. No	Feature	Specifications	Compliance
1	Form Factor	Bullet	
2	Image Sensor	1/2.8" CMOS or better	
3	Day/ Night Operation	Yes with IR Cut Filter	
4	Minimum Illumination	Color 0.1 lux B/W 0.01 lux	
5	Lens	2.8 - 12 mm, P-Iris, Megapixel Lens with remote zoom and focus	
6	Electronic Shutter	1 ~ 1/10,000 s	

3 MP Bullet Camera with 40 Meter IR Illuminator			
S. No	Feature	Specifications	Compliance
7	Image Resolution	3 MP or better	
8	Compression	H.264 , MJPEG	
9	Compression profile	Should support H.264 baseline , Main profile and high profile	
10	Frame Rate and Resolution	H.264 3M (2048 X 1536) @25/30 fps , 2 MP (1920 X 1080) @ 50/60 FPS	
11	Simultaneous Stream	Minimum 2 streams should be configurable at 1920 X 1080 @ 25 fps simultaneously	
12	White Balance	Auto / Manual / ATW / One Push	
13	GOV Length	It should be possible to vary the GOV length in the camera setting.	
14	Field Of View	36 ° to 106 °	
15	Noise Reduction	Digital Noise Reduction 2D / 3D DNR	
16	Zoom	4x optical Zoom , 10x Digital Zoom	
17	Digital PTZ	Camera should support digital PTZ	
18	Video Streams	Quad Stream supportable , All stream should be H.264	
19	Video quality view	Video compression type (H.264/MJPEG) and bit rate of each stream should be viewable on home screen	
20	Image Setting	Saturation, Brightness, Contrast, Sharpness, Hue adjustable	
21	Two way audio	Line in / Line Out	
22	Audio Compression	G.711 / G.726 / AAC / LPCM	
23	Iris	P iris	
24	Wide Dynamic Range	120 dB or better	
25	IR	Upto 40 mtr IR distance	
26	Alarm	1 x Input / 1 x output	
27	Edge Video Content Analytics	Camera should have in-built Edge Bases Analytics, Abandoned Object, Intrusion Detection, Tampering, Wrong Direction, Loitering Detection, Object Counting, Stopped Vehicle, Object Removal	
28	Storage backup on network failure	Camera should support network failure detection , Camera should have the capability to start the recording automatically on SD card in case of connectivity between camera and NVR/Storage device goes down	
29	Edge Storage	Built in SD card slot with support upto 128 GB SD card	
30	Network Interface	RJ-45, 10/100Mbps Ethernet	
31	Protocols	IPv4/v6, TCP/IP, UDP, RTP, RTSP, HTTP, HTTPS, ICMP, FTP, SMTP, DHCP, PPPoE, UPnP, IGMP, SNMP, QoS, ONVIF	

3 MP Bullet Camera with 40 Meter IR Illuminator			
S. No	Feature	Specifications	Compliance
32	Text Overlay	Date & time, and a customer-specific text etc.	
33	Security	HTTPS / IP Filter / IEEE 802.1X	
34	Firmware Upgrade	The firmware upgrade shall be done through web interface, The firmware shall be available free of cost	
35	Video Output	1 X BNC	
36	Image Rotation	Normal , Mirror , 90 deg clockwise , 90 deg anti clockwise , 180 deg rotate	
37	Privacy Masks	Upto 5 privacy masks	
38	Audio Transmission mode	Full Duplex , Half Duplex , Simplex	
39	Enclosure	IP 67 weather proof , IK 10	
40	Power	POE / 12 V DC /24 V AC	
41	Operating Temperature	-30 °C to 60 °C	
42	Operating Humidity	Humidity 10%–90% No Condensation	
43	Certification	UL, CE, FCC, RoHS	
44	ONVIF	ONVIF Profile S and G	
45	User accounts	20	
46	Supported Web Browser	Internet Explorer (7.0+) / Firefox / Safari	

32 Channel NVR with Pre-Installed VMS			
S. No	Feature	Specification	Compliance
	System		
1	CPU	Intel i7 core or better	
2	RAM	2x2GB, DDR3L or better	
3	Graphics	Intel HD Graphics	
4	IP Camera Input	Up to 32 CH	
5	Operating System	Embedded Linux OS	
6	Video Management System	Pre-Installed with appropriate licenses	
	Recording / Playback		
7	Throughput	160 Mbps	
8	Decoding	Upto 960 PPS @ D1	
9	Recording Mode	Continuous, Schedule, Event Recording	
10	Play Back Mode	Auto, Custom, Split Mode	
	Storage and I/O		
11	Built-in SATA Interface	2.5" SATA x 1 (for OS) + 3.5" SATA x 4 (for storage)	
12	RAID	Hardware RAID 0/1/5/10	
13	e-SATA	1 port	
14	COM Port	RS-232 x 1 + RS-485 x 1	
15	Video Output	HDMI / VGA	
16	Audio Input	1 x Mic In	
17	Audio Output	1 x Line Out	
18	USB Port	USB 3.0 x 2 + USB 2.0 x 3	
19	Digital Input	TTL-level x 4	
20	Digital Output	Relay NC/NO x2 (DC24V/1A)	
	Network		
21	WAN Port	1 x 10/100/1000 Mbps	
22	LAN Port	1 x 10/100/1000 Mbps	
23	SFP Combo Port	1 x 1 Gbps	
	Built-in PoE Switch		
	General		
24	Operation Temperature	0°C ~ 40°C	
25	Operation Relative Humidity	10% ~ 90% Non-condensing	

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VMS			
S. No.	Features	Specifications	Comply
1	Maximum Number of NVR	Unlimited	
2	Maximum Number of Clients	1 admin / 5 users or more (concurrent) per NVR	
3	Maximum Number of Cameras	Unlimited	
4	Compression	H.264	
5	Compatibility	ONVIF profile S & G	
	Live view		
6	Display Mode	1, 4, 9, 16, 25, 36, 49, 64, 128, Browser, Custom	
7	View Manager	An interface to define layouts and pre-set cameras in multiple view mode	
8	View Patrol	Able to switch between different view pages and devices	
9	Layout Manager	An interface to modify display layout, position and the size of live view of camera within layout	
10	Digital Zoom	Zoom in/ Zoom out digitally by mouse scroll wheel	
11	Snapshot	Instant snapshot upon mouse click	
12	Event Notification	Alarm, Motion detection, Connection loss/ auto reconnect between VMS and NVR/camera	
13	Bandwidth Management	Live view with stream 1 in full screen mode or stream 2 in multi-view screen mode (Bitrate adjustable)	
14	Camera Management	Camera control, image setup, camera video format, IR/Exposure setup, Camera information	
	E-Map		
15	Layout	Area maps with camera icons, small live view screen; alarm trigger, event trigger	
16	Setup	Google map positioning; E-Map image upload; camera positioning; camera vision angle and direction	
	PTZ		
17	Control	Pan, tilt, zoom control; focus, exposure adjustment	
18	Preset Points and Tours	Set/ Activate Preset points; Set/ Activate tour routes	
19	Joystick	USB based Joystick support	
	Device Management		
20	Device Search	Auto connect/ Auto scan / Manual add NVR or Camera	
21	Device Information	Model name, IP address, MAC address, type, protocol, streaming port, port, video snapshot	

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22	Search Filter	IPCAM, NVR, DVR, VSS; ONVIF	
	Playback & Export		
23	Recording Search	Search video recording by time, event, channel from multiple cameras/ NVRs Instant view, snapshot and export	
24	Playback control	Continuous forward and backward with speed 1/4x, 1/2x, 1x, 2x, 4x; pause	
25	Synchronized Playback	32 CH(Local)/ 64 CH(Remote)	
26	Snapshot	Instant snapshot upon mouse click	
27	Digital Zoom	Zoom in/ Zoom out digitally by mouse scroll wheel	
28	Video Export	Export Video clips with AVI, RAW, MP4, MKV, MOV; digital signature supported	
	Event Management		
29	Event Source	Multiple cameras/ NVRs	
30	Event Trigger	Video motion detection, Alarm, Video loss	
31	Event Response	Instantly Record video, audio notification, full screen pop-out with live video, email notification	
32	Smart Search	Smart search list for recorded videos by video motion detection/ alarm/ video loss	
	System		
33	Permission Management	Unlimited number of users, Active Directory, customized permissions for different user including covert cameras/ NVRs, device management, playback & export	
34	Language	Multiple language support	
35	Operation Management Log	Recorded list of user operation, IPCAM event, NVR event	
36	System status	Instant view of CPU usage, RAM, HDD valid space, Network status	
37	Setting Import/ Export	Possibility to import or export setting packs for convenient VMS setting management	
	Remote Access		
38	PC Client Software	VMS Client software with Live view, Playback, E-map, setup	
39	PC Web Browser	Microsoft Internet Explorer 11+ with 16CH display layout	
PTZ CAMERA			

Construction of Landscaping of Canal Area (Zone 3) in Dholera Special Investment Region, Dholera

S. No	Features	Specifications	Compliance
1	Certifications	UL ,CE,FCC	
2	Compatibility	ONVIF profile s	
3	Sensor	1/3 " Progressive CMOS or larger	
4	Resolution	3 MP (2048 X 1536)	
6	Multiple Stream	Minimum Triple Stream	
7	Frame Rate	upto 25 fps @ 3MP , Upto 50fps @ 2MP (Main Stream)	
8	Focal Length	4.3-129 mm	
9	Field Of view	60° - 2.4 °	
10	Optical Zoom	30X	
11	Digital Zoom	10X	
12	Focus	Auto / Manual	
13	WDR	120 dB	
14	Noise Reduction	2D / 3D	
15	Shutter Speed	1/3 ~ 1/10000 sec.	
16	IR	Inbuilt IR , IR distance upto 100 mtr	
17	Day & Night	IR Cut filter	
18	Min Illumination	0.05 @ F1.6 (Color), B/W : 0.005 Lux @ F1.6	
19	Iris	Auto iris	
20	SD Card support	Yes	
21	Video Compression	H.265 ,H.264	
22	Privacy Mask	upto 20 privacy zones	
23	Audio	1/1 channel In/Out	
24	PAN	360 ° endless , Manual speed 0.1° ~ 90°/s , preset speed upto 280°/s	
25	Tilt	,-15 ° ~ 90° , Manual speed 0.1° ~ 60°/s , Preset speed upto 300°/s , Auto flip	
26	Presets	80	
27	Protocols	IPv4/v6, TCP/IP, UDP, RTP, RTSP, HTTP, HTTPS, ICMP,FTP, SMTP, DHCP, PPPoE, UPnP, IGMP, SNMP, QoS,ONVIF	
28	Alarm	2 Input / 1 Output	
29	Ethernet Interface	1 X RJ 45	
30	Weather Proof	IP 66	
31	Operating Temperature	,-30°C ~ 50°C	
32	Power Supply	24 V AC / POE	

1.5 Network Video Recorder Based CCTV System:

- i) The system shall have the capability to handle 128 video inputs.
- ii) The basic configuration of the NVR shall be :
 - Camera Inputs: 128
- I. External monitor : 02 composite CCTV monitor
- II. Display : Real time
 - Recording Speed (Min.) : PAL 400 Frame/Sec. at 4 CIF
 - Image Compression method: MPEG-4 or better.
 - External Alarm Input: 128 Channels
 - Relay Control Output: 8 Outputs
 - Remote Transmission: On LAN/WAN
 - Image Verify Water-Mark.
 - Surveillance Method: Motion Detection, sensor.
- i) PAN/TILT: RS-422/ other data.
- ii) Compliance to UL/EN Listed.
- iii) The system programming shall be password protected and shall have different levels of passwords for programming. Antivirus protection must be provided in the NVR using operating system like Windows, UNIX, Linux etc.
- iv) All cameras and the integrated CCTV System equipment shall be designed for continuous/motion operation.
- v) The NVR should have built in DVD Writer. The system should allow connectivity of external hard disks arrays through SCSI ports. The NVR should have hard disk of 12 TB (min) internal built in with a capacity to expand up to 24 TB.
- vi) The NVR shall support Ethernet bandwidths of 10 Mbps or 100 Mbps or 1000 Mbps
- vii) The NVR shall be provided with Graphical User Interface (GUI) software for remote playback and viewing that shall support the Windows XP, 7 and Vista operating systems and full searching capabilities. It shall be possible to remotely set up the NVR unit using the remote viewing software.
- viii) The NVR shall not stop recording during any Ethernet access, nor shall it be possible to remotely issue a command via Ethernet to stop the recording.
- Ix) The system shall be upgraded through flash programming upgrades of software, using either an USB drive or TCP/IP.

1.6 The NVR shall have the following additional specifications:

a) Video:

- i) Total available video memory shall be at least 1 GB.
- a) Live/playback display memory shall be at least 128 MB.
- b) Record memory shall be as per the manufacturer calculation @25 FPS
- ii) Video sampling rate shall be at least 27 MHz.
- iii) Available colors shall be to specification YUV 4:2:2, providing up to 65K colors.
- iv) There shall be 256 grayscale levels.
- v) Horizontal resolution shall be 704 pixels.
- vi) Vertical resolution shall be:
 - a) 480 active lines NTSC/EIA
 - b) 576 active lines PAL/CCIR

b) Camera :

- 1) There shall be 64 camera inputs.
- 2) Inputs shall use BNC/VGA connectors.
- 3) Inputs shall be NTSC/EIA or PAL/CCIR compatible.

c) Audio :

- i) There shall be per camera one associated and synchronized audio input
- ii) 1 bidirectional audio line output
- iii) The audio inputs shall use RCA connectors

d) Signal conditioning :

- 1) All inputs shall have automatic gain control.
- 2) Video input signal 1.0 Vp-p 75Ω

e) Outputs :

- i) The NVR shall have three monitor outputs as follows:
 - a) One analog Multi screen monitor-A output
 - b) One digital HDMI Multi screen monitor-B output
 - c) One analog VGA Multi screen monitor-C output

- ii) VGA connector:
- iii) Shall be able to display all cameras live or in sequence mode

- f) The NVR shall have a RS-232 serial data ports to support the following functionality:**
 - i) Remote communications
 - ii) Transaction Text insertion

- g) The NVR shall have 2-4 USB ports for:**
 - i) USB memory key archiving devices
 - ii) USB HDD archiving devices
 - iii) Mouse control functions

- h) Esata:**
 - i) The NVR shall have an eSATA port for eSATA HDD archiving devices

- i) The NVR shall have a removable strip for input/output connector to support the following Functionality:**
 - i) Alarm inputs
 - ii) Relay outputs

- j) Electrical:**
 - i) Input voltage: 100 to 240 VAC, 50 to 60 Hz
 - ii) Power: 126 W maximum

- k) Environmental:**
 - i) Operating temperature range -10 to +55°C
 - ii) Relative humidity: 10% to 90% non-condensing

1.7 32” Monitors (Colored) :-

The monitor shall be suitable for the highest level of quality control. These shall provide reliable, high resolution video viewing in the most demanding security applications. Under scan shall be available, brightness, contrast and power ON/OFF shall be standards.

The minimal equipment specification for alarm monitor is as follows:

- i) Name of the Manufacturer : to be furnished by the Tender
- ii) Model No. : to be furnished by the Tenderer
- iii) Size : 32” Colour

iv)	Picture tube	:	Flat square 53cm measured diagonally.
v)	Deflection	:	90°
vi)	Resolution	:	1920x1080
vii)	Viewing area	:	20" Diagonal
viii)	Scanning system	:	PAL standard
ix)	Input voltage	:	240V AC, 50Hz, single phase switchable
x)	Power (max.)	:	35 W
xi)	Power Linearity		
	- Horizontal	:	3% Typical
	- Vertical	:	3% Typical
xii)	Humidity	:	20%-80% non-condensing
xiii)	Operating temp	:	0 to 40°C
xiv)	Connectors		
	- Video	:	BNC/RG45

1.8 Video CO-Axial Cables :-

Co-axial cable of the following minimum specification shall be used .

i)	Type	:	RG 11 armoured
ii)	Impedance	:	75 Ohms
iii)	Conductor (dia)	:	18 AWG Solid Bare Copper
iv)	Insulation	:	Cellular Polyethylene
v)	Nominal O.D.	:	0.242"
vi)	Shielding	:	95% Bare Copper Braid
vii)	Jacket	:	Black Flame Retardant PVC
viii)	Nominal Velocity of prop.	:	78%

ix) Nominal Attenuation	:	<u>MHz</u>	<u>db/100 ft</u>
		10	1.0
		50	2.1
		100	3.0
		200	4.5
		400	6.6
		900	10.1
		1000	10.9

Power Cable for All Cameras:

2 C x 1.5 Sq.mm FRLS unarmoured PVC insulated copper conductor 1100 Volt grade cable for power supply to all cameras.

1.9 Conduits (MS/GI) :

Conduits and Accessories shall conform to IS: 9537 (Part-2). Solid drawn 16 gauge screwed steel conduits protected by black bituminous enamel shall be used in all situations except where galvanized steel conduits are called for. Where conduits for buried wiring are passing underground they shall be of galvanized steel conduit. Joints between conduits and accessories shall be securely made to ensure earth continuity.

Section 4. List of Standards and Specifications for Water Infrastructure

The design and Construction of all water infrastructure shall conform to design requirements and construction specifications set out in the Indian and International Standards given below:

Potable Water Supply Network

Specifications and Standards

POTABLE WATER SUPPLY NETWORK

1.0 Background

The potable water is coming from the Water Treatment Plant (WTP) of TP1 area to the potable water Master Balancing Reservoir (MBR-P) located within the TP2E area. Then the potable water is pumped from the MBR-P to the Elevated service reservoirs (ESRs) within the TP2E area. The distribution network from the ESR will serve to the different plots. The ESRs are planned based on different water supply zones and topography.

Table 11: Potable Water Network Details

Canal Park area	Approx. area in ha	Population served	Potable water demand (MLD)
Zone 1	1.8	7500	0.0375
Zone 2	1.5	5000	0.025
Zone 3	0.6	2000	0.01
Zone 4	0.8	3000	0.015
Zone 5	0.5	2000	0.01
TOTAL (A)	5.2	19500	0.0975

2.0 Potable Water Distribution System

The design parameters for the Potable water distribution system shall be as follows:

Table 16: Design Parameters for distribution system

Table 12: Potable Water Network Parameters

Sr. No.	Design Parameters	Value
1	Bedding: for pipe diameters up to 400 mm for pipe diameters greater than 400 mm	Minimum Depth of Granular Bedding below the pipe 15 cm 20 cm
2	Clear cover above the crown of pipe	0.9 m (minimum)
3	Basis of supply to the Parks	24 x 7 and on gravity
4	Max. Unit head loss in the Pipe	4 m/Km.
5	Hazen's William coefficient	140
6	Pipe Material	HDPE (PE -100/ PN 6.0) as per IS 4984/1995

3.0 List of Standards and Specifications for Potable Water Supply

The design and Construction of potable water supply network shall conform to design requirements and construction specifications set out in the Indian and International Standards given in Table 15 and Table 16 under "List of Standards and Specifications for Potable and Recycled Water Supply".

4.0 List of Acceptable Makes of Pipes, Valves and Equipment

List of Acceptable Makes of Pipes, Valves and Equipment is given in Table 20.

Recycled Water Supply Network

Specifications and Standards

RECYCLED WATER SUPPLY NETWORK

1.0 Background

The recycled water is pumped from two central Recycled water master balancing reservoirs (MBR (R1) and MBR (R2)) within the project area to the different Recycled Water Elevated Service Reservoirs (ESRs). The ESRs are planned based on different recycled water supply zones for the TP2E area.

Table 13: Recycled Water Network Details

Canal Park area	Approx. area in ha	Population served	Recycled water demand (MLD)	Irrigation (Recycled water demand (MLD))
Zone 1	1.8	7500	0.0375	0.09
Zone 2	1.5	5000	0.025	0.075
Zone 3	0.6	2000	0.010	0.03
Zone 4	0.8	3000	0.015	0.04
Zone 5	0.5	2000	0.01	0.025
TOTAL (A)	5.2	19500	0.0975	0.26

The design parameters for the Recycled water network shall be as follows:

Table 30: Design parameters for recycled water main

Table 14: Recycled Water Network Parameters

Sr. No.	Design Parameters	Value
1	Source of Recycle Water	Recycle Water main nearby
2	Max. Unit head loss in the Pipe	10 m/Km.
3	Hazen's William coefficient	140
4	Pipe Material	HDPE (PE -100/ PN 6.0)
5	Working pressure in the pipelines	40-45 m
6	Working Hours	10 hours
7	Bedding: for pipe diameters up to 400 mm for pipe diameters greater than 400 mm	Depth of Granular Bedding 15 cm 20 cm
8	Clear cover above the crown of pipe	0.9 m
9	Basis of supply to the Parks	24 x 7 and on gravity
10	Max. Unit head loss in the Pipe	4 m/Km.
11	Hazen's William coefficient	140

2.0 List of Standards and Specifications for Potable and Recycled Water Supply

The design and Construction of potable water and recycled water supply networks shall conform to design requirements and construction specifications set out in the Indian and International Standards given in Table 15 and Table 16.

Table 15: Relevant Indian Standards & Specifications

Sr. No.	Code or Standard	Description
1.	Manual for Water Supply & Treatment	CPHEEO Manual for Water Supply & Treatment - 1999- MoUD, GoI
2.	Manual on operation and Maintenance on water supply	CPHEEO Manual on Operation and Maintenance of water supply systems, 2005 MoUD, GoI
3.	SP 7 (Part-9 Section-1) 1983	National Building Code of India
4.	SP 35:1987	Hand book on water supply & drainage
5.	IS 2065:1983	Code of practice for water supply in buildings
6.	IS 1172 :1993	Code of Basic requirements for water supply, drainage and Sanitation
7.	IS. 3370 part I to IV	Code of practice for concrete structure for the storage of liquids
8.	IS 456-2000	Code of Practice for plain and reinforced concrete
9.	IS 1893-2002 part I to V	Criteria for earthquake –resistant design of structures
10.	IS 13920-1993	Detailing of reinforced concrete structures subjected to seismic forces
11.	IS. - 11682 / 1985	Criteria for design of R.C.C. staging for overhead tanks.
12.	IS 1992-1979 / IS 6403-1981.	Electroplated coating of lead, Code of practice for determination of bearing capacity of shallow foundations
13.	IS 2309-1989	Protection of Buildings and Allied Structures Against Lightning
14.	IS 875 part I to III,1987	Code of practice for design loads for building and structures
15.	IS 7357	Code of practice for structural design of tanks
16.	IS 1786-2008	High strength deformed steel bars and wires for concrete reinforcement
17.	IS 3589-2001	Electrically welded steel pipes for water and sewerage (168.3 to 2540 mm nominal size)
18.	IS 5822	Code of practice for laying of welded steel pipes for water supply
19.	IS 1916-1989	Code for outside coatings for MS pipes
20.	IS 7322-1989	Code for MS Specials
21.	IS 4711	Method for sampling of steel pipes, tubes and fitting
22.	IS 10221	Code of practice for coating and wrapping of underground steel pipelines
23.	IS: 8329-2000	Centrifugally Cast (spun) ductile iron pressure pipes for water, gas and sewage
24.	IS: 5382-1985	Specification for Rubber sealing rings for gas mains, water mains and sewers.
25.	IS: 8112	Specification for 43 Grade ordinary Portland cement.
26.	IS: 638	Specification for rubber and insertion jointing.
27.	I.S. 1538 (Part I to XXII) 1993	Cast iron fittings for pressure pipes for water, gas and sewage

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Sr. No.	Code or Standard	Description
28.	IS: 3658-1999	Code of practice for liquid penetrant flaw detection
29.	IS. 226-1975	Specification for Structural steel
30.	IS 4984/1995	High density polyethylene pipes for potable water supplies
31.	IS: 9523	Ductile iron fittings for pressure pipes for water, gas and sewerage
32.	IS: 1500	Code for Hardness test for DI pipes
33.	IS:909-1992	Specification for Underground Fire Hydrant, Sluice Valve Type
34.	IS 7634 Part-2 (2012)	Code of practice for plastic pipework for potable water supplies –Laying and jointing of polyethylene pipes
35.	IS 8360 :2003	Fabricated high Density polyethylene (HDPE) fittings for potable water supplies
36.	IS 8008	Injection-molded HDPE fittings for potable water supplies
37.	IS 11606-1986	Methods of sampling cast iron pipes and fittings
38.	IS 1726 : 1991	Cast iron manhole covers and frames - specification
39.	IS 3764-1992	Excavation works-Code of Safety
40.	IS 11906:1986	Recommendations for cement mortar lining for cast iron, Mild steel and Ductile Iron pipes and fittings for transportation of water
41.	IS 5477	Methods for fixing the capacities of reservoirs
42.	IS 9668:1990	Code of practice for provision and maintenance of water supply for fire fighting
43.	IS 8062	Code of practice for cathodic protection for steel structures
44.	IS 12288:1987	Code of practice for laying of ductile iron
45.	IS 779:1994	Water meters (Domestic Type)
46.	BIS IS 2104: 1981	Water meter boxes (domestic type)
47.	IS2373:1981	Water meter (bulk type)
48.	BIS IS 2401: 1973	Code of Practice for fire selection, installation and maintenance of domestic water meters
49.	IS 6784:1996	Method for performance testing of water meters (domestic type)
50.	IS 14846:2000	Sluice valves for water works purposes (50 to 1200 mm size)
51.	IS 2906:1990	Sluice valves for water works purposes (350 to 1200 mm size)
52.	IS 2685:1971	Code of practice for selection, installation and maintenance of sluice valves
53.	IS 3950:2003	Specification for Surface boxes for sluice valves
54.	IS 5312	Swing check type reflux(non-return) valves for water works purposes
55.	IS 9739:1981	Pressure reducing valves for domestic water supply systems
56.	IS 2692:1989	Ferrules for water services-Specification
57.	IS 10446:1983	Glossary of terms relating to water supply and

Sr. No.	Code or Standard	Description
		sanitation
58.	IS 10500:2012	Drinking water quality
59.	IS2951-1965	Recommendation for estimation of flow of liquids in closed conduits.
60.	A guideline note on continuous water supply (24X 7 supply)	Guidelines for preparation of DPRs for water supply system by MoUD, 2013
61.	Advisory note on improving Urban Water Supply & Sanitation Services	Guidelines for preparation of DPRs for water supply system by MoUD, 2013
62.	General Guidelines for water Audit & water Conservation	Central water commission, December 2005
63.	IWWA Publication	Leak Detection and Waste Prevention in Water Distribution Systems.

Table 16: Relevant International Standards & Specifications

Sr. No.	Code or Standard	Description
1.	ISO: 10803-2011	Design method for ductile iron pipes
2.	ISO: 2531-2009	Ductile iron pipes, fittings and accessories and their joints for water application
3.	ISO: 4179-2005	Ductile iron pipes and fittings for pressure and non-pressure pipelines - Cement mortar lining
4.	BS: 3416	Bitumen based coatings for cold application, suitable for use in contact with Potable water.
5.	ISO: 8179-2004	Ductile iron pipes - External zinc-based coating -- Part 1: Metallic zinc with finishing layer
6.	ISO: 4633-2015	Rubber seals - Joint rings for water supply, drainage and sewerage pipelines - Specification for materials
7.	AWWA C600	Installation of ductile iron water mains and their appurtenances
8.	BSEN -545	Code for Ductile Iron Flanges and Specials
9.	AWWA Manual M11	Steel Pipe- A guide for design and Installation(Fourth Edition)
10.	AWWA Manual M41	Ductile Iron Pipe and Fittings (Third Edition)
11.	AWWA Manual M55	PE Pipe- Design and Installation (First Edition)
12.	AWWA Manual M36	Water Audits and Loss control Programs (Third Edition)
13.	IWA Publication	Losses Task
14.	WHO Publication	Leakage Management and control
15.	IWA Publication	Losses in water distribution network

3.0 List of Acceptable Makes of Pipes, Valves and Equipment

List of Acceptable Makes of Pipes, Valves and Equipment is given in Table 20.

Sewerage Network

Specifications and Standards

SEWERAGE NETWORK

1.0 Background

The Sewerage network would be designed for the expected domestic sewage flows from Canal Park's toilets. Sewage flow from a plot shall be primarily based on the estimated population for the plot and per capita sewage generation rate as per the CPHEEO manual/ National Building Code norms/ as per Development Plan.

2.0 Sewerage Network

Table 17: The design parameters for the sewerage network shall be as follows:

Canal Park area	Approx area in ha	Population served	Potable water demand (MLD)	Recycled water demand (MLD)	Irrigation (Recycled water demand (MLD))
Zone 1	1.8	7500	0.0375	0.0375	0.09
Zone 2	1.5	5000	0.025	0.025	0.075
Zone 3	0.6	2000	0.01	0.010	0.03
Zone 4	0.8	3000	0.015	0.015	0.04
Zone 5	0.5	2000	0.01	0.01	0.025
TOTAL (A)	5.2	19500	0.0975	0.0975	0.26

Table 18: Design parameters for sewerage network

Sr. No.	Design Parameters	Value
1	Ground water infiltration	500 ltr/day/manhole
2	Peak Factor	2.25
3	Capacity of conduits	80% full at peak flow
4	Minimum velocity	0.6 m/s – minimum velocity at initial peak flow 0.8 m/s – peak flow
5	Depth of cover	1.2 m Minimum depth of cover will be provided over top of pipe at the start of the sewers.
6	Bedding for Sewers	Bedding Type-Granular
7	Manholes	@ 30 m c/c distance and at junctions
8	Pipe Material	HDPE (PE -100/ PN 6.0) as per IS 4984/1995
9	Working Hours	12 Hours

3.0 List of Standards and Specifications for Sewerage Network

4.0 List of Acceptable Makes of Pipes, Valves and Equipment

List of Acceptable Makes of Pipes, Valves and Equipment is given in Table 20.

Table 19a: Relevant Indian Standards for Design and Construction

Sr.	Code or Standard	Description
1.	Manual for Sewage collection system	CPHEEO Manual on sewerage and sewage treatment systems-Latest, MoUD, GoI
2.	SP 7	National Building Code of India
3.	SP 35:1987	Handbook on water supply & drainage
4.	IS 1172 :1993	Code of Basic requirements for water supply, drainage and Sanitation
5.	IS 456-2000	Code of Practice for plain and reinforced concrete
6.	IS 13920-1993	Detailing of reinforced concrete structures subjected to seismic forces
7.	IS 1786- 2008	High strength deformed steel bars and wires for concrete reinforcement
8.	IS: 8329-2000	Centrifugally Cast (spun) ductile iron pressure pipes for water, gas and sewage
9.	IS:12288-1987	Code of practice for use and laying of ductile iron pipes
10.	IS: 5382-1985	Specification for Rubber sealing rings for gas mains, water mains and sewers.
11.	IS: 8112	Specification for 43 Grade ordinary Portland cement.
12.	IS: 638	Specification for rubber and insertion jointing.
13.	IS: 3658-1991	Code of practice for liquid penetrant flaw detection
14.	IS 14845: 2000	Resilient Seated Cast Iron Air Relief Valves for Water Works IS 14846Sluice valves for water works purpose (50 to 1200 mm size)
15.	I.S. 226-1975	Specification for Structural steel
16.	IS: 9523	Ductile iron fittings for pressure pipes for water, gas and sewerage
17.	IS: 1500	Code for Hardness test for DI pipes
18.	IS 7634 Part-2	Code of practice for plastic pipework for potable water supplies –Laying and jointing of polyethylene pipes
19.	IS 8360	Fabricated high Density polyethylene (HDPE) fittings for potable water supplies
20.	IS 8006	Injection-molded HDPE fittings for potable water supplies
21.	IS 1726 : 1991	Cast iron manhole covers and frames specification
22.	IS 3764-1992	Safety code of Excavation works and related Drilling Operations
23.	IS 14333- 1996	HDPE pipes for sewerage application
24.	IS 12592:2002	Specification for Precast RCC/ SFRC Manhole Frame & cover

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Sr.	Code or Standard	Description
25.	IS 4111-1986 Part 1, IS 5455- 2003, IS 4883- 1980.	Specifications for manholes
26.	IS 8008	Injection-molded HDPE fittings for potable water supplies
27.	IS 10552:1983	Buckets to be used in power driven buckets type sewer cleaning machine
28.	IS 10595:1983	Requirement for power driven bucket type sewer cleaning machine
29.	IS 11117:1984	Requirement for power driven rodding machine for sewers
30.	IS 11387:1985	Requirement for high pressure jetting machine for sewer cleaning
31.	IS 11397:1985	Attachment tools for power driven rodding machine
32.	IS 11972:1987	Code of practice for safety precautions to be taken when entering a sewage system
33.	IS 14846:2000	Sluice valves for water works purposes (50 to 1200 mm size)
34.	IS 1726 (1991) Part I to Part VIII	Specification for cast iron manhole covers and frames
35.	IS 2685:1971	Codes of practice for selection, installation and maintenance of sluice valves
36.	IS 2906:1990	Specification for sluice valves for water works purposes (350 to 1200 mm size)
37.	IS 3950: 2003	Surface boxes for sluice valves
38.	IS 5455: 2003	Specification for cast iron steps for manholes
39.	Advisory on “Recent trends in technologies in sewerage systems	Guidelines for preparation of DPRs for water supply system by MoUD, 2013
40.	Advisory note on improving Urban Water Supply & Sanitation Services	Guidelines for preparation of DPRs for water supply system by MoUD, 2013

Table 19b: Relevant International Standards for Design and Construction

S. No.	Code or Standards	Description
1	ISO: 10803-1997	Design method for ductile iron pipes
2	ISO: 2531-1991	Ductile iron pipes, fittings and accessories for pressure pipelines.
3	ISO: 4179- 2005	Ductile iron pipes for pressure and non-pressure-Centrifugal cement mortar lining – General requirements.
4	BS: 3416	Bitumen based coatings for cold application, suitable for use in contact with Potable water.
5	ISO: 8179- 2004	Ductile iron pipes-External coating-Part-1 Metallic Zinc with finishing layer.
6	ISO: 4633- 2015	Rubber seals-Joint rings.
7	AWWA C600	Installation of ductile iron water mains and their appurtenances
8	AWWA Manual M41	Ductile Iron Pipe and Fittings (Third Edition)
9	AWWA Manual M55	PE Pipe- Design and Installation (First Edition)

1.0 List of Acceptable Makes of Pipes, Valves and Equipment

List of Acceptable Makes of Pipes, Valves and Equipment is given in Table 20.

Table 20: List of Acceptable Makes of Pipes, Valves and Equipment

Sr. No.	Equipment	Acceptable manufacturer/ vendor
1.	Sluice Valves	Kirloskar Brothers Ltd. Indian Valve Company, VAG
2.	Non return valves	Kirloskar Brothers Ltd. Indian Valve Company VAG
3.	Sluice Gates	Jash Engineering (P) Ltd. The Indian Valve Co. Oriental Castings Upadhaya
4.	DI pipe and specials	Electro Steel Castings SAINT GOBIN TATA Jindal pipes Sri Kalahasti Pipes
5.	HDPE Pipes	Jain Irrigation Dutron Noble Polymers Tijaria Finolex Supreme Apollo pipes
6.	Butterfly Valves	Fouress Indian Valve Co. Kirloskar VAG
7.	MS pipes	Tata Pipes Jindal Pipes Jadia Pipes (India) Ltd. SAIL
8.	Lightening Protection Unit	National Radio & Electronics Co. Ltd.

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Sr. No.	Equipment	Acceptable manufacturer/ vendor
9.	Ultra-sonic / Electromagnetic flowmeter, Ultrasonic level transmitter	Krone Marshall Endress & Hauser (India) Pvt. Ltd. Siemens
10.	Pressure Gauges	Manometers India Limited H Guru Instruments Pvt. Ltd. General Instruments (P) Ltd. A.N. Instruments
11.	Online Analyzer	Polymetron ABB E&H Yokigawa Hach Forbes & Marshall
12.	Mechanical Flow Meter	Kent Schlumberger Capstan
13.	Mechanical Flow Meter (Turbine Type)	Kent Schlumberger Capstan Nivo Control Sapple- Rahul
14.	Magnetic insertion flowmeter	Crone Marshal Nivo Control Ultraline IEPL Rose Mount Letrotek Crystal ODNI

The contractor shall obtain the prior approval of Employer's Engineer before procurement of items in the list of acceptable makes of equipment. The Contractor can also propose equivalent make with prior approval of the Employer's engineer.

Storm Water Drainage System

Specifications and Standards

STORM WATER DRAINAGE SYSTEM

Table 21: Potable Water Network Details

Canal Park area	Approx. area in ha
Zone 1	1.8
Zone 2	1.5
Zone 3	0.6
Zone 4	0.8
Zone 5	0.5
TOTAL (A)	5.2

1.0 Other Design Parameters

The design parameters for the drainage system shall be followed as per the following table.

Table 22: Design Parameters

Sr. No.	Design Parameter	Value
1	System	Gravity system
2	Minimum and maximum velocity	As per CPHEEO manual
3	Rainfall Intensity	50.77 mm/hr
4	Time of Concentration	As per CPHEEO manual
5	Coefficient of Run off	As per CPHEEO manual
6	Manning's 'n' value	As per CPHEEO manual

2.0 List of Standards and Specifications for Design and Construction of Storm Water Drainage System

The design and Construction of storm water drainage network shall conform to design requirements and construction specifications set out in the following Indian and International Standards.

Table 23: Indian Standards

Sr. No.	Indian Standards	Title of the Standard
1	Manual on Sewerage and Sewage Treatment Systems	CPHEEO Manual for Sewerage and sewage systems – Latest Version- MoUD, GoI
2	IRC SP-50-1999	Guidelines on Urban Drainage
3	IS 12592: 2002	Precast Concrete Manhole Cover and Frame-Specification
4	IRC SP-42-1994	Guidelines on Road Drainage
5	IS 456:2000	Code of practice for plain and reinforced concrete
6	IS 458:2000	Code of practice for concrete pipes
7	SP 7 (Part-9 Section-1) 1983	National Building Code of India
8	SP 35:1987	Hand book on water supply & drainage

Sr. No.	Indian Standards	Title of the Standard
9	IS 1172 :1993	Code of Basic requirements for water supply, drainage and Sanitation
10	IS 3370 part I to IV	Code of practice for concrete structure for the storage of liquids
11	IS 1893-2002 part I to V	Criteria for earthquake –resistant design of structures
12	IS 1992-1979 / IS 6403-1981	Electroplated coating of lead, Code of practice for determination of bearing capacity of shallow foundations
13	IS 875 part I to III,1987	Code of practice for design loads for building and structures
14	IS 7357	Code of practice for structural design of tanks
15	IS 1786-2008	High strength deformed steel bars and wires for concrete reinforcement

3.0 IDF Curve Details for Design of Storm Water Drainage System is given under;

Table 24: IDF Curve Details

Duration (min)	1.6 Year (mm/h)	2 Year (mm/h)	2.6 Year (mm/h)	5 Year (mm/h)	10 Year (mm/h)
5	93.73	106.42	119.43	147.83	175.25
10	87.04	98.81	110.89	137.27	162.73
15	81.23	92.23	103.50	128.12	151.88
20	76.16	86.46	97.03	120.11	142.39
25	71.68	81.38	91.33	113.05	134.01
30	67.69	76.86	86.25	106.77	126.57
35	64.13	72.81	81.71	101.15	119.91
40	60.93	69.17	77.63	96.09	113.91
45	58.02	65.88	73.93	91.51	108.49
50	55.39	62.88	70.57	87.35	103.56
55	52.98	60.15	67.50	83.56	99.05
60	50.77	57.64	64.69	80.07	94.93
180	23.00	26.77	30.64	39.08	47.23
360	13.09	15.70	18.36	24.19	29.82
720	7.38	9.00	10.65	14.27	17.77
1,440	4.42	5.55	6.71	9.24	11.68

Section 5. SPECIFIC LANDSCAPE REQUIREMENT

1.1. Scope of Work

- a) The work in this contract covers the supply and installation of all hard landscape works. The Contractor shall furnish all labour, material, tools and equipment necessary to complete the works as indicated on the drawings. Any item not specifically shown in the drawings or specified but normally required to conform to such intent should be considered part of the work. Contractor shall include and price for such item in the BOQ accordingly;
- b) All works indicated in the Drawings by notes will be provided, whether or not mentioned in this specification. Any item not specified nor specifically shown in the drawings, but are normally required to conform to such intent, are considered part of the work and deemed to be included in this contract and their execution shall be covered by the contract price, in the same manner as if they have been expressly shown on the drawings and described in the specifications.
- c) The works shall be completed within the scheduled time and shall be certified by the Employer's Representative in consultation with the Landscape Architect upon practical completion;
- d) The Contractor shall submit for approval, his proposed Work Programme based on the criteria of the overall programme showing the intended sequences, stages and order of proceeding with the works together with the period of time he has estimated for each and every stage of the progress.
- e) The Contractor shall complete the works within or by the date of completion as set forth in the Contract. The Contractor shall undertake all responsibility for rectification of defects of the landscape for a period of twelve (12) months from the issuance of Practical Completion Certificate.

1.2. Site Preparation

Prior to the start of any construction works on site contractor should make sure that the below listed items have been executed.

1.2.1. Site Survey

- a) Prior to commencing the works Contractor shall carry out own survey and inform the Employer's Representative/Landscape Architect of any discrepancies with the Construction Drawings.
- b) Site survey shall be carried out by skilled and experienced team for the type of work.
- c) If any unforeseen/unrecorded hazards or items have been discovered, the Contractor shall give notice to the Employer/ Employer's Representative. **No works** shall be carried out until the issue has been resolved.

1.2.2. Site Investigation

a) General

- Contractor shall be solely responsible for obtaining all the information on the nature of the site and sub-surface soil conditions for the purpose of preparing tender and the subsequent execution of the contract.
- Site investigation shall provide data to allow Contractor to proceed with works.
- Extent of the investigation shall be determined by the Employer/ Employer's Representative and the Contractor.
- Site investigation shall include:
 - Establish records of mean water table;
 - Identify all previous known uses of the site;
 - Identify site features to be preserved;
 - Identify areas of limited access, incomplete work by others or any other issues which may hamper the execution of the works;
 - Locate and identify all known land and water contaminants;
 - Locate and identify soil types to a depth of 4.0m below existing ground level;
 - Recommendations for further investigations.

b) Public and Safety

- During any temporary works during the investigation, area investigated shall be secured and public access shall be limited;
- Erect temporary fences, footpaths, warning lights etc. Before starting the investigation.
- Area of any investigation shall be kept clean and protected from ground and surface waters.

c) Field test General

- Each test shall be recorded and following data shall be provided:
 - Project name and reference;
 - Date and time of test;
 - Weather conditions;
 - Soil types and description;
 - Location and detail of the sample;
 - Site photograph
 - If any feature should be encountered, provide description and depth of:
 - Changes in soil strata,
 - Drains,
 - Foundations/structures;
 - Hard strata;
 - Services

d) Field test - Soils

- Soil test shall be carried out in accordance with relevant Indian standards;
- Tests shall be carried out at every test pit;
- Method of testing to be proposed by contractor.
- Test shall provide the information on the following:

- Permeability; Geophysical conditions; Any special features, as advised should be undertaken in an approved manner, by the contractor.
- e) Samples**
- When taking samples make sure the following:
 - Method should be undertaken in an approved manner, by the contractor. It should include information on: depth, frequency and locations.
 - Samples should be collected and stored in a manner that prevents exposure to direct heat and sunlight, extreme temperatures;
 - Samples should not be contaminated;
 - Ensure samples are a typical representation of the zone from which they were taken;
 - Retain samples for 28 days post submission of the final report.
- f) Site test - water**
- Tests should identify ground water levels and pressures.
 - Method to be undertaken in an approved manner, by the contractor.
- g) Laboratory tests**
- a) Mechanical and Chemical properties shall be tested;
 - b) Method of testing should be undertaken in an approved manner, by the contractor and at the contractor's expense. Records are to be kept of all Testing in a ledger noting time, date and type of test with result kept in a secure, lockable location in the site office.
- h) Final Report**
- Final site investigation report should include:
 - All known land and water contaminants;
 - Identify all previously known uses of the site;
 - Locate and identify soil types to a depth of the 4.0m below existing ground level
 - Mean water table;
 - Recommendations for further investigation;
 - Features to be included:
 - All above and below ground features;
 - All underground services;
 - Topography

1.2.3. Demolition & Site Clearance

- a) General**
- Contractor to survey and agree with the Employer/ Employer's representative extent of demolition and methodology for elements which have been identified on the Demolition Plan or drawings.
 - Extent of works should be within site boundary, otherwise notify and agree with Employer/ Employer's Representative;
 - Contractor to submit details of the demolition works prior to proceeding. The document should include:
 - Location and types of structures, site and surrounding area,

- Extent;
- Removal method;
- Information on adjoining premises which may be affected;
- Information on below and above ground services, including arrangements for disconnection/removal;
- Health and safety procedures for protecting public and site workers;
- Proposed programme of workplace
- Any special requirements.

b) Services affected by Demolition

- Contractor shall give notice at least 24 hours prior so that the Employer's representative may inspect existing services which might be affected by demolition work.

c) Material arising

- All components and materials arising from the demolition works shall be utilised as per Waste Management Plan procedures.

d) Site Clearance general guidelines

- Contractor will be responsible for clearing all planting areas of existing vegetation not specified to remain and all other debris and foreign materials considered a hindrance to the planting operation and/or unsightly in appearance.
- Contractor will be responsible for cleaning the planting areas after completion of civil and other works in that area, and turning them over to the horticulturalist suitable for planting.
- Carefully remove items indicated to be salvaged and stored the site where indicated. Except for stripped Subsoil or other materials indicated to remain on Employer's property, cleared materials shall become the Contractor's property and shall be removed from the project site, on a periodic basis and on completion of site works.
- Contractor will take care and maintain previously established grades and swales.

1.3. Earthworks

Prior to the start of any construction works on site contractor should make sure that the below listed items have been executed.

1.3.1. General items

a) General notes

- The section refers to excavation grading and filling of soil across the site as part of the works.

b) Setting Out

- Before start of excavation works Contractor shall carry out preliminary setting out of key items pertaining to the construction and excavation works;

- Contractor will be fully responsible for establishing and locating at site all grid lines, base lines, levels and limits for project.
- Qualified surveyor should be engaged to prepare the above works;
- All setting out information established by Contractor on site should conform accurately with information in the Drawings
- Employer's Representative shall approve all setting out and locations prior to any excavation works;
- Prior to start of further works, Contractor should do a Quality check and any errors/non-compliance with Drawings should be highlighted to the Employer's Representative. If the setting out will be a cause of errors in further execution of works, Contractor should seek clarification from the Employer's Representative. Any works done which cause obstruction to future works, without approval from the Employer's Representative, shall be demolished and reconstructed at the expense of the Contractor;
- The Contractor shall follow the datum set out by the Main Civil Works Contractor. Contractor shall be responsible for providing, maintaining and safeguarding the position and levels of all survey pillars/pegs and benchmarks existing on site or added;
- Contractor shall maintain sufficient number of pillars/pegs for checking/monitoring of the works for the entire duration of the project.

1.3.2. Preservation of Existing top soil

a) Stripping top soil

- For the extent/depth of the topsoil refer to site investigation report;
- Before beginning general excavation or filling, Contractor shall strip topsoil from areas where there will be regrading, paving/roads and other areas shown on drawings.
- Topsoil shall be removed to an average depth of 300mm, if the depth of topsoil is difficult to determine, the Contractor shall give notice to Employer/ Employer's Representative
- Stripped topsoil to be reused immediately after stripping or removed from site;
- **Location of stockpile:** To be agreed - topsoil shall be stored in an area of the site where it should not interfere with other site operations so that it can be left undisturbed during the construction process.
- The area that is to be used for storing the topsoil shall be cleared of vegetation and any waste arising from the development e.g. building rubble and fill materials.
- **Protection** - Contractor to make sure the following treatment has been applied to remove topsoil:
 - Topsoil not to be mixed with subsoil, stone, hardcore, rubbish or material from demolition, other soil or materials containing aggressive weeds or non soil forming materials, oil, fuel cement or other substances harmful to plant growth;
 - Do not place any other material on top of storage heaps.
 - Do not allow construction plant to pass over storage heaps.
 - Prevent compaction and contamination, by fencing and covering as appropriate.

1.3.3. Excavation

a) **General**

- All excavation works shall be in accordance with relevant Indian standards or equivalent international standards;
- Any features like: pavement wearing surface, concrete paths, kerbs, channels or alike, should be cut by saw to give clean break line along the edge of excavation.
- If excavating next to existing features (existing boundary wall, signage, existing structures, pillars, ramps, services, trees etc.) Contractor to ensure all health and safety procedures are strictly followed to avoid disturbance of foundations, tree roots etc.
- All excavation shall be carried out by mechanical equipment, unless specified otherwise by Employer's representative. The Contractor can suggest alternative methodology for Employer 's Representative approval. However any consequent loss or damage will be still under Contractor's liability.

b) **Extent**

- Excavate over the site to give correct levels and profiles as the basis for construction, paving, filling and other relevant works. Make allowance for compaction and settlement.
- Excavate for footings, pits and alike, to the required size and depths. Confirm the bedding capacity is as specified.

c) **Accuracy and Permissible Deviation**

- All excavation works shall be taken up to such widths, lengths, depths and profiles as are shown on the drawings or such other lines and grades as specified by Employer 's Representative.
- All excavation shall be done to minimum dimensions as required for safety, quality and efficiency.
- Any deviation from formation levels beneath mass concrete foundations, ground bearing slabs, embankments and cuttings, external walls etc. shall be consulted with Engineer.
- General permissible deviation from linear dimension to be 25mm.

d) **Excavation to existing foundations and structures**

- Prior to commencing excavation excavate trial pits adjacent to existing foundations to determine extent and formation level
- Agree with engineer formation level in the new excavation for the safety of the structure;
- Backfill material to excavation to be determine by structural engineer;
- Provide support to adjacent structures if necessary, sufficient to prevent damage arising from works;
- Supports should be lateral (shoring) and vertical (piling or underpinning);
- If permanent support required give notice to the Employer / Employer 's Representative.

e) Adjacent excavation

- Where excavation encroaches below a line drawn at 45 angle from the nearest formation level of another higher excavation, the lower excavation, all work within it and backfilling thereto must be completed before higher excavation is made.

f) Dewatering/ Drainage

- All excavations should be kept free of water.
- Grading to the excavation should be such as to exclude rain/surface water draining into excavated areas.
- Any water in the excavated areas should be pumped out by Contractor, this should be continued until area is clear of water and up till foundation work is completed and backfilled.
- Do not disturb excavated faces or stability of adjacent ground or structures during pumping. Pumped water should be discharged without flooding adjacent property outside the site. Sumps made for dewatering shall be clear of excavations and fill on completion.

g) Inspection

- Contractor to give 5 days' notice for inspections of formations for foundations and filling formations, service trenches, roads and paving.
- Seal the approved formation with blinding concrete within 4 hours of inspection.

1.3.4. Filling

a) Fill Material - General

- Fill material specification should be according to relevant Indian standards or under the guidance of technical expert.
- Submit full details of proposed fill materials, including:
 - Type and source of imported fill;
 - Proposals for processing and reuse of material excavated on site;
 - Test reports as required;
- Submit the above at least 21 days before starting filling.

b) Fill Material Properties and types of Fill material

- Any fill material used for filling should be free of hazardous, aggressive or unstable content.
- Within the top 1000mm of any area to receive topsoil, do not use fill materials which would, either in themselves or in combination with other materials or ground water, give rise to a health hazard, damage to building structures or instability in the filling;

- c) Sulphur content:** Do not use filling with sulphur content exceeding 0.5% within 0.5 m of cement bound elements (for example concrete structures or masonry), unless such elements are protected by impermeable membranes or by other suitable means.

d) Sources:

- Where directed, re-use material recovered from excavations on the site. Dry out recovered material as necessary prior to use.
- **Fill types recommendations:**
 - General fill: Well-graded material, maximum particle size 75 mm, plasticity index $\leq 55\%$.
 - Select fill: Granular material complying with the following properties:
 - Particle size: 75 mm maximum.
 - Proportion passing 0.075 mm sieve: 25% maximum.
 - Plasticity index: $\geq 2\%$, $\leq 15\%$.
 - Soaked CBR: Not less than 15.
 - Maximum depth of fill to be compacted not too exceeds 300mm at any one time.
 - **Road embankment fill:** Well graded material with maximum plasticity index 35% and maximum particle size determined by location and layer thickness, but not exceeding two-thirds of the uncompact layer thickness.
 - Fill sub grade: Use class 3 materials or select fill.

e) Testing of suitability of Fill Materials

- If required the Employer's Representative may request for a laboratory test of the proposed fill material.
- Samples should be submitted to accredited laboratory by Contractor.
- Report to be submitted by Contractor to Structural engineer.

f) Preparation of Filling

- General: Remove loose material, debris, rubbish, standing water and organic matter.
- Benching:
 - If filling is to be placed against a ground surface that has slopes more than 1:4, bench into the natural surface for at least 1 m at every 1 m change of level to form a key for the filling.
- Underground slabs, pavements and other load bearing elements:
 - For under filling that will support slabs, pavements and other load-bearing elements, compact the stripped surface as for filling. If necessary, loosen the material to a depth of 200 mm and adjust the moisture content.
- Under earth mounds:
 - Cultivate the ground by ripping to a depth of 200 mm before mound formation.
- Rock:
 - Remove any loose or unstable blocks of rock.

g) Placing fill

- Place and compact fill material in layers;
 - Place so that only one type of material occurs in each layer.
 - Each layer to be min 150mm, max 300mm thick
- Site grading shall be carried out as indicated in the drawings and as directed by the Employer's Representative.

- Adjacent structures, membranes and buried services:
 - Do not overload, destabilize or damage.
 - Submit proposals for temporary support necessary to ensure stability during filling. Remove support progressively as backfilling proceeds.
 - Allow 14 days (minimum) before backfilling against in situ concrete structures.
 - **Compaction**
 - Compact fill as soon as possible after placing.
 - After compaction surface of each layer must be well closed, showing no movement under compaction plant, and without cracks, holes, ridges, loose material and the like.
 - Defective areas: Remove existing material from site and re-compact to full thickness of layer using new material.
 - To ensure that the fill has been compacted as specified, the Contractor at his cost shall carry out field and laboratory tests. Field compaction test shall be carried out at different stages of filling and also after the fill to the entire height have been completed. This shall hold good for embankments as well. Reports to be provided to Employer's representative and Landscape Architect.
 - The fill shall be carried out such dimensions and levels as indicated on the drawings after the stipulated compaction. The fill will be considered as incomplete if the desired compaction has not been obtained.
 - The Contractor shall protect the earth fill from being washed away by rain damaged in any other way. Should any slip occur, the contractor shall remove the affected material and make good the slip occur. The Contractor shall remove the affected material and make good the slip at his cost.
- h) **Reuse of material for fill**
- As specified in 2.3.4(e), the rock as obtained from excavation may be used for filling and levelling to indicate grades without further breaking.
 - In such an event, filling shall be done in layers not exceeding 300 mm approximately.
 - After rock filling to the approximate level, indicated above has been carried out, void in rocks shall be filled with finer materials such as earth, broken stone etc.. and the area flooded so that the finer materials fill up the voids. Care shall be taken to ensure that the finer fill material does not get washed out.
 - Over the layer so filled, a 100 mm thick mixed layer of broken material and earth shall be laid and consolidation carried out by a 12 tonne roller. No less than twelve passes of the roller shall be accepted before subsequent similar operations are taken up.
 - To ensure that the fill has been compacted as specified, the Contractor at his own expense shall carry out field and laboratory tests to validate standards of compaction achieved. Field compaction test shall be carried out at different stages of filling and also after the fill to the entire height have been completed.

i) Tolerance of cut & fill

- Unless otherwise specified, no portion of the earth cutting shall vary from the specified or proposed level by an amount exceeding 150mm. The tolerance of the fill level or those on slope shall not be more than 75mm from the proposed level. The same tolerance shall be applicable to the limits and lines of cut and fill. All levels are those applicable at the end of the Defects Liability Period. The Contractor should therefore make the necessary allowance for shrinkages, consolidation, settlement and any other losses and to include all expenses for this in his quoted rates.
- Notwithstanding the above, all cut or fill area shall be such that there is no stagnation of water. Should there be any local depressions, the Contractor shall be required to re-grade or fill up the depressions as necessary. The Contractor shall be responsible for making good all settlements or erosion in the filling and cut area whenever the defects occur or as directed by the Employer's -Representative up to the end of the maintenance period.

1.4. Anti-Termite Treatment

This section covers the general requirements for Anti-Termite Treatment measures, chemical treatment of soils for the protection of features & buildings attack of subterranean termites, Chemicals to be used with their minimum rates of application and procedure to be followed for treatment of Foundation.

1.4.1. Chemicals

- The chemical used for soil treatment shall be any one of the following:

Table 25: Chemical details for soil treatment

Chemical	Relevant Indian Standard	Concentration by weight_%
<i>Chlorpyrifos emulsifiable concentrate</i>	IS: 8944-1978	1.0
<i>Heptachlor emulsifiable concentrate</i>	IS: 6439-1972	0.5
<i>Chlordane emulsifiable concentrate</i>	IS:2682-1966	1.0

1.4.2. Application

- The method of application and the stages it will be applied shall be submitted for approval and this shall conform to relevant Indian standard or equivalent.
- All works related to application of the Chemicals shall strictly follow Health and Safety procedures as mentioned in section 1.6.3. Health and Safety Plan.
- Workers shall be properly protected during application and shall wear the necessary clothes, masks, goggles and other gear to avoid direct contact and inhalation of chemicals ;
- No work shall be carried out under unsuitable weather conditions, these include:
 - Rain or when the soil is wet due to rain or sub-soil water;

- Strong winds;
- Heat waves;
- o Chemicals shall be brought to the site of work in sealed original containers. The materials shall be brought in at a time, in adequate quantity to suffice for the work. The material shall be kept in cool and locked stores. The empties shall not be removed from the work site till the relevant item of work has been completed and permission granted by the Employer / Employer's Representative.
- o Chemicals available in concentrated forms with concentration indicated on the sealed containers shall only be used. Chemicals shall be diluted with water in the desired quantity before use, using graduated containers to achieve the desired percentage of concentration.
- o Hand operated pressure pump with graduated containers shall be used to ensure uniform spraying and to facilitate proper penetration of the chemical. Continuous check shall be kept to ensure that the specified quantity of chemicals is used for the required area during the operation.
- o Soil treatment shall start when the foundation trenches and pits are ready to receive mass concrete in foundations. Laying of mass concrete will start when the chemical emulsion has been absorbed by the soil and the surface is quite dry. The above mentioned also applies in the case of treatment to the filled earth surface within the plinth before laying the sub grade for the floor. The treated soil barriers shall not be disturbed after they are formed. If by chance, treated soil barriers are disturbed, immediate steps shall be taken to restore the continuity and completeness of the barrier system.

1.5. Hardscape Specification

- a) This section covers the general specifications of basic materials which are part of landscape civil work which includes Brickwork, Stone masonry, Concrete work; wood work, bamboo work, steel work and related treatment procedures.
- b) All materials and workmanship shall comply with the relevant Indian Standards and Codes or latest CPWD specifications, 2009.

1.5.1. Brickwork/ masonry work

- a) **Brickwork classification:** Class 1 for exposed brick work; Class 2 for compound wall with plastering
- b) **Strength:** For class 1 - average compressive strength should not be less than 10.7 N/mm² For Class 2 - 7.5 which means average compressive strength should not be less than 7.5 N/mm² and not more than 10 N/mm² .
- c) **Manufacturer:** from Suppliers Schedule provided or equivalent approved.
 - o Quality: Well burnt F.P.S. bricks
 - o Special shapes: The bricks shall have smooth rectangular faces with sharp corner and shall be uniform in colour and emit clear ringing sound when struck
 - o Size: (229 x 110 x 70) mm – nominal size.
- d) **Mortar:** The mortar for the brick work shall be as specified, and conform to accepted standards. Lime shall not be used where reinforcement is provided in brick work because it will allow corrosion of metal. More details are given in section 2.5.4.

e) **Sampling of brick samples:**

Samples of bricks shall be subjected to the following tests:

- Dimensional tolerance.
- Water absorption.
- Efflorescence.
- Compressive strength.

f) **Soaking of Bricks:**

- Bricks shall be soaked in water before use for a period for the water to just penetrate the whole depth of the bricks based on field test.
- Alternatively bricks may be adequately soaked in stacks by profusely spraying with clean water at regular intervals for a period not less than six hours.
- The bricks required for masonry work using mud mortar shall not be soaked.
- When the bricks are soaked they shall be removed from the tank sufficiently early so that at the time of laying they are skin-dry.

g) **Laying:**

- Bricks shall be laid in English bond unless otherwise specified.
- For brick work in half brick wall, bricks shall be laid in stretcher bond.
- All loose materials, dirt and set lumps of mortar which may be lying over the surface on which brick work is to be freshly started, shall be removed with a wire brush and surface wetted.
- Bricks shall be laid on a full bed of mortar.

h) **Joints:**

- The thickness of all types of joints including brick wall joints and cross joints shall be such that four course and three joints taken consecutively not more than 31mm. Specified thickness of joints shall be of 1 cm. Deviation from the specified thickness of all joints shall not exceed one-fifth of specified thickness.
- Flushed joint. Plumb at every fifth cross joint.

i) **Curing:** 7 days.

j) **Brick Quality:**

Class 1 Bricks:

- Plain surface, sharp edges and size with tolerance in dimensions $\pm 3\%$
- Uniform red or brownish coloured.
- High crushing strength, not less than 10.7 N/mm²
- Machine moulded
- Efflorescence- NIL
- Water absorption less than 15%.
- Application: used for the exterior wall brick works, short columns and arches.

Class 2 Bricks:

- Slightly uneven faces and edges with tolerance in dimensions $\pm 8\%$
- Uniform colored but may be slightly over burnt.

- High crushing strength, not less than 7 N/mm²
- Hand moulded
- Efflorescence- Little
- Water absorption less than 20%.
- Application: used for internal walls and compound walls.

Class 3 Bricks:

- May be distorted with blunt edges.
- Over burnt or under burnt and non uniform color.
- High crushing strength, not less than 3.5N/mm²
- Hand moulded
- Efflorescence- Large
- Water absorption less than 25%.
- Application: flooring, paving, small brick foundations and brick bat lime concrete(B.B.L.C.).

1.5.2. Stone work

- a) **Stone type:** Granite
- b) **Source:** shall be obtained from the quarries, approved by the Employer's representative.
- c) **Sampling:** To match approved material sample produced by contractor which should be approved by Employer's representative and Landscape Architect.
- d) Stone shall be hard, sound, durable and free from weathering decay and defects like cavities, cracks, flaws, sand holes, injurious veins, patches of loose or soft materials and other similar defects that may adversely affect its strength and appearance.
- e) **Sizes of stone:** the length of stones for stone masonry shall not exceed three times the height and the breadth on base shall not be greater than three-fourth of the thickness of wall, or not less than 150 mm. The height of stone for rubble masonry should not be less than 200mm.
- f) **Dressing:** Each stone shall be hammer dressed on the face, the sides and the beds. Hammer dressing shall enable the stones to be laid close to neighbouring stones such that the bushing in the face shall not project more than 40 mm on the exposed face.
- g) **Thickness of joints:** The joint thickness shall not exceed 30 mm at any point on the face.
- h) **Mortar:** As section 2.5.4.
- i) **Laying:**
 - The stone shall be wetted before laying. They shall then be fixed with mortar in position without the use of chips or underpinning of any sort.
 - The walls shall be carried up truly plumb. All courses shall be laid truly horizontal and all vertical joints truly vertical. The stone shall break joints on the face for at least half the height of the course, unless otherwise shown in the drawings. The stone shall be laid in regular courses not less than 200mm height and all the stones shall be of the same height unless otherwise specified. No stone shall be less in length than one and a half times its height unless otherwise specified.

j) **Joints**

- The joints shall be done with cement mortar 1: 3 (1 cement: 3 coarse sand). All joints shall be full of mortar. Special care shall be taken to see that the groundings for veneer work are full of mortar.
- The thickness of joints shall be as small as possible, not exceeding 5 mm. For a close butt jointed facing the thickness shall not exceed 1.5 mm.
- The face joints shall be uniform throughout.

1.5.3. Concrete work

a) **Procurement:**

- Concrete work shall be done with Design Mix Concrete or Ready Mixed Concrete from reputed and approved suppliers approved by contractor or Engineer in charge.
- The Design Mix Concrete will be designated based on the principles given in Indian standards. The contractor shall design mixes for each class of concrete such that the concrete ingredients and proportions will result in concrete mix meeting specified requirements. In case of admixtures and or white cement, the mix shall be designed with these ingredients as well. The specification mentioned herein below shall be followed for Design Mix Concrete.

b) **Ingredients**

- All ingredients selected should be as per relevant Indian Standards and CPWD specifications, 2009.
- Coarse Aggregate
- Fine Aggregate
- Water – It shall conform to requirements laid down as per standards.
- Cement – Cement arranged by the contractor will be slag or Portland Pozzolana Cement (PPC). Cement of grade lower than that used for mix design shall not be allowed to be used in the work. The Indian standards for PPC Cement are as follows and is highly recommended.
 - IS 1489 (Part 1) 1991, Portland Pozzolana Cement – specification (fly ash based).
 - IS 1489 (Part 2) 1991, Portland Pozzolana Cement – specification (Calcined clay based)
 - IS 3812 1981 – specification for flyash as pozzolana and admixture IS 1344 1981
- **Admixtures** – Wherever required, admixtures of approved quality shall only be mixed with concrete as specified. The admixtures shall conform to relevant Indian Standards alongwith the approval of Employer's representative.
- **Grade of Concrete** – The Characteristic compressive strength of various grades of concrete shall be M20 Grade in the case of plain concrete and M30 in case of reinforced concrete.
- Special attention shall be given to the design of the mix to obtain the densest possible concrete: slag, broken brick, soft lime stone, soft sandstone, or other porous or weak aggregates shall not be used.

- In reinforced concrete structures, care shall be taken to protect the reinforcement from exposure to saline atmosphere during storage, fabrication and use. It may be achieved by treating the surface of reinforcement with cement wash or by suitable methods.
- c) **Laying concrete**
- Surfaces on which concrete is to be placed should be free from debris and standing water.
 - Pre-moist the base material prior to placing concrete.
 - Timing: Place as soon as practicable after mixing and while sufficiently plastic for full compaction. After discharge from the mixer do not add water or retemper.
 - Temperature of concrete at point of delivery:
 - In hot weather (maximum): 30°C.
 - In cold weather (minimum): 5°C.
 - ✓ Do not use frozen materials.
 - ✓ Do not place concrete against frozen or frost covered surfaces.
 - ✓ Do not place concrete when air temperature is below 3°C on a falling thermometer. Do not resume placing until rising air temperature has reached 3°C.
 - Placing in final position:
 - Place in one continuous operation up to construction joints.
 - Do not place concrete simultaneously on both sides of movement joints.
 - Spreading: Spread and strike off with surcharge sufficient to obtain required compacted thickness.
 - **Joints:** Cracking of concrete takes place when curing takes place and secondly when concrete shrinks with change in temperature. There are four different types of joints which are introduced depending on structural requirement of the concrete slab.
 - **Contraction joints** – are intended to create weakened planes in the concrete and regulate the location where cracks, resulting from dimensional changes, will occur.
 - **Isolation or expansion joints** – separate or isolate slabs from other parts of the structure, such as walls, footings, columns, driveways and patios from sidewalks, plstairss, light poles, other point of restraint.
 - **Construction joints** – are surfaces where two successive placements of concrete meet. The location of construction joint should be planned.
 - **Guidelines for executing joints:**
 - Refer relevant standards and structural consultant guidelines before executing joints in concrete slabs.
 - The maximum joint spacing should be 24 to 36 times the thickness of the slab as basic thumb rule. Consult structural consultant for technical details.
 - For contraction joints, the joint groove should have minimum depth of ¼ the thickness of the slab as basic thumb rule.
 - Tooled joints must be run early in the finishing process and rerun later to ensure groove bond has not occurred.
 - Early-entry-dry-cut joints are generally run 1 to 4 hours after completion of finishing of concrete setting.
 - Conventional saw-cut joints should be run within 4 to 12 hours after the concrete

- has been finished.
- Use pre-moulded joint filler such as compressible foam strips for isolation joints to separate slabs from building wall or footings. At least 50mm of sand over the top of a footing will also prevent bond to the footing.
 - If the slab contains wire mesh as reinforcement, cut out alternate wires, or preferably discontinue the mesh, across contraction joints.
- d) Construction joints, use Connelly joints <https://www.connollykeyjoint.com/> or similar approved at all joints keying the two edges of the slab together. **Compaction of Concrete**
- Concrete shall be compacted during placing so that:
 - A monolithic mass is created between the ends of the member, planned joints or both;
 - The formwork is completely filled to the intended level;
 - The entrapped air is expelled;
 - All reinforcement, tendons, ducts, anchorages and embedments are completely surrounded;
 - The specified finish to the formed surfaces of the member is provided;
 - The required properties of the concrete can be achieved.
 - **Compaction Methodology:**
 - **Hand compaction:** this method is used for non-structural items. Workability should be decided to minimize the chances of honey combing. Rodding and Tamping are two common methods which can be used for pathways and paved areas.
 - **Mechanical Compaction:** Vibration is imparted to the concrete by mechanical means. It causes temporary liquefaction so that air bubbles come on the top and expelled ultimately.
 - Concreting shall be carried out in one operation between the expansion joints and construction joints without any break at the dummy joints.
 - Concrete shall be deposited on the base as near the joints as possible without touching them. It shall then be shoveled against the sides, maintaining equal pressure and deposited approx. 50 mm higher than the depth of the joints, care being taken that it is worked well around the joints. The concrete shall not be dumped from the bucket directly upon or against the joints.
- e) **Finishing of Concrete**
- During compaction, any low or high spots shall be made up by adding or removing concrete.
 - After longitudinal floating has been completed but while concrete is still plastic, the slab surface shall be tested for trueness with a 3 m straight edge.
 - Any depressions or high spots showing departure from the true surface shall be immediately rectified. High spots shall be cut down and refinished. Depressions shall be enlarged to about 8-10 cm and filled up with fresh concrete, compacted and finished.
 - Adjacent work: Form neat junctions and prevent damage. Keep clean all channels, kerbs, inspection covers, etc to be installed and kept clean during the installation process.

1.5.4. Mortar

- (a) Desirable properties of mortars for use in masonry are:
- **Workability**
 - Water retentivity
 - Rate of stiffing
 - Strength
 - Resistance to rain penetration
 - Durability
- (b) **Standards:** All materials and workmanship shall comply with the relevant Indian Standards and Codes or latest CPWD specifications.
- (c) Contractor to follow Health and Safety procedures set in Section 1.6.1. on Health and Safety Plan.
- (d) **Material specifications**
- **Water**
 - Water used for mixing and curing shall be clean and free from injurious quantities of alkalies, acids, oils, salts, sugar, organic materials, vegetable growth or other substance that may be deleterious to bricks, stone, concrete or steel. Potable water is generally considered satisfactory for mixing.
 - The Ph value of water shall be not less than 6.
 - The physical and chemical properties of ground water shall be tested along with soil investigation and if the water is not found conforming to the requirements as mentioned in IS codes, the contractor has to arrange good quality water for construction indicating the source.
 - Water found satisfactory for mixing is also suitable for curing.
 - Sea water shall not be used for mixing or curing.
 - Water from each source shall be tested before the commencement of the work and thereafter once in every three months till the completion of the work. In case of ground water, testing shall also be done for different points of drawdown. Water from each source shall be got tested during the dry season before monsoon and again after monsoon.
 - **Cement**
 - The cement used shall be grade as mentioned in Indian Standards and the type selected should be appropriate for the intended use.
 - Portland cement is a hydraulic binder and a finely ground inorganic material. When mixed with water, it forms a paste which sets and hardens by means of hydraulic reactions. India has made great strides in producing world class cement.
 - **Blended cements:** Blended cements or composite cements are those cements in which a mineral additive has been added to portland cement. Blended cement is a hydraulic cementitious product, similar to ordinary portland cement, but due to the addition of blending material it has certain improved properties compared to OPC.
 - **Portland pozzolana cement (PPC)** is manufactured either by grinding intimately together portland cement clinker, gypsum and a pozzolana such as flyash, or by intimately and uniformly blending portland cement and fine pozzolana. The BIS has differentiated PPC based on the pozzolana added to the mix. As per updated IS standards, the proportion

of flyash as a pozzolana used can vary between 15 and 35 percent by weight of cement, as stipulated by IS 1489:(Part I) 1991. The physical requirements of OPC and PPC are similar.

- Increased impermeability, lower heat of hydration, lower plastic shrinkage, reduced alkali aggregate expansion, and improved resistance to aggressive chemical agents and corrosion are some of the major benefits to be derived from the use of PPC.
- The use of PPC is, thus desirable for enhancing durability in different construction jobs, especially for structures subjected to aggressive environments.
- The Indian standards for PPC Cement are as follows and is highly recommended.
 - IS 1489 (Part 1) 1991, Portland Pozzolana Cement – specification (fly ash based).
 - IS 1489 (Part 2) 1991, Portland Pozzolana Cement – specification (Calcined clay based)
 - IS 3812 1981 – specification for flyash as pozzolana and admixture IS 1344 1981

o **Sand**

- Type and grading of sand to be used shall be specified. It shall be coarse sand, fine sand. Use of sea sand shall not be allowed.
- **Coarse sand** shall be either river sand or pit sand or a combination of the two.
- **Fine sand** shall be either river sand or pit sand or a combination of the two.
- Sand must be checked for organic impurities such as decayed vegetation humps, coal dust etc.

(a) Preparation of Mortar

- This shall be prepared by mixing cement and sand with or without the addition of pozzolana in 1:3 proportions as per relevant Indian standards.
- **Proportioning:** Proportioning on weight basis shall be preferred taking into account specific gravity of sand and moisture content. Boxes of suitable size shall be prepared to facilitate proportioning on weight basis. Cement bag weighting 50 kg shall be taken as 0.035 cubic metre. Other ingredients in specified proportion shall be measured using boxes of size 40 x 35 x 25 cm. Sand shall be measured on the basis of its dry volume in the case of volumetric proportioning.
- **Mixing:** The mixing of mortar shall be done in mechanical mixers operated manually or by power as decided by Engineer-in-Charge.

1.5.5. Cement Plastering

- (a) Cement Plaster mortar type and quality to Engineer's specification and to comply with relevant Indian standards and regulations. Plastering of the surface to be

performed to Engineer's specification or have a deviation of less than <5mm at a vertical and horizontal angles.

- (b) Contractor to submit samples of cement, coarse and fine aggregate. For external work and under coat work, the fine aggregate shall conform to grading IV. For finishing coat work the fine aggregate conforming to grading zone V shall be used.
- (c) Preparation of surface: The joints shall be raked out properly. Dust and loose mortar shall be brushed out. Efflorescence if any shall be removed by brushing and scrapping. The surface shall then be thoroughly washed with water, cleaned and kept wet before plastering is commenced.
- (d) The mortar shall be prepared using The mix and type of fine aggregate specified in the description of the item shall be used for the respective coats
- (e) Thickness: 12mm, 15mm and 20mm as specified in the item.

(f) Application:

Plastering shall be started from the top and worked down towards the floor. To ensure even thickness and a true surface, plaster about 15 × 15 cm shall be first applied, horizontally and vertically, at not more than 2 metres intervals over the entire surface to serve as gauges.

(g) Curing

The plaster shall be kept wet for a period of at least 7 days. During this period, it shall be suitably protected from all damages at the contractor's expense by such means as the Engineer-in-Charge may approve.

(h) Finish

The plaster shall be finished to a true and plumb surface and to the proper degree of smoothness as required. The work shall be tested frequently as the work proceeds with a true straight edge not less than 2.5 m long and with plumb bobs.

1.5.6. Wood work

- a) **Standards:** All materials and workmanship shall comply with the relevant Indian Standards and Codes or latest CPWD specifications.
- b) **Timber procurement**
 - Timber (including timber for wood based products): Obtained from well managed forests/ plantations in accordance with:
 - The laws governing forest management in the producer country or countries.
 - International agreements such as the Convention on International Trade in Endangered Species of wild fauna and flora (CITES).
 - Documentation: Provide either: Documentary evidence (which has been or can be independently verified) regarding the provenance of all timber supplied, or Evidence that suppliers have adopted and are implementing a formal environmental purchasing policy for timber and wood based products.
- c) **Seasoning of Timber:**
 - The process of drying timber under controlled conditions is called seasoning of timber.
 - Timber shall be either air seasoned or kiln seasoned and in both cases moisture content of the seasoned timber should be achieved as per relevant Indian Standards.

- Air seasoned timber shall be used.
 - Kiln seasoning of timber, where specified, shall be done as per IS standards in a plant approved by Engineer in-Charge.
- d) **Preservation of Timber**
- Preservative treatment does not improve basic properties of timber but gives varying degree of protection against deterioration due to attacks by fungi, termites, borers and marine organisms.
 - Preservative treatment, where specified, shall be done using Oil type, Organic solvent type or Water-soluble type preservative. Oil type preservatives shall be used if the timber is not required to be polished or painted. Before preservative treatment, the timber shall be sawn and seasoned.
 - All surfaces exposed after treatment, except due to planing, shall be thoroughly brushed with the preservation before jointing.
 - Preservative treatment of timber shall be done as per relevant Indian Standards in a plant approved by the Engineer-in-Charge.
- e) **Material:**
- **Timber**
 - Timber panels shall be preferably made of timber of larger width. The minimum width and thickness of a panel shall be 150 mm and 15 mm respectively. When made from more than one piece, the pieces shall be joined with a continuous tongue and groove joint, glued together and reinforced with metal dowels.
 - The grains of timber panels shall run along the longer dimensions of the panels.
- f) **Application:**
- **For Framework:**
 - The work shall be carried out as per detailed drawings and as directed by the Engineer-in-Charge, specified timber shall be used.
 - Sawing shall be truly straight and square, and in the direction of the grains.
 - The scantlings shall be accurately planed smooth to the full dimensions and rebate roundings and mouldings shown in the drawings, before the same are framed.
 - Patching or plugging of any kind shall not be permitted.
 - A tolerance of +3 mm and -2 mm shall be allowed in the finished cross sectional dimension.
 - **Timber Panels**
 - Timber panels shall be preferably made of timber of large width; the minimum width and thickness of the panel shall be 100 mm, and 15 mm respectively. When made from more than one piece, the pieces shall be jointed with a continuous tongued and grooved joint glued together and reinforced with headless nails at regular intervals not exceeding 100 mm. Depth and thickness of such joint shall be equal to one-third of thickness of panel. The panels shall be designed such that no single panel exceeds 0.5 square metre in area. The grains of timber panels shall run along the

longer dimensions of the panels. All panels shall be of the same species of timber unless otherwise specified.

- **For Fitting**

- Fitting shall be of stainless steel. These shall be well made, reasonably smooth, and free from sharp edges and corners, flaws and other defects. Screw holes shall be counter sunk to suit the head of specified wood screws.

g) Timber Decking

- **Seasoning and Preservation**

- All timber used for decking and paving shall be thoroughly seasoned in accordance with relevant Indian Standards as mentioned in point (c). After seasoning the timber shall be treated with preservative in accordance with relevant Indian Standards as mentioned in point (d).
- Seasoning and preservative treatment shall be paid for separately unless otherwise specifically included in the description of the item of flooring.

- **Boards/ Planking**

- It shall be of the class of timber and thickness specified in the description of the item. The timber shall be as specified in section 2.5.6. Only selected boards of uniform width shall be used. Unless otherwise specified or shown in the drawings.
- The minimum length of boards shall be such that the boards shall rest at least on three supports, except where otherwise required by the pattern specified in the drawings or as directed by the Engineer-in-Charge.
- The boards shall be planed true on the outside face only unless otherwise specified in the description of the item.
- Butt joint should be provided where it lies over a vertical beam.
- Iron Screws: Iron screws shall be of the slotted counter sunk head type, of length not less than the thickness of planks plus 25 mm, subject to a minimum of 40 mm, and of designation No. 9 conforming to Indian Standards.

- **Fixing**

- The joists on which the planks shall be fixed shall be checked and corrected to levels. The end boards shall be accurately fixed with the sides parallel and close to the walls. Each adjoining board shall be carefully jointed and shall be tightened in position and screwed.
- Pre- drill holes for end screws.
- For fixing the boards to the joists, two screws shall be used at each end of the boards and one screw at each of the intermediate joists in a zig zag manner. The screws shall be countersunk and screw holes filled with approved stopping.
- The flooring shall be truly level and plane. The joints shall be truly parallel and or perpendicular to the walls, unless otherwise specified.
- The floor shall be planed in both directions and made perfectly even, true and smooth.

1.5.7. Bamboo work

- a) Some relevant standards for Bamboo based applications are as follows:
- **IS: 6874-1973:** Method of tests for round bamboos To evaluate physical (moisture content, specific gravity, and shrinkage) and mechanical (static bending, and compression parallel to grain) properties of whole bamboo culms.
 - **IS: 8242-1976:** Methods of tests for split bamboos To evaluate physical (moisture content, and specific gravity) and mechanical (static bending, and compression parallel to grain) properties of split bamboo.
 - **IS: 10145-1982:** Specification for bamboo supports for camouflaging equipment Requirements relating to materials, types, dimensions, workmanship and finish, permissible defects and preservation of bamboo supports for camouflaging equipment.
 - **IS: 7344-1974:** Specification for bamboo tent poles Covers wall, standing, and ridge poles.
 - **IS: 9096-1979:** Code of practice for preservation of bamboos for structural purposes Types of preservatives and methods of treatment of bamboos used for structural purposes like posts, scaffolding, house building and wall trusses. The preservatives recommended are Coal Tar Creosote, Copper Zinc Naphthenates and Abietates, Boric Acid and Borax, Copper-Chrome-Arsenic (CCA) Composition, Acid-Curpric-Chromate Composition, Copper-Chrome-Boric Composition
 - **IS 1902: 1993:** Preservation of bamboo and cane for non-structural purposes- Code of practice (First Revision) Types of preservatives and methods of treatment of bamboos and canes used indoors and outdoors for non-structural purposes. The preservatives recommended are Coal Tar Creosote, Copper and Zinc Naphthenates and Abietates, Boric Acid and Borax, Copper-Chrome-Arsenic (CCA) Composition, Acid-Copper-Chrome (ACC) Composition, Copper-Chrome-Boron (CCB) Composition, Boronated Copper Chrome Arsenic.
 - **Referred Standards**
 - Specification for creosote and anthracene oil for use as wood preservatives (second revision) IS 218: 1983.
 - Code of practice for treatment of timber (third revision) IS 401: 1982.
 - Code of practice for preservation of bamboos for structural purposes IS 9096: 1979.
- (c) **Bamboo treatment or Preservation:**
- Brushing or Dipping techniques is commonly used for bamboo treatment.
 - For non-structural members, Boric acid and Borex to be used in 1:1.5 proportion. For structural members (Poles, beams) for treatment Boric acid, copper sulphate, Sodium or Potassium dichromate to be used in proportion of 1.5:3 – 4.

(d) Bamboo Selection

Bamboo has been categorized into structural Group A & B & Group C.

Structural Group A and Group B Species	
Special Grade:	70mm < diameter < 100m
Grade I	50mm < diameter ≤ 70m
Grade II	30mm < diameter ≤ 50m
Grade III	Diameter ≤ 30m
Structural Group C	
Special grade I	80mm < diameter ≤ 100m
II	60mm < diameter ≤ 80m
III	Diameter ≤ 60m

Bamboo should be selected on the basis of its characteristics importance for structural utilization. Such as;

- Diameter and length of culms
- Taper of culms
- Straightness of culms
- Inter-nodal length
- Wall thickness
- Density and strength
- Durability and seasoning.

(e) Bamboo Specification

- Main structural elements (column and roof members) should be 70 – 100mm in diameter at thin end.
- Unsupported height of the post shall not be more than 3.0m.
- Taper: shall not be > 5.8 mm/m may be length in any grade.
- Curvature : max. curvature shall not be >75mm in length of 6m of any grades.
- Wall thickness of bamboo should be 10 – 12mm.
- Distance between nodes (intermodal length) should not exceed 300 – 600mm.
- Bambusa bamboos (height 15 – 30m; Diameter – 150mm; Internodes – 200 to 400mm; Thickness – thick walled) are the best suited species for construction.

(f) Construction Process:

- Practice of putting bamboo post directly in the ground shall not be permitted. Bamboo post shall be fixed in to the foundation pile or plinth.
- Tar or Creosote treatment at the bottom of the post is required that needs to be embedded in the foundation pile or plinth.

- Minimum 300mm deep and 100mm dia hole shall be made in the foundation pile.
- (g) **Joinery/ Connections of bamboo**
 - **Lashing or Friction-tight Rope Connection** – is used for joining two or more poles together with a tying material.
 - **Dowel or Plug-in/Bolt Connections** – Is a pin (wood or bamboo with fibres in longitudinal directions) of 10mm
 - **Clove Hitch or Positive fitting connections** – Clove Hitch lashing is used for joining two or more poles together with atypical material.
 - **Interlocking connections** – There are two different types of woodcore connections.
 - A piece of wood can be used and glue can be employed to stick it to the inner surface of the bamboo. Any normal glue provides a capacity far larger than that of bamboo in the tangential direction. Two slots are needed in the bamboo cane to control cracking during the insertion of the wood cylinder.
 - **Metal anchor technique** is another technique to build interlocking connection.

The steel plate C is introduced in the slot of the wood cylinder and glued to it with a mixture of epoxy resin and portland cement. The plate is projected, so that its outer extreme can be adapted for different applications. Metal anchor technique is the most commonly and popular system being used.

1.5.8. Steel work

- a) **Supply of Material:** General requirements relating to supply of structural steel shall conform to IS standards.
- b) **Grades:** There are nine grades of steel as given in Indian Standards. While placing the order the steel should be designated by 'Designation'.
- c) **Manufacture:**
 - The whole work shall be representative of the highest class of workmanship. The greatest accuracy shall be observed in the design, manufacture and erection of every part of the work to ensure that all parts will fit accurately together on erection.
 - The processes used in the steel making and further hot rolling into steel plates, strips, sections, flats, bars, etc., are left to the discretion of the manufacturer/supplier and it should meet relevant standards and product requirement.
- d) **Fabrication:**
 - Fabrication shall generally be done as specified in Indian standards. In major works or where so specified, shop drawings giving complete information for the fabrication of the component parts of the structure including the location, type, size, length and details of all members, shall be prepared in advance of the actual fabrication and approved by the Engineer-in-charge.
 - Great accuracy shall be observed in the fabrication of various members, so that these can be assembled without being unduly packed, strained or forced into position and when built up, shall be true and free from twist, kinks, buckles or open joints.

- All the steel sections used in the fabrication must have mill test certificate clearly indicating the specification to which the steel conforms and whether steel is killed and normalized.
- Use of steel of any quality other than those mentioned above would require the prior approval of the Structural Engineer.
- **Processes which are involved in Fabrication of MS components are given below:**
 - **Surface Cleaning**
 - All finished materials shall be well and cleanly rolled to the dimensions, sections and masses specified. The finished material shall be reasonably free from surface flaws; laminations; rough/jagged and imperfect edges and all other harmful defects prior to fabrication or painting.
 - There are three different types of methods involved in surface cleaning. Such as, Hand preparation using wire brush, blast cleaning & Flame cleaning depending on requirement and skills.
 - **Cutting and Machinery**

Following surface preparation, cutting to length is always the first process to be carried out, and this is done by any of the following methods:

 - Shearing and cropping
 - Cold Sawing
 - **Punching and Drilling**
 - Wooden or metal sheet templates shall be made to correspond to each member and position of rivet/ bolt holes shall be marked accurately on them and holes drilled. The templates shall then be laid on the steel members, and holes for riveting and bolting marked on them. The ends of the steel members shall also be marked for cutting as per required dimensions.
 - The base of steel columns and the positions of anchor bolts shall be carefully set out at the required location.
 - **Straightening, Bending and Rolling**
 - Rolled steel may get distorted after rolling due to cooling process. Further during transportation and handling operations, materials may bend or may even undergo distortion. Therefore before attempting further fabrication the material should be straightened. In current practice, either rolls or gag presses are used to straighten structural shapes.
- All steel materials, plates, bars and structural's shall have straight edges, flat surfaces and be free from twist. If necessary, they shall be cold straightened or flattened by pressure before being worked or assembled unless they are required to be of curvilinear form. Pressure applied for straightening or flattening shall be such as it would not injure the material and adjacent surfaces or edges shall be in close contact or at uniform distance throughout.

- **Fitting and Reaming**
 - Before final assembly, the component parts of a member are fitted-up temporarily with bolts or small amount of welds.
 - In bolted work, especially when done manually, some holes in the connecting material may not always be in perfect alignment and small amount of reaming may be required to permit insertion of fasteners.

- **Connections or Fastening Method**
 - The strength of the entire structure depends upon the proper use of fastening methods. There are two methods of fastening approved namely bolting and welding.
 - Welding is the most common method of shop fabrication of steel structures. In addition to being simple to fabricate, welded connection considerably reduce the size of the joint and the additional fixtures and plates.

- **Specifications for welding:**
 - Welding shall be carried out by qualified welding personnel in accordance with the relevant Indian standards and code of practice.
 - The work shall be positioned for downward welding wherever possible.
 - The sequence of welding shall be such as will avoid undue distortion and minimize residual shrinkage stresses. Recommendation of IS 9595 shall be followed.
 - The welds shall be free from cracks, discontinuity in welding and other defects such as (i) under-size (ii) over-size, (iii) under-cutting and (iv) over-cutting in the case of fillet welds and defects (ii), (iii) & (iv) in the case of butt welds.
 - As far as possible every efforts shall be made to limit the welding that must be done after the structure is erected.
 - All welds shall be cleaned of slag and other deposits after completion. Till the work is inspected and approved painting shall not be done.
 - All operation connected with welding and cutting equipment shall conform to the safety requirements given in IS 818 for safety requirements and Health provision in Electric and gas welding and cutting operations.

- **Specifications for bolted connections:**
 - The Contractor shall carry all field connection work as per the shop drawings prepared. All bolts, nuts, washers, rivets, electrodes required for the Contractor shall supply field connections.
 - Bolts and nuts shall be galvanised conforming to the requirement given in the following Indian specifications.
 - In case of bolted connections, taper washers or flat washers or spring washers shall be used with bolts as necessary.
 - The length of the bolt shall be such that at least one thread of the bolt projects beyond the nut.
 - In all cases where bearing is critical, the unthreaded portion of bolt

- shall bear on the members assembled.
 - A washer of adequate thickness may be provided to exclude the threads from the bearing thickness, if a longer grip bolt has to be used for this purpose.
 - All connections and splices shall be designed for full strength of members or loads.
 - Column splices shall be designed for the full tensile strength of the minimum cross section at the splice.
 - Splicing shall be avoided at critical locations and be done only after the approval of Engineer-in-charge as per the splice drawing submitted by Contractor and approved by Engineer-in-charge.
 - All members likely to collect rain water shall have drain holes provided.
- **Surface Finishing**
- Structural members whose ends must transmit loads by bearing against one another are usually finished to a smooth even surface. Finishing is performed by sawing, milling or other suitable means.
- **Surface Treatment**
- Materials and products, including fixings, concealed and structural components, shall be corrosion resistant or protective coated to prevent corrosion in a marine environment.
 - Structural steelwork is protected against corrosion by galvanization in the shop or at site. Preferably in the shop, same can be decided as per site requirement.
 - Approved method of applying metal coating to steel surfaces is Hot-dip galvanising.
 - In Galvanising method, the cleaned and fluxed steel is dipped in molten zinc at a temperature of about 4500C. The steel reacts with molten zinc to form a series of zinc or iron alloys on its surface. As the steel workpiece is removed, a layer of relatively pure zinc is deposited on top of the alloy layers.
 - Structural Steelwork exposed to weather, embedded into concrete or masonry, or in contact with chemically treated timber shall be hot dip galvanized based on Indian standards codes given for proper workmanship.
 - For most applications galvanised steel does not require painting.
- **Erection**
- The Contractor shall provide at his/her own cost all tools, machinery, equipment and erection material necessary for the expeditious execution of the work and shall erect the structural steel and iron work, in every respect as covered by the contract and in accordance with the drawings and specifications.
 - The contractor however shall be fully responsible for the work being carried out in a safe and proper manner without unduly stressing the various members and proper equipment such as derricks, lifting tackles, winches, ropes etc. shall be used.
 - The work of erection may be done in suitable units as may be

- directed by the Engineer-in-charge.
 - Steel members shall be hoisted and erected in position carefully, without any damage to itself, other structures and equipment and injury to workmen.
 - The method of hoisting and erection proposed to be adopted by the contractor shall be got approved from the Engineer-in-charge in advance.
 - Fabricated members shall be lifted at such points so as to avoid deformation or excessive stress in members. The structure or part of it placed in position shall be secured against over-turning or collapse by suitable means.
 - Where necessary mechanical appliances such as lifting tackle winch etc. shall be used. It should be inspected for safety prior to use.
 - During execution, the steel members shall be securely bolted or otherwise fastened when necessary temporarily braced to provide for all loads including those due to erection equipments and its operation to be carried safely by structure during erection. The steel members shall be placed in proper position as per approved drawing, final riveting or permanent bolting shall be done only after proper alignment has been checked and confirmed.
 - Columns and stanchions shall be erected truly vertical with the necessary cross bracing etc. and the base shall be properly fixed with the foundation concrete by means of anchor bolts etc. as per drawing.
 - Anchor bolts to be placed in the concrete foundation should be held in position with a wooden template. At the time of concreting anchor bolt locations shall be provided with suitable timber mould or pipe sleeve to allow for adjustment which shall be removed after initial setting of concrete. The spaces left around anchor bolts shall be linked to a stopping channel in the concrete leading to the side of the pedestal and on the underside of the base plate to allow the spaces being grouted up after the base plate is fixed in the position along with the column footing. Grouting shall be of cement mortar 1:3 (1 cement: 3 coarse sand) or as specified.
- **Bedding of Column, Stanchions etc.**
Bedding shall not be carried out until the steel work has been finally levelled, plumbed and connected together. The stanchion shall be supported on steel wedges and adjusted to make the column plumb. For multistoreyed buildings, the bedding shall not be done until sufficient number of bottom lengths of stanchions have been properly lined, levelled and plumbed and sufficient floor beams are fixed in position. The base plates shall be wedged clear of the bases by M.S. wedges and adjusted where necessary to plumb the columns. The gaps under the base plate may be made upto 25 mm which shall be pressure grouted with cement grouts.

- **Completion Process**

▪ **Cleaning**

- ✓ General: Leave the works in a clean, tidy condition.
- ✓ Surfaces: Clean immediately before handover.

▪ **Fixings**

- ✓ All components: Tighten.
- ✓ Timing: Before handover.

1.5.9. Stainless Steel Works

- a) **Steel type:** Type 316 Stainless Steel
- b) **Characteristics:** Type 316 stainless steel has better corrosion resistance to most chemicals, salts and acids and is more resistant to marine atmosphere because of an addition of 2.0 to 3.0% molybdenum. This addition improves the corrosion resistance of austenitic steels and imparts hot strength characteristics.
Type 316 stainless steel is high creep strength at elevated temperatures.
- c) **Fabrication:** Roll formed, spun, deep drawn, hot and cold forged or bent and folded with a strong force, owing to the material's high strength and work hardening rate as per IS standards.
- d) **Dimensions:**
Stainless steel sheets and strips shall be supplied in the following standard dimensions:
Sheets width 60mm (min.) to 1200mm (max.) (Refer structural consultant for specific sheet size).
Thickness of sheets and strips ranges between (1.25mm to 0.20mm). (Refer structural consultant for specific sheet size).
- e) **Freedom from Defects:** Stainless steel sheets and strips shall be free from harmful defects, such as scale, rust, blister, laminations, cracked edges and seams.
- f) **Physical and Chemical properties:** Stainless steel sheets and strips should undergo some check analysis and tensile test to achieve standards as mentioned in IS standard code.
- g) **Tolerances**
The rolling tolerances for stainless steel sheets and strips shall be as follows:
Width (± 1.5 mm); Length (± 10.0 mm); Thickness 2.20 to 0.40(± 0.04 mm); 0.40 to 0.80(± 0.10 mm); 0.80 to 1.00(± 0.12 mm); 1.00 to 1.25(± 0.14 mm);
- h) **Application**
316 Stainless Steel is specified for use with high purity products where product contamination must be held to a minimum. Typical applications are, Chemical Processing, Pharmaceutical and Textile Finishing Equipment and Marine Exterior Trim.

2. LANDSCAPE ELEMENTS SPECIFICATIONS

2.1. Kerbs and edges

- a) To be read with Preliminaries/ General Conditions and Engineer's details and specifications.
- b) All materials and workmanship shall comply with the relevant Indian Standards and Codes or CPWD specifications.
- c) Contractor to follow Health & Safety procedures set in Health & Safety Plan (as per section 1.6.3.) at any time during the works.

2.1.1. Kelevant Drawing and Documents

The section to be read in conjunction with relevant drawings:

Contractor is responsible to have most recent Drawings in his possession (e.g. relevant structural details) and discard superceded drawings upon revision. A drawing register is to be kept in the site office noting current plans current plans changes to plans during the work programme.

2.1.2. General quality

- a) The quality of materials method and control of manufacture and transportation of all concrete work in respect of mix, where reinforced or otherwise, shall conform to the applicable portions of these specifications.
- b) The Engineer-in-charge shall have the right to inspect the sources of materials, the layout and operation of procurement and storage of materials, the concrete batching and mixing equipment's and the quality control system. Such an inspection shall be arranged by the contractor and the Engineer-in-charge's approval shall be obtained prior to starting the concrete work.

2.1.3. Material Samples Required

The ingredients to be used in the manufacture of standard concrete shall consist solely of a standard type Portland cement, clean sand, natural coarse aggregate, clean water and admixtures if specially called for as per drawings or schedule of quantities.

2.1.4. Delivery, Storage, and Handling

- a) Kerbstone units to be delivered on site in suitable packaging free from cracks, chippings or discolorations of the material.
- b) Store materials on elevated platforms, under cover, and in a dry location. Do not use materials that have become damp.
- c) Store all accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.
- d) All materials shall be stored in a secured location and in accordance with Health and Safety Plan (as per "1.6.3. General Requirements, Section on Health and Safety").
- e) Contractor to be responsible for the safekeeping of all materials delivered to site and replacement at own cost as required.

2.1.5. Natural Precast Concrete Flushed Kerb

- a) **Manufacturer:** from Suppliers Schedule provided or equivalent approved.
- b) Application: For all typical edges with level drop of 150mm average;
- c) Concrete type: Manufactured by using M-30 grade of concrete using vibro-compaction process using jointless moulds.
- d) Size (width x length x height): Refer the Relevant Drawings & Schedule
- e) Special shapes: Refer the Relevant Drawings & Schedule
- f) Finish: Smooth
- g) Plan dimension deviation class: ± 2 mm.
- h) Diagonal deviation class: ± 2 mm.
- i) Thickness deviation class: ± 2 mm.
- j) **Colour:** Refer the Relevant Drawings & Schedule. To match approved samples held by Employer / Employer's S Authorised Representative.
- k) **Bedding:** approved Kerbstone is to be laid onto a concrete base/ footing. The base should typically be as per structure consultant advice. It should compose of compacted semi-dry concrete (typically in 1:2:4 cement: sand: aggregate) mix. A minimum of one-third of the unit must be fully bedded into the mortar mix.
- l) **Joints:** 5mm wide joint, Mortar colour to match edge colour.
- m) Sealant movement joints: Refer to relevant Indian standards and updated CPWD specification.
- n) Fixing of the kerb and any structural related details to Engineer's specification.
- o) Contractor to reject any kerb units that do not comply with the above requirements. The Employer's Representative reserves the right to reject products that do not comply to specifications.

2.1.6. Brick Kerb

- a) **Manufacturer:** Machine moulded from Suppliers Schedule provided or equivalent approved.
- b) Brick type: Class 1 Bricks; Average compressive strength should not be less than 10.7 N/mm²
- c) Water absorption less than 15%.
- d) Size (length x width x height): Refer the Relevant Drawings & Schedule
- e) Special shapes: Refer the Relevant Drawings & Schedule
- f) Finish: Smooth.
- g) Plan dimension deviation class: ± 2 mm.
- h) Diagonal deviation class: ± 2 mm.
- i) Thickness deviation class: ± 2 mm.
- j) Colour: Refer the Relevant Drawings & Schedule To match approved samples held by Employer/ Employer's Representative .
- k) **Bedding:** approved Kerbstone is to be laid onto a concrete base/ footing. The base should typically be as per structure consultant advice. It should compose of compacted semi-dry concrete (typically in 1:2:4 cement: sand: aggregate) mix. A minimum of one-third of the unit must be fully bedded into the mortar mix.
- l) Sub base layer: Granular subbase. Refer to structural details.
- m) Joints: 5mm wide joint, Mortar colour to match edge colour.
- n) Sealant movement joints: Refer to relevant Indian standards or CPWD specifications,
- o) Fixing of the kerb and any structural related details to Engineer's specification.

- p) Contractor to reject any kerb units that do not comply with the above requirements. Employer's Representative to reserve right to reject products that do not comply to specifications.

2.1.7. Laying Concrete Kerbs

- a) **Excavation:** the depth of the excavation depends on height of the kerbstone. Which way it will be laid and upstand is intended. Refer section 2.3.3 for more details.
- b) Do not install in adverse weather conditions. Adequately protect foundations, bedding and haunching against extreme temperatures and rapid drying by wind and sun.
- c) Concrete used for foundations or haunching should comply with Indian standards and relevant Designated mix: Not less than **GEN - 0 or Standard mix ST1**, Workability: Very low.
- d) All cuts need to be machine cut. Cutting to be neat and accurate, without spalling. Form neat junctions. Minimum cut as specified on Drawings. If minimum cut not possible use oversized unit;
- e) Use special corner and radii units at bends, corners and junctions as per location on drawings.
- f) Units to be positioned true and levelled along top and front faces, in a mortar bed on accurately cast foundations; responding to site levels provided by the Landscape Architects.
- g) Ends of units buttered with bedding mortar as laying proceeds. Joints completely filled, 5mm wide mortar joint and surplus mortar removed immediately.
- h) After bedding has set, secure units with a continuous haunching of concrete; Refer point no. 3.1.5. (i),(j), (k) for Deviation in finish kerb levels.

2.2. Paving

2.2.1. Scope

- a) This section of the Specification covers the general requirements for concrete paving, natural stone paving, bituminous surfaces, tactile paving and allied works including all materials, labour, curing, scaffolding, tools etc.
- b) All items and works related to the section shall be compliant with relevant Indian standards or equivalent standards;
- c) Contractor to follow Health & Safety procedures set in Health & Safety Plan (as per section 1.6.3.) at any time during the works.

2.2.2. Relevant Drawing and Documents

- a) All sections of this document to be read in conjunction with the relevant drawings & schedules provided as part of the landscape package;
- b) Contractor is responsible to have most recent Drawings in his possession (e.g. relevant structural details) and discard superceded drawings upon revision. A drawing register is to be kept in the site office noting current plans current plans changes to plans during the work programme.

2.2.3. Quality Assurance

- a) All paving materials to be obtained from single source, and supplied preferably, in one lot to keep variations to the minimum as per approved Supplier's list or approved alternate – submitted by Contractor and approved by Employer's Representative;
- b) The Contractor shall also segregate and sort the paving material according to colour, shade, texture and size of grains etc. to keep variation(s) in material used at anyone paving to the minimum.
- c) Any paving material with variation in the colour, shade, texture and size of grains etc., not acceptable to the Engineer-in-Charge, shall not be used in the work and shall be removed and replaced by the Contractor.
- d) Source Limitations for Other Materials: Obtain sample for each type of cementitious material, mortar, and other material from single source or producer for each aggregate;
- e) Use manufacturer's standard test methods to determine whether mortar and grout materials will obtain optimum adhesion with, and will be non-staining to, installed paving stones and other materials constituting stone paver installation.
- f) Pre-installation Inspection: Conduct inspection at Project site with Employer's Representative as per approved Works Programme.
- g) **Mockups;**
 - Construct Mockups to set quality standards for materials and execution as coordinated and approved by Employer's Representative.
 - Construct Mockups for each type of paving, each Mockup shall be to scale, and surface areas as dimensioned as stipulated in the Drawings'. Notes for each Mockup to be provided.
 - Contractor to submit the drawing showing layout, location and dimensions for 'on-site' Mockup area, for Employer's Representative's approval prior to construction of Mockup.
 - Mockup should include kerbs, recessed manhole covers, paving transitions, interface with lighting and any additional feature as required;
 - Approval of mock-ups should include quality of finish, materials, mortars & P.C.C. and workmanship;
 - Approval of mockups is also for other material and construction qualities that the Employer's Representative specifically approves in writing. Approval of mockups does not constitute approval of deviations from the Contract Documents unless Employer's Representative specifically approves such deviations in writing.
 - If any major item has been rejected, mockup panel shall be removed or corrected and presented again for approval.
 - If minor items have been rejected, notes shall be taken and followed during the construction programme in respect to mentioned items.

2.2.4. Delivery, Storage, and Handling

- a) Paving units to be delivered on site in suitable packaging free from cracks, chippings or discolorations of the material.
- b) Store materials on elevated platforms, under cover, and in a dry location. Do not use materials that have become damp.

- c) Store all accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.
- d) All materials shall be stored in a secured location and in accordance with Health and Safety Plan (as per “1.6.3. General Requirements, Section on Health and Safety”).

2.3. Paving Types

2.3.1. Concrete Pavers –paving type

- a) Refer the Relevant Drawings & Schedule
- b) **Granular sub-base:** Thickness and specifications as per structural consultant
- c) **Sand bed:** 50mm thk; specifications as per structural consultant compacted to remain true to level.
- d) **Paving type** – Pre-cast Concrete pavers; S-locking/(Basant Beton’s Lock Pavers or equivalent). Refer the Relevant Drawings & Schedule
- k) **Manufacturer:** from Suppliers Schedule provided or equivalent approved. Manufacturer to produce schedule of materials. Refer to Basis of the Design
- l) **Size** – Refer the Relevant Drawings & Schedule
- m) **Shape** – irregular or partly rounded
- n) **Colour-** Grey
- o) **Finish** – Sand blasted
- p) Plan dimension deviation class: ± 2 mm.
- q) Diagonal deviation class: ± 2 mm.
- r) Thickness deviation class: ± 2 mm.
- s) **Joints:** 5mm joint filled with self-binding polymeric sand (as recommended by manufacturer). Flush finish. All joints to align as shown in drawings Contractor to provide samples for approval.

2.3.2. EPDM Flooring –paving type

- a) Refer the Relevant Drawings & Schedule
- b) **Manufacturer:** Virgin EPDM or SBR rubber granules and accessory materials such as binders and solvents shall be as produced and/or supplied by vendor or equal approved by the Employer’s Representative. Manufacturer to produce schedule of materials. Refer to Basis of the Design.
- c) **Materials:**
 - Granules - Pure vulcanized EPDM rubber chips ranging in size from 0.5-1.5mm minimum dimension (as per vendor and standards) to 1-4mm maximum dimension (as per vendor and standards).
 - EPDM rubber shall be UV stable.
 - Size (width x length): 500(W) x 500(L) mm
 - Colour: Refer the Relevant Drawings & Schedule
 - ROYAL BLUE - R:65 G:105 B:225
 - AQUAMARINE- R:127 G:255 B:212
 - SEA GREEN- R:46 G:139 B:87
 - INDIAN RED- R:205 G:92 B:92
 - GOLDEN ROD- R:218 G:165 B:32
 - Binder- Resin (Chemical Family: Aromatic (as per vendor and standards) or

- Aliphatic (as per vendor and standards) Isocyanate as specified by Employer's Representative).
 - Binder shall be 100% urethane and contain no TDI. Accelerators may be used with aliphatic binders when job site temperature requires it. (Aliphatic binders should be considered on indoor applications where there is UV exposure or where light coloured rubber granules are used.)
 - Primer – Aromatic or Aliphatic resin thinned with solvent.
- d) **Base Preparation & Laying**
- Slab thickness and galvanized reinforcement mesh sizes and specifications (as per relevant Indian standards & structural consultant).
 - Maintain a slope of no less than 2% to for surface run-off and to make it water permeable surface,
 - First layer application should be determined by the current Sports Authority of India standards for rubberised flooring for play areas. Thickness of the rubber safety surface can range from 30mm to 100mm (SBR rubber) meeting standards for safety surfacing.
 - Second layer to be applied at a minimum thickness of 5-8mm, using E.P.D.M. rubber granules ranging from 2.5mm to 3.5mm in size.
 - Polyurethane binder shall be mixed throughout the entire thickness.
 - Bevel is installed at the perimeter of the installation running from the thickness of the surface down to the base. The outside line of the bevel must be clear and follow the designed edge of the installation.
- e) **Finished product:** Shall meet or exceed current standards and specification.
- f) **Testing:** The system should be tested to the following standard.
- Hardness: as per standards, best practice International standards or relevant Indian codes of practice.
 - Water Absorption: as per standards, best practice International standards or relevant Indian codes of practice.
 - Ultraviolet Resistance: as per standards, best practice International standards or relevant Indian codes of practice.
 - Fungal Resistance: as per standards, best practice International standards or relevant Indian codes of practice.
 - Spread Of Flame Resistance: as per standards, best practice International standards or relevant Indian codes of practice.
 - Accelerated: weathering no change after 2000 hours
 - Freeze /Thaw: no change after 30 days at minus 50 in 24 hour period

2.3.3. Brushed Concrete Finish –paving type

- a) Refer the Relevant Drawings & Schedule.
- b) **Supplier:** Concrete supply should be finalized and approved by Employer's representative prior to commencement of works. Concrete batching plant to provide batching details for records.
- c) Concrete type and quality to Engineer's specification and to comply with relevant Indian standards and regulations; reinforced as per structural consultant guidance. Refer section 2.5.3 for more details on concrete work.
- d) M25 grade of concrete in 1:1.5:3 ratio or as specified as per standards.
- e) Slab thickness and galvanized reinforcement mesh, sizes and specifications (as

- per relevant Indian standards & structural consultant).
- f) Slump of concrete should be maximum 110mm or as per structural consultant advice.
- g) Slab length should not be larger than 4.5m.
- h) Joints: expansion joints at 4.5m c/c; construction joints @2.25m c/c.

Broom finish on Concrete:

Surface Finish:

- i) Tools: Min 450mm width stiff broom in a synthetic material such as nylon. Brush finish to be installed pulling broom head towards operator. Sample to be approved by the Site Engineer.
- j) **Workmanship:** skilled labour working under supervision of contractor following all standards and specifications.

2.3.4. Exposed Aggregate Concrete Finish – paving type

- a) Refer the Relevant Drawings & Schedule
- b) **Supplier:** Concrete supply should be finalized and approved by Employer's representative prior to commencement of works. Concrete batching plant to provide batching details for records.
- c) Concrete type and quality to Engineer's specification and to comply with relevant Indian standards and regulations; reinforced as per structural consultant guidance. Refer section 2.5.3 for more details on concrete work.
- d) M25 grade of concrete in 1:1.5:3 ratio or as specified as per standards.
- e) Cement for concrete should be PPC depending on marine condition adjacent to site.
- f) Slab thickness and galvanized reinforcement mesh sizes and specifications (as per relevant Indian standards & structural consultant).
- g) Slump of concrete should be as recommended by the structural consultant.
- h) Slab length should not be larger than 4.5m in any direction.
- i) Joints: expansion joints at 4.5m c/c; construction joints @2.25m c/c.

Aggregate for Concrete:

- a) Limitations on contaminants: Free from absorbent particles which may cause 'popouts', and other particles such as coal and iron sulfide which may be unsightly or cause unacceptable staining
- b) Supply: From a single source and maintained throughout the contract.
- c) Colour: consistent.
- d) Aggregates should be single sized aggregate, 10 – 12mm in diameter, coarse/rounded edge.
- e) Sample should be submitted and approved prior to placement.
- f) Surface should undergo steel floating process to get IPS (Indian Patent Stone Flooring) Finish using steel trowel. Application of retardant and removal of retardant as per vendor and Engineer's specification. Exposure of aggregate should be 5mm maximum.

2.3.5. Sand Pit in Children play Area – paving type

- a) **Supplier:** from Schedule provided or equivalent approved. Supplier to produce

schedule of materials.

- b) Paving type: Playing Sand comprised of washed and graded river sand 2mm.
- c) Size (depth): Refer the Relevant Drawings & Schedule
 - Colour: Natural. To match samples approved by Employer/ Employer's Representative.
 - Thickness deviation class: ± 2 mm.
 - Geotextile sheet laid below sand.
 - **Subbase** - Compacted Gravel bed(thickness and specifications as per structural consultant).
 - Drainage: sump at the centre of sandpit area with compacted earth sloping at the centre point to capture surface run-off.

2.3.6. Pedestrian Ramp

- a) Refer the Relevant Drawings & Schedule

Civil Material:

- b) **Granular sub-base:** Thickness and specifications as per structural consultant
- c) Brick tow wall: 230mm thk, Class – '1' -Brickwork; Exposed; (Refer section 2.5.1 for Brick work for sizes and other details; refer drawing for quantities and details).
- d) Footing for brickwork – In 100mm thk. PCC. (For ratio and details refer section 2.5.3 for Concrete work construction and structural consultant).
- e) **Ramp Surface:**
 - Concrete type and quality to Engineer's specification and to comply with relevant Indian standards and regulations; reinforced as per structural consultant guidance. Refer section 2.5.3 for more details on concrete work.
 - Concrete slab: Slab thickness as per structural advice; concrete base using appropriately sized reinforcement mesh; (sizes and specifications as per relevant Indian standards & structural consultant advice).
 - Surface finish: Brushed concrete finish (Refer section 3.3.3 on Brushed Concrete finish details and specifications).

Miscellaneous items:

- f) Railing. Refer the Relevant Drawings & Schedule and section 3.6.7. for detail specifications).

2.3.7. Steps

- a) Refer the Relevant Drawings & Schedule.

Civil Material:

- b) **Technical Specification**
 - **Size:**
 - Refer the Relevant Drawings & Schedule
 - **Material:**
 - **Granular sub-base:** Thickness and specifications as per structural consultant

- Brickwork: Class – ‘1’ -Brickwork; Exposed; (Refer section 2.5.1 for Brick work for sizes and other details; refer drawing for quantities and details).
- Footing for brickwork – In 100mm thk. PCC. (For ratio and details refer section 2.5.3 for Concrete work construction and structural consultant).
- **Surface:**
 - Concrete type and quality to Engineer’s specification and to comply with relevant Indian standards and regulations; reinforced as per structural consultant guidance. Refer section 2.5.3 for more details on concrete work.
 - **Thickness:** concrete thickness as per structural advice; (sizes and specifications as per relevant Indian standards & structural consultant advice).
 - **Surface Finish:** Brushed Concrete finish. (Refer section 3.3.3 on Brushed Concrete finish details and specifications).
- **Colour:** Refer the Relevant Drawings & Schedule
- **Special requirement:**
 - **Nosing:** Bull nose; 10mm in radius/ Refer the Relevant Drawings & Schedule
 - Step Tread Grooves parallel to face; set of four (5X5)mm groove placed 50mm from face of riser as slip resistant measurement of pedestrian surface as per IS standards.

2.3.8. Stage

- a) Refer the Relevant Drawings & Schedule

Civil Material:

- b) **Technical Specification**

- **Size:** Refer the Relevant Drawings & Schedule
- **Material:**
 - **Granular sub-base:** Thickness and specifications as per structural consultant.
 - **Brickwork:** Class – ‘1’ -Brickwork; Exposed; (Refer section 2.5.1 for Brick work for sizes and other details; refer drawing for quantities and details).
 - **Footing for brickwork** – In 100mm thk. PCC. (For ratio and details refer section 2.5.3 for Concrete work construction and structural consultant).

Concrete slab:

- Concrete type and quality to Engineer’s specification and to comply with relevant Indian standards and regulations; reinforced as per structural consultant guidance. Refer section 2.5.3 for more details on concrete work.

- **Thickness:** concrete thickness as per structural advice; (sizes and specifications as per relevant Indian standards & structural consultant advice).
- Surface Finish:** Brushed Concrete finish. (Refer section 3.3.3 on Brushed Concrete finish details and specifications).
- Colour:** Natural.

Special requirement:

- **Nosing:** Bull nose; 10mm in radius. Refer the Relevant Drawings & Schedule
- Step Tread Grooves parallel to face; set of four (5X5)mm groove placed 50mm from face of riser as slip resistant measurement of pedestrian surface as per IS standards.

c) **Technical Specification for Platform/ Stage**

- **Material:**
 - **Granular sub-base:** Thickness and specifications as per structural consultant.
 - Brickwall: 300mm thk. Class – ‘1’ -Brickwork; Exposed; (Refer section 2.5.1 for Brick work for sizes and other details; refer drawing for quantities and details).
 - RCC pedestal for fixing existing columns – Sizes as per structural consultant. (For ratio and details refer section 2.5.3 for Concrete work construction and structural consultant).
 - PCC base – Thickness as per structural consultant. (For ratio and details refer section 2.5.3 for Concrete work construction and structural consultant).
- **Concrete slab:**
 - Concrete type and quality to Engineer’s specification and to comply with relevant Indian standards and regulations; reinforced as per structural consultant guidance. Refer section 2.5.3 for more details on concrete work.
 - **Thickness:** Slab thickness as per structural advice; concrete base using appropriately sized reinforcement mesh; (sizes and specifications as per relevant Indian standards & structural consultant advice).
- **Surface finish:**
 - Platform surface finish – Smooth Concrete Finish.
 - Wall Finish – Cement Plaster. (Refer section 2.5.5 on Cement Plastering.
 - Finish - Smooth
 - Colour – Light grey
 - Acrylic emulsion exterior paints (Refer CPWD specifications and relevant Indian standards for execution guidelines along with manufacturer’s recommendation).

2.3.9. Miscellaneous items used in execution of Paving

a) **Mortar**

- Refer section 2.5.4 for details being used in Paving and wall construction.

- b) **Tooled coloured joints in mortar bedded units**
- Joints: Completely filled with bedding mortar as work proceeds. Tooled to neat flush profile.
 - Joint width: 5 to 7mm.
 - Pointing: 1:3 cement: sand mortar with pigment, colour to match stone colour. Refer to 2.5.4.
 - Depth: 10mm.
- c) **Cementitious bases and sub-bases**
- General: Protect from moisture loss, if not covered by another pavement course within 2 hours of completion.
- d) **Sealant movement joints in mortar bedded units**
- Spacing: 10-12m or as per structural consultant or relevant Indian standards; aligned with paving pattern to minimize cutting at construction joints.
 - Extent of joints: Through edge units, haunching and foundation.
 - Joint filler: Compressible cellular rubber or plastics compatible with specified sealant. Build in as work proceeds.
 - Joint width: 10mm.
 - Barrier (joint breaker): As recommended by sealant manufacturer. Position filler and barrier accurately to fully support sealant at recommended distance from exposed faces of units.
 - Sealant: Submit proposals.
 - Colour: Colour to match adjacent paving. Contractor to source to source up to 3 samples of suitable colours and submit for approval from Employer's representative and Employer.

2.4. Execution of Pavement Work

2.4.1. Laying Concrete

- a) Refer Section 2.5.3 for Concrete work details.

2.4.2. Laying Natural Stone/ Tile Paving

- a) Do not install in adverse weather conditions. Adequately protect foundations, bedding and haunching against extreme temperatures and rapid drying by wind and sun, heavy rainfall.
- b) Sub base and bedding to be laid to Engineer's specification.
- c) Bedding to be firm and properly compacted before proceeding with paving and it should meet minimum Indian standards for compaction.
- d) Cutting to be neat and accurate, without spalling to form neat junctions with edging and adjoining finishes. Minimum cut as specified on Drawings. If minimum cut not possible use oversized unit;
- e) Levels and lines of finished surface should be smooth and even with falls to prevent ponding.
- f) When laying on the slope, lay paving units from the bottom of slope, upwards.
- g) Paving should appear even and regular with even joint widths and free of mortar and sand stains.
- h) Deviation in finish paving levels should be no more than $\pm 2\text{mm}$. Allowed deviation in height of finished paving above features (gullies/drainage

channels/kerbs) to be no more than $\pm 3\text{mm}$, sudden irregularities are not permitted. Variation in levels between adjacent block/pavers sets to be no more than $\pm 2\text{mm}$.

- i) Paving to be kept clean at all times. All deleterious materials to be removed immediately.
- j) Do not overload previously laid paving with stacks of materials. Avoid damage to unit corners, surfaces etc.
- k) After laying do not allow for any pedestrian traffic for 24h, vehicular traffic for 28days.

2.5. Wall Coping and Cladding

2.5.1. Scope

- a) This section of the Specification covers the general requirements for masonry works, natural stone cladding, paints, mosaic tiling and allied works including all materials, labour, curing, scaffolding, tools etc.
- b) All items and works related to the section shall be compliant with relevant Indian standards or CPWD specifications, 2009 for all items and related work.
- c) Contractor to follow Health & Safety procedures set in Health & Safety Plan (as per section 1.6.3.) at any time during the works.

2.5.2. Relevant Drawing and Documents

- d) The section to be read in conjunction with the Relevant Drawings & Schedule
- e) Contractor is responsible to have most recent Drawings in his possession (e.g. relevant structural details) and discard superceded drawings upon revision. A drawing register is to be kept in the site office noting current plans current plans changes to plans during the work programme.

2.5.3. Quality assurance

- a) Installer Qualifications: Registered Contractor;
- b) All cladding materials to be obtained from single source and supplied preferably, in one lot to keep variations to the minimum, as per approved Supplier's list – submitted by Contractor and approved by Employer's Representative.
- c) Any cladding material with variation in the colour, shade, texture and size of grains etc., not acceptable to the Engineer-in-Charge, shall not be used in the work and shall be removed and replaced by the Contractor
- d) All Masonry materials to be obtained from single source, as per approved Supplier's list – submitted by Contractor and approved by Employer's Representative and in conformance with applicable Indian Standards IS.
- e) Source Limitations for Other Materials: Obtain each type of cementitious material, mortar, grouts and other material from single source or producer for each aggregate.
- f) Use relevant Indian standard test methods to determine whether mortar and grout materials will obtain optimum adhesion with, and will be non-staining to, installed cladding and other materials constituting cladding installation.
- g) Pre-installation Inspection: Conduct inspection at Project site with Employer's Representative as per approved Works Programme to determine suitability of the

site for proposed works.

h) **Mockups:**

- Construct Mockups to set quality standards for materials and execution as coordinated and approved by Employer's Representative.
 - Construct Mockups for each type of cladding, each Mockup shall be to actual scale, and surface areas as dimensioned as stipulated in the Drawings'. Notes for each Mockup to be provided.
 - Contractor to submit the drawing showing layout, location and dimensions for 'on-site' Mockup area, for Employer's Representative's approval prior to construction of Mockup.
 - Mockup should include cladding, coping, cladding transitions, interface with lighting and any additional feature as required;
 - Approval of mock-ups should include quality of finish, materials, mortars & P.C.C. and workmanship;
 - Approval of mockups is also for other material and construction qualities that the Employer's Representative specifically approves in writing. Approval of mockups does not constitute approval of deviations from the Contract Documents unless Employer's Representative specifically approves such deviations in writing.
 - If any major item has been rejected, mockup panel shall be removed or corrected and presented again for approval.
- i) If minor items have been rejected, notes shall be taken and followed during the construction programme in respect to mentioned items.

2.5.4. Delivery, Storage, and Handling

- a) Cladding units to be delivered on site in suitable packaging free from cracks, chippings or discolorations of the material.
- b) Store materials on elevated platforms, under cover, and in a dry location. Do not use materials that have become damp.
- c) Store all accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.
- d) All materials shall be stored in a secured location and in accordance with Health and Safety Plan.

Wall Types

2.5.5. Brick Wall

- a) Refer the Relevant Drawings & Schedule

Technical Specifications:

- b) Wall Size: Refer the Relevant Drawings & Schedule
- c) Refer section 2.5.1. on Brick work construction.
- d) Manufacturer: Machine moulded from Suppliers Schedule provided or equivalent approved.
- e) Brick type: Class 1 Bricks; Average compressive strength should not be less than 10.7 N/mm²

- f) Water absorption less than 15%.
- g) Size (length x width x height): Refer the Relevant Drawings & Schedule
- h) Finish: Refer the Relevant Drawings & Schedule
- i) Plan dimension deviation class: $\pm 2\text{mm}$.
- j) Diagonal deviation class: $\pm 2\text{mm}$.
- k) Thickness deviation class: $\pm 2\text{mm}$.
- l) Colour: Refer the Relevant Drawings & Schedule. To match approved samples held by Employer/ Employer's Representative.
- m) **Wall Base Finish:**
 - Surface finish: Acrylic emulsion exterior paints(Refer CPWD specifications and relevant Indian standards for execution guidelines along with manufacturer's recommendation)
 - Colour: Light Grey (As per manufacturer).
 - Finish: Smooth (As per manufacturer). 20mm thk. Cement Plaster; Deviation: $\pm 2\text{mm}$ (Refer section 2.5.5 on Cement Plaster)
- n) **Coping-** Refer the Relevant Drawings & Schedule.

2.5.6. Brick Wall with GI Fencing

- a) Refer the Relevant Drawings & Schedule.
- Technical Specifications:**
- b) Wall Dimension: Refer the Relevant Drawings & Schedule.
 - Fence Pre-fabricated Hot Dipped Galvanised Framework of primary and secondary members.
 - **Structural members** (Vertical and Horizontal members) -Hollow box sections of varying sizes as per drawing should be in Mild steel and Hot Dipped Galvanized. (For standards, Fabrication and Surface treatment of Steel refer section 2.5.8; consult structural consultant for technical advice).
 - For Brick wall specifications refer section 3.5.5 for Brick wall; Refer section 2.5.1. for Brick work construction.
- c) **Wall Base Finish:**
 - 20mm thk. Cement Plaster; Deviation: $\pm 2\text{mm}$ (Refer section 2.5.5 on Cement Plaster)
 - Surface finish: Acrylic emulsion exterior paints (Refer CPWD specifications and relevant Indian standards for execution guidelines along with manufacturer's recommendation)
 - Colour: Light Grey (As per manufacturer).Refer the relevant drawings & schedule
 - Finish: Smooth (As per manufacturer).Refer the relevant drawings & schedule
- d) **Coping-** Refer the relevant drawings & schedule
- e) **Railing/ Fencing Finish** – Hot dipped galvanized fencing. (Refer section 2.5.6 for Steel works).

- f) **Fixing Detail** – consult structural consultant for technical advice.

2.6. Landscape Elements, Site Furniture/ Equipment

2.6.1. Scope

This section needs to be read with Preliminaries/ General Conditions and Engineer's details and specifications provided in different sections of the document.

2.6.2. Relevant Drawing and Documents

- a) The section to be read in conjunction with below listed Drawings:
- b) Contractor is responsible to have most recent Drawings in his possession (e.g. relevant structural details) and discard superceded drawings upon revision. A drawing register is to be kept in the site office noting current plans current plans changes to plans during the work programme

2.6.3. Quality Assurance

- a) Specialist landscape element, Site/ Street furniture supplier to complete and develop landscape elements provided in drawing schedule and submit shop drawings and material schedules for approval by Employer's representative. Components and performance to be designed to a life span of at least 20 years. Contractor to submit proposed guarantee period.
- b) Contractor to ensure all materials, methodologies and mixes are suitable to the local climate conditions.
- c) The supplier/subcontractor must complete the design and detailing and submit detailed design including shop drawings and calculations to the Landscape Architect/ Employer's representative for comment before production. The Employer's representative and Employer are to approve prior to manufacture.
- d) The supplier/subcontractor is to prepare designs such that they form a family of co-ordinated furniture that share the same materials, finishes, patterns and design solutions.
- e) The works shall comply with the most recently published at time of construction Indian Standard for Construction or equivalent approved standard. Contractors who do not have a copy of these standard specifications may obtain a copy from BIS Bureau of Indian Standards (www.bis.org). The supplier/subcontractor's attention is directed to the fact that high standards of work are required.
- f) The supplier/subcontractor must carry out all fixing, reinforcement and foundation details.
- g) Environment: The supplier/subcontractor must select materials and carry out workmanship that is resistant to affects by local climatic and environmental conditions and provide a minimum life-span of 20 years for all permanent furniture. All materials and finishes are to be agreed and must not become excessively hot to touch during typical daytime conditions.
- h) Material samples: The supplier/subcontractor must prepare samples of all other surface finishes prior to manufacture. Obtain approval of appearance, and finishes prior to manufacture.

- i) Prototypes: After finalisation of all details, the supplier/subcontractor must prepare prototypes and obtain approval of appearance and fixings before proceeding with prototype testing and manufacture of the final samples. Supplier/contractor is to provide relevant design and methods for the safe lifting and installation of furniture items.
- j) Prototype testing (Employer's representative to confirm details): After the first stage of prototype approval, the contractor is to arrange for the testing of all prototypes within a comparable location over a minimum of 3 months. The contractor will prepare a series of tests to demonstrate that prototypes are suitable for purpose.
- k) Tests will include, but not exhaustive of the following: Material suitability within local climate, regular cleaning with water and approved cleaning substances, requirements of maintaining and use by campus service personnel, regular use by the public and agreed tests for durability. Any further tests proposed to be agreed with the Employer's representative.
- l) The contractor should take into consideration the specialist design, production and transport duration of obtaining landscape items when developing his programme.
- m) Control Samples: After finalization of all details, comments and approvals of prototypes the supplier/subcontractor must prepare samples and obtain approval of appearance and fixings before proceeding with manufacture of the remaining quantity.
- n) The contractor should take into consideration the specialist design, production and transport duration of obtaining landscape items when developing his programme.
- o) The Employer's representative and Landscape Architect retain the right to reject prototypes, samples and final furniture pieces until they achieve the highest standards required by this specification and associated drawings or are damaged due to transportation and installation. All prototypes, samples and final furniture pieces not achieving the approved standard will be replaced at the Contractor's own cost.
- p) The Contractor shall appoint a specialist to install furniture pieces to the specified location. The Contractor is to provide details of their proposed sub-consultant for the installation of furniture to the Employer's representative for approval prior to appointment.

2.6.4. Delivery, Storage, and Handling

- a) All landscape elements, fixtures to be delivered on site in suitable packaging free from cracks, chippings or discolorations of the material.
- b) Store materials on elevated platforms, under cover, and in a dry location. Do not use materials that have become damp.
- c) Store all accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.
- d) All materials shall be stored in a secured locked location and in accordance with Health and Safety Plan.

Landscape Elements

2.6.5. Seating – Type

- a) Refer Drawing no. Refer the relevant drawings & schedule for Seating Details.
- b) **Technical Specification**
 - Size:
 - Refer the relevant drawings & schedule
 - Material:
 - **Brickwork:** Class – ‘1’ -Brickwork; Exposed; (Refer section 2.5.1 for Brick work for sizes and other details; refer drawing for quantities and details).
 - **Footing for brickwork** – In 100mm thk. PCC. (For ratio and details refer section 2.5.3 for Concrete work construction and structural consultant).
 - **Granular Subbase** – Thickness and specifications as per structural consultant).
 - **Concrete Seating slab:** 1500 X 450 mm and refer drawing.
 - Concrete type and quality to Engineer’s specification and to comply with relevant Indian standards and regulations; reinforced as per structural consultant guidance.
 - Slab thickness concrete base using reinforcement mesh; (sizes as per relevant Indian standards & structural consultant).
 - Colour: Brickwork – Natural; Concrete top – Natural; Mortar joints – to match brickwork. Refer relevant drawings & Schedule
 - Finish: Brickwork – Exposed surface finish; Concrete – Brushed finish.
 - Accessories/ Special requirements: No
 - Joint & Fixing: 5mm mortar joint in brickwork: (Refer section 2.5.4 for Mortar specifications).

2.6.6. Pergola structure

- a) Refer Relevant Drawings & Schedule for Pergola Details.
- b) **Technical Specification**
 - Reinforced Cement Concrete footing for base (sizes and technical details as per structure) (Refer section 2.5.3 for Concrete work construction).
 - 100mm thick PCC Bed. (sizes as per structure) (Refer section 2.5.3 for Concrete work construction).
 - **Granular Subbase** – Thickness and specifications as per structural consultant).

Structural components:

 - **Structural members** (Hollow box sections used for post, rafter, purlins) of varying sizes given as per drawing should be in Mild steel, fabricated and Hot Dipped Galvanized (For standards, Fabrication and Surface treatment of Steel refer section 2.5.8; consult structural consultant for technical advice & drawing for location and details).

- c) Colour – Dark Brown
- d) Finish – Stain Finish
- e) Shop drawings: Submit for approval by Employer’s Representative.
- f) Structural calculations: Submit for approval by Structural consultant.
- g) Contact between dissimilar metals: Avoid.
- h) Frameworks: Assemble and brace, including temporary members required for installation.
- i) Surface Foundation: As per structural consultant.
- j) Fixing: Under supervision of structural consultant. Finish and colour to match adjacent material.
- k) Installation: As per drawing and structural consultant.

2.6.7. Handrail

- a) Refer the relevant drawings & schedule for Handrail Details.
- b) **Technical Specification**
 - **Structural members** (Hollow box sections, Hollow circular section, Flat Plate used for railing frame structure, railing single post and vertical bars & handrail) of varying sizes given as per drawing should be in stainless steel and fabricated (For standards, Fabrication and Surface treatment of Stainless Steel refer section 2.5.9; consult structural consultant for technical advice & drawing for location and details).
- c) Material – Stainless Steel / Refer the relevant drawings & schedules.
- d) Finish – Non – directional SS brushed finish / Refer the relevant drawings & schedule
- e) Fixing and connections: Under supervision of structural consultant. Finish and colour to match adjacent material.
- f) Installation: As per structural consultant and manufacturer’s specification.

2.6.8. Gate

- a) Refer the relevant drawings & schedule for Gate.
- b) **Technical Specification**
 - **Overall size**
Refer the relevant drawings & schedule Structural members (Hollow box sections & Flat plate for gate framework and vertical bars) of varying sizes given as per drawing should be in Mild steel, fabricated and Hot Dipped Galvanized (For standards, Fabrication and Surface treatment of Steel refer section 2.5.8; consult structural consultant for technical advice & drawing for location and details).
 - **Fixing and Connection**
 - Holdfast, Hinges, screws, bolts, nuts (details as per drawing and detail).
 - **Accessories:**
Latch Lock as per detail.

2.7. Play Equipment

2.7.1. Scope

This section needs to be read with Preliminaries/ General Conditions and Manufacturer's details and specification. Refer to relevant sections for detail.

2.7.2. Relevant Drawing and Documents

- a) The section to be read in conjunction with Manufacturer Drawings and details.
- b) Refer International Standards for Playground equipment for park – specification document for reference and details.

2.7.3. Quality Assurance

- a) Specialist play equipment supplier to complete and develop selected design and submit shop drawings and material schedules for approval by Employer's representative. Components and performance to be designed to a life span of 20 years. Contractor to submit proposed guarantee period.
- b) Contractor to ensure all materials and installation methodologies are suitable to the marine climate conditions.
- c) The supplier/subcontractor must complete the design and detailing and submit detailed design including shop drawings and calculations to the Landscape Architect/ Employer's representative for comment before final production. The Employer/ Employer's Representative are to approve prior to manufacture.
- d) The works shall comply with the most recently published Indian Standard for Construction or equivalent approved International standards. Contractors who do not have a copy of these standard specifications may obtain a copy from BIS Bureau of Indian Standards (www.bis.org). The supplier/subcontractor's attention is directed to the fact that high standards of work are required.
- e) Supplier should follow Health and Safety norms as mentioned in section 1.6.3 as per updated Indian Standard for Construction or equivalent approved International standards guidelines for Playground surface and play equipment.
- f) Equipment should also undergo Safety test to check Finger, Hand, Limb and head traps.
- g) The equipment shall be subjected to load test (prescribed in Indian standards).
- h) The Contractor shall appoint a specialist to install play equipment to the specified location. The Contractor is to provide details of their proposed sub-consultant for the installation of play equipment to the Project Manager for approval prior to appointment.
- i) The supplier/subcontractor must carry out all fixing, reinforcement and foundation details.

2.7.4. Construction general guidelines

a) Support

- Foundations for the equipment should be prepared in accordance with the manufacturer's recommendation and structural confirmation.
- Particular attention is necessary during preparation of foundations to ensure that final erection, especially where steel tube supports will be embedded in

concrete, can be carried out to the correct levels as per Indian Standard for Construction or equivalent approved International standards specifications.

- Manufacturer should pay attention in the selection of appropriate size and strength of chains to safeguard the safety of the users which allows the movement backwards and forwards.

b) Fastenings/ Connections

- All fastening and connections will be as per manufactures' specification along with relevant Indian Standard for Construction or equivalent approved International standards specifications.
- Fastenings used in any accessible part of the equipment shall be of round headed type or hexagon type with chamfered corners unless countersunk or counter bored to eliminate sharp protrusions.
- Accessible nuts shall have the projecting screw thread cut off and the remainder peened so that no sharp edges remain. Nuts, bolts and screws should be secured against loosening. S-hooks, if used shall be pinched and closed as tightly as possible.
- All connection points of stainless steel members should be treated with pickling process. All edges should be grinded to achieve smooth surface.

c) Profile and exposed Surface

- Components parts shall not have any rough or sharp edges or projections in any position that present a hazard to the child.

d) Seating

- Each seating position shall be constructed for use by one child at a time.
- The top of the seat shall be checkered (anti-skid) type.
- The clamps or clamp fasteners shall not project from the top surface of the seat.

e) Finish

- Play equipment workmanship and finish shall conform to the requirement prescribed in Indian and International standards.
- The surfaces of all parts, not naturally resistant to corrosion or deterioration shall be protected by surface coating or impregnation as per International standards and Health and safety norms.
- For example, by sealing hollow sections to prevent the ingress of water or making provision for water to drain away; by designing joints and connections so that they are ventilated, self-draining or sealed to prevent ingress of water by capillary action.
- **Iron and Steel**
Primary members will be comprised of galvanized steel. It should undergo all surface cleaning, surface treatment process before installation especially in aggressive climatic conditions. (Refer section 2.5.8 for Steel Work).

f) Surfacing Materials for Play Equipment

- Surface material of the play equipment should be as per relevant Indian standards or approved International Standards

- It is strongly recommended that impact absorbing surfaces be provided in at least the operating area around the equipment, particularly those items from which falls are possible.
- Manufacturers will be able to provide recommendations for the minimum surface areas needing protection

g) Installation of Play equipment

- The manufacturer shall supply installation instructions which shall include sizes and other details for foundations, erection sequence, tightening for all bolts and similar items and checklist against which correct assembly and operation can be assessed.
- The Contractor shall appoint a specialist to install play equipment to the specified location. The Contractor is to provide details of their proposed sub-consultant for the installation of play equipment to the Project Manager for approval prior to appointment.

h) Packing and Marking

- The equipment shall be packed for delivery as agreed to between the purchaser and the supplier
- Marking shall be durably marked with the following particulars in a visible location when erected on site:
 - Indication of the source of manufacture
 - Month and year of manufacture
 - Batch and serial number
- **BIS** (Bureau of Indian Standards) certification marking is important to be provided on play equipment as per BIS Act, 1986. As a licence for working of play equipment.

i) Safety Barrier

- The equipment shall be packed for delivery as agreed to between the purchaser and the supplier.

2.7.5. List of Play Equipment

- Refer the relevant drawings & schedule

3. GENERAL LANDSCAPE REQUIREMENT (SOFTSCAPE)

3.0. Project Details

3.1.1. General Description

Proposed landscape design focusses on landscape interventions which encourage more of physical activities for all age groups along with passive spaces for cultural and social diversity.

Interventions such as paving material, seating, street furniture, play equipment and planting palette are basic components

3.1. Purpose of the specification

The Softscape specification defines the requirements and gives guidance for implementation and maintenance of the soft landscape works.

3.2. Scope of the specification

The specification describes the general requirements for soft landscape elements in landscape works. The works under this section include but are not limited to the following:

- **EARTHWORKS**

Ground works general, site clearing, supply & soil placement for all planting areas, fine grading, mounding, excavation of pits and erosion control;

- **PLANTING**

Section includes plant procurement, delivery & storage, installation of plant materials, maintenance during execution, plant replacement, gap filling, pruning, tree staking operations, pest and weed control etc.

- **POST-CONSTRUCTION**

Section includes maintenance during Defects Liability Period, Operations and Maintenance Manual and as-built drawings.

3.3. List of related documents

Specification to be read in conjunction with:

- Bills of Quantities as prepared by appointed Quantity Surveyor;
- Relevant Indian Standards as listed in Annexure.

Note: If work item is not included in Indian Standards, appointed contractor should refer to relevant international standard (BS or equivalent). This should be approved by Employer's representative prior to commencing any works on site.

3.4. Terminology

In the Specification and other Documents forming part of the Contract, the following expressions and words shall, unless the context otherwise requires, have the meaning hereby respectively assigned to them:

"Approved"	or	means approved by or approval of, the Employer's
"approval"		Representative

"Submitted" or "submit"		means submitted to or submit to the Employer's Representative in writing prior to commencing works
"Accepted" acceptance"	or	means accepted by or acceptance of, the Employer's Representative
"As shown Drawings"	on	means all works required to conform with the intent shown on the landscape drawings whether or not specifically described in these documents/drawings but are necessary for the full and satisfactory completion of the Contract Works
"As required"		means as required to satisfactory standard match the description in the Specification and other Documents forming part of the Contract
"As directed"		means as directed by the Employer's Representative

4. GENERAL LANDSCAPE REQUIREMENTS

4.1. General soft works requirements

4.1.1. Scope of works

- (a) The work in this contract covers the supply, installation and maintenance of all soft landscape works. The scope of works of the Softscape Contractor covers all horticultural operations and services including labour, material, tools, equipment and transport necessary to complete and maintain the work as indicated on the drawings and in this specifications document.
- (b) All works indicated in the Drawings by notes will be provided, whether or not mentioned in this specification. Any item not specified nor specifically shown in the drawings, but are normally required to conform to such intent, are considered part of the work and deemed to be included in this contract and their execution shall be covered by the contract price, in the same manner as if they have been expressly shown on the drawings and described in the specifications. In case of discrepancy, drawings will override the plant lists.
- (c) As mentioned in sub section 2.1.3. The works shall be completed within the scheduled time, and includes maintenance of the entire softscape works for one year after practical completion of the work, when certified by the Employer's Representative in consultation with the Landscape Architect.
- (d) The Softscape Contractor will provide landscape planting in the areas shown in the Drawings with plants in a healthy and vigorous growing condition.
- (e) The Contractor shall submit for approval, his proposed Work Programme based on the criteria of the overall programme showing the intended sequences, stages and order of proceeding with the works together with the period of time he has estimated for each and every stage of the progress.
- (f) The Contractor shall complete the works within or by the date of completion as set forth in the Contract.

4.1.2. Adjustment to Scope

- (a) The Landscape Architect reserves the right to make field adjustment and reasonable substitution to ensure proper implementation of the landscape concept in relation to the field condition.
- (b) If any material or installation specified is not available or achievable, the Contractor shall submit a written proposal to the Landscape Architect within two (2) weeks of award of the contract. This request may present an alternative material or process which fulfils the same design intent, with the proposed adjustment to the contract price for each item due to the change.
- (c) Substitution of plant materials is not permitted unless authorised in writing by the Landscape Architect & the Employer.

4.1.3. Timelines

The Contractor shall complete the works within or by the date of completion as set forth in the Contract.

4.1.4. Defects & Maintenance

The Contractor shall undertake all responsibility for defects and maintenance of the landscape for a period of twelve (12) months from the date of practical completion.

4.1.5. Discrepancies

The Contractor to study the drawings at the time of the tender and notify Employer's Representative of any discrepancy at the time of the tender submission.

4.1.6. Progress of work

- (a) Progress of all the works related to Landscaping shall be in line with the Main Civil Contract works like roads, external drains, paving and all other works. All works are to be completed within the time schedule of the Main Contract or as agreed within the Landscape contract. All the works related to Landscaping shall be carried out in full co-ordination with Related Works Contractors and Relevant Authorities.
- (b) The work front for Landscaping shall be provided in phases and contractor needs to take up the work in the areas as and when they are made available.

Note: The general description of the works mentioned above is only for the guidance of the Contractor and any error or omission shall not constitute ground for claim by the Contractor. The onus for investigating and ensuring the actual extent and nature of the works comprised in this Contract prior to the submission of the quotation is solely with the Contractor. Any doubts should be clarified with the Employer's Representative before the quotation is submitted. No claim arising out of lack of clarity or availability of information will be entertained. Allowance for any or all of these provisions shall be made in the quotation.

4.2. Quality standards and control

4.2.1. Products and execution

(a) Incomplete Documentation

- Where and to an extent that products are not fully documented they should be of standard appropriate to the nature and character of that part of works where they will be used; suitable for the purpose of stated or reasonably to be inferred from the project documents;
- Omissions or errors in description or quantity shall not vitiate the Contract nor release the Contractor from any obligations or liabilities.

(b) Installer Qualification and Skills

- A qualified landscape installer whose work has resulted in successful establishment of plants. Installers should be able to produce evidence of their qualifications when requested;
- Installer is required to maintain an experienced full-time Foreman on Project site;
- Installers should be appropriately skilled and experienced for the type and quality of work.

- Installers should be able to produce evidence of their qualifications when requested.

(c) Products

- Samples are required prior to installation and approval of Landscape Architect or Employer's representative required. Entire quantity of all products and plant materials should be of consistent kind, size, quality and overall appearance;
- Where critical, measure a sufficient quantity to determine compliance;
- Deterioration should be prevented - products and plant materials should be ordered in suitable quantities to a programme and stored appropriately to be used in appropriate sequence.

(d) Execution

- Generally install all plant material level to the finished grades neatly and in specified alignment;
- Use plants of similar specifications within the same bed;
- Check on-site dimensions;
- Finished work should be free of defects e.g. no gaps in planting, trees and palms not upright or out of alignment.

(e) Protection

- The Contractor shall exercise extreme care in the execution of his work, he will provide all necessary safeguards and exercise caution against injury or defacement of existing site. He will ensure that his works in no way shall adversely affect the work of others or adjoining properties.
- The Softscape Contractor will prevent vehicles of any kind from passing over sidewalks, curbs, etc., unless adequate protection is provided. If any damage to existing roads or kerbs is incurred, they shall be rectified and made good immediately by the contractor at his own cost.
- Pre-commencement photos of site will be required to be provided by the contractor.
- The Softscape Contractor is responsible for any damages resulting from landscape planting operations, and will repair all damages and return the area to its previous condition at his own expense.

(f) Compliance

- Contractor shall provide quality, size, genus, species, and variety of plants and sod as indicated on drawing, complying with applicable requirements as specified herein and drawing;
- Proprietary specifications should be followed;
- Evidence that the proprietary product specified has been supplied and used on site should be retained by Contractor;
- Selection of plants and sod purchased under allowances will be made by Employer's Representative.
- If plants specified being not available, notify the Employer's Representative with both available substitution and reasonable explanation for approval of Employer's Representative. Refer sub point 2.1.1 for reference.

(g) Inspection

- Notify Employer's Representative in writing 2 days in advance when reasonable sections of the following stages are ready for inspection of the works compliance. Obtain confirmation from Employer's Representative before proceeding to next stage. Inspections should be done minimum at the following stages:
 - Delivery of each shipment of plants to site
 - After Subsoil preparation, "Ripping"
 - After spreading and levelling of Soil Mix
 - After setting out of trees, planting beds and any additional features
 - After completion of tree planting pits
 - At the time of initial installation of trees
 - Tree staking mock-up.
 - After completion of all planting installation.
 - At ready for Practical Completion inspection.
 - At completion of every three-months of maintenance period.
 - Inspection or any other action must not be taken as approval unless confirmed in writing. Written statement should include:
 - Date of the inspection;
 - Part of the work inspected;
 - Characteristics which are approved;
 - Extent and purpose of the approval;
 - Any associated conditions.

(h) Related or new work

- Provide the site installation team with all necessary details of the work;
- Before commencing new type/section of work ensure previous work is :
 - Appropriately complete;
 - In accordance with project documents and requirements;
 - To suitable standard;
 - In suitable condition to receive new work;
- Ensure all necessary preparatory work has been carried out.

(i) Manufacturers recommendation/ Instructions

- Always comply with manufacturers printed recommendations and instructions current on the date of the invitation to tender;
- If there are any changes to recommendations or instructions – submit details to Landscape Architect and Employer's representative.

(j) Soil test laboratory Qualifications

An independent laboratory, recognized by the Government of NCT and / or Government of India based on the geographical location of the site and approved by Employer's Representative with the experience and capability to conduct the testing indicated and that specializes in types of tests to be performed. Results to be provided to Landscape Architect and Employer's representative prior to installation.

(k) Soil Sampling and Analysis

- Take soil sample under the supervision of Employer's Representative.

- One Composite Sample should be taken for every batch of volume agreed for each soil type to be used. Each composite sample should be made up of 10 No. sub-samples taken from evenly spaced locations across the field/stockpile. The sub-samples should be mixed together and quartered down to form a 1kg composite sample.
- The composite sample(s) should be placed in a clean plastic bag(s) and labelled with the source reference and date of sampling.
- Take sample of existing surface soil from at 200-300mm depth of existing sub grade at each major planting area as designated by Employer's Representative;
- Report suitability of local soil material for plant growth.
- Take samples of Imported Planting Soil for every batch mixed. Mixing shall be performed either off-site or on-site at a designated area approved by Employer's Representative
- Furnish soil analysis on the samples by a qualified soil-testing laboratory as stated here-in to the Employer's Representative.
- The result should state percentages of organic matter, gradation of sand, silt, and clay content; cat ion exchange capacity; sodium absorption ratio; deleterious material; pH; heavy metals and plant-nutrient values N, P, K copper.
- Report recommended quantities of nitrogen, phosphorus, and potash nutrients and soil amendments to be added to Local soil material/imported soil to meet plant growth requirements as agreed with the Employer's Representative.

4.2.2. Samples and approvals

(a) General

Products or installations should comply with all specification requirements and in respect of the stated or implied characteristics to match a sample expressly approved as a standard for the purpose.

(b) Approval of Products

- Submissions, samples, inspections and tests should be undertaken and arranged to suit the Works programme;
- Do not confirm orders or use the product until approval of the sample has been obtained.
- Approved sample should be documented and retained in good, clean condition on site. Remove when no longer required.

(c) Approval for procurement

- Procurement plan should be submitted post tender stage. This will identify the procurement and delivery schedule for all plant material.
- All plant samples shall be approved by Employer's Representative/Landscape Architect (either at pre-arranged nursery visit prior to delivery or on site). As required, take photos and tag approved plants with waterproof label indicating their species, size, serial number and nursery source. Submit list of approved plants together with photo taken to Employer's Representative at least 7 days before delivery to site.

- Plant materials identified as specimen will be subject to inspection and approval by the Landscape Architect at the place of growth and after it's delivery at site for conformance with the specification as stated in the Bill of Quantities. All plant materials not conforming to the specification will be rejected.
- Notify Employer's Representative in writing 1 week in advance to arrange for any nursery visits. As the plants are ready to deliver in each shipment, notify the Employer's Representative at least 7 days prior to the delivery on site.
- All plants supplied on site should be of same or similar specifications as the selected plant sample. No substitution to plant species or alternate specifications of plants shall be permitted. Plants that are not approved shall be replaced with properly conforming materials.
- Plant materials that are:
 - dead or dying and not in a vigorous thriving condition;
 - improperly installed;
 - infested with pests and/or showing signs of disease will be replaced immediately with a healthy, vigorous thriving plant of the same species and size as originally planned.

(d) Approval of Execution

- Submissions, samples, inspections and tests should be undertaken and arranged to suit the Works programme;
- Do not proceed with affected work until compliance with requirements is confirmed.

4.2.3. Work related to or around services

(a) Compliance with regulations

- Any tree felling or transplanting operations should comply with the Bylaws and Regulations of the relevant statutory authority.
- Any relevant documentation required to start the work or at the completion to be submitted to relevant statutory authorities. This should be included in Detailed Programme of Work.

(b) Co-ordination of Engineering services

- Prior to commencing extensive execution the softscape contractor will ascertain the exact location of all underground utilities and other obstructions that may affect the work. Any services and obstruction encountered will be reported to the Landscape Architect immediately.
- The Softscape Contractor shall exercise due care and precaution for works related to or around any existing or new services and repair all damages to any known services or other underground obstructions at his/her own expense, whether accidental or otherwise. The Softscape Contractor will report all damages to any services to the Employer's Representative immediately.
- The contractor is responsible for coordinating with the respective agencies or other works' contractors working alongside, included but limited to electrical, hard landscape works, irrigation etc.

- Site organisation staff must include one or more persons with appropriate knowledge and experience of mechanical and electrical engineering services to ensure compatibility between engineering and the Works.
- Submit when requested CVs or other documentary evidence relating to the staff undertaking.

4.3. Health and safety

4.3.1. General

The safe completion of the works is a primary aim of the contract. All works should be executed in compliance with all applicable statutory requirements. Below listed are general requirements and items contractor should take care of and provide in respect to Health and Safety on site.

Contractor should always liaise with Employer's Health and Safety Representative during pre-construction, construction and post construction/maintenance stage of work.

Employer's Health and Safety Representatives' responsibilities include the following:

- (a) Advise and assist the Employer, Contractor and Consultants involved in project with their Health and Safety duties;
- (b) Notify details of the project to respective Health and Safety authorities;
- (c) Co-ordinate health and safety aspects of construction work and co-operate with others involved with the project;
- (d) Facilitate good communication between the Employer, designers and contractors;
- (e) Liaise with the principal contractor regarding ongoing work;
- (f) Identify, collect and pass on pre-construction information;
- (g) Prepare/update the health and safety file.

4.3.2. Pre-construction Health & Safety Information

- (a) Health and Safety Plan to be submitted by Contractor to the Employer / Employer's Representative prior to commencement of works for written approval;
- (b) Following items should be included as part of the plan:
 - Method statements on how risks from hazards identified in pre-construction information and other hazards identified by the Contractor will be addressed;
 - Details of management structure and responsibilities, with clearly stated point of contact in case of emergency;
 - Arrangements for issuing health and safety directions;
 - Selection procedures for ensuring competency of other contractors;
 - Procedures for informing other contractors and employees of health and safety hazards ;
 - Procedures for communications between the project team, other contractors and site operatives;
 - Arrangements for coordination and cooperation between contractors;
 - Procedures for carrying out risk assessments and for managing and controlling the risks;

- Emergency procedures including those for fire prevention and escape;
 - Arrangements for ensuring that all accidents, illness and dangerous occurrences are recorded;
 - Arrangements for welfare facilities;
 - Procedures for ensuring that all persons on site have all the required safety gear and have received relevant health and safety information and training;
 - Arrangements for ensuring that all visitors to site receive the required safety gear and training prior to entering the site;
 - Arrangements for consulting with and taking views of people on site;
 - Arrangements for preparing site rules and drawing them to the attention of the those affected and ensuring their compliance;
 - Monitoring procedures to ensure compliance with site rules, health and safety standards and statutory requirements.
- (c) In addition, all statutory health and safety requirements should be included as part of the Health and Safety Plan.

4.3.3. Construction stage Health and Safety Information

(a) Site Preparation – General

- All health and safety measures and procedures as stated in Health and Safety Plan should be followed during site preparation and subsequent works;
- Construction site should be fenced off from general public. No unauthorised access should be possible;
- Any fencing and barriers should be clearly visible during the day and night;
- If public pedestrian/vehicular roads are blocked due to construction works, alternative route should be provided and clearly labelled;
- Any excavated areas, particularly pits and deep excavation, should be fenced off and clearly identified.

(b) General Execution Hazards

All common hazards during execution should be identified and controlled by good management and common practice.

(c) General Product hazards

When dealing with hazardous substances site personnel levels must not exceed occupational exposure standards (upper limit on the acceptable concentration of a hazardous substance in workplace) and maximum exposure limits stated in the relevant local regulations.

(d) Security

- Safeguard the site, the Works, products, materials, and any existing buildings affected by the Works from damage and theft.
- Take all reasonable precautions to prevent unauthorized access to the site, storage areas, site facilities, the Works and adjoining property.
- Liaise with Employer's Health and Safety Representative.

(e) Stability

Maintain the stability and structural integrity of the Works and adjacent structures during the Contract.

(f) Occupational Premises

- Any existing buildings on or along the site will be occupied and/ or used during the Contract as follows need to be secured and provided an access if required;
- All works should be carried out without undue inconvenience and nuisance and without danger to occupants and users.

(g) Communication

- Clear communication procedures should be established and followed as per Health and Safety Plan on daily basis.
- Health and Safety information should be provided across the site by clearly marked access points, emergency exits, medical points etc.

4.4. Site Management

4.4.1. General

Prior to site handover to the Contractor for commencement of works, the Softscape Contractor should prepare and get written approvals of the Site Management Plan.

After the handover of the site to the Softscape Contractor, site preparation measures have to be taken up before the commencement of work.

4.4.2. Site Management Plan

- Plan to be prepared by Contractor and approved by the Employer / Employer's representative prior to handover of the site.
- Plan should be followed during Construction.
- Plan should comply with all relevant statutory regulations as well as Health and Safety requirements (as per 'B. General Requirements, Section 2.3. Health and Safety', of this Specification)
- Plan should include and detail the following items;
 - Detailed information on site preparation measures to be taken up before commencement of works as well as during the works and maintenance period;
 - Clear site arrangement layout for temporary structures, storage, water, electricity supply, vehicular circulation and parking areas etc.
 - Method statements on how site management will be carried out;
 - Details of management structure and responsibilities, with clearly stated points of contact;
 - Communication procedure within site team;
 - Procedures for informing other contractors and employees of site management issues;
 - Procedures for communications between the project team, other contractors and site operatives;
 - Procedures for keeping the records of site queries, obtained approvals, tests, any documentation that affects the site works etc.
 - Storage of the materials and equipment on site;
 - Any additional information required by statutory regulations.

4.4.3. Environmental Management Plan

- (a) **Noise control**
Comply with local regulations and minimise the noise level where possible.
- (b) **Pollution**
Protect the site, the Works and the general environment including the atmosphere, land, streams and waterways against pollution. If pollution occurs inform immediately, including to the appropriate authorities and provide relevant information.
- (c) **Nuisance**
Prevent nuisance from smoke, dust, rubbish, vermin and other causes. Prevent hazardous build-up on site, in excavations and to surrounding areas and roads, No dumping of material in the surrounding areas is permitted.
- (d) **Asbestos containing materials**
Report immediately any suspected materials discovered during execution of the Works. Agree methods for safe removal or encapsulation.
- (e) **Fire prevention**
Prevent personal injury or death, and damage to the Works or other property from fire. Comply with local statutory fire regulations.
- (f) **Burning on site**
Burning on site not permitted.
- (g) **Moisture**
Prevent from wetness and dampness where this may cause damage to the works.
- (h) **Contaminated materials**
Where instructed to remove material affected by contamination from the site, minimize the risk of infecting other parts of the site.
- (i) **Waste**
Waste includes rubbish, debris, spoil, containers and surplus material. Keep site and works clean and tidy,
Remove waste frequently and dispose off site in a manner approved by Waste Regulation Authority and as per Waste Management Plan.

4.5. Preservation of Existing Features, Vegetation and Services

4.5.1. Existing topsoil and subsoil

- (a) Prevent over compaction of existing topsoil and subsoil in those areas which may be damaged by construction traffic, parking of vehicles, temporary site accommodation or storage of materials and which will require reinstatement prior to completion of the Works. Before starting work submit proposals for protective measures.

(b) Stripping Top Soil

- Before beginning general excavation or filling, Contractor shall strip topsoil from areas where there will be working;
- Topsoil shall be removed to an average depth of 300mm, if the depth of topsoil is difficult to determine Contractor shall give notice to Employer 's Representative;
- Stripped topsoil may be reused immediately after stripping or stockpiled in the on-site top soil dump as directed by the Employer's Representative for later use;
- **Location of stockpile:** To be agreed - topsoil shall be stored in an area of the site where it should not interfere with other site operations so that it can be left undisturbed during the construction process.
- **Site Clearance:** The area that is to be used for storing the topsoil shall be cleared of vegetation and any waste arising from the development e.g. building rubble and fill materials.
- **Protection:**
 - Topsoil not to be mixed with subsoil, stone, granular aggregate, rubbish or material from demolition, other soil or materials containing aggressive weeds or non-soil forming materials, oil, fuel cement or other substances harmful to plant growth.
 - Do not place any other material on top of storage heaps.
 - Do not allow construction plant to pass over storage heaps.
 - Prevent compaction and contamination, by fencing and covering as appropriate.
- **Height:**
 - If the topsoil is reasonably dry and friable, the topsoil shall be heaped to a maximum height of 3m. Compaction of the surface to be done.
 - If the topsoil is moist and plastic, the topsoil shall then be heaped up further to a maximum height of 2m. No further compaction required.
- Stock-piled top soil should be planted with rough grasses etc. to limit erosion of soil if left for a period of more than two weeks.

4.5.2. Preservation of trees – General notes

- (a) No existing trees should be cut/pruned without written permission of Employer's representative/PM;
- (b) All works shall be carried out in coordination with experienced horticulturalist;
- (c) All works to trees shall be in accordance with relevant Indian standards;

4.5.3. Guidelines for trees to be removed

- (a) Any existing trees identified as "to be removed" or any dead trees:
 - Contractor shall cut and fell, as close to the ground as possible;
 - Trunks to be cut to convenient lengths;
 - Root stumps shall be removed to a minimum depth of 800mm below ground level;
 - Any debris or material that comes from the above works shall be utilised in accordance with Waste Management Plan.
- (b) All works shall follow Health and Safety procedures.

4.5.4. Guidelines for trees to be retained

- (a) Trees identified as “to be retained”:
- (b) All retained trees should be clearly identified and information signs should be displayed on site in prominent positions at each entrance;
- (c) All retained trees shall be marked by visible, durable tags, lettered to tree number or symbol (if any) on the drawings.
- (d) Trees should be fenced off the works area if possible, in all cases tree trunk and roots should be protected from site works;
- (e) Protected area should be in a shape of a circle around each tree with radius of half the tree's height, measured from tree trunk.
- (f) Do not allow soil compaction to occur under the tree;
- (g) Do not store any materials or site equipment under or near the trees.
- (h) Do not allow for any vehicles to be parked near retained trees or to pass under the trees;
- (i) Prevent damage to tree bark, do not attach any items to trees.
- (j) Do not expose tree roots;
- (k) When works under the tree:
 - Do not fill against tree trunks even temporarily;
 - Open excavation under tree canopy should be carried for as short period as possible. If exposing roots is necessary, temporarily line with polyethylene sheet to reduce evaporation;
 - Use only hand methods to locate, expose, and cleanly remove the soil around roots on the line of excavation. Root systems should be preserved intact.
 - When it is necessary to cut the roots bigger than 25mm diameter, make sure the cutting does not disturb remaining root system. Cut should be smooth with no ragged edges. Cut surface should be immediately treated with bituminous fungicidal sealant.

4.5.5. Guidelines for transplantation of matured trees

- (a) Transplanting is the process of bodily lifting of mature and large plants from their position to a new position.
- (b) The contractor should appoint specialised person for the relocation of existing trees. He shall have minimum 10 years' experience in relocation of existing plant materials and be recognized by IS standards.
- (c) Protect existing trees to remain during construction phases as mentioned in 2.5.4. Provide tree protection barriers for those existing trees adjacent to tree transplantation operations. Any trees scarred or destroyed, designated to remain, will be replaced at the Contractor's expense, with similar species, size, and quality.
- (d) Remove other vegetation as necessary and as directed by the consultant to accommodate new plantings as mentioned in 2.5.3.
- (e) Prepare areas to be planted according to relevant drawings and documents submitted
- (f) **Best time for Transplantation:**

Transplanting is done when there is enough moisture in the soil. Hence, monsoon is the right time as there is enough moisture in the soil. This may vary based on the local site condition and specific plant species requirement.

(g) Relocated site selection criteria:

- Select location and orientation where light, moisture, soil pH, and wind exposure are appropriate for the particular species;
- Consider size of tree for root and crown development and then choose the site.
- Soil test should be performed to check soil drainage quality.
- Resulting tree pits of relocated material shall be backfilled with clean fill and brought back flush with surrounding grade, unless the pits are to be immediately replanted. Stabilize grade if required. Correct problems caused by erosion, wind, etc., in the reclaimed area.

(h) Quality Assurance

- Tree transplantation should be done with supervision of well experienced Horticulturalist recommendation and guidelines.
- Pruning and removal of branches from trees should be done under supervision of specialist and following recommendations.
- Recommend procedures to compensate for loss of roots (if any) and perform initial pruning of branches and stimulation of root growth where removed to accommodate new construction.
- Evaluate existing trees and verify trees are free of disease and ready to survive relocation from the site to their new location on-site or off-site.
- Protect tree crowns with shade cloth to prevent desiccation and wind burn. Crowns shall be periodically sprayed with water to help ensure against desiccation.
- Provide routine progress evaluation reports on relocated trees until the end of the maintenance period.
- All damaged trees that require replacement will be costed at 20.00 INR per metre as bonded sum.

(i) Delivery, Storage and Handling

- Properly handle trees and palms during moving so trunks will not be scarred or damaged and to avoid broken limbs. Broken limbs not causing the tree to be rejected shall be repaired as follows:
 - Properly prune dead, dying, or damaged branches with clean, sharp equipment.
 - Remove injured bark and wood of a tree wound with a clean, sharp knife to a point where healthy bark and wood make contact at their margins. Inspect and treat wound for insect and disease.
 - Seal wounds with bituminous base wound paint for all oak limbs greater than 3 inch diameter.
- Transport trees on vehicles of adequate size to prevent overcrowding, broken limbs, foliage damage, or root ball damage.
- Keep root balls moist during relocation.
- Handle plant material only in ways and means accepted by the landscaping industry and accepted by governing and updated standards.
- Plant material shall be planted the same day it is dug. Coordinate preparation of planting pits or beds to ensure this schedule.

(j) Maintenance

- If rainfall is inadequate, the soil around the plant's roots should be deeply watered approximately every 2 - 3 days post installation.
- Maintain relocated plant materials immediately after each item is planted and continued until the 90 day watering period is completed, upon which time the Employer will take over maintenance of materials following procedures and recommendations of contractor and specifications.
- For relocated trees or palms that die, contractor has to replace their canopy area with new trees as specified in Planting list or document.
- Replacements shall be provided at no additional cost to the Employer.
- All damaged trees that require repair or replacement will be costed at 20.00 INR per metre as bonded sum.

(k) Execution

- Digging, Wrapping, and Handling: Plants shall be dug and prepared for moving in a manner that will not cause damage to branches, shape, root system, and development.
- **Balled and Burlapped Plants:**
 - Balls shall be firmly wrapped with burlap or accepted cloth substitute.
 - No balled plant will be acceptable if the ball is cracked and broken or if the stem or trunk is loose in the ball, either before or during transplanting.
 - Balled plants shall be lifted and handled from the bottom of the ball.
 - Protect ball and deliver to the site, plant immediately, and water thoroughly.
 - Ball sizes shall be as recommended in standards.
 - Burlapping is required. Trees that are burlapped for relocation shall comply and be handled in same manner as new plant material as specified by specialist.

(l) Precautions before relocation

- **Watering**
 - Following transplantation, water trees daily for the first two weeks, every other day for the next three weeks, and every third day for the balance of the three month watering/maintenance period. Such watering shall thoroughly saturate the root ball to its full depth.
- **Root Preparation**
 - Trees to be relocated shall be root pruned at least 45 days before digging with clean, sharp equipment.
 - Maintain root pruned materials by watering, weeding, mowing, spraying, fertilizing, and other horticulture practices.
 - After root pruning, backfill with good rooting medium, fertilize with organic fertilizer to promote root growth.
 - Mulch tree pits to reduce weeds, discourage foot traffic, conserve moisture, and minimize temperature fluctuation.
 - Feed with a diluted solution of N-P-K in solution form
- **Crown preparation**
 - Shade and flowering trees: Selectively prune and thin crown to remove approximately one third of the branches. Preserve the basic shape and

form of the tree, eliminate cross-branching and dead or diseased branches.

- Palms: Follow standard procedure for transplantation of palms.

- o **On-site relocation**

- On-site relocation shall include root pruning, canopy pruning, on-site transportation, hauling and dumping of debris, and 90-day maintenance.
- If the tree or palm dies within the 90 day maintenance period, remove the tree, replace the material, and restore the site at no additional cost to the Board.

5. SPECIFIC LANDSCAPE REQUIREMENT

5.1. Site preparation

Prior to the start of any construction works on site, the Contractor should make sure that the below listed items have been executed.

5.1.1. Site survey

- (a) Prior to commencing the works Contractor shall carry out own survey and inform the Employer's Representative/Landscape Architect of any discrepancies with the Construction Drawings.
- (b) Site survey shall be carried out by skilled and experienced team for the type of work.
- (c) If any unforeseen/unrecorded hazards or items have been discovered Contractor shall give notice to the Employer 's Representative. No works shall be carried out until the issue has been resolved.

5.1.2. Site Investigation

(a) General

- Contractor shall be solely responsible for obtaining all the information on the nature of the site and sub-surface soil conditions for the purpose of preparing tender and the subsequent execution of the contract.
- Site investigation shall provide data to allow Contractor to proceed with works.
- Extent of the investigation shall be determined by the Employer 's Representative and the Contractor.
- Site investigation shall include:
 - Establish records of mean water table;
 - Identify all previous known uses of the site;
 - Identify site features to be preserved;
 - Identify areas of limited access, incomplete work by others or any other issues which may hamper the execution of the works;
 - Locate and identify all known land and water contaminants;
 - Locate and identify soil types to a depth of 4.0m below existing ground level;
 - Recommendations for further investigations.

(b) Public and Safety

- During any investigation works on site, the area investigated shall be secured and public access shall be limited;
- Erect temporary fences, footpaths, warning lights etc. Before starting the investigation.
- Area of any investigation shall be kept clean and protected from ground and surface waters.

(c) Field test General

- Each test shall be recorded and following data shall be provided:
- Project name and reference;

- Date and time of test;
- Weather conditions;
- Soil types and description;
- Location and detail of the sample;
- Site photograph
- If any feature should be encountered, provide description and depth of:
 - Changes in soil strata,
 - Drains,
 - Foundations/structures;
 - Hard strata;
 - Services

(d) Samples and Analysis

- Refer section 2.2.1 (j) and 2.2.1 (k) for procedure and analysis

(e) Final Report

Final site investigation report should include:

- All known land and water contaminants;
- Identify all previously known uses of the site;
- Locate and identify soil types to a depth of the 4.0m below existing ground level
- Mean water table;
- Recommendations for further investigation;
- Features to be included:
 - All above and below ground features;
 - All underground services;
 - Topography

5.2. Demolition and Site Clearance

5.2.1. General

- (a) The Softscape Contractor will clear all planting areas of existing vegetation not specified to remain and all other debris and foreign materials considered a hindrance to the planting operation and/or unsightly in appearance.
- (b) The Softscape Contractor will maintain previously established grades and swales.
- (c) The Main Contractor will be responsible for cleaning the planting areas after completion of civil and other works in that area, and turning them over to the Softscape Contractor suitable for planting. It is to the responsibility of the Softscape Contractor to ensure that this is done. Failing this, clean-up will be the responsibility of the Softscape Contractor.
- (d) The Softscape Contractor will arrange to have all cleared materials moved to areas on site as directed by the Main Contractor.

5.3. Earthwork and Grading

5.3.1. General

- (a) The section refers to excavation, grading and filling of soil across the site as part of the works.
- (b) Contractor should carry out own survey to identify levels and services, prior to start of works.
- (c) If significant variations in site levels or ground water levels in compare to site investigation report or Drawings, Contractor shall notify Employer's Representative.

5.3.2. Setting out

- (a) Before start of excavation works Contractor shall carry out setting out works;
- (b) Contractor will be fully responsible for establishing and locating at site all grid lines, base lines, levels and limits for project;
- (c) Qualified surveyor should be engaged to prepare the above works;
- (d) All setting out information established by Contractor on site should conform accurately with information in the Drawings. Position of individual plants and outlines of all planting areas shall be staked and set out according to the Drawings.
- (e) The Landscape Architect will approve all planting areas and locations prior to any excavation of planting pits, trenches or beds;
- (f) In the event that site conditions necessitate relocation of planting areas or locations, due to subsurface utilities, pipes, structures, impervious materials or inadequate drainage, the Landscape Architect will designate new locations;
- (g) Prior to start of further works, Contractor should do a Quality check and any errors/non-compliance with Drawings should be highlighted to the Employer's Representative. If the setting out will be a cause of errors in further execution of works, Contractor should seek clarification from the Employer's Representative. Any works done which cause obstruction to future works, without approval from the Employer's Representative, shall be demolished and reconstructed at the expense of the Contractor;
- (h) The Contractor shall follow the datum set out by the Main Civil Works Contractor. He shall be responsible for providing, maintaining and safeguarding the position and levels of all survey pillars/pegs and benchmarks existing on site or added;
- (i) Contractor shall maintain sufficient number of pillars/pegs for checking/monitoring of the works for the entire duration of the project.

5.3.3. Excavation

(a) General

- All excavation works shall be in accordance with relevant local standards;
- The work shall include the hauling and satisfactory disposal of surplus excavated or deleterious material;
- Notify Employer's Representative if unexpected rock, hardpan or obstructions detrimental to trees or shrubs are encountered in excavations.

- Hardpan Layer: Drill 150-mm diameter holes, 600 mm apart, into free-draining strata or to a depth of 10 feet (3 m), whichever is less, and backfill with free-draining material.
- If excavating next to existing features (metro pillars, ramps, services, trees etc.) Contractor to ensure all health and safety procedures are strictly followed to avoid disturbance of foundations, tree roots etc.;
- Protect, structures, utilities, sidewalks, pavements and other facilities and lawns and existing plants from damage caused by settlement, lateral movement, washout and other hazards created by Excavation Works;
- Provide erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways;
- All excavation shall be carried out by mechanical equipment, unless specified otherwise by Employer's representative. Contractor can suggest alternative methodology for Employer's Representative approval. However any consequent loss or damage will be still under Contractor's liability;
- Remove any rubbish or debris from the planting surfaces. Grades, which have been established, shall be maintained in a true and even condition;
- Maintenance shall include any necessary repairs to previous graded areas;
- Remove obstructions, debris, rubbish, rocks greater than 100mm in diameter, trees, shrubs, grass, and other vegetation to permit installation of soil layers during the Filling works;
- Side slopes shall be as steep as will withstand safely for actual site conditions encountered for planting beds;
- The following actions need to be followed during this process:
 - Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
 - Cut minor roots and branches of trees indicated to remain in a clean and careful manner where such roots and branches obstruct installation of new construction. Ensure adequate protection is provided to any exposed roots.
 - Grind stumps and remove roots, obstructions, and debris extending to a depth of 800 mm below exposed sub-grade.
 - Chip removed tree branches and stockpile or dispose in areas approved by Employer's Representative.
 - The type of soil to be excavated for pits will cover all soil types such as soft soil, hard moorum and soft rock as is incident on site.

5.3.4. Preservation of existing topsoil

(a) Stripping topsoil

Refer section 2.5.1 (a) and (b) for details.

(b) Disposal Materials

- Surplus subsoil to be stockpiled in temporary storage heaps or spread and level on site as per Contractor's proposal. Protection from wind and disturbance shall be provided.
- Never rise soil levels within root spread and above the root flare of existing trees that are to be retained.

(c) Inspections

Contractor to give 2 days' notice for inspections of excavated areas and tree/palm pits.

(d) Sizes and Depth

- **Pits and Trenches:** Excavate square or circular pits for trees and palms, and circular pits for large shrubs, with side slopes vertical. Where impractical to do so due to non-cohesive nature of the soil, they shall be so excavated as to provide not less than the specified plan size at the bottom of the excavation. Trim base leaving central area slightly raised to support root ball and assist in drainage. Break base to 100mm depth. Scarify sides of plant pit smeared or smoothed during excavation.
- Fill excavations with water and allow percolating away before positioning trees and shrubs.
- Pest control treatment to be done as required in pits before planting, with approval of Employer's Representative.

(e) The minimum size of tree & shrub pits and planting beds shall be as follows:

- Trees/ Palms: 1.2m x 1.2m x 1.0m or as specified in the Drawings.
- Large Shrubs: 0.6m x 0.6m x 0.6m
- Shrub beds: 0.6m depth x area as per Drawings
- Ground cover beds: 0.3m depth x area as per Drawings
- Turf areas: 0.3m depth x area as per Drawings

5.3.5. Grading & Filling

(a) General

- The work shall consist of grading, contouring, smoothing or otherwise shaping areas beyond the planting beds and lawns at the locations shown on the drawings, including earth mounds.
- Roadway shoulders and soil areas left exposed after planting shall be graded as required to leave a generally smooth appearance conforming to the general shape and cross section indicated on the drawings. The final surfaces shall be raked. All objectionable material, trash, brush, weeds and stones larger than 2 inches/ 50 mm in diameter shall be removed from the site and disposed of in an approved manner.
- Make up any deficiency of existing sub-grade level on site with approved backfill to achieve required sub-grade levels.
- Landscape levels will be tied to existing conditions such as existing trees, palms, landscape features, utility lines, pavement and kerbs, etc. Finished grades will bear proper relationship to such control. The Contractor will adjust all works as necessary to meet the conditions and fulfill the intention of the Drawings.
- For areas below earth mounds, cultivate the ground by ripping to a depth of 200mm before mound formation.
- All grades shall provide for natural run off of water without low spots or pockets, flow lines shall be accurately set and shall not be less than 2% gradient, unless otherwise noted. Grades will be smooth and even on a

uniform plane without abrupt changes or pockets and slope it away from all buildings.

- The Contractor will verify the surface drainage of all planting areas and notify the Employer's Representative of any discrepancies, obstructions, or other conditions considered detrimental to proper execution of the work and plant growth. The Contractor will adjust finished grading with screened soil as necessary.

(b) Ripping

- Light and non-cohesive sub-grade: When ground conditions are reasonably dry, rip sub-grade thoroughly to a minimum depth of 300 mm.
- Stiff clay and cohesive sub-grade: When ground conditions are reasonably dry, rip sub-grade thoroughly to a minimum depth of 450 mm.
- Remove stones larger than 25mm in any dimension and sticks, roots, rubbish, weeds and other extraneous matter harmful to plants growth and legally dispose of them outside the Project Site.
- Roughly grade to form free flowing contour without humps and water retaining hollows. Operate along with contour when on slope area to avoid significant alteration of formed sub grade level.
- **Ripping on slope:**
 - Sub-grade at slope between 15 and 27 degree (2:1) shall be ripped parallel to the contour lines of existing sub grade.
 - Sloped sub-grade exceeding 27 degree (2:1) shall not be ripped.

(c) Mixing

- Thoroughly blend top soil/ imported sub-standard planting soil applied with the recommended soil amendments and fertilizers to form General Planting Soil Mix. Mixing to be done at approved site area as approved by Employer's Representative, before spreading on surface of specific planting area.
- Delay mixing fertilizer with planting soil if planting will not proceed within a few days.

(d) Filling

- Planting pits and beds shall be filled carefully to fill all voids and to avoid breaking or bruising roots. Pack backfill firm to prevent settlement. When pit or bed is nearly filled, water thoroughly and allow water to soak away. If settling of the fill occurs after watering, add more fill to bring to level.
- Sloped surfaces steeper than 1 vertical to 4 horizontal should be ploughed, scarified, or broken up sloped so fill material will bond with existing material.
- Spread specified Planting Soil Mix corresponding to planting types and as indicated in the Drawings to meet finish grades after natural settlement. Place and compact fill material in layers as follows:
 - Under planted areas, place specified soil material;
 - Over Drainage Cells place specified soil material;
 - In raised planter areas place specified soil material.
- Do not spread if planting soil or sub-grade is muddy, or excessively wet.
 - Spread approximately one-half the thickness of planting soil mix over loosened sub-grade. Compact the layer reasonably. Spread remainder of planting soil mix.

- Do not mix or spread specified Planting Soil Mix until sample from each blended batch has analysed, reported and is submitted and approved by Employer's Representative.
- Cover and temporarily store prepared plant mix on site area designated by Employer's Representative during the period of soil testing; Take measure to prevent degradation, fermentation, puddling and pest of the soil during the period.

(e) Finished Grading

- Grade planting beds to a smooth, uniform surface plane with loose, uniformly fine texture. Water the plant bed thoroughly and allow settlement of planting soil mix. Finishing level and finished contouring profile as indicated on the drawings.
- Unless otherwise specified, finishing grade for planting areas shall be:
 - Planting bed 50mm below hard finish level
 - Lawn area 25mm below hard finish level
 - Raised planters 100mm below adjoining hard finish level
 - Adjoining soil areas Merge
- Before planting, restore planting beds if eroded or otherwise disturbed after finished grading.

(f) Tolerance

The tolerance of the fill level or those on slope shall not be more than 75mm from the proposed level. The same tolerance shall be applicable to the limits and lines of cut and fill. All levels are those applicable at the end of the Defects Liability Period. The Contractor should therefore make the necessary allowance for consolidation, settlement and any other losses and to include all expenses for this in his quoted rates.

(g) Preparation of Turf

- Check and ensure drainage of lawn area is in place and working properly; report to Employer's Representative if any irregularity is spotted.
- Fill the planting bed with the Soil Mix to the required depths as per drawings and meet Final Grade as indicated on drawing.
- Level the soil in gradient as indicated and tread or roll to firm up soil to prevent any settling of soil mass but without compaction; never firm up soil when it is wet.
- Rip through the Top soil to remove impurity, materials harmful to plant growth, stones over 25mm in diameter and to form a fine tilth. If carpet or seeding is not installed on the same day, rake the area again just before sod is laid.
- Protect the prepared plant bed from soil erosion or soil compaction if carpet is not installed on the same day of preparation works.

5.4. Treatment of pits/beds

5.4.1. Pre-Planting Weed Control

- The Softscape Contractor will remove all visible weeds before any soil placement.
- Herbicides and weedicides are not allowed.

5.4.2. Anti-termite Treatment

- (a) Any of the following chemicals (conforming to relevant Indian Standards) in water emulsion shall be applied by pressure pumps, uniformly over the area treated:

Table 26: Chemical details for Anti-Termite treatment

Chemical	Relevant Indian Standard	Concentration by weight_%
Chlorpyriphos 20 EC	IS: 8944-1978	1.0
Lindane 20 EC	IS: 632-1978	1.0

- (b) The method of application and the stages it will be applied shall be submitted for approval and this shall conform to relevant IS codes.
- (c) All works related to application of the Chemicals shall strictly follow Health and Safety procedures;
- (d) No work shall be carried out under unsuitable weather conditions, these include:
- Rain or when the soil is wet due to rain or sub-soil water;
 - Strong winds;
 - Heat waves.
- (e) Chemicals shall be brought to the site of work in sealed original containers. The materials shall be brought in at a time, in adequate quantity to suffice for the work. The material shall be kept in cool and locked stores. The empties shall not be removed from the work site till the relevant item of work has been completed and permission granted by the Employer's Representative.
- (f) Chemicals available in concentrated forms with concentration indicated on the sealed containers shall only be used. Chemicals shall be diluted with water in the desired quantity before use, using graduated containers to achieve the desired percentage of concentration.
- (g) Hand operated pressure pump with graduated containers shall be used to ensure uniform spraying and to facilitate proper penetration of the chemical. Continuous check shall be kept to ensure that the specified quantity of chemicals is used for the required area during the operation.
- (h) The treated soil barriers shall not be disturbed after they are formed. If by chance, treated soil barriers are disturbed, immediate steps shall be taken to restore the continuity and completeness of the barrier system.

5.5. Soils

5.5.1. Soil materials

(a) Local Soil Material

- **Availability:** Top soil to be used for planting mixes is to be transported from the on-site top soil dump. The location of the top-soil dump will be provided by the Employer's Representative.
- **Composition:** Topsoil obtained shall generally be reasonably loose and friable in form containing not more than 10-15% of moisture content. Employer's Representative will reject topsoil delivered in a wet and soggy condition. Where required, the Topsoil may be used as sub soil as well.

- **Uses:** Top soil from on-site dump is to be improved by addition of soil nutrients to comply to form the Soil Mix.
- **Testing:** Planting Soil shall be tested for N.P.K. value, organic matter content, Cation Exchange Capacity ratio, organic carbon, pH value, physical content of sand, silt and clay and water content. Soil testing shall be arranged by the Contractor and carried out by an approved reputable firm or institute at Contractor's cost, and the Report shall be submitted to the Employer's Representative for approval.

(b) Imported Sub –soil

The imported sub-soil shall be evenly textured local soil as per specifications, that meet the following as minimum requirements:

- pH range of 6.0 to 7.5
- Free of grass or weed growth of any kind, sticky clays, or stones 100 mm or larger in any dimension and extraneous materials harmful to plant growth
- Total percentage of stones should be less than 30% in volume
- Salinity range of 2.0 – 4.0 ECe (dS/m)

(c) Imported Planting Soil

- **Availability:** Planting Soil is prepared off-site for on-site use. The Contractor has to ensure that the prepared soil is mixed as per the requirements for planting mixes specified in this Specification.
- **Composition:** Imported Planting Soil shall be evenly textured, fertile, dark brown or black coloured medium loam free from weeds, deleterious matter and stones larger than 25mm in any dimension and shall not be excessively sandy, gritty or water logged.
- **Uses:** Imported Planting Soil may need to be amended per the specification here-in to produce specialty Planting soil Mixes for Palms, seasonals and lawn areas, upon approval of the Employer's Representative.
- **Testing:** Imported Planting Soil shall be tested for N.P.K. value, organic matter content, Cation Exchange Capacity ratio, organic carbon, pH value, physical content of sand, silt and clay and water content. Soil testing shall be arranged by the Contractor and carried out by an approved reputable firm or institute at Contractor's cost, and the Report shall be submitted to the Employer's Representative for approval. The soil analysis report shall be submitted to the Employer's Representative at least 6 weeks in advance of the programme date for the start of filling operations. Upon approval by the Project Manager the Contractor would be able to prepare the soil stock mix.
- Imported Planting Soil for General Planting Soil purposes shall comply with the following minimums:

pH value	: 5.5 – 7.5
% Organic Matter	: not less than 7.5%
% Organic Carbon	: 2.0 – 3.0
% Total Nitrogen	: 0.09 – 0.15
Carbon / Nitrogen ratio	: 25:1 – 45:1
Available P2O5	: 7mg/100 – 10mg/100g
Exchangeable K2O	: 15mg/100g – 30mg/100g
Cation Exchange Capacity	: 16 – 20 m.e. %
Soil Texture	: Sandy loam preferable

- **Source:** The Contractor should submit details of the source of Imported Planting Soil to the Employer's Representative. No change in the source of Imported planting Soil shall be allowed at a later date without the prior approval of the Employer's Representative based on such tests and samples as specified here-in.

5.5.2. Soil amendments

(a) Inorganic Soil Amendments

- **Charcoal:** Horticultural charcoal, size not more than 10mm.
- **River Sand:** Clean, washed, natural or manufactured quartz sand, free of toxic materials, brick and other building materials and wastes, plant matter, roots of perennial weeds and any other foreign matter or material or substance that would render the sand unsuitable for use.

(b) Fertilizers

N-P-K 15:15:15 chemical fertilizer as per approval and as recommended by soil analysis. Will be uniformed in composition, free flowing and suitable for application with approved equipment. It will be delivered to the site in un-opened containers, each fully labelled and conforming to the applicable fertilizer laws. It will bear the name or mark of the manufacturer.

(c) Organic Compost

Farm yard manure (FYM): Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 13mm sieve; soluble salt content of 5 to 10 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings.

(d) Mulches

- **Organic Mulch:** Organic mulch, free from deleterious materials and suitable as a top dressing of trees and shrubs, consisting of one of the following:
 - Type: Shredded hardwood.
 - Type: Coco peat or coconut husk
 - Type: Ground or shredded bark.
 - Type: Pine straw.
 - Type: Salt hay or threshed straw.
 - Type: Wood and bark chips.
 - Type: Pine needles.
 - Type: Peanut, pecan, and cocoa-bean shells.
- **Mineral Mulch:** Hard, durable stone, washed free of loam, sand, clay, and other foreign substances, of following type, size range, and color:
 - Type: Rounded riverbed gravel or smooth-faced stone.
 - Type: Crushed stone or gravel.
 - Type: Marble or granite chips.
 - Size Range: 40mm maximum, 20mm minimum.
 - Size Range: 20mm maximum, 6mm minimum.

- (b) Planting soil mix shall be spread uniformly on the designated areas to the required depths. When necessary, the area shall be cultivated to a sufficient depth to break up any materials which may have been compacted as a result of the spreading operations.
- (c) The finished surface shall be free of all rocks and stones larger than one inch 25 mm in diameter.
- (d) The Softscape Contractor will mix the soil mix composition thoroughly before placing it into the planting pit.
- (e) Clean all subsoil areas to be filled free of rubbish and foreign materials and remove all stones exceeding 25mm in diameter and builders' debris from site. Any areas contaminated by petrol, oil or other toxic builders' chemical substances shall be immediately, fully and completely removed from site before filling commences.
- (f) Excavated silty-clay site materials must not be used in backfilling. Dispose all excavated materials at the location as indicated by the Employer's Representative.
- (g) The soil mix must be free from heavy clay or coarse sand, stones, lumps, other vegetation, roots, sticks and other foreign material larger than 25 mm in diameter.
- (h) The soil mix will be of the same composition and structure throughout and will not be delivered, handled or placed in a muddy condition.

6. PLANTING

The softscape work is intended to achieve an instant, visually lush effect. All plant materials are to be of an instant, well-grown quality that is free from any infestation &/or defects. The installation is to be executed to the best of professional horticultural standards thereby achieving the required visual effect – well-established, lush-looking with full, bushy plant specimens & materials.

6.1. General

6.1.1. Site Conditions

- Weather Limitations:
 - Proceed with plant bed establishment, planting and related works only when existing and forecasted weather conditions permit the works to be performed. Notify Employer's Representative of any works delay and/or any deviation from Works Program approved due to weather limitations.
 - Planting operations shall be conducted under favourable weather conditions during the next season or seasons which are normal for such work as determined by accepted practice in the locality of the project. At the Softscape Contractor's option and full responsibility, planting operations may be conducted under unseasonable conditions without additional compensation.
- Coordination with Lawns: Plant trees and shrubs after finish grades are established and before planting lawns unless otherwise acceptable to Employer's Representative. When planting trees and shrubs after lawns, protect lawn areas and promptly repair damage caused by planting operations.
- All planting shall be done during the time specified by the Architect.

- Planting shall not be done in soil that is excessively moist or otherwise in a condition not satisfactory for planting in accordance with accepted horticultural practice.
- Plants in containers shall be planted and watered the same day the plant is potted.
- Plants shall be removed from containers in such a manner that the root ball is not broken. Plants with broken root balls or with root balls that fall apart while being planted may be rejected.

6.1.2. Pre –Planting Meeting

Contractor shall coordinate a Meeting with the Employer’s Representative prior to the installation of any of the works here-in.

6.1.3. General Quality Standards for Plant Material

- All plants shall be supplied by the Contractor unless prearranged in writing by the Landscape Architects.
- The Contractor must immediately review all stock received and inform the Landscape Architects in writing if the plants are not suitable for any reason. The following applies to all plants. They shall:
 - Meet or exceed – All Plants and trees specimen should meet the require standards recommended or as per the specifications given by the Landscape Consultant.
 - Plant species should be free of pests and disease including of viruses, nematodes, phytopthera, scale, mealy bug, red spider, aphids, white fly and thrips.
 - Plant species should be free of mechanical or insect damage including leaf burn, chewing insects and stem marks.
 - Plant species should be healthy and showing consistent vigour during the growth period.
 - Plant species should be well hardened with consistent even growth typical of the species.
 - Plant species should be fully acclimated to light and climatic conditions for interior operations, where applicable.
 - Plant species should be correctly and clearly labelled with plant scientific name, size, and production and approval reference numbers.
 - Plant species should be supplied in approved recyclable containers .e.g. “Spring Ring” to provide room for root pruning during root growth.

6.1.4. General Quality Standards for trees

- Trees shall be vigorous, healthy trees that can be easily trained into attractive trees with structurally strong roots and crowns:
 - All trees shall be true to type or name as ordered or shown on the plans and are to individually tagged or tagged in groups by species and cultivar (variety).
 - All trees shall be healthy, have a form typical for the species or cultivar, be well-rooted, and properly trained.
 - The root-balls of all trees shall be moist throughout and their crown is to show no signs of moisture stress.
 - For trees in pedestrian areas, be properly and adequately pruned to acceptable clear stem height prior to installation.

6.1.5. Delivery, Storage and Handling

- Deliver freshly dug trees and shrubs. Do not prune before delivery, except as approved by Engineer. Protect bark, branches, and root systems from sun scald, drying, sweating, whipping, and other handling and tying damage. Do not bend or bind-tie trees or shrubs in such a manner as to destroy natural shape. Provide protective covering during delivery. Do not drop trees and shrubs during delivery.
 - Immediately after digging bare-root stock, pack root system in wet straw, hay, cocopeat or other suitable material to keep root system moist until planting.
- Handle balled and burlapped stock by the root ball, not to damage or break the rootball during handling.
- Deliver trees and shrubs after preparations for planting have been completed and install immediately. If planting is delayed more than 6 hours after delivery, set trees and shrubs in shade, protect from weather and mechanical damage, and keep roots moist.
 - Heel-in bare-root stock. Soak roots in water for 2 hours if dried out.
 - Set balled stock on ground and cover ball with soil, peat moss, sawdust, or other acceptable material.
 - Do not remove container-grown stock from containers before time of planting.
 - Water root systems of trees and shrubs stored on site with a fine-mist spray. Watering as often as necessary to maintain root systems in a moist condition.

6.2. Products

6.2.1. Trees and Palms

- **Trees:** Provide all trees with single sturdy straight trunk (or as indicated on drawing), branching spread equal or greater than indicated in the Plant Schedule (or as indicated on Drawings), well-balanced crown with sufficient branches and spread dimension as indicated on drawing, intact leader, with height, calliper and form as required.
- **Palm Trees:** Provide Palm Trees with form according to natural development of species and type or special form requirements as indicated in the Plant Schedule or on the Drawings, with relationship of calliper and height according to health growth stock of species and type, with upright habit (unless otherwise specified) and balanced crown form, with trunk height or total height, spread, number of fronds as specified in the Plant Schedule, with trunk free of lesions, sign of deterioration and damaged or deformed leave scale and with a health and sound meristem.
- All Trees & Palm Trees shall fulfil requirement of as listed in the Plant Schedule or as indicated in the Drawings.
- All plants shall be typical of their species or variety. All plants shall have normal, with developed branches and vigorous root systems. Trees and palms will be straight and have uniformed shape without damage. They shall be sound, healthy, vigorous, and free from defects, plant disease, insect eggs, borers, and all other forms of infections. Trees with abrasions on the bark, sunscalds, disfiguring knots or damaged limbs over 25mm diameter which have not been pruned, will be rejected.

- All plants shall be nursery grown unless otherwise stated and shall have been growing under the same climatic conditions as the location of this project after the award of Sub-Contract. Refer to the drawings for specific forms and branching of plant material.
- The minimum acceptable size of all trees after pruning, with branches in normal positions, will conform to the measurement specified in the Bill of Quantities unless stated otherwise.
- Calliper measurement will be taken at a point on the trunk 1.0 meter above the ground.
 - Plants that meet the specified measurement, but do not possess a normal configuration or balance of height and spread will be rejected. All trees supplied will be branched as specified in the Bill of Quantities. Natural form of the trees must be kept after pollarding. De-topped trees will be rejected. All trees supplied must have terminal shoots.
 - Plant materials larger in size than specified may be used, but are subjected to the approval of the Landscape Architect. The use of larger plant material will make no change in the contract price. Height will not be substituted for balanced form.
 - All plant materials will have a root ball of sufficient size to support the plant's recovery from transplanting. Any plant materials delivered with small or inadequate root balls will be rejected. In all cases, the decision of the Landscape Architect will be final.
 - All trees and palms will be transplanted from growing site and planted at project site by mechanical crane whenever possible.
 - All specimen trees must have a minimum crown spread of not less than half the size of the overall height.
 - All instant trees must have minimum four main branching from the trunk with a minimum crown spread of not less than half the size of overall height.
 - In case discrepancy between specification given in the Plant Schedule and indication on the Drawings, Drawings shall take precedent.

6.2.2. Shrubs

- Shrubs: Provide shrubs grown from transplanted seedling or rooted cutting, pruned to encourage bushiness, with minimum of 3 numbers of canes/stems, with spread dimension at least two-third of height, and with well-developed root system.
- Shrub sizes indicated are sizes after pruning.

6.2.3. Groundcover Plants

- Provide ground covers of species, height, spread as indicated in the Plant Schedule or on the Drawings, established and well rooted in pots or similar containers of reasonable size.

6.2.4. Seasonal

Provide seasonals of species, height, spread as indicated in the Plant Schedule or on the Drawings, established and well rooted in pots or similar containers of reasonable size.

6.2.5. Climbers

Provide climbers of species as indicated on drawing and complying with requirements as follows:

- Two-year plants with heavy, well-branched tops, with not less than 3 runners(shoots) 450 mm or more in length (or as indicated on drawing), and with a vigorous well-developed root system.
- Provide field-grown climbers. Climbers grown in pots or other containers of adequate size and acclimated to outside conditions will also be acceptable.

6.2.6. Bamboos

Provide healthy, field-grown plants from a commercial nursery, of species, variety and size as indicated on drawing complying with requirements as below:

- Height as per Plant Schedule (or Drawings)
- Vigorous rhizome system.
- Minimum 8 numbers of culms (or as indicated in the Plant Schedule) supplied with branches and leaves.
- Provide field-grown bamboo in pot, container, or fabric bag of adequate size.

6.2.7. Turf Grass Carpet

Provide viable carpet of uniform density, colour, and texture, strongly rooted, free of disease, pest and weeds, and capable of vigorous growth and development when planted.

- Turf grass Species: Turf species as indicated in the Plant Schedule;
- Carpet Dimension: 500mm(Length) x 300mm(Width) x 25mm(Thickness)
- Tolerance: 10% difference.

6.2.8. Guying for Large / Specimen Trees & Palms

- Guy Cables: 5-strand, 4.8 mm diameter, galvanized-steel cable, with zinc-coated turnbuckles, a minimum of 75 mm long, with two 10-mm galvanized eyebolts per Detail.
- Deadman Anchor: Pressure-Preservative (alternate material to be suggested) with thickness by length as indicated, pointed at one end per Detail.
- Hose Chafing Guards: Reinforced rubber hose at least 12 mm in diameter, black, cut to lengths required to protect tree trunks from damage per Detail.

6.2.9. Staking for Trees & Palms

- Wooden/Bamboo Stakes: Wooden/Bamboo with at least 50mm diameter flat cut at both end with length as per detail.
- Trunk Padding: Rubber sheath cut to lengths to protect tree trunks from damage as per Detail.
- Rubber Ties per Detail.
- Bamboo Stake Foot Plate: For Tree installation with-in Tree Grates.

6.3. Execution

6.3.1. Planting – Preparation

- Examine areas to receive soil, plants and lawns for compliance with requirements and conditions affecting installation and performance.
- Locate and clearly flag utilities, trees or vegetation to remain or to be relocated
- Proceed with installation only after unsatisfactory conditions have been corrected
- Lay out individual tree and shrub locations and areas for multiple plantings as set out in the Drawings. Stake locations, outline areas, adjust locations when requested, and obtain Employer's Representative's acceptance of layout before planting. Make minor adjustments as required.

6.3.2. Tree, Palm and Large Shrubs

- **Trees & Shrubs:** Set Trees and Shrubs plumb and in centre of pit or trench with root ball resting on a soil bench as per Drawings.
- **Palms:** Set Palms plumb and in centre of pit or trench with top of root ball 25mm below adjacent finish grades.
- Before planting, verify that root collar is not visible at top of root ball covered by 25mm of soil.
 - Remove covering from tops of root balls and partially from sides, but do not remove from under root balls or carefully remove root ball from container/ fabric bag. Do not use planting stock if root ball is cracked or broken before or during planting operation.
 - Place appropriate Planting Soil Mix around root ball in layers, tamping to settle mix and eliminate voids and air pockets. When pit is approximately one-half backfilled, water thoroughly before placing remainder of backfill. Repeat watering until no more water is absorbed. Water again after placing and tamping final layer of planting soil mix. Soil material shall be carefully firmed around the roots or the ball of the plant so as to eliminate air pockets. Soil shall be compacted around the roots or ball of the plants after planting operations to stabilise the rootball and ensure the tree is upright and vertical.
 - Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water, as per detail drawing.
 - Remove any wrapping and tying materials on trees/shrubs.
 - Remove any wrapping and tying materials from palms; if planting is not during planting season, keep fronds tied until establishment at location.
 - Immediately after planting, all plants shall be thoroughly irrigated until the soil fill around and below the roots or the root ball of each plant is saturated.
- **Tree and Palm Planting on Slope:** Planting should be carried out as soon as excavation or loosening of the prepared plant bed and immediately is fully supported as specified. Formed saucer indentation around tree or planting basin should be made with fall to drain as indicated on drawing.

6.3.3. Shrubs, Ground covers, Seasonals, Climber, Bamboos

Plant **Ground Cover, Seasonals, Climber** and **Bamboo** as following as general requirement:

- Set out and space as indicated on drawing.
- Dig holes large enough to allow spreading of roots and backfill with planting soil type as indicated in the Drawings.
- Work soil around roots to eliminate air pockets and leave a slight saucer indentation around plants to hold water.
- Water thoroughly after planting, taking care not to cover plant crowns with wet soil.
- Protect plants from hot sun and wind; remove protection if plants show evidence of recovery from transplanting shock.

6.3.4. Turfing

- Harvest turf (carpet grass) with turf cutter. Lay turf within 24 hours of harvesting. Do not lay turf if dormant or if ground is muddy.
- Lay turf pieces to form a solid mass with tightly fitted joints. Butt ends and sides of each piece; do not stretch or overlap. Stagger turf strips or pads to offset joints in adjacent courses. Avoid damage to sub-grade or turf during installation. Tamp and roll lightly to ensure contact with sub-grade, eliminate air pockets, and form a smooth surface. Work sifted soil or fine sand into minor cracks between pieces of turf if and when shrinkage occurs; remove excess to avoid smothering turf and adjacent grass.
- Laying on slopes:
 - Lay turf pieces across angle of slopes exceeding 1:3.
 - Anchor turf pieces on slopes exceeding 1:6 with wood pegs or steel staples spaced as recommended by the grass carpet manufacturer, not less than 2 anchors per carpet strip to prevent slippage.
- Saturate turf with fine water spray within half hour of planting. During first week after planting, water as necessary to maintain moist soil and moisten 100-150mm deep of soil below turf layer as watered every time.
- The top dressing media for all turf will consist of the following:
 - 100% good quality, loamy topsoil
 - 5kg/m³ of NPK 15-15-15-fertilizer

6.3.5. Guying and Staking

- **Guying for Large Palms and Semi-Mature Trees:** Unless otherwise indicated, securely attach no fewer than 3 guys to stakes 500 mm long, driven to grade.
 - For trees more than 150 mm in calliper, anchor guys to pressure-preservative-treated Deadman, 100 mm in diameter and 500 mm long buried at least 450 mm below grade. Provide turnbuckle for each guy wire and tighten securely.
 - Secure trees with guy wire looped as detailed with-in reinforced rubber hose at contact points with tree trunk and reaching to turnbuckle. Allow enough slack to avoid rigid restraint of tree.
 - Paint turnbuckles with luminescent white paint.

- **Stakes for Standard Trees & Palms:** Unless otherwise indicated, provide bracing system with stakes around perimeter of trunk as form of tripod to secure until established.
 - Place 2 X 2 stakes on either side of the tree trunk. Supporting point should be at one third of the trunk height. Firmly press end of all four bamboo stakes against finished grade and into the ground for stability but without disturbing root ball area. Care should be taken that the stakes remain firm and stable throughout the staking period.
 - Cushion contact area between stake and trunk with 5mm thick, 150 x 150 rubber tire trunk protection sheath.
 - Secure Bamboo stakes together where they join at contact area at trunk with rubber ties in an '8' profile, as detailed in the drawings and mock-up approved by the Landscape Architect/ Employer's Representative.
 - For Tree Grate installations, secure stakes to Stake Foot Plate as per detail.
- **Staking for Climbers:** For staking against walls, pergolas and other as indicated. Provide 25mm diameter by 2000 ht. Bamboo poles driven 300mm depth to soil.
 - Attached and twist runner of climbers around bamboo pole.
 - Tie climbers to building wall or vertical members of pergola or railing as available.
- **Bamboo on slope:** For bamboo planted on slope area or over 2 meter in height; provide support by tying and staking with bamboo poles of minimum 50mm diameter.

6.3.6. Tree and Shrub Pruning

- Remove only dead, dying, or broken branches. .
- Prune, thin and shape trees and shrubs as directed by Employer's Representative.
- Prune, thin and shape trees and shrubs according to standard horticultural practice. Prune trees to retain required height and spread. Unless otherwise indicated by Employer's Representative, do not cut tree leaders; remove only injured or dead branches from flowering trees. Prune shrubs to retain natural character or achieve desired form as specified in the drawing.
- Clean all wounds with an approved fungicidal.

7. OPERATIONS AND MAINTENANCE

7.1. Maintenance

7.1.1. General

Maintain and establish plantings by carrying out the Maintenance Works as described here.

(a) Scope

- Planting Maintenance will continue for twelve (12) months upon receiving the Handover Certificate from the Landscape architect under the Main contract.
- Care of the plant materials during installation is not considered part of the maintenance period.
- The Contractor shall be responsible for the care and protection of trees, shrubs and plants planted. He will maintain all installation areas in optimum

growing condition and appearance at all times. Such care and protection shall include, but not be limited to, the watering of stock, removal of trash and debris, controlling weeds, repairing, adjusting or replacing stakes and guying, furnishing and applying sprays and dust to combat diseases and insects and taking such precautions as necessary to prevent damage from sunburn or other hazards.

- The Landscape Sub-Contractor shall remove and replace, at his expense, all dead plants and all plants that show signs of failure to grow or which area so injured or damaged as to render them unsuitable for the purpose intended, as determined by the Architect.

(b) Submittals

- Operations & Maintenance Manual: This should be submitted upon commencement of the maintenance period and shall include schedule and instructions for all activities to be undertaken for operations and maintenance of established works.
- **As-built drawings:**
 - The Contractor shall prepare As-built drawings and certify on these drawings that the drawings reflect the actual works installed.
 - The As-Built Drawings shall be submitted to the Project Architect at Practical Completion for checking before submission.
 - Three sets of these drawings (hardcopy and softcopy) shall be submitted to the Employer post approval and record.
 - The Contractor shall ensure that this submission of As-Built drawings will not delay subsequent inspections and tests by the relevant authorities; otherwise he shall be fully responsible for any consequence due to his delay.

(c) Maintenance schedule and monthly status report:

- Provide Maintenance Schedule and Monthly Status Report.
- The Contractor will assume the responsibility of maintenance including watering, fertilizing, spraying, weeding, forking, repairing and straightening stakes, etc. upon completion of planting until the end of the Maintenance period.
- Contractor shall visit and walk around the site with the Employer's Representative to observe and document existing site condition and to clarify scope of maintenance in addition to routine maintenance works.

7.1.2. Care and Protection of Plants

(a) Tools and equipment:

- Do not use tools and equipment at the site which has not been thoroughly cleaned of mud, sap, residue etc., after previous use elsewhere.
- Sterilize pruning tools previously used on diseased plant materials at other sites prior to their use at the site. When pruning diseased plant materials at the site, sterilize equipment after each cut to prevent the spread of disease.

(b) Daily inspections:

- Daily inspection should be part of the maintenance routine. In addition, a comprehensive inspection should be conducted on a monthly basis to analyse plant materials for signs of stress, damage and potential form the following:
 - Infestation: Moles, rats or other gnawing rodents, snails, slugs, insects, etc.
 - Disease: Withering of leaves, die-back, blackened or galled branches, wilt, fungus growths, cancer, bleeding bark, root rot, stunted growth, discoloured or blotchy foliage.
 - Loss of vigour: In normal healthy plants, this is seen as a failure to thrive, a dropping of unopened flowers, leaves that are small for the species, or thin or leggy growth. These symptoms may have many causes: heat stress, desiccation, wind damage, improper irrigation, incorrect installation, damage from construction or maintenance vehicles, or altered growing condition. Treat each instance individually when determining cause of decline and treatment.
 - Fertilizer or soil chemical imbalance: Fertilizer ‘burn’ at leaf margins, unusually light green or yellowish-green leaf colour (chlorosis), yellow/brown salt ‘burn’ at leaf margin, or other symptoms. Make sure that spraying an application of fertilizers and soil chemical is done discriminately and in accordance with manufacturers’ recommendations and confined to the areas affected.

(c) Clearing up

- Remove dead and/ or over hanging branches of existing trees, palm, shrubs and groundcovers.
- Remove any garbage and unsightly foreign materials.
- Remove dead vines and plant materials.

(d) Weeding

- Keep planting areas free of weeds and undesirable grasses through daily weeding if required. Remove the entire root system of all weeds.
- Dispose off all weeds in appropriate trash container.

(e) Pruning

- Pruning Procedures: Carry out pruning using sharp tools to give a clean cut, free from ragged edges and:
 - Prune all trees as directed by the Landscape Architect to establish desired form, habit and appearance.
 - Ensure cuts are immediately above buds or branches and slope away from an outward facing bud.
 - Prune back branches, to the main stem to encourage bushy growth and improve flowering.
 - Remove dead, damaged or crossing branches and dead flower heads.
 - Retain the individual habit and shape of the plant, unless otherwise directed or the intention of the design is to form a clipped hedge.
 - Prune flowering shrubs by removing the shoots bearing the dead flower heads and/or the new growth dependant on species.

- Do not clip shrubs into balled or boxed forms unless specifically called for in the design. Only shrubs designated as “hedges” are to be sheared. Periodically pinch back ‘wild’ growth on shrubs to maintain uniform habit.
- Immediately dispose of pruning and trimming debris from trees and shrubs off site at an approved dumpsite.
- Edge groundcover adjacent to walks to keep in boundary. When appropriate, trim top growth in spring by mow in order to renew growth, improve density and attractiveness, and to achieve an overall even appearance. Do not mow until plants have been firmly established and have formed a dense mat. The Employer’s Representative will determine mowing height. Dispose of groundcover clippings off site.

(f) Thinning

- Where instructed by Employer’s Representative reduced the number of plants due to overcrowding as follow:
 - Dig up plants, transport and replant in locations as directed or remove from site as approved by Employer’s Representative.
 - Backfill the excavated void with Planting Soil Mix.

(g) Aeration

- Shrub areas, including bamboos, climbers, and perennial: immediately after fertilizing, cultivate the soil by hand using fork to a depth of 100mm.
- Ground cover areas: immediately after fertilizing lightly break up the soil by hand using a fork to a depth of 75mm.
- Grass areas: immediately before fertilizing aerate the soil by inserting a fork to a depth of 100mm at 200mm centres.

(h) Watering

- The contractor shall be supplied with non-toxic water for irrigation at pre-defined locations by the Employer. The Contractor shall provide at all times a supply of non-toxic water to the planting area from the provided water source. The Contractor shall make due allowance in this rates for importing non-toxic water during periods of restrictions or pipe work failure if a piped supply has been laid on.
- Water all planted areas so as to maintain a moist soil (not saturated) through the depth of the soil profile adequate to ensure satisfactory establishment and as minimum:
 - Adjust watering as per rainfall and weather conditions.
 - Water desert origin plants at a much lower frequency to keep their growing medium reasonably dry to suit their species-specific habit; avoid over watering which might cause rotting of root and trunk
 - Carry out watering either early mornings or late afternoon or both.
 - Regulate watering as necessary to avoid erosion and gulling.

(i) Control of pest and disease

- Fertilize as needed in accordance with the manufacturer’s recommendations and five days prior to the Final Inspection.

- Regularly inspect any sign pest invasion, fungal growth or disease outbreak, report and take immediate counter-action to prevent further spread and reduce damages to plants.
- Immediately effect remedial measures by spraying with solution of pesticide or germicide approved in strict accordance with the manufacturer's instruction
- Remove by corrective pruning plant material infested by pest or disease immediately after being identified.
- Transport diseased or infested plant materials or plant material cuttings completely off the site immediately after their removal. Do not permit pruned materials from diseased planting to be stockpiled anywhere on site at any time.
- Inspect new plant materials for signs of insect infestation or disease upon delivery to the site. If possible, quarantine new materials in the nurseries for 3 weeks prior to installation.
- Immediately wash off sprayer drippings and materials accidentally spilled on plants.
- Exercise caution, proper supervision and take necessary measures to avoid scorching of plants.

(j) Lawn Maintenance

- Maintain all lawn areas by watering, fertilizing, weeding, mowing, aeration, replanting, and other operations. Roll, re-grade, and replant bare or eroded areas and re-mulch to produce a uniformly smooth lawn. Provide materials and installation the same as those used in the original installation.
- Watering: Provide and maintain temporary piping, hoses, and lawn-watering equipment to convey water from sources and to keep lawn uniformly moist to a depth of 100 mm.
- Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
- Water lawn with fine spray as required unless rainfall precipitation is adequate.
- Mow the lawn as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than 1/3 of grass height. Remove no more than 1/3 of grass-leaf growth in initial or subsequent mowing. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowing to maintain the following grass height:
 - Mow the grass to a height of 25 mm whenever the average height exceeds 50mm
 - Grass will be cut according to the contours of the ground.
 - All clippings must be removed on the same day.
- Lawn installations shall meet the following criteria as determined by Employer's Representative:
 - Satisfactory Lawn: At the end of maintenance period, a healthy, well-rooted, even-coloured, viable lawn has been established, free of weeds, open joints, bare areas, and surface irregularities.

- Use specified materials to re-establish lawns that do not comply with requirements and continue maintenance until lawns are satisfactory.

(k) Tree Stabilization Materials

- Re-stake, straighten, tighten, repair, reset guys and stakes to proper grades or upright position for any plants that are not in their proper growing position.
- Remove all tree stabilization materials toward the end of maintenance period upon approval of the Employer's Representative.

(l) Defective Plants & Materials

- The expense of replacement of defective materials during the maintenance period will be borne by the Landscape Contractor and shall be included for in his price for this section of the work. The Landscape Architect shall be at liberty to reject any installation, materials and workmanship not complying with the requirements of the sub-contract specification or which are in any way unsuitable and to order their removal and replacement, without increase to the contract sum.
- All plants shall be guaranteed to remain alive and healthy for the Maintenance period.
- Plant materials with pest infestations and/or in diseased conditions during the maintenance period shall have additional warranty period of twelve (12) months from the end of the Maintenance Period. The Landscape Architect shall determine the non-conformance of the plant materials and notify the Contractor.
- Upon receipt of written notice from the Landscape Architect of rejection of any plant materials during the warranty period due to death, diseased or unacceptable/ defective growth pattern, the plant materials will be promptly replaced with the same species as originally planned. The replacement made will be of similar size as if normal growth had occurred since the original planting. Replacement will be subjected to all requirements as stated in this Specification and Bill of Quantities. All replacement works shall be completed within seven (7) working days from the date of the end-Maintenance Inspection.
- When plants are replaced, the Contractor will advise the Landscape Architect, in writing, of the necessary establishment maintenance which must be performed. If this information is not provided, the Contractor will be liable for the total cost of replacement should the replaced plant die.

I Drawings

- a. The drawings which form part of these specifications show the work to be done under these specifications as definitely and in as much detail as possible at the present stage of development of the designs.
- b. Some of the working drawings included herein may show few details of construction and other details and specifications not forming a part of the work required under this contract. Such details shown on some of these drawings that are not applicable shall be disregarded.
- c. Parts of the work for which dimensions are not shown have been drawn to a scale as nearly final dimensions as possible. However dimensions scaled from the drawing shall only be considered as approximate and the contractor must own all responsibility for deduction and conclusions that may be made as a result of scaling dimensions from the drawings.
- d. Except as otherwise provided in these specifications for drawing to be furnished by the Contractor, the enclosed drawings will be supplemented by additional or revised general and detailed drawings as may be necessary or desirable as the work progresses and the Contractor shall not execute the work without proper drawings and instructions. The additional or revised general and detailed drawings furnished by the SSNNL GICC will show dimensions and details necessary for construction purposes.
- e. All features of the work are not shown completely in the enclosed drawings but only for the knowledge of the bidder, tentative and typical drawings are enclosed. The contractor shall be required to perform the work in accordance with the additional, general and detailed drawing of revisions furnished by the Engineer-in-Charge during the course of execution. No claim of any kind, on account of typical drawings shall be entertained.
- f. The contractor shall check all the drawings carefully and suggest to the Engineer-in-Charge of any errors or omissions as are discovered.
- g. The contractor will be furnished with such additional copies of the specifications and drawings as may be required for carrying out the work.
- h. Drawing of the structures proposed to be constructed on Right Side Embankment is available online. It is also advisable to refer the drawings before quoting the rates for the works.
- i. Following Drawings are given in **Section 4** of this document:

Section 6. Tender Drawings

Due to size constraint drawings are uploaded in tender section of DICDL website

Section 7. Copy of Letter of Award and Acceptance

Section 8. Response to Queries, Addendum and Correspondences

Construction of Landscaping of Canal Area (Zone 3) in Dholera Special Investment Region, Dholera

CANAL PARK - POTABLE WATER SUPPLY - Zone 3

SL.NO	SHORT DESCRIPTION	DESCRIPTION OF ITEMS	Z 03 QTY	UNIT	Unit Rate	Total Amount
1	Excavation for sewer collecting system and sewer manholes in all sorts of soils and soft murrum including all safety provision using site rails and removing and spreading the excavated stuffs directed with lead upto 90 m including restoration the infrastructure facilities like water pipe line, electricity, telephone cables etc. In all sorts of soils & soft murrum					
	(a) 0 to 1.5 meters		2735	CUM		
	(b) 1.5 to 3 meters		427	CUM		
	(c) 3 to 4.5 meters		1	CUM		
2	Extra rate over Item No.1 if excavation is carried out in soft and decomposed rock or brick masonry in lime mortar or C M of any proportion or BBCC		60	CUM		
3	Extra over item No.1 if excavation of asphalt pavement of any thickness including demolishing the asphalt carpet, metal soiling etc. complete with stacking the material as directed.		60	SQM		
4	Providing open type of wooden shoring and strutting with 50 mm thick planks including necessary waling, struts etc. complete.		706	SQM		
5	Transport of material such as Excavated soil, sand, kapachi, brickbats, debris, etc. to the site shown upto 5 km. lead, including of loading, unloading, stacking and spreading etc. as directed complete.		300	CUM		
6	Extra rate over item no.1 if excavation is to be done in wet condition or in sub soil water inclusive of bailing out of water, dewatering the trenches by ordinary pumps or well point system as required		64	CUM		

Construction of Landscaping of Canal Area (Zone 3) in Dholera Special Investment Region, Dholera

SL.NO	SHORT DESCRIPTION	DESCRIPTION OF ITEMS	Z 03 QTY	UNIT	Unit Rate	Total Amount
	according to site condition, is to be done during excavation					
7	Refilling of pipe line trenches including ramming, watering, consolidating desposal of surplus stuff as directed within radius of 3 km		300	CUM		
8	Providing and supplying in standard length ISI mark high density polyethelyene (HDPE) pipes suitable for potable water as per IS spec No 4984/1995 including all local and central taxes, transportatio, freight charges, octroi, inspection charges, loading, unloading, conveyance to dept store etc com					
	(a) 50 mm internal diameter 6 kg/cm2		1120	RM		
9	Lowering, laying and jointing HDPE pipes and specials following diameters (By butt fusion welding method) including cost of conveyance from store to site of work including cost of labor, material, giving satisfactory hydraulic testing complete					
	(a) 50 mm internal diameter 6 kg/cm2		1120	RM		
10	Supplying and filling sand of approved quality in trenches & in plinth including laying in 300 mm layer, ramming, watering, consolidation etc. complete as per standard specifications & as directed by Engineer-in-charge.		336	CUM		
11	Providing and supplying ISI mark CI D/F sluice valves, butterfly valves & Reflux valves of following class and diameter including all taxes , insurance, transportation, freight charges, octroi, inspection charges, loading, unloading, conveyance to departmental stores, stacking etc complete sluice Valves with ISI mark only- PN-1 with out gear					
	50 mm diameter		4	Nos		

Construction of Landscaping of Canal Area (Zone 3) in Dholera Special Investment Region, Dholera

SL.NO	SHORT DESCRIPTION	DESCRIPTION OF ITEMS	Z 03 QTY	UNIT	Unit Rate	Total Amount
	80 mm diameter		2	Nos		
12	Lowering, laying, jointing in position following C.I./ D/F reflux valve, butterfly valve, sluice valve including cost of all labour, jointing material, including nuts and bolts and giving satisfactory hydraulic testing etc. complete.					
	50 mm diameter		4	Nos		
	80 mm diameter		2	Nos		
13	Providing and supplying C.I. double acting air valve of approved make and quality wof following class and diameter including all taxes, insurance, transportation, freight charges, octroi, inspection charges, loading, unloading, conveyance to departmental stores, stacking etc complete -Kinetic Air Valve (DK)					
	50 mm diameter		2	Nos		
14	Lowering, laying, jointing in position following C.I./ D/Fdouble ball air valve including cost of all labour, jointing material, including nuts and bolts and giving satisfactory hydraulic testing etc. complete.					
	50 mm diameter		2	Nos		
15	Construction of valves chambers in brick or bela stone masonry, locally available in C. M. 1:6. Foundation concrete 150 mm thick in C. C. 1:4:8 of trap metal size 25 mm to 40 mm thick, inside cement plaster in C. M. 1:3 and cement pointing outside in C. M. 1:3 and top cover of precast RCC slab 100 mm thick (with key hole in two parts, each with handles or MS Bar etc. complete as given size) Upto 1 Mt. depth from G. L. to pipe invert level incl. complete civil works but excl. cost of excavation and refilling, with cast in situ RCC slab		8	Nos		

Construction of Landscaping of Canal Area (Zone 3) in Dholera Special Investment Region, Dholera

SL.NO	SHORT DESCRIPTION	DESCRIPTION OF ITEMS	Z 03 QTY	UNIT	Unit Rate	Total Amount
	in one single piece with fixing of CI-MH Frame and cover (excl. cost of CI-MH Frame and cover) with 23 mm thick brick masonry wall in C.M.1:6, Size of 0.9 m x 0.9 m and 1.0 m deep, With precast slab in two parts 15 mm					
16	Supply of Electromagnetic full bore meter with factory calibrated, IP-68, battery operated, flanged connection, flow sensor, indicator, transmitter & Totalizer with all accessories viz power & control cable up to starter panel, cabinates, hardwares etc complete as per following specifications flow sensor: Neoprene/Polyurethane lining, DC pulsed, SS 316 electrodes, CS/SS 316 flanges, / SS 30 sensors Construction & Housing Flow Transmitter: Microprocessor based / modular design, HaRT type, 2 line back lit LCD for indication of actual flow rate, forward, reverse sum totalizer display, One Current (4-20 ma) / one scalble pulse, / one status output, IP67 die cast aluminum with pu finish with glass window enclosure, 10 m long sensor cable - 100 mm NB		2	Nos		

Construction of Landscaping of Canal Area (Zone 3) in Dholera Special Investment Region, Dholera

CANAL PARK - RECYCLE WATER SUPPLY - Zone 3

SL.NO	SHORT DESCRIPTION	DESCRIPTION OF ITEMS	Z 03 QTY	TOTAL QTY	UNIT	Unit Rate	Total Amount
1	Excavation for sewer collecting system and sewer manholes in all sorts of soils and soft murrum including all safety provision using site rails and removing and spreading the excavated stuffs directed with lead upto 90 m including restoration the infrastructure facilities like water pipe line, electricity, telephone cables etc. In all sorts of soils & soft murrum			-			
	(a) 0 to 1.5 meters		2799	2,799	CUM		
	(b) 1.5 to 3 meters		108	108	CUM		
	(c) 3 to 4.5 meters		1	1	CUM		
2	Extra rate over Item No.1 if excavation is carried out in soft and decomposed rock or brick masonry in lime mortar or C M of any proportion or BBCC		55	55	CUM		
				-			
3	Extra over item No.1 if excavation of asphalt pavement of any thickness including demolishing the asphalt carpet, metal soiling etc. complete with stacking the material as directed.		55	55	SQM		
				-			
4	Providing open type of wooden shoring and strutting with 50 mm thick planks including necessary waling, struts etc. complete.		706	706	SQM		
				-			
5	Transport of material such as Excavated soil, sand, kapachi, brickbats, debris, etc. to the site shown upto 5 km. lead, including of loading, unloading, stacking and spreading etc. as directed complete.		300	300	CUM		
				-			
6	Extra rate over item no.1 if excavation is to be		59	59	CUM		

Construction of Landscaping of Canal Area (Zone 3) in Dholera Special Investment Region, Dholera

SL.NO	SHORT DESCRIPTION	DESCRIPTION OF ITEMS	Z 03 QTY	TOTAL QTY	UNIT	Unit Rate	Total Amount
	done in wet condition or in sub soil water inclusive of bailing out of water, dewatering the trenches by ordinary pumps or well point system as required according to site condition, is to be done during excavation						
				-			
7	Refilling of pipe line trenches including ramming, watering, consolidating disposal of surplus stuff as directed within radius of 3 km		100	100	CUM		
8	Providing and supplying in standard length ISI mark high density polyethelyene (HDPE) pipes suitable for potable water as per IS spec No 4984/1995 including all local and central taxes, transportatio, fright charges, octroi, inspection charges, loading, unloading, conveyance to dept store etc com						
	(a) 63 mm internal diameter 6 kg/cm ²		560	560	RM		
	(b) 110 mm internal diameter 6 kg/cm ²		560	560	RM		
9	Lowering, laying and jointing HDPE pipes and specials following diameters (By butt fusion welding method) including cost of conveyance from store to site of work including cost of labor, material, giving satisfactory hydraulic testing complete						
	(a) 63 mm internal diameter 6 kg/cm ²		560	560	RM		
	(b) 110 mm internal diameter 6 kg/cm ²		560	560	RM		
10	Supplying and filling sand of approved quality in trenches & in plinth including laying in 300 mm layer, ramming, watering, consolidation etc. complete as per standard specifications & as directed by Engineer-in-charge.		168	168	CUM		
11	Providing and supplying ISI mark CI D/F sluice						

Construction of Landscaping of Canal Area (Zone 3) in Dholera Special Investment Region, Dholera

SL.NO	SHORT DESCRIPTION	DESCRIPTION OF ITEMS	Z 03 QTY	TOTAL QTY	UNIT	Unit Rate	Total Amount
	valves, butterfly valves & Reflux valves of following class and diameter including all taxes , insurance, transportation, freight charges, octroi, inspection charges, loading, unloading, conveyance to departmental stores, stacking etc complete sluice Valves with ISI mark only- PN-1 with out gear						
	50 mm diameter		10	10	Nos		
	80 mm diameter		2	2	Nos		
12	Lowering, laying, jointing in position following C.I./ D/F reflux valve, butterfly valve, sluice valve including cost of all labour, jointing material, including nuts and bolts and giving satisfactory hydraulic testing etc. complete.						
	50 mm diameter		10	10	Nos		
	80 mm diameter		2	2	Nos		
13	Providing and supplying C.I. double acting air valve of approved make and quality wof following class and diameter including all taxes, insurance, transportation, freight charges, octroi, inspection charges, loading, unloading, conveyance to departmental stores, stacking etc complete -Kinetic Air Valve (DK)						
	50 mm diameter		2	2	Nos		
14	Lowering, laying, jointing in position following C.I./ D/Fdouble ball air valve including cost of all labour, jointing material, including nuts and bolts and giving satisfactory hydraulic testing etc. complete.						
	50 mm diameter		2	2	Nos		
15	Construction of valves chambers in brick or bela stone masonry, locally available in C. M.		14	14	Nos		

Construction of Landscaping of Canal Area (Zone 3) in Dholera Special Investment Region, Dholera

SL.NO	SHORT DESCRIPTION	DESCRIPTION OF ITEMS	Z 03 QTY	TOTAL QTY	UNIT	Unit Rate	Total Amount
	1:6. Foundation concrete 150 mm thick in C. C. 1:4:8 of trap metal size 25 mm to 40 mm thick, inside cement plaster in C. M. 1:3 and cement pointing outside in C. M. 1:3 and top cover of precast RCC slab 100 mm thick (with key hole in two parts, each with handles or MS Bar etc. complete as given size) Upto 1 Mt. depth from G. L. to pipe invert level incl. complete civil works but excl. cost of excavation and refilling, with cast in situ RCC slab in one single piece with fixing of CI-MH Frame and cover (excl. cost of CI-MH Frame and cover) with 23 mm thick brick masonry wall in C.M.1:6, Size of 0.9 m x 0.9 m and 1.0 m deep, With precast slab in two parts 15 mm						
16	Supply of Electromagnetic full bore meter with factory calibrated, IP-68, battery operated, flanged connection, flow sensor, indicator, transmitter & Totalizer with all accessories viz power & control cable up to starter panel, cabinets, hardwares etc complete as per following specifications flow sensor: Neoprene/Polyurethane lining, DC pulsed, SS 316 electrodes, CS/SS 316 flanges, / SS 30 sensors Construction & Housing Flow Transmitter: Microprocessor based / modular design, HaRT type, 2 line back lit LCD for indication of actual flow rate, forward, reverse sum totalizer display, One Current (4-20 ma) / one scalable pulse, / one status output, IP67 die cast aluminum with pu finish with glass window enclosure, 10 m long sensor cable - 100 mm NB		2	2	Nos		

Construction of Landscaping of Canal Area (Zone 3) in Dholera Special Investment Region, Dholera

Canal Park Sewer - Z3

SL.NO	SHORT DESCRIPTION	DESCRIPTION OF ITEMS	Z 03 QTY	UNIT	Unit Rate	Total Amount
1	Excavation for sewer collecting system and sewer manholes in all sorts of soils and soft murrum including all safety provision using site rails and removing and spreading the excavated stuffs directed with lead upto 90 m including restoration the infrastructure facilities like water pipe line, electricity, telephone cables etc. In all sorts of soils & soft murrum					
	(a) 0 to 1.5 meters		951	CUM		
	(b) 1.5 to 3 meters		265	CUM		
	(c) 3 to 4.5 meters		1	CUM		
2	Extra rate over Item No.1 if excavation is carried out in soft and decomposed rock or brick masonry in lime mortar or C M of any proportion or BBCC		20	CUM		
3	Extra over item No.1 if excavation of asphalt pavement of any thickness including demolishing the asphalt carpet, metal soiling etc. complete with stacking the material as directed.		20	SQM		
4	Providing open type of wooden shoring and strutting with 50 mm thick planks including necessary waling, struts etc. complete.		236	SQM		
5	Transport of material such as Excavated soil, sand, kapachi, brickbats, debris, etc. to the site shown upto 5 km. lead, including of loading, unloading, stacking and spreading etc. as directed complete.		23	CUM		
6	Extra rate over item no.1 if excavation is to be done in wet condition or in sub soil water inclusive of bailing out of water, dewatering the trenches by ordinary pumps or well point system as required		25	CUM		

Construction of Landscaping of Canal Area (Zone 3) in Dholera Special Investment Region, Dholera

SL.NO	SHORT DESCRIPTION	DESCRIPTION OF ITEMS	Z 03 QTY	UNIT	Unit Rate	Total Amount
	according to site condition, is to be done during excavation					
7	Refilling of pipe line trenches including ramming, watering, consolidating disposal of surplus stuff as directed within radius of 3 km		6	CUM		
8	Providing and supplying in standard length ISI mark high density polyethylene (HDPE) pipes suitable for potable water as per IS spec No 4984/1995 including all local and central taxes, transportation, freight charges, octroi, inspection charges, loading, unloading, conveyance to depot store etc com PE-100 PN-6					
	(a) 110 mm internal diameter 6 kg/cm ²		375.00	RM		
9	Lowering, laying and jointing HDPE pipes and specials following diameters (By butt fusion welding method) including cost of conveyance from store to site of work including cost of labor, material, giving satisfactory hydraulic testing complete					
	(a) 110 mm internal diameter 6 kg/cm ²		375.00	RM		
10	Supplying and filling sand of approved quality in trenches & in plinth including laying in 300 mm layer, ramming, watering, consolidation etc. complete as per standard specifications & as directed by Engineer-in-charge.		23.0	CUM		
11	Providing and constructing Sewer manholes, scraper manholes and unit house connection chamber, as per the type design in brick masonry in C. M. 1:5 and outside 20 mm thick plastering in C. M. 1:3 necessary 100 mm coping in R.C.C.M. 20 fixing C. I. steps and fixing manhole frame and covers (But					

Construction of Landscaping of Canal Area (Zone 3) in Dholera Special Investment Region, Dholera

SL.NO	SHORT DESCRIPTION	DESCRIPTION OF ITEMS	Z 03 QTY	UNIT	Unit Rate	Total Amount
	excluding supply of manhole frame and covers) over manholes and house connection chambers and fixing Manhole covers (but excluding supplying of manhole covers) over scraper manhole etc. complete, providing and fixing safety chain wherever necessary as per the stipulations in the type desing complete (excl. excavation).					
	Manhole type "B" circular type having inside diameter of minimum 1500 mm but upto 1.5 M depth.		15.00	Nos		
12	Extra depth beyond 1.5 M but upto 4.0 M depth for type "B" manhole above.		2.00	m		
13	RCC precast M.H. Frame & Cover Manufacture, supply & Delivery at store or at site of work precast RCCM.20 Frame & cover suitable to drainage M.H. and as per type design & Drawing including cost of reinforcement M.S. Angles or Flate, curring mold work etc. Heavy duty		15.00	NOS.		

Construction of Landscaping of Canal Area (Zone 3) in Dholera Special Investment Region, Dholera

Canal Park SWD - Z3

SL.NO	SHORT DESCRIPTION	DESCRIPTION OF ITEMS	Z 03 QTY	UNIT	Unit Rate	Total Amount
1	Excavation for sewer collecting system and sewer manholes in all sorts of soils and soft murrum including all safety provision using site rails and removing and spreading the excavated stuffs directed with lead upto 90 m including restoration the infrastructure facilities like water pipe line, electricity, telephone cables etc. In all sorts of soils & soft murrum					
	(a) 0 to 1.5 meters		1010.74	CUM		
	(b) 1.5 to 3 meters		1	CUM		
	(c) 3 to 4.5 meters		1	CUM		
2	Extra rate over Item No.1 if excavation is carried out in soft and decomposed rock or brick masonry in lime mortar or C M of any proportion or BBCC		15	CUM		
3	Extra over item No.1 if excavation of asphalt pavement of any thickness including demolishing the asphalt carpet, metal soiling etc. complete with stacking the material as directed.		15	SQM		
4	Providing open type of wooden shoring and strutting with 50 mm thick planks including necessary waling, struts etc. complete.		693	SQM		
5	Transport of material such as Excavated soil, sand, kapachi, brickbats, debris, etc. to the site shown upto 5 km. lead, including of loading, unloading, stacking and spreading etc. as directed complete.		202	CUM		
6	Extra rate over item no.1 if excavation is to be done in wet condition or in sub soil water inclusive of bailing out of water, dewatering the trenches by ordinary pumps or well point system as required		21	CUM		

Construction of Landscaping of Canal Area (Zone 3) in Dholera Special Investment Region, Dholera

SL.NO	SHORT DESCRIPTION	DESCRIPTION OF ITEMS	Z 03 QTY	UNIT	Unit Rate	Total Amount
	according to site condition, is to be done during excavation					
7	Refilling of pipe line trenches including ramming, watering, consolidating desposal of surplus stuff as directed within radius of 3 km		108.941	CUM		
8	Providing and supplying in standard length ISI mark high density polyethelyene (HDPE) pipes suitable for potable water as per IS spec No 4984/1995 including all local and central taxes, transportatio, freight charges, octroi, inspection charges, loading, unloading, conveyance to dept store etc com PE-100 PN-6					
	(a) 315 mm internal diameter 6 kg/cm2		1095.00	RM		
9	Lowering, laying and jointing HDPE pipes and specials following diameters (By butt fusion welding method) including cost of conveyance from store to site of work including cost of labor, material, giving satisfactory hydraulic testing complete					
	(a) 315 mm internal diameter 6 kg/cm2		1095.00	RM		
10	Supplying and filling sand of approved quality in trenches & in plinth including laying in 300 mm layer, ramming, watering, consolidation etc. complete as per standard specifications & as directed by Engineer-in-charge.		202.0	CUM		
11	Providing and constructing Sewer manholes, scraper manholes and unit house connection chamber, as per the type design in brick masonry in C. M. 1:5 and outside 20 mm thick plastering in C. M. 1:3 necessary 100 mm coping in R.C.C.M. 20					

Construction of Landscaping of Canal Area (Zone 3) in Dholera Special Investment Region, Dholera

SL.NO	SHORT DESCRIPTION	DESCRIPTION OF ITEMS	Z 03 QTY	UNIT	Unit Rate	Total Amount
	fixing C. I. steps and fixing manhole frame and covers (But excluding supply of manhole frame and covers) over manholes and house connection chambers and fixing Manhole covers (but excluding supplying of manhole covers) over scraper manhole etc. complete, providing and fixing safety chain wherever necessary as per the stipulations in the type desing complete (excl. excavation).					
	Manhole type "B" circular type having inside diameter of minimum 1500 mm but upto 1.5 M depth.		53.00	Nos		
12	Extra depth beyond 1.5 M but upto 4.0 M depth for type "B" manhole above.		3.00	m		
13	RCC precast M.H. Frame & Cover Manufacture, supply & Delivery at store or at site of work precast RCC M.20 Frame & cover suitable to drainage M.H. and as per type design & Drawing including cost of reinforcement M.S. Angles or Flate, curring mold work etc. Heavy duty		53.00	NOS.		

Construction of Landscaping of Canal Area (Zone 3) in Dholera Special Investment Region, Dholera

LANDSCAPE DEVELOPMENT WORKS - POWER ESTIMATE FOR CANAL PARKS (Zone-03)

SL.NO	SHORT DESCRIPTION	DESCRIPTION OF ITEMS	Zone 03 QTY	UNIT	Unit Rate	Total Amount
	ZONE-3					
1	Lighting Feeder Pillar-1					
		Supply, assembly, erection, connecting, testing & commissioning of LT weather proof dust and vermin proof, outdoor feeder pillar, fabricated out of suitable sized angle iron and flats and covered with 3mm thick CRCA sheet steel including canopy, duly painted, both sides (front and rear) openable with locking arrangement, rubber gasket cable glands, etc. bus bar supports including RCC 1:2:4 (1 cement: 2 coarse sand : 4 graded stone aggregate 20mm nominal size) foundation, 450 mm deep and 150 mm above the ground. The feeder pillars shall be complete with 3 phase and neutral bus bars of capacities as described below ,copper FRLS control wiring with 1.5sq.mm, complete in all respects as per specifications as required.				
		INCOMING:-				
a)		63A 4P RCBO (25ka) with thermal magnetic release & rotary handle - 1no.				
b)		3 Phase and neutral (100%N) aluminium bus bars of 100/ 100 amps. Capacity.				
		OUTGOING:-				
a)		70 AMP. TP CONTACTOR WITH NO/ NC CONTACTS -1 set.				
b)		24 HOUR TIMER - 1 set.				
c)		16A DP MCB (10ka) - 12 nos.				
d)		25A DP MCB (10ka) - 2 nos.				
e)		40A 4P MCB (10ka) - 2 nos.				
f)		63A 4P MCB (10ka) - 1 no.				
		16 AMP. SWITCH & SOCKET - 1 no. with in the feeder pillar.				
		Lighting Feeder Pillar-1 as above	1	Set		
2	Lighting Feeder Pillar-2					
		Supply, assembly, erection, connecting, testing & commissioning of LT weather proof dust and vermin proof, outdoor feeder pillar, fabricated out of suitable sized angle iron and flats and covered with 3mm thick CRCA sheet steel including canopy, duly painted, both sides (front and				

Construction of Landscaping of Canal Area (Zone 3) in Dholera Special Investment Region, Dholera

SL.NO	SHORT DESCRIPTION	DESCRIPTION OF ITEMS	Zone 03 QTY	UNIT	Unit Rate	Total Amount
		rear) openable with locking arrangement, rubber gasket cable glands, etc. bus bar supports including RCC 1:2:4 (1 cement: 2 coarse sand : 4 graded stone aggregate 20mm nominal size) foundation, 450 mm deep and 150 mm above the ground. The feeder pillars shall be complete with 3 phase and neutral bus bars of capacities as described below ,copper FRLS control wiring with 1.5sq.mm, complete in all respects as per specifications as required.				
		INCOMING:-				
a)		63A 4P RCBO (25ka) with thermal magnetic release & rotary handle - 1no.				
b)		3 Phase and neutral (100%N) aluminium bus bars of 100/ 100 amps. Capacity.				
		OUTGOING:-				
a)		70 AMP. TP CONTACTOR WITH NO/ NC CONTACTS -1 set.				
b)		24 HOUR TIMER - 1 set.				
c)		16A DP MCB (10ka) - 12 nos.				
d)		25A DP MCB (10ka) - 2 nos.				
e)		40A 4P MCB (10ka) - 2 nos.				
f)		63A 4P MCB (10ka) - 1 no.				
		16 AMP. SWITCH & SOCKET - 1 no. with in the feeder pillar.				
		Lighting Feeder Pillar-2 as above	1	Set		
		OUTGOING:-				
a)		70 AMP. TP CONTACTOR WITH NO/ NC CONTACTS -1 set.				
b)		24 HOUR TIMER - 1 set.				
c)		16A DP MCB (10ka) - 17 nos.				
d)		25A DP MCB (10ka) - 2 nos.				
e)		40A 4P MCB (10ka) - 2 nos.				
f)		63A 4P MCB (10ka) - 1 no.				
		16 AMP. SWITCH & SOCKET - 1 no. with in the feeder pillar.				
		Lighting Feeder Pillar-3 as above		Set		
		Lighting Feeder Pillar-4 as above		Set		
	TOTAL					
	SUB HEAD: II CABLE & PIPE					


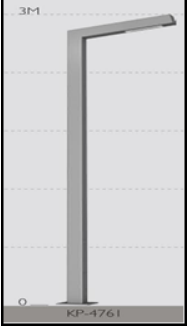
Construction of Landscaping of Canal Area (Zone 3) in Dholera Special Investment Region, Dholera

SL.NO	SHORT DESCRIPTION	DESCRIPTION OF ITEMS	Zone 03 QTY	UNIT	Unit Rate	Total Amount
1		Supply, laying, testing and commissioning of 1.1 kv grade XLPE insulated PVC sheathed steel armoured aluminium stranded conductor ISI marked LT Cables in trenches/ ducts/ through RCC pipes under roads/ on cable trays of following sizes, complete all as specified (as per CPWD specifications for External Electrical works), i/c clamping, dressing, earth work digging, sand filling, bricks protection, back filling etc. as required & approved by Engineer's Incharge. (Tagging to be provided with aluminium strips on both the ends as approved).				
1.1		3 core X 4 Sq.mm	4479	RM		
1.2		3 core X 6 Sq.mm	656	RM		
1.3		3 core X 10 Sq.mm	R.O.	RM		
1.4		3 core X 16 Sq.mm	R.O.	RM		
2		Supplying and making cable end termination with brass compression glands and aluminium lugs including inhibiting compound to be used in each lug, for the following XLPE aluminium conductor armoured cables of 1.1 KV grade etc, complete as required.				
2.1		3 core X 4 Sq.mm	36	Set		
2.2		3 core X 6 Sq.mm	4	Set		
2.3		3 core X 10 Sq.mm	R.O.	Set		
2.4		3 core X 16 Sq.mm	R.O.	Set		
3		Providing, laying and jointing HDPE PIPE conforming to IS : 4984 -1987 of class III, (4kg per sqcm) including all fittings (plain or door) e.g. bend junctions cowls, offsets access pieces etc. and jointing with solvent cement complete as per manufacturers specification. The cost including testing of joints and making good the leakage/damages wherever required.				
3.1		50mmØ HDPE PIPE FOR CABLES	1950	RM		




Construction of Landscaping of Canal Area (Zone 3) in Dholera Special Investment Region, Dholera

SL.NO	SHORT DESCRIPTION	DESCRIPTION OF ITEMS	Zone 03 QTY	UNIT	Unit Rate	Total Amount
3.2		90mmØ HDPE PIPE FOR CABLES	650	RM		
3.3		140mmØ HDPE PIPE FOR CABLES	550	RM		
3.4		200mmØ HDPE PIPE FOR CABLES	60	RM		
3.5		90mmØ HDPE PIPE FOR LV CABLES	2230	RM		
4	Handhole	Supply,fixing , installation & testing of heavy duty handholes	26	Nos.		
	TOTAL					
	SUB HEAD: III EARTHING					
1		Supply, installation & testing of advance maintenance free Chemical Gel Earthing of Dual Pipe Technology (Cu) of 3mtr long 80mm dia of outer shell (MS) with the 50mm dia of inner shell (cu) of electrode filled with highly conducting metallic compounds with the permanent sealings at both the ends with the lead terminal of 25 x 5mm size at the top along with 50 Kgs of chemical mixture of Resistance Lowering Grounding Minerals. The loss on ignition by mass of the chemical compound shall be less than 20%. The chemical compound should be tested and certified by any International accredited and BIS (Bureau of Indian Standards) accredited laboratory. The earth electrode shall be duly tested & certified by CPRI (Central Power Research Institute), Govt of India. The chemical earth electrode manufacturer shall be an ISO 9001: 2008 & ISO 14001: 2004 certified organization. The Earth pit should be covered with heavy duty polyplastic weather proof chamber. (neutrals)	24			
2		Providing, laying, fixing, connecting and testing of undernoted sizes of copper strip/ GI strip/ wire from earth electrode to equipment loop and earthing system, in trenches, on surfaces, along pole or along M.S. support, etc. including excavation where required for laying the copper strip/ GI strip and filling back complete, conforming to relevant IS and all as specified.				
a		G.I. wire 6 SWG on surface or in recess	500			
b		GI strip 25mmx 5mm on surface or in recess	240			
	TOTAL					
	SUB HEAD: IV					

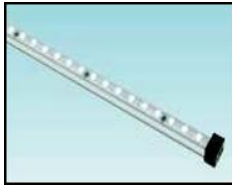
Construction of Landscaping of Canal Area (Zone 3) in Dholera Special Investment Region, Dholera

SL.NO	SHORT DESCRIPTION	DESCRIPTION OF ITEMS	Zone 03 QTY	UNIT	Unit Rate	Total Amount
	FIXING OF LIGHT & FIXTURES					
1	L2 - 3M POST TOP LIGHT	1X50 W LED LIGHT, 3.0 M HEIGHT , SINGLE ARM, LENGTH OF ARM IS 900 MM; LED WARM WHITE; POLE: GRAPHITE GREY 	65	Nos.		
2	L2a - 3M POST TOP LIGHT	1X50 W LED LIGHT, 3.0 M HEIGHT , SINGLE ARM, LENGTH OF ARM IS 900 MM; LED WARM WHITE; POLE: GRAPHITE GREY 	1	Nos.		

Construction of Landscaping of Canal Area (Zone 3) in Dholera Special Investment Region, Dholera

SL.NO	SHORT DESCRIPTION	DESCRIPTION OF ITEMS	Zone 03 QTY	UNIT	Unit Rate	Total Amount
3	L5 - SPIKE LIGHT	SPIKE MOUNTED LED LUMINAIRE MADE OF 316L GRADE SS WATTAGE:3W COLOR TEMP:2700K BEAN ANGLE:6/25/40INPUT VOLTAGE:12VIP:68POWER SUPPLY EXTRA FOR SHURBHS AND SMALL PLANTERS UPTO 5-6 FEETS		91	Nos.	
4	L7 - MOUNTED DOWN LIGHT	SURFACE MOUNTED CYLINDRICAL LED LUMINAIRE WATTAGE:18.5W COLOR TEMP:4000K BEAM ANGLE:9/25/36/60 DEGREES INPUT VOLTAGE:240V IP:54		42	Nos.	
5	L11 - UPLIGHT LIGHT1	IP 67, IK - 10, 150MM DIA, 15.8 W LED, WARM WHITE		26	Nos.	
6	L14 - HANDRAIL			6	Nos.	

Construction of Landscaping of Canal Area (Zone 3) in Dholera Special Investment Region, Dholera

SL.NO	SHORT DESCRIPTION	DESCRIPTION OF ITEMS	Zone 03 QTY	UNIT	Unit Rate	Total Amount
	(CONCEALED LED STRIP LIGHT	IP65, IK07, HOUSING OF OXIDISED EXTRUDED ALUMINIUM; DIFFUSER OF CLEAR POLYCARBONATE; WITH IP67 CONNECTOR, L=1235MM, 11.5W, RGB COLOUR				
						
7	LED STRIP LIGHT FOR BENCHES SIGNAGES (in mtr.)		200	Nos.		
	TOTAL					
	SUB HEAD: V PA SYSTEM					
1	HORN SPEAKER	Supply of 200 watts high powered array speaker, with NEMA4 rating, TUV certified for outdoor applications. Wired, 2 HORNS, Regulatory. Horn dimensions: 3' 2" W x 2' 1" H x 1' 4 7/16" D / 96.52 cm x 63.5 cm x 41.91 cm (2 horns with drivers, omni-directional), Horn weight: 52 lbs for each horn and driver kit (pair) / 23.6 kg,	4	Nos.		
2	IP MICROPHONE	TCP/IP based microphone assembly with mixing TCP/IP & optical fibre connectivity pre amplifier in 14U rack with battery & battery charger. Desktop microphone type, Full duplex two way communication from any point to another intercom system. Embed PC technology, With 3.4 inch LCD user-friendly human-machine interface. amplifier with Built-in single channel TCP/IP decoder, Decode digital audio data to analog amplifier, Supplied a remote control over music selection, IP address change and volume attenuation, 4 channel 100V speaker inputs loop and 4 channel 3 wired volume control	0.2	Nos.		
3	POLE	Pole required to HPSA 7102 speaker. Speaker weight will be minimum 20 KG. Pole height will be in between 10~15 mtrs above ground level.	4	Nos.		
4	IP AMPLIFIER	IP based Amplifier 240W with OFC communication - Amplifier shall be fully IP based amplifier	4	Nos.		

Construction of Landscaping of Canal Area (Zone 3) in Dholera Special Investment Region, Dholera

SL.NO	SHORT DESCRIPTION	DESCRIPTION OF ITEMS	Zone 03 QTY	UNIT	Unit Rate	Total Amount
	with OFC connectivity	for the transmission of the program over internet to its built in amplifier then to 100V/70V speaker. The Amplifier shall have wattage according to requirement for that it shall have all range of wattage of 240W. The Amplifier shall have be full IP based which provide transmission of large distance, and simultaneous maximum program over non dedicated network wiring. The Amplifier shall have Volume control and program selection keys. The Amplifier shall have automatic standby mode if no input is detected for 5 minutes and automatically back into service once input is detected. The Amplifier shall have built in Priority management for Voice evacuation and local input and it shall also have LED indication for monitoring Output Level Meter, amplifier power, protection, equipment power indicator. High temp, overload and short circuit protection				
5	CABINET	IP65 rating cabinet for amplifier. Electronic cabinet dimensions: 36" W x 48" H (60" with pedestals) x 12" D / 91.4 x 121.9 (152.4 with pedestals) x 30.5 cm. Inclusive of battery,	4	Nos.		
6	GRAPHIC SOFTWARE	Graphics software: IP based Software with System Monitor, Media Player, Program Timer, System Memory function and many more functions. The Software shall be capable to broadcast MP3 files, Schedule and matrix function to designated Zones. Flexible multiple zone definitions, Built in Weekly timer, Analog to digital encoding, Graphic Map display for Visual simple monitoring and Operation. The System shall be full duplex system and it can be able to use for Network paging system and and intercom two systems. The System shall be able to TCP/IP or OFC communication protocol built in decoder to transfer analog signal to digital signal. The Server shall have built in weekly timer to program over music or sound files to automatically broadcast to designated zones at pre set time. Built in System display to surveillance each unit working status, Priority selection, Licenses code registration, Password protection to change the configuration and user log in, Customized mapped connection diagram shall also be available. Will be installed in command centre	0.2	Nos.		
7	Cable	Supply of speaker wire Speaker wire 12–16 AWG stranded two-conductor jacketed cable. Non-shielded either twisted or non-twisted. UL/CSA/EU: approved for outdoor use. The distance of the cable length between the speaker and each amplifier is limited to a maximum of 100 feet.	200	RM		
8	Cable	Supply of optical fibre cable for amplifier connectivity	1080	RM		
	TOTAL					
	SUB HEAD: VI CCTV					

Construction of Landscaping of Canal Area (Zone 3) in Dholera Special Investment Region, Dholera

SL.NO	SHORT DESCRIPTION	DESCRIPTION OF ITEMS	Zone 03 QTY	UNIT	Unit Rate	Total Amount
1	3 MP Bullet Camera	3 MP Bullet Camera / box , ONVIF profile S & G , UL,CE,FCC certified , Motorized varifocal, 2.8 mm to 12 mm ,1/2.8" CMOS sensor , Quad stream ,frame rate 25 FPS @ 3MP , 50 FPS @ 2 MP ,2 streams simultanepusly at 1920 X 1080 p ,Shutter speed : 1 ~ 1/10000 sec , P-iris , Min illumination : Color 0.1 lux , B/W 0.01 lux , Auto ICR ,Two way audio support ,Video compression : H.264 , MJPEG ,120 dB WDR ,Auto white balance , SD Card support ,Support upto 20 user accounts , 1 X BNC analog output ,Digital Zoom ,Digital PTZ ,2D / 3D Noise reduction, Edge analytics : Abandoned Object, Intrusion Detection, Tampering, Wrong Direction, Loitering Detection, Object Counting, Stopped Vehicle, Object Removal InbuiltIR LEDs , IR distance upto 40 mtrs , IP 67 weather proof , POE. Camera shall have all mounting arrangements. (Approved Make - Axis, Impulse, Bosch, Pelco)	44	Nos.		
2	128 Channel Network Video Recorder	128 Channel Network Video Recorder, Embedded Linux OS, Pre-installed VMS with licenses, ONVIF profile S & G ,H.264 Recording and Playback, Intel Based i7 Processor, 2x2GB DDR3 RAM , Intel HD Graphics , Throughput Input: 160Mbps / Output: 160Mbps, Decoding Rate Up to 960 PPS @ D1, 2.5" SATA x 1 (for OS) + 3.5" SATA x 4 ports , each slot support HDD of upto 6TB , 1X e-SATA Port for External Storage Device , RAID 0/1/5/6/10, Support , COM Port RS-232 x1 and RS-485 x1 , USB 3.0 x 2 + USB 2.0 x 3 , Digital Input : TTL-level x 4 , Digital Output : Relay NC/NO x2 (DC24V/1A) , 1 x WAN (10/100/1000 BaseT), 1 x LAN (10/100/1000 BaseT), 1 x SFP Port (1 Gbps),Dual monitor support , E-mail notification Support. Venor shall quote with the HDD , shall caluculate for one month recording @ 25 fps. 30 days recording backup. (Approved Make - Axis, Impulse, Bosch, Pelco)	0.4	Nos.		
3		Supply Installation Testing & Commissioning of Client PC with Intel processor 7th Gen Intel Core tmi7,8GB RAM -4GBx2,2GB Grapics card 500GB HDD, OS widows 7 or better specs, as recommended by VMS Software , AS per specification & at site of work in line with Engineer in ChargeInstructions Make:- HP/DEII/IBM	0.2	Nos.		
4		Supply Installation Testing & Commissioning of User PC with Intel processor 7th Gen Intel Core tmi7,8GB RAM -4GBx2,2GB Grapics card 500GB HDD, OS widows 7 or better specs, as recommended by VMS Software , AS per specification & at site of work in line with Engineer in ChargeInstructions Make:- HP/DEII/IBM	0.2	Nos.		
5		Supply Installation Testing & Commissioning of 24 Port layer 2 POE , fully managed Gigega bit ,Energy efficient design switch 10/100 ,2 SFP port ,as per IEEE 802.1X switch with suitable size	2	Nos.		

Construction of Landscaping of Canal Area (Zone 3) in Dholera Special Investment Region, Dholera

SL.NO	SHORT DESCRIPTION	DESCRIPTION OF ITEMS	Zone 03 QTY	UNIT	Unit Rate	Total Amount
		rack and othr accessories. Make: HP/ CISCO/ D LINK				
6		Supply Installation Testing & Commissioning of 24 Port Layer 3 POE , fully managed Gigega bit ,Energy efficient design switch 10/100 ,2 SFP port ,as per IEEE 802.1X switch with suitable size rack and othr accessories. Make: HP/ CISCO/ D LINK	0.2	Nos.		
7		Supply Installation Testing & Commissioning of 40 Inch LED with HDMI / VGS Port with mounting kit and accessories as per engineer inchrage instructions. Make LG/ SONY/ SAMSUNG	1.8	Nos.		
8		Supply Installation Testing & Commissioning of 3X1.5 SQ. MM power cable. Make : Rallison / Polycab/ Finolex	1100	RM		
9		Supply Installation Testing & Commissioning of STP cat 6 cable. Make : D Link, Rallison, Schneider	4400	RM		
10		Supply Installation Testing & Commissioning of Optical Fiber Multi mode. Make : D Link/Schneider/ Molex/ Rallison	360	RM		
11		Supply Installation Testing & Commissioning of 5 KVA UPS. Make : APC/Emmersion	0.4	Nos.		
12		Supply Installation Testing & Commissioning of UPS DB with suitable no of MCB and should be mount in CCTV room for the UPS power circuit of CCTV System . The DB should included the cost of Earthing wire upto the nearset earthing points.	0.4	Nos.		

Construction of Landscaping of Canal Area (Zone 3) in Dholera Special Investment Region, Dholera

Canal Park Zone 03

SL.NO	SHORT DESCRIPTION	DESCRIPTION OF ITEMS	ZONE-3 QTY	UNIT	Unit Rate	Total Amount
	PAVERS					
1	P9 - KOT KASTA GRANITE					
1.01	Paving type P9 - 30mm thk Kot kasta granite Minimum size: 600 mm; Maximum size: 1200 mm Color: Yellow / Gold Finish: Leather Fixing: Butt in cement mortar 1:4	Providing and laying leather finish kota kasta Granite stone flooring in required design and patterns, in linear as well as curvilinear portions of the building all complete as per the architectural drawings with 30 mm thick stone slab over 20 mm (average) thick base of cement mortar 1:4 (1 cement : 4 coarse sand) laid and jointed with cement slurry and pointing with white cement slurry admixed with pigment of matching shade including rubbing, curing and polishing etc. all complete as specified and as directed by the Engineer-in-Charge : 30 mm thk Kota kasta granite	1,653	Sqm		
2	P15- SADARHALLI GRANITE					
2.01	Paving type P15 - Sadarhalli granite Size: 450(L) x 450(W) x 30(D) mm Color: White & Grey blend Finish: Shot blasted Fixing: Butt in cement mortar 1:4	Providing and laying sand blast finish Granite stone flooring in required design and patterns, in linear as well as curvilinear portions of the building all complete as per the architectural drawings with 30 mm thick stone slab over 20 mm (average) thick base of cement mortar 1:4 (1 cement : 4 coarse sand) laid and jointed with cement slurry and pointing with white cement slurry admixed with pigment of matching shade including rubbing, curing and polishing etc. all complete as specified and as directed by the Engineer-in-Charge : Sadarahali Granite	3,332	Sqm		
3	P16 - SERA GREY GRANITE					
3.01	Paving type P16 - Sera grey granite Size: 450(L) x 450(W) x 30(D) mm Color: White & Grey blend	Providing and laying sand blast finish Granite stone flooring in required design and patterns, in linear as	2,806	Sqm		

Construction of Landscaping of Canal Area (Zone 3) in Dholera Special Investment Region, Dholera

SL.NO	SHORT DESCRIPTION	DESCRIPTION OF ITEMS	ZONE-3 QTY	UNIT	Unit Rate	Total Amount
	naturalFinish: Shot blastedFixing: Butt in cement mortar 1:4	well as curvilinear portions of the building all complete as per the architectural drawings with 30 mm thick stone slab over 20 mm (average) thick base of cement mortar 1:4 (1 cement : 4 coarse sand) laid and jointed with cement slurry and pointing with white cement slurry admixed with pigment of matching shade including rubbing, curing and polishing etc. all complete as specified and as directed by the Engineer-in-Charge : Sera Grey Granite				
	EDGES					
4	E2 - EDGE TYPE - PIN KERB					
4.01	Pin Kerb E2 Size 300(L) x 150(W) x 300 (D) mm Finish : Smooth, grey Colour	Providing and laying at or near ground level factory made kerb stone of M-25 grade cement concrete with 25mm thk chamfer on the kerb free edge in position to the required line, level and curvature, jointed with cement mortar 1:3 (1 cement: 3 coarse sand), including making joints with or without grooves (thickness of joints except at sharp curve shall not to more than 5mm), including making drainage opening wherever required complete etc. as per direction of Engineer-in-charge (length of finished kerb edging shall be measured for payment). (Precast C.C. kerb stone shall be approved by Engineer-in-charge) E2 Kerb - Precast concrete kerb size 300(L) x 150(W) x 300(D)mm, finished smooth with grey colour	1,352	Rmt		
	BENCHES					
5	B5 - BENCH					
5.01	Concrete bench Size: Varies (L) x 720 (W) x 750 (D) mm Color: White Finish: Smooth, Polished Material: Terrazzo with coloured glass chips in white cement Refer to Engineer's details & specification	Concrete Bench Cast in situ - B5	148	Rmt		

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SL.NO	SHORT DESCRIPTION	DESCRIPTION OF ITEMS	ZONE-3 QTY	UNIT	Unit Rate	Total Amount
	WALLS					
6	W1C - WALL					
6.01	230mm thk wall	Brick work using common burnt clay building bricks having crushing strength not less than 35 kg./Sq.Cm. in foundation and plinth in Cement Mortar 1:5. (1- Cement : 5 -fine sand) (C) Fly Ash Bricks	72	cum		
6.02	Sadarhalli granite coping Size: 750(L) x 475(W) x 50(D) mm Finish: Leather Color: White & grey blended Mortar to match stone color	50 mm thick fine dressed stone flooring over 20 mm (average)thick base of cement mortar 1:5 (1 cement : 5 coarse sand), including pointing with cement mortar 1:2 (1 cement : 2 stone dust) with an admixture of pigment to match the shade of stone. Sadarahali granite- Leather	56	Sqm		
6.03	Granite cladding Size: Varies as per module (550x200mm; 400x200mm; 550x300mm; 400x300mm) Finish: Shot blasted Color: Cera grey Mortar to match stone color	Granite work (machine cut edges Veneer work) for wall lining upto 10 m height, backing filled with a grout of 12 mm thick cement mortar 1:3 (1 Cement : 3 coarse sand) and jointed with Cement mortar 1:2 (1 cement : 2 stone dust), including rubbing and polishing complete. Cera grey granite Cladding Size : various sizes Colour: cera Grey, Finish : Shotblasted	598	Sqm		
7	W2C - WALL SEATER					
7.01	370mm thk wall	Brick work using common burnt clay building bricks having crushing strength not less than 35 kg./Sq.Cm. in foundation and plinth in Cement Mortar 1:5. (1- Cement : 5 -fine sand) (C) Fly Ash Bricks	8	cum		
7.02	Sadarhalli granite coping Size: 750(L) x 475(W) x 50(D) mm Finish: Leather Color: White & grey blended Mortar to match stone color	50 mm thick fine dressed stone flooring over 20 mm (average)thick base of cement mortar 1:5 (1 cement : 5 coarse sand), including pointing with cement mortar 1:2 (1 cement : 2 stone dust) with an admixture of pigment to match the shade of stone. Sadarahali granite- Leather	9	Sqm		

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SL.NO	SHORT DESCRIPTION	DESCRIPTION OF ITEMS	ZONE-3 QTY	UNIT	Unit Rate	Total Amount
7.03	Granite cladding Size: Varies as per module (550x200mm; 400x200mm; 450x200mm; 550x150mm; 450x150mm) Finish: Shot blasted Color: Cera grey Mortar to match stone color	Granite work (machine cut edges Veneer work) for wall lining upto 10 m height, backing filled with a grout of 12 mm thick cement mortar 1:3 (1 Cement : 3 coarse sand) and jointed with Cement mortar 1:2 (1 cement : 2 stone dust), including rubbing and polishing complete. Cera grey granite Cladding Size : various sizes Colour: cera Grey, Finish : Shotblasted	21	Sqm		
7.04	Granite skirting Size: 600(L) x 150(W) x 50(D) mm Finish: Polished Color: Cera grey Mortar to match stone color	Stone slabs 50 mm thick in skirting, dado and pillars laid on 20 mm (average) thick cement mortar 1:4 (1 cement: 4 coarse sand) and jointed with grey cement slurry mixed with pigment to match the shade of the slabs, including rubbing and polishing complete. Granite Size - 600(L) x 150(W) x 50(D) mm, Finish: Polished Colour: Black	3	Sqm		
8	W4B - WALL WITH PLANTER					
8.01	230mm thk wall	Brick work using common burnt clay building bricks having crushing strength not less than 35 kg./Sq.Cm. in foundation and plinth in Cement Mortar 1:5. (1- Cement : 5 -fine sand) (C) Fly Ash Bricks	9	Cum		
8.02	Granite coping Size: 500/600(L) x 300(W) x 50(D) mm Finish: Leather Color: Black Mortar to match stone color	50 mm thick fine dressed stone flooring over 20 mm (average)thick base of cement mortar 1:5 (1 cement : 5 coarse sand), including pointing with cement mortar 1:2 (1 cement : 2 stone dust) with an admixture of pigment to match the shade of stone. Kadappa Granite stone - Leather	20	Sqm		
8.03	25mm thk Kota stone cladding Size: Varies as per module Finish: Honed Color: Grey Mortar to match stone color	Stone work (machine cut edges Veneer work) for wall lining upto 10 m height, backing filled with a grout of 12 mm thick cement mortar 1:3 (1 Cement : 3 coarse sand) and jointed with Cement mortar 1:2 (1 cement : 2 stone dust), including rubbing and polishing complete. Kota stone Cladding Size : various sizes Colour: Grey,	45	Sqm		

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SL.NO	SHORT DESCRIPTION	DESCRIPTION OF ITEMS	ZONE-3 QTY	UNIT	Unit Rate	Total Amount
		Finish : Honed				
9	W4C - WALL WITH PLANTER					
9.01	230mm thk wall	Brick work using common burnt clay building bricks having crushing strength not less than 35 kg./Sq.Cm. in foundation and plinth in Cement Mortar 1:5. (1- Cement : 5 -fine sand) (C) Fly Ash Bricks	153	Cum		
9.02	Sadarhalli granite copingSize: 500/600(L) x 300(W) x 50(D) mmFinish: LeatherColor: GreyMortar to match stone color	50 mm thick fine dressed stone flooring over 20 mm (average)thick base of cement mortar 1:5 (1 cement : 5 coarse sand), including pointing with cement mortar 1:2 (1 cement : 2 stone dust) with an admixture of pigment to match the shade of stone. Sadarahali granite- Leather	192	Sqm		
9.03	Cera granite cladding Size: Varies as per module Finish: Leather Color: Grey Mortar to match stone color	Granite work (machine cut edges Veneer work) for wall lining upto 10 m height, backing filled with a grout of 12 mm thick cement mortar 1:3 (1 Cement : 3 coarse sand) and jointed with Cement mortar 1:2 (1 cement : 2 stone dust), including rubbing and polishing complete. Cera grey granite Cladding Size : various sizes Colour: cera Grey, Finish : Leather	763	Sqm		
10	W6C - PLOT BOUNDARY WALL					
10.01	230mm thk wall	Brick work using common burnt clay building bricks having crushing strength not less than 35 kg./Sq.Cm. in foundation and plinth in Cement Mortar 1:5. (1- Cement : 5 -fine sand) (C) Fly Ash Bricks	139	Cum		
10.02	Sadarhalli granite coping Size: 50 mm thk Finish: Leather Color: Grey Mortar to match stone color	50 mm thick fine dressed stone flooring over 20 mm (average)thick base of cement mortar 1:5 (1 cement : 5 coarse sand), including pointing with cement mortar 1:2 (1 cement : 2 stone dust) with an admixture of pigment to match the shade of stone. Sadarahali granite- Leather	93	Sqm		
10.03	Cera granite cladding	Granite work (machine cut edges Veneer work) for wall		Sqm		

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SL.NO	SHORT DESCRIPTION	DESCRIPTION OF ITEMS	ZONE-3 QTY	UNIT	Unit Rate	Total Amount
	Size: Varies as per module (550x200mm; 400x200mm; 450x200mm; 550x150mm; 450x150mm); 20mm thk Finish: Leather Color: Grey Mortar to match stone color	lining upto 10 m height, backing filled with a grout of 12 mm thick cement mortar 1:3 (1 Cement : 3 coarse sand) and jointed with Cement mortar 1:2 (1 cement : 2 stone dust), including rubbing and polishing complete. Cera grey granite Cladding Size : various sizes Colour: cera Grey, Finish : Leather	524			
10.04	Plastering - 20mm thk cement mortar as per specification	Providing 20 mm. thick cement plaster in single coat on single or half brick wall for interior plastering upto floor two level finished even and smooth in [II] Cement mortar 1:4 (1 cement : 4 fine sand)	873	Sqm		
10.05	Textured paint over 20mm thk cement mortar as per specification	Finishing walls with textured exterior paint of required shade :New work (Two or more coats applied @ 3.28 ltr/10 sqm) over and including priming coat of exterior primer applied @ 2.20kg/10 sqm	873	Sqm		
	Furnitures					
11	Fixture					
11.01	Litter Bin Size : 0.75m (D) x 1.3m (H) Material : MS Colour : Graphite Grey (RAL 7024) Finish : Powder Coated	LT Litter Bin	15	Nos		
	RALINGS & Trellis					
11.02	RL1- Railing Size : 1.5m (W) x 0.9m (H)Material : Stainless SteelColour : Natural SteelFinish : Polished Details: i) HDG box section -Size:80 X 150 X 1500 mmii) HDG MS base plate-Size: 100 x 1500 mm wide-Finish: Powder coated-Color: Graphite grey (RAL 7024)-Bolted to MS casingiii) HDG MS plate-Size: 800 x 50 mm wide-Finish: Powder coated-Color: Graphite grey (RAL 7024)-Welded at top and bottomiv) Wire rope	Providing and fixing stainless steel (Grade 304) railing made of Hollow tubes, channels, plates etc., including welding, grinding, buffing, polishing and making curvature (wherever required) and fitting the same with necessary stainless steel nuts and bolts complete, i/c fixing the railing with necessary accessories & stainless steel dash fasteners , stainless steel bolts etc., of required size, on the top of the floor or the side of waist slab with suitable arrangement as per approval	32,823	Kg		

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SL.NO	SHORT DESCRIPTION	DESCRIPTION OF ITEMS	ZONE-3 QTY	UNIT	Unit Rate	Total Amount
	balustrade-Color: Graphite grey (RAL 7024)v) HDG MS base plate-Size: 200 x 200 mm wide- Finish: Powder coated-Color: Graphite grey (RAL 7024)-Bolted by HDG threaded rodsvi) HDG MS adjustment plate-Size: 200 x 200 mm wide-Finish: Powder coated-Color: Graphite grey (RAL 7024)-Welded at the box section belowvii) Acorn nuts on HDG threaded anchors at 135mm centers to the base plateviii) HDG MS casing; Size-75 x 150 x 1500mm; Finish: Powder coated-Color: Graphite grey (RAL 7024)-Edge to be rounded offix) 150mm thk RCC slab-Refer to Engineer's details & specification	of Engineer-in-charge, (for payment purpose only weight of stainless steel members shall be considered excluding fixing accessories such as nuts, bolts, fasteners etc.).				
11.03	Drinking water fountain Size : 0.35m (W) x 1.2m (H) Material : Stone or Concrete Colour : Natural Finish : Aggregate	Drinking Fountain	4	Nos		
12	TR3-Trellis structure 2 Size : VariesMaterial : Stainless Steel & Acrylic PanelsColour : Various Details: i) 10mm thk coloured plexi glass sheetii) 3mm thk HDG hollow MS beam; Size: Varies(L) x 50(W) x 50(D) mm; Color: Graphite grey (RAL 7024)Finish: Powder coated; Bolted to the HDG MS beamiii) 3mm thk HDG hollow MS beam; Size: Varies(L) x 150(W) x 150(D) mm; Color: Graphite grey (RAL 7024); Finish: Powder coated; Bolted to the HDG MS columniv) 5mm thk HDG hollow MS column; Size: 150(L) x 200(W) x 4000(D) mm; Color: Graphite grey (RAL 7024); Finish: Powder coated; Bolted to RC structure belowv) 3mm thk HDG MS C section channel; Size: Varies(L) x 150(W) x 50(D) mm; Color: Graphite grey (RAL 7024); Finish: Powder coated; Bolted to RC structure belowvi) Anchors		1	Kg		

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SL.NO	SHORT DESCRIPTION	DESCRIPTION OF ITEMS	ZONE-3 QTY	UNIT	Unit Rate	Total Amount
	to bolt the column to RCC basevii) Base plate to fix column to pedestal as per structural consultantviii) Bitumen fill as per Engineer's specification					
12.01	MS works	"Hot Dip Galvanized Structural steel work in riveted, bolted or welded in built up sections, trusses and framed work including supplying, fabricating, cutting, assembling, hoisting and fixing in position at all heights of all shapes and size with all leads and lifts as per latest IS 4923, IS 1161, IS 806 for the work for Bridges It should be including necessary rolled joists, channels, angles, tees, flats, angle cleats, gusset plates, position hip and jack lifters, purlins, RHS, SHS, CHS, tension cable etc. including cutting and welding the members as per detailed drawing and design. The rate shall include 1 coat of Zinc chromate primer and 2 coat of Approved Enamel Paint to over all the surfaces of the steel sections or as specified in the drawing. (Only standard measurements will be paid for as actual cut length used at site). Rate shall be inclusive of cutting, wastage, welding, bending (shop at site), fixing as per profile, bolting wherever necessary, in position welding of required length, grinding, finishing edges, filling the welded spots with metal putty. It should also include the cost of approved ISI make and size zinc coated nut-bolt and Anchor fasteners of Hilti or Fisher as approved by engineer-in-charge"	81,065	Kg		
12.02	Plexi Glass	"Supply and fixing of Plexi glass of approved quality of and approved size connected to the MS structure with appropriate fixing system like as nut & bolt or any as per the approved drawings or as directed by Engineer - Incharge. The rate is inclusive of the material, labour, lead , lift, line, level, proper finishe as approved by Engineer-In charge."	1,584	Sqm		

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SL.NO	SHORT DESCRIPTION	DESCRIPTION OF ITEMS	ZONE-3 QTY	UNIT	Unit Rate	Total Amount
13	TP1 - Tree grate Size : 1.5M (L) x 1.5m (W) Colour : Natural Finish : Matte		20	Nos		
	SIGNAGES AND ART WORKS					
14	WS1 - Entrance wall Signage Size: 6000(L) x 200(W) x 1100(H) mm Material : Concrete, MS Sheet & Stainless Steel Colour : Refer to DWG GFC-ZN-L-5201 Finish : Smooth (concrete) & Powder Coated (steel)	WS1 - Entrance wall Signage	4	Nos		
15	SG1 - Identification signage Size : 0.5m (W) x 1.8m (H) Material : Aluminum Panels Colour : Refer to DWG GFC-ZN-L-5205 Finish : Powder Coated	SG1 Identification Signage - Size 300x 1800 x 60 mm & 300 x 1200 x 60mm , 6mm thk aluminium powder coated panel	1	Nos		
16	SG2 - Building signage Size : Varies (W) x 0.6m (H) Material : Aluminum Panels Colour : Refer to DWG GFC-ZN-L-5206 Finish : Powder Coated		1	Nos		
17	SG3 - Directional signage Size: 950(L) x 200(W) x 2400(D) mm Material : Aluminum Panels Colour : Refer to DWG GFC-ZN-L-5205 Finish : Powder Coated	SG3 Directional Signage - Size 900x 2400x 200 mm , 2.5mm thk aluminium powder coated panel	2	Nos		
18	SG4 - Entry/Exit signage		1	Nos		
19	SG5 - Interpretative signage			Nos		

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SL.NO	SHORT DESCRIPTION	DESCRIPTION OF ITEMS	ZONE-3 QTY	UNIT	Unit Rate	Total Amount
	Size: 700(L) x 900(W) x 1200(D) mm Material : Aluminum Panels Colour : Refer to DWG GFC-ZN-L-5205 Finish : Powder Coated		3			
20	SG6 - Information map signage Size: 625(L) x 200(W) x 1800(D) mm Material : Aluminum Panel Colour : Refer to DWG GFC-ZN-L-5205 Finish : Powder Coated		3	Nos		
21	Artwork					
21.01	AW3.1 - HEXAGONAL SCULPTURES (COLOURED) Size : 1.5 - 2m (D) x 1m (H) Material : Coloured , Acrylic, SS Frame & Lights Colour : Pastel Shades Finish : Frosted & Glossy		1	Nos		
21.02	AW3.2 - HEXAGONAL SCULPTURES (WHITE) Size : 1.5 - 2m (D) x 1m (H) Material : Sheets or Acrylic Colour : White Finish : Frosted		6	Nos		
	SOFTSCAPE					
22	trees					
22.01	Alstonia scholaris, As		41	Nos		
22.02	Mimusops elengi, Me		11	Nos		
22.03	Pongamia pinnata, Ppi		20	Nos		
22.04	Acacia nilotica, An		7	Nos		
22.05	Acacia leucophloea, Ale			Nos		

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SL.NO	SHORT DESCRIPTION	DESCRIPTION OF ITEMS	ZONE-3 QTY	UNIT	Unit Rate	Total Amount
22.06	Ficus benjamina , Fb		10	Nos		
22.07	Ficus virens, Fv		1	Nos		
22.08	Albizzia lebbeck, Al		1	Nos		
22.09	Delonix elata, De		8	Nos		
22.10	Ficus religiosa, Fr		5	Nos		
	Palm list					
22.11	Phoenix sylvestris, Ps		1	Nos		
23	Shrubs					
23.1	Adhatoda vasica	Adhatoda vasica	318	Sqm		
23.2	Tabernaemontana coronaria	Tabernaemontana coronaria	251	Sqm		
23.3	Ficus longisland	Ficus longisland	688	Sqm		
23.4	Jasminum angustifolium	Jasminum angustifolium	318	Sqm		
23.5	Zephyranthes candida	Zephyranthes candida	331	Sqm		
23.6	Zephyranthes rosea	Zephyranthes rosea	72	Sqm		
C	Planting Soil					
1.00	Sweet Soil		891	Cum		
	Tree Protections works		1	LS		

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SL.NO	SHORT DESCRIPTION	DESCRIPTION OF ITEMS	ZONE-3 QTY	UNIT	Unit Rate	Total Amount
	Land Fill and Realted Items					
	Clearing and grubbing park land in an area of light jungle by mechanical means including uprooting rank vegetation, grass, bushes, shrubs, saplings and trees girth up to 300 mm, removal of stumps of trees cut earlier and disposal of unserviceable materials and stacking of serviceable material to be used or auctioned, up to a lead of 1000 metres including removal and disposal of top organic soil not exceeding 150 mm in thickness as per Technical specifications and as directed by the Engineer-in-charge.		0.10	Hec		
	Construction of embankment with approved material obtained from borrow pits with all lifts and leads, transporting to site, spreading, grading to required slope and compacting to meet requirement of Technical specifications and as directed by the Engineer-in-charge.		2,527	Cum		
	Construction of sub-grade and earthen shoulders with approved material obtained from borrow pits with all lifts & leads, transporting to site, spreading, grading to required slope and compacted to meet requirement as per Technical specifications and as directed by the Engineer-in-charge.		3,900	Cum		

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Canal Park- Benches

SL.NO	SHORT DESCRIPTION	DESCRIPTION OF ITEMS	Zone-03 QTY.	UNIT	Unit Rate	Total Amount
A.	GENERAL NOTES					
I	All costs to be inclusive of :					
II	Labour, material, tools, tackles etc.					
III	Labour camp, equipment storage and security					
IV	Water & electricity for construction & water for drinking purpose.					
V	Setting out of works, levels, including the provision and erection of permanent setting out marks as directed by the Engineer from time to time. All setting out marks are to be clearly visible and fixed to immovable objects. All resources required in order to perform the above mentioned work.					
VI	All costs to be inclusive of provision, maintenance and removal of all temporary works after completion & handing over of site.					
VII	All arrangements for electricity & water to be arranged by contractor at his own costs.					
1.0	EARTH WORK					
1		Excavation for foundation upto 1.5m depth including sorting out and stacking of useful materials and disposing of the excavated stuff upto 50 metre lead. (A) Loose or soft soil :				
I		Excavating soil < 1.5 m	86.27	CuM		
II		Excavating soil > 1.5 m-3.0 m	1	CuM		
III		Excavating Soil >3.0-4.5 m	1	CuM		
1.2		Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers as directed including consolidating each deposited layer by ramming and watering etc complete	18.54	CuM		
		Add extra for disposing off the excavated stuff for lead of 400m to 500m	67.73	CuM		

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SL.NO	SHORT DESCRIPTION	DESCRIPTION OF ITEMS	Zone-03 QTY.	UNIT	Unit Rate	Total Amount
		Within lead up to 500 M				
		TOTAL EARTHWORK				
2.0	SUB-HEAD - PLAIN / REINFORCED CEMENT CONCRETE WORK					
		PLAIN / REINFORCED CEMENT CONCRETE WORK - PROVIDING AND PLACING CONCRETE WORK INCLUDING COST OF LABOUR, MATERIALS AND EQUIPMENT FOR HANDLING, TRANSPORTATION, BATCHING, MIXING, PLACING, VIBRATING AND CURING, (EXCLUDING COST OF CENTERING, SHUTTERING AND REINFORCEMENT) COMPLETE AS PER DRAWING AND SPECIFICATIONS UNLESS SPECIFIED.				
		Supplying, Casting, vibrating and curing as per specifications. Approved additives and admixtures. Incurred costs on Concrete Mix Designs, Sample taking, testing and providing test results certificates, storing and saving of samples, and preparation of bar bending schedules and workshops.				
		1. In case of supply and pouring of concrete, civil contractor shall use batching plants, transit mixers and concrete pumps with boom placer equipment (if required) etc for all major concreting works and the rate shall include the provision for the same.				
		2. All reinforced concrete shall be done using super-plasticiser as per manufacturer's instruction and as directed by Site Engineer/ Consultant.				
		Note: 1) Cement for all concrete works shall be Portland puzzolana cement (fly ash based) conforming to IS: 1489 with minimum 15% of fly-ash. It can be Portland slag cement conforming to is: 455 or sulphate resisting Portland cement conforming to IS: 12330 or high alumina cement conforming to is: 6452 without any extra cost as directed by the Site				

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SL.NO	SHORT DESCRIPTION	DESCRIPTION OF ITEMS	Zone-03 QTY.	UNIT	Unit Rate	Total Amount
		Engineer/Consultant. 2) The consumption of cement (per cum. of concrete) shall be as per recommended/approved concrete design mix subject to minimum requirement of IS 456 Specifications/ Approved drawing (whichever is higher). However no extra claim shall be entertained on account of excess cement consumption as per the actual design mix to achieve required target strength & other parameters.				
2.1		Providing & laying in position plain cement concrete of specified grade in raft, bases of column footing, Brick walls footing, base of floor, as screed over areas to make up levels or to form slopes, laid to required levels and grade at all locations, consolidated finished fair and cured including side forms as required complete in all respects.				
2.1.1		Providing and Laying CC 1:2:4 (1 cement :2 coarse sand : 4 graded stone aggregate 20mm nominal size) and curing complete excluding cost of form work .	20.16	CuM		
	DESIGN MIX					
2.2		Providing and laying in position machine mixed and machine vibrated Design Mix cement concrete conforming to IS:456 & IS 10262-2009 for reinforced concrete works with coarse sand and graded hard stone aggregate of 20mm nominal size in superstructure at any level above finished floor level, any shape, position or thickness etc complete including use of plasticizers/ superplasticizer conforming to IS:9103 (latest) to achieve required slump in concrete all complete as per specification & drawing for the following grade (Rate of formwork to be excluded)				
2.2.1		M25 in column (foundation)	1	CuM		
2.2.2		M25 in Footing	47.57	CuM		

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SL.NO	SHORT DESCRIPTION	DESCRIPTION OF ITEMS	Zone-03 QTY.	UNIT	Unit Rate	Total Amount
2.2.3		M25 in Slabs, Beams, Columns (Superstructure)				
		Fair faced finish (exposed concrete in super structure) for reinforced concrete works of grade M-25 Grade in Columns and piers of any shape and profile, Walls, Beams, lintels, ties, brackets, ribs, gutter beams, plinth beams, pergola beams, shear walls, string courses, Slabs, suspended slabs, floor and roof projections, canopies, chajjas, landing slabs, planting box bottoms, copings, sills, and such other elements . Important: 12 mm square groove , bolt holes to be made as per the drawing details.	29.33	CuM		
		TOTAL RCC/PCC				
3.0	SUB-HEAD - SHUTTERING					
		Providing, fixing and removing form work at any elevations for all structures, as per specifications and including all labour, material, scaffoldings and centering complete including pockets etc. complete as per drawing, specifications and as per direction of engineer in charge for the following.				
3.1		Providing formwork of ordinary timber plankings so as to give a rough finish including centering,shuttering, strutting and propping etc. Height of propping and centering below supporting floor to ceiling not exceeding 4 m and removal of the same for concrete and plain concrete works.				
3.1.1		Shuttering for Columns, foundation, beams , slabs and other R.C.C works	201.32	Sqm		
3.1.2		Extra for providing form work with sheating of steel sheets so as to give a fair finish (For all items under NBO No. 3.1 above)	510.09	Sqm		
		TOTAL SHUTTERING				
4.0	SUB-HEAD – STEEL REINFORCEMENT					
4.1		Supply, fabrication, hoisting and placing in position HYSD reinforcement bars conforming to IS 1786 - Latest Edition Grade FE 500 as per detailed drawing	8.46	M.T.		

Construction of Landscaping of Canal Area (Zone 3) in Dholera Special Investment Region, Dholera

SL.NO	SHORT DESCRIPTION	DESCRIPTION OF ITEMS	Zone-03 QTY.	UNIT	Unit Rate	Total Amount
		and specifications including cutting, bending and tying with 18 SWG binding wire complete. The rates shall be applicable for all heights and depths. Payment shall be made as per reinforcement drawings and with theoretical weights only including all authorized laps and hooks. Unauthorized chairs, spacers and laps will not be measured and paid for. (For all heights & diameters)				
		TOTAL STEEL REINFORCEMENT				

Construction of Landscaping of Canal Area (Zone 3) in Dholera Special Investment Region, Dholera

Canal Park - Deck

SL.NO	SHORT DESCRIPTION	DESCRIPTION OF ITEMS	Zone-03 QTY.	UNIT	Unit Rate	Total Amount
			AC			
A.	GENERAL NOTES					
I	All costs to be inclusive of :					
II	Labour, material, tools, tackles etc.					
III	Labour camp, equipment storage and security					
IV	Water & electricity for construction & water for drinking purpose.					
V	Setting out of works, levels, including the provision and erection of permanent setting out marks as directed by the Engineer from time to time. All setting out marks are to be clearly visible and fixed to immovable objects. All resources required in order to perform the above mentioned work.					
VI	All costs to be inclusive of provision, maintenance and removal of all temporary works after completion & handing over of site.					
VII	All arrangements for electricity & water to be arranged by contractor at his own costs.					
1.0	EARTH WORK					
1		Excavation for foundation upto 1.5m depth including sorting out and stacking of useful materials and disposing of the excavated stuff upto 50 metre lead. (A) Loose or soft soil :				
I		Excavating soil < 1.5 m	2197.12875	CuM		
II		Excavating soil > 1.5 m-3.0 m	1611.22775	CuM		
III		Excavating Soil >3.0-4.5 m		CuM		
1.2		Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers as directed including consolidating each deposited layer by ramming and watering etc complete	1606.11525	CuM		
		Add extra for disposing off the excavated stuff for lead	1	CuM		

Construction of Landscaping of Canal Area (Zone 3) in Dholera Special Investment Region, Dholera

SL.NO	SHORT DESCRIPTION	DESCRIPTION OF ITEMS	Zone-03 QTY.	UNIT	Unit Rate	Total Amount
		of 400m to 500m				
		Within lead up to 500 M				
1.3		Providing, diluting and injecting chemical emulsion chlorophyriphos/ Lindane 20 % emulsifiable concentrates 1 % as per IS: 6313 (Part -II) : 2001 for pre constructional anti -termite treatment and creating a continuous chemical barrier under and around the column pits, wall trenches, basements excavation, top surface of plinth filling, junction of wall and floor along the external perimeter of the building, expansion joints over the top surface of consolidated earth on which apron is to be laid, surroundings of pipes and conduits etc. complete as per specifications. The work shall be carried out by approved agency. Plinth area of building at ground floor only shall be measured for payment.				
1.3.1		Chlorpyriphos / Lindane emulsifiable concentrate 20% with 1% concentration.	9819.99294	Cum		
		TOTAL EARTHWORK				
2.0	SUB-HEAD - PLAIN / REINFORCED CEMENT CONCRETE WORK					
		PLAIN / REINFORCED CEMENT CONCRETE WORK - PROVIDING AND PLACING CONCRETE WORK INCLUDING COST OF LABOUR, MATERIALS AND EQUIPMENT FOR HANDLING, TRANSPORTATION, BATCHING, MIXING, PLACING, VIBRATING AND CURING, (EXCLUDING COST OF CENTERING, SHUTTERING AND REINFORCEMENT) COMPLETE AS PER DRAWING AND SPECIFICATIONS UNLESS SPECIFIED.				
		Supplying, Casting, vibrating and curing as per specifications. Approved additives and admixtures. Incurred costs on Concrete Mix Designs, Sample taking, testing and providing test results certificates, storing and saving of samples, and preparation of bar bending schedules and workshops.				

Construction of Landscaping of Canal Area (Zone 3) in Dholera Special Investment Region, Dholera

SL.NO	SHORT DESCRIPTION	DESCRIPTION OF ITEMS	Zone-03 QTY.	UNIT	Unit Rate	Total Amount
		1. In case of supply and pouring of concrete, civil contractor shall use batching plants, transit mixers and concrete pumps with boom placer equipment (if required) etc for all major concreting works and the rate shall include the provision for the same.				
		2. All reinforced concrete shall be done using super-plasticiser as per manufacturer's instruction and as directed by Site Engineer/ Consultant.				
		Note: 1) Cement for all concrete works shall be Portland puzzolana cement (fly ash based) confirming to IS: 1489 with minimum 15% of fly-ash. It can be Portland slag cement conforming to is: 455 or sulphate resisting Portland cement conforming to IS: 12330 or high alumina cement conforming to is: 6452 without any extra cost as directed by the Site Engineer/Consultant. 2) The consumption of cement (per cum. of concrete) shall be as per recommended/approved concrete design mix subject to minimum requirement of IS 456 Specifications/ Approved drawing (whichever is higher). However no extra claim shall be entertained on account of excess cement consumption as per the actual design mix to achieve required target strength & other parameters.				
2.1		Providing and laying in position machine mixed and machine vibrated Design Mix cement concrete conforming to IS:456 & IS 10262-2009 for reinforced concrete works with coarse sand and graded hard stone aggregate of 20mm nominal size in superstructure at any level above finished floor level, any shape, position or thickness etc complete including use of plasticizers/ superplasticizer conforming to IS:9103 (latest) to achieve required slump in concrete all complete as per specification & drawing for the following grade (Rate of formwork to be excluded)				
2.1.1		M25 in column (foundation)	1	CuM		

Construction of Landscaping of Canal Area (Zone 3) in Dholera Special Investment Region, Dholera

SL.NO	SHORT DESCRIPTION	DESCRIPTION OF ITEMS	Zone-03 QTY.	UNIT	Unit Rate	Total Amount
2.1.2		M25 in Footing	374.79	CuM		
2.1.3		M25 in Slabs, Beams, Columns (Superstructure)	433.15	CuM		
		TOTAL RCC/PCC				
3.0	SUB-HEAD - SHUTTERING					
		Providing, fixing and removing form work at any elevations for all structures, as per specifications and including all labour, material, scaffoldings and centering complete including pockets etc. complete as per drawing, specifications and as per direction of engineer in charge for the following.				
3.1		Providing formwork of ordinary timber plankings so as to give a rough finish including centering, shuttering, strutting and propping etc. Height of propping and centering below supporting floor to ceiling not exceeding 4 m and removal of the same for concrete and plain concrete works.				
3.1.1		Shuttering for Columns, foundation, beams , slabs and other R.C.C works	5516.48	Sqm		
3.1.2		Extra for providing form work with sheating of steel sheets so as to give a fair finish (For all items under NBO No. 3.1 above)		Sqm		
		TOTAL SHUTTERING				
4.0	SUB-HEAD – STEEL REINFORCEMENT					
4.1		Supply, fabrication, hoisting and placing in position HYSD reinforcement bars conforming to IS 1786 - Latest Edition Grade FE 500 as per detailed drawing and specifications including cutting, bending and tying with 18 SWG binding wire complete. The rates shall be applicable for all heights and depths. Payment shall be made as per reinforcement drawings and with theoretical weights only including all authorized laps and hooks. Unauthorized chairs, spacers and laps will not be measured and paid for. (For all heights & diameters)	88.87	M.T.		
		TOTAL STEEL REINFORCEMENT				

Construction of Landscaping of Canal Area (Zone 3) in Dholera Special Investment Region, Dholera

Canal Park – Edges

SL.NO	SHORT DESCRIPTION	DESCRIPTION OF ITEMS	Zone-03 QTY.	UNIT	Unit Rate	Total Amount
			AC			
A.	GENERAL NOTES					
I	All costs to be inclusive of :					
II	Labour, material, tools, tackles etc.					
III	Labour camp, equipment storage and security					
IV	Water & electricity for construction & water for drinking purpose.					
V	Setting out of works, levels, including the provision and erection of permanent setting out marks as directed by the Engineer from time to time. All setting out marks are to be clearly visible and fixed to immovable objects. All resources required in order to perform the above mentioned work.					
VI	All costs to be inclusive of provision, maintenance and removal of all temporary works after completion & handing over of site.					
VII	All arrangements for electricity & water to be arranged by contractor at his own costs.					
1.0	EARTH WORK					
1		Excavation for foundation upto 1.5m depth including sorting out and stacking of useful materials and disposing of the excavated stuff upto 50 metre lead. (A) Loose or soft soil :				
I		Excavating soil < 1.5 m	709.83	CuM		
II		Excavating soil > 1.5 m-3.0 m	1	CuM		
III		Excavating soil > 3.0 m-4.5 m	1	CuM		
1.2		Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers as directed including consolidating each deposited layer by ramming and watering etc complete	395.48	CuM		
		Add extra for disposing off the excavated stuff for lead of 400m to 500m	314.35	CuM		

Construction of Landscaping of Canal Area (Zone 3) in Dholera Special Investment Region, Dholera

SL.NO	SHORT DESCRIPTION	DESCRIPTION OF ITEMS	Zone-03 QTY.	UNIT	Unit Rate	Total Amount
		Within lead up to 500 M				
1.3		Providing, diluting and injecting chemical emulsion chlorophyriphos/ Lindane 20 % emulsifiable concentrates 1 % as per IS: 6313 (Part - II) : 2001 for pre constructional anti -termite treatment and creating a continuous chemical barrier under and around the column pits, wall trenches, basements excavation, top surface of plinth filling, junction of wall and floor along the external perimeter of the building, expansion joints over the top surface of consolidated earth on which apron is to be laid, surroundings of pipes and conduits etc. complete as per specifications. The work shall be carried out by approved agency. Plinth area of building at ground floor only shall be measured for payment.				
		Chlorpyriphos / Lindane emulsifiable concentrate 20% with 1% concentration.	1	CuM		
		TOTAL EARTHWORK				
2.0	SUB-HEAD - PLAIN / REINFORCED CEMENT CONCRETE WORK					
		PLAIN / REINFORCED CEMENT CONCRETE WORK - PROVIDING AND PLACING CONCRETE WORK INCLUDING COST OF LABOUR, MATERIALS AND EQUIPMENT FOR HANDLING, TRANSPORTATION, BATCHING, MIXING, PLACING, VIBRATING AND CURING, (EXCLUDING COST OF CENTERING, SHUTTERING AND REINFORCEMENT) COMPLETE AS PER DRAWING AND SPECIFICATIONS UNLESS SPECIFIED.				
		Supplying, Casting, vibrating and curing as per specifications. Approved additives and admixtures. Incurred costs on Concrete Mix Designs, Sample taking, testing and providing test results certificates, storing and saving of samples, and preparation of bar bending schedules and workshops.				
		1. In case of supply and pouring of concrete, civil contractor shall use batching plants, transit mixers and concrete pumps with boom placer equipment (if required) etc for all major concreting works and the rate shall include the provision for the same.				
		2. All reinforced concrete shall be done using super-plasticiser as				

Construction of Landscaping of Canal Area (Zone 3) in Dholera Special Investment Region, Dholera

SL.NO	SHORT DESCRIPTION	DESCRIPTION OF ITEMS	Zone-03 QTY.	UNIT	Unit Rate	Total Amount
		per manufacturer's instruction and as directed by Site Engineer/ Consultant.				
		Note:1) Cement for all concrete works shall be Portland puzzolana cement (fly ash based) confirming to IS: 1489 with minimum 15% of fly-ash. It can be Portland slag cement conforming to is: 455 or sulphate resisting Portland cement conforming to IS: 12330 or high alumina cement conforming to is: 6452 without any extra cost as directed by the Site Engineer/Consultant.2) The consumption of cement (per cum. of concrete) shall be as per recommended/approved concrete design mix subject to minimum requirement of IS 456 Specifications/ Approved drawing (whichever is higher).However no extra claim shall be entertained on account of excess cement consumption as per the actual design mix to achieve required target strength & other parameters.				
2.1		Providing & laying in position plain cement concrete of specified grade in raft, bases of column footing, Brick walls footing, base of floor, as screed over areas to make up levels or to form slopes, laid to required levels and grade at all locations, consolidated finished fair and cured including side forms as required complete in all respects.				
2.1.1		Providing and Laying CC 1:2:4 (1 cement :2 coarse sand : 4 graded stone aggregate 20mm nominal size) and curing complete excluding cost of form work .	10.14	CuM		
	DESIGN MIX					
2.2		Providing and laying in position machine mixed and machine vibrated Design Mix cement concrete conforming to IS:456 & IS 10262-2009 for reinforced concrete works with coarse sand and graded hard stone aggregate of 20mm nominal size in superstructure at any level above finished floor level, any shape, position or thickness etc complete including use of plasticizers/ superplasticizer conforming to IS:9103 (latest) to achieve required slump in concrete all complete as per specification & drawing for the following grade (Rate of formwork to be excluded)				
2.2.1		M25 in column (foundation)	60.84	CuM		
2.2.2		M25 in Footing	243.37	CuM		
2.2.3		M25 in Slabs, Beams, Columns (Superstructure)	1	CuM		

Construction of Landscaping of Canal Area (Zone 3) in Dholera Special Investment Region, Dholera

SL.NO	SHORT DESCRIPTION	DESCRIPTION OF ITEMS	Zone-03 QTY.	UNIT	Unit Rate	Total Amount
		TOTAL RCC/PCC				
3.0	SUB-HEAD - SHUTTERING					
		Providing, fixing and removing form work at any elevations for all structures, as per specifications and including all labour, material, scaffoldings and centering complete including pockets etc. complete as per drawing, specifications and as per direction of engineer in charge for the following.				
3.1		Providing formwork of ordinary timber plankings so as to give a rough finish including centering,shuttering, strutting and propping etc. Height of propping and centering below supporting floor to ceiling not exceeding 4 m and removal of the same for concrete and plain concrete works.				
3.1.1		Shuttering for Columns, foundation, beams , slabs and other R.C.C works	1622.91	Sqm		
3.1.2		Extra for providing form work with sheating of steel sheets so as to give a fair finish (For all items under NBO No. 3.1 above)	1	Sqm		
		TOTAL SHUTTERING				
4.0	SUB-HEAD – STEEL REINFORCEMENT					
4.1		Supply, fabrication, hoisting and placing in position HYSD reinforcement bars conforming to IS 1786 - Latest Edition Grade FE 500 as per detailed drawing and specifications including cutting, bending and tying with 18 SWG binding wire complete. The rates shall be applicable for all heights and depths. Payment shall be made as per reinforcement drawings and with theoretical weights only including all authorized laps and hooks. Unauthorized chairs, spacers and laps will not be measured and paid for. (For all heights & diameters)	33.46	M.T.		
		TOTAL STEEL REINFORCEMENT				

Construction of Landscaping of Canal Area (Zone 3) in Dholera Special Investment Region, Dholera

Canal Park – Pavers

SL.NO	SHORT DESCRIPTION	DESCRIPTION OF ITEMS	Zone-03 QTY.	UNIT	Unit Rate	Total Amount
A.	GENERAL NOTES					
I	All costs to be inclusive of :					
II	Labour, material, tools, tackles etc.					
III	Labour camp, equipment storage and security					
IV	Water & electricity for construction & water for drinking purpose.					
V	Setting out of works, levels, including the provision and erection of permanent setting out marks as directed by the Engineer from time to time. All setting out marks are to be clearly visible and fixed to immovable objects. All resources required in order to perform the above mentioned work.					
VI	All costs to be inclusive of provision, maintenance and removal of all temporary works after completion & handing over of site.					
VII	All arrangements for electricity & water to be arranged by contractor at his own costs.					
1.0	EARTH WORK					
1		Excavation for foundation upto 1.5m depth including sorting out and stacking of useful materials and disposing of the excavated stuff upto 50 metre lead. (A) Loose or soft soil :				
I		Excavating soil < 1.5 m	2717.73	CuM		
II		Excavating soil > 1.5 m-3.0 m	1	CuM		
III		Excavating soil > 3.0 m-4.5 m	1	CuM		
1.2		Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers as directed including consolidating each deposited layer by ramming and watering etc complete	1	CuM		
		Add extra for disposing off the excavated stuff for lead of 400m to 500m	2717.73	CuM		
		Within lead up to 500 M				

Construction of Landscaping of Canal Area (Zone 3) in Dholera Special Investment Region, Dholera

SL.NO	SHORT DESCRIPTION	DESCRIPTION OF ITEMS	Zone-03 QTY.	UNIT	Unit Rate	Total Amount
1.3		Providing, diluting and injecting chemical emulsion chlorophyriphos/ Lindane 20 % emulsifiable concentrates 1 % as per IS: 6313 (Part -II) : 2001 for pre constructional anti -termite treatment and creating a continuous chemical barrier under and around the column pits, wall trenches, basements excavation, top surface of plinth filling, junction of wall and floor along the external perimeter of the building, expansion joints over the top surface of consolidated earth on which apron is to be laid, surroundings of pipes and conduits etc. complete as per specifications. The work shall be carried out by approved agency. Plinth area of building at ground floor only shall be measured for payment.				
		Chlorpyriphos / Lindane emulsifiable concentrate 20% with 1% concentration.	7247.28	CuM		
		TOTAL EARTHWORK				
2.0	SUB-HEAD - PLAIN / REINFORCED CEMENT CONCRETE WORK					
		PLAIN / REINFORCED CEMENT CONCRETE WORK - PROVIDING AND PLACING CONCRETE WORK INCLUDING COST OF LABOUR, MATERIALS AND EQUIPMENT FOR HANDLING, TRANSPORTATION, BATCHING, MIXING, PLACING, VIBRATING AND CURING, (EXCLUDING COST OF CENTERING, SHUTTERING AND REINFORCEMENT) COMPLETE AS PER DRAWING AND SPECIFICATIONS UNLESS SPECIFIED.				
		Supplying, Casting, vibrating and curing as per specifications. Approved additives and admixtures. Incurred costs on Concrete Mix Designs, Sample taking, testing and providing test results certificates, storing and saving of samples, and preparation of bar bending schedules and workshops.				
		1. In case of supply and pouring of concrete, civil contractor shall use batching plants, transit mixers and concrete pumps with boom placer equipment (if required) etc for all major concreting works and the rate shall include the provision for the same.				
		2. All reinforced concrete shall be done using super-plasticiser as per manufacturer's instruction and as directed by Site Engineer/				

Construction of Landscaping of Canal Area (Zone 3) in Dholera Special Investment Region, Dholera

SL.NO	SHORT DESCRIPTION	DESCRIPTION OF ITEMS	Zone-03 QTY.	UNIT	Unit Rate	Total Amount
		Consultant.				
		Note: 1) Cement for all concrete works shall be Portland puzzolana cement (fly ash based) confirming to IS: 1489 with minimum 15% of fly-ash. It can be Portland slag cement conforming to is: 455 or sulphate resisting Portland cement conforming to IS: 12330 or high alumina cement conforming to is: 6452 without any extra cost as directed by the Site Engineer/Consultant. 2) The consumption of cement (per cum. of concrete) shall be as per recommended/approved concrete design mix subject to minimum requirement of IS 456 Specifications/ Approved drawing (whichever is higher). However no extra claim shall be entertained on account of excess cement consumption as per the actual design mix to achieve required target strength & other parameters.				
2.1		Providing & laying in position plain cement concrete of specified grade in raft, bases of column footing, Brick walls footing, base of floor, as screed over areas to make up levels or to form slopes, laid to required levels and grade at all locations, consolidated finished fair and cured including side forms as required complete in all respects.				
2.1.1		Providing and Laying CC 1:2:4 (1 cement :2 coarse sand : 4 graded stone aggregate 20mm nominal size) and curing complete excluding cost of form work .	543.55	CuM		
	DESIGN MIX					
2.2		Providing and laying in position machine mixed and machine vibrated Design Mix cement concrete conforming to IS:456 & IS 10262-2009 for reinforced concrete works with coarse sand and graded hard stone aggregate of 20mm nominal size in superstructure at any level above finished floor level, any shape, position or thickness etc complete including use of plasticizers/ superplasticizer conforming to IS:9103 (latest) to achieve required slump in concrete all complete as per specification & drawing for the following grade (Rate of formwork to be excluded)				
2.2.1		M25 in column (foundation)	1	CuM		
2.2.2		M25 in Footing	1	CuM		

Construction of Landscaping of Canal Area (Zone 3) in Dholera Special Investment Region, Dholera

SL.NO	SHORT DESCRIPTION	DESCRIPTION OF ITEMS	Zone-03 QTY.	UNIT	Unit Rate	Total Amount
2.2.3		M25 in Slabs, Beams, Columns (Superstructure)	1087.09	CuM		
		TOTAL RCC/PCC				
3.0	SUB-HEAD – STEEL REINFORCEMENT					
3.1		Supply, fabrication, hoisting and placing in position HYSD reinforcement bars conforming to IS 1786 - Latest Edition Grade FE 500 as per detailed drawing and specifications including cutting, bending and tying with 18 SWG binding wire complete. The rates shall be applicable for all heights and depths. Payment shall be made as per reinforcement drawings and with theoretical weights only including all authorized laps and hooks. Unauthorized chairs, spacers and laps will not be measured and paid for. (For all heights & diameters)	65.23	M.T.		
		TOTAL STEEL REINFORCEMENT				

Construction of Landscaping of Canal Area (Zone 3) in Dholera Special Investment Region, Dholera

Canal Park – Plinth

SL.NO	SHORT DESCRIPTION	DESCRIPTION OF ITEMS	Zone-03 QTY.	UNIT	Unit Rate	Total Amount
A.	GENERAL NOTES					
I	All costs to be inclusive of :					
II	Labour, material, tools, tackles etc.					
III	Labour camp, equipment storage and security					
IV	Water & electricity for construction & water for drinking purpose.					
V	Setting out of works, levels, including the provision and erection of permanent setting out marks as directed by the Engineer from time to time. All setting out marks are to be clearly visible and fixed to immovable objects. All resources required in order to perform the above mentioned work.					
VI	All costs to be inclusive of provision, maintenance and removal of all temporary works after completion & handing over of site.					
VII	All arrangements for electricity & water to be arranged by contractor at his own costs.					
1.0	EARTH WORK					
1		Excavation for foundation upto 1.5m depth including sorting out and stacking of useful materials and disposing of the excavated stuff upto 50 metre lead. (A) Loose or soft soil :				
I		Excavating soil < 1.5 m	4.66	CuM		
II		Excavating soil > 1.5 m-3.0 m	1	CuM		
III		Excavating soil > 3.0 m-4.5 m	1	CuM		
1.2		Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers as directed including consolidating each deposited layer by ramming and watering etc complete	1.22	CuM		
		Add extra for disposing off the excavated stuff for lead of 400m to 500m	3.45	CuM		

Construction of Landscaping of Canal Area (Zone 3) in Dholera Special Investment Region, Dholera

SL.NO	SHORT DESCRIPTION	DESCRIPTION OF ITEMS	Zone-03 QTY.	UNIT	Unit Rate	Total Amount
		Within lead up to 500 M				
		TOTAL EARTHWORK				
2.0	SUB-HEAD - PLAIN / REINFORCED CEMENT CONCRETE WORK					
		PLAIN / REINFORCED CEMENT CONCRETE WORK - PROVIDING AND PLACING CONCRETE WORK INCLUDING COST OF LABOUR, MATERIALS AND EQUIPMENT FOR HANDLING, TRANSPORTATION, BATCHING, MIXING, PLACING, VIBRATING AND CURING, (EXCLUDING COST OF CENTERING, SHUTTERING AND REINFORCEMENT) COMPLETE AS PER DRAWING AND SPECIFICATIONS UNLESS SPECIFIED.				
		Supplying, Casting, vibrating and curing as per specifications. Approved additives and admixtures. Incurred costs on Concrete Mix Designs, Sample taking, testing and providing test results certificates, storing and saving of samples, and preparation of bar bending schedules and workshops.				
		1. In case of supply and pouring of concrete, civil contractor shall use batching plants, transit mixers and concrete pumps with boom placer equipment (if required) etc for all major concreting works and the rate shall include the provision for the same.				
		2. All reinforced concrete shall be done using super-plasticiser as per manufacturer's instruction and as directed by Site Engineer/ Consultant.				
		Note: 1) Cement for all concrete works shall be Portland puzzolana cement (fly ash based) conforming to IS: 1489 with minimum 15% of fly-ash. It can be Portland slag cement conforming to is: 455 or sulphate resisting Portland cement conforming to IS: 12330 or high alumina cement conforming to is: 6452 without any extra cost as directed by the Site Engineer/Consultant. 2) The consumption of cement (per cum. of concrete) shall be as per recommended/approved concrete design mix subject to minimum requirement of IS 456 Specifications/ Approved				

Construction of Landscaping of Canal Area (Zone 3) in Dholera Special Investment Region, Dholera

SL.NO	SHORT DESCRIPTION	DESCRIPTION OF ITEMS	Zone-03 QTY.	UNIT	Unit Rate	Total Amount
		drawing (whichever is higher). However no extra claim shall be entertained on account of excess cement consumption as per the actual design mix to achieve required target strength & other parameters.				
2.1		Providing & laying in position plain cement concrete of specified grade in raft, bases of column footing, Brick walls footing, base of floor, as screed over areas to make up levels or to form slopes, laid to required levels and grade at all locations, consolidated finished fair and cured including side forms as required complete in all respects.				
2.1.1		Providing and Laying CC 1:2:4 (1 cement :2 coarse sand : 4 graded stone aggregate 20mm nominal size) and curing complete excluding cost of form work .	0.57	CuM		
	DESIGN MIX					
2.2		Providing and laying in position machine mixed and machine vibrated Design Mix cement concrete conforming to IS:456 & IS 10262-2009 for reinforced concrete works with coarse sand and graded hard stone aggregate of 20mm nominal size in superstructure at any level above finished floor level, any shape, position or thickness etc complete including use of plasticizers/ superplasticizer conforming to IS:9103 (latest) to achieve required slump in concrete all complete as per specification & drawing for the following grade (Rate of formwork to be excluded)				
2.2.1		M25 in column (foundation)	1	CuM		
2.2.2		M25 in Footing	1	CuM		
2.2.3		M25 in Slabs, Beams, Columns (Superstructure)	0.78	CuM		
		TOTAL RCC/PCC				
3.0	SUB-HEAD – MASONRY WORK					
		BRICK MASONRY SUB STRUCTURE				
3.1		Providing and laying 230 mm thick Brick work using common burnt clay building bricks having crushing strength not less than 35 kg/sq.cm. in foundation and plinth in C.M.1:5 (1 cement :5 fine sand) conventional bricks	1.83	CuM		
		BRICK MASONRY SUPER STRUCTURE				

Construction of Landscaping of Canal Area (Zone 3) in Dholera Special Investment Region, Dholera

SL.NO	SHORT DESCRIPTION	DESCRIPTION OF ITEMS	Zone-03 QTY.	UNIT	Unit Rate	Total Amount
3.2		Providing and laying 230 mm thick Brick work using common burnt clay building bricks having crushing strength not less than 35 kg/sq.cm. in Superstructure (above Plinth level) in C.M.1:5 (1cement :5 fine sand) conventional bricks	0.81	CuM		
		TOTAL MASONRY WORK				
4.0	SUB-HEAD – WALL FINISHES					
		Note : Cement for all plastering works shall be Portland puzzolana cement (fly ash based) confirming to IS: 1489 with minimum 15% of fly-ash				
4.1		Providing and laying 20mm thick cement plaster in two coats with underlayer 12mm in C M 1:3 (1 cement : 3 coarse sand) and top layer 8mm in C M 1:3 (1 cement : 3 coarse sand) finish rough with sponge and curing etc. (For exterior plastering upto 15m height above G L) Important Note : 12 mm square groove , bolt holes to be made as per the drawing details and Sampling to be done at site by contractor for approval prior execution.	3.53	Sqm		
		TOTAL WALL FINISHES				
5.0	SUB-HEAD – STEEL REINFORCEMENT					
5.1		Supply, fabrication, hoisting and placing in position HYSD reinforcement bars conforming to IS 1786 - Latest Edition Grade FE 500 as per detailed drawing and specifications including cutting, bending and tying with 18 SWG binding wire complete. The rates shall be applicable for all heights and depths. Payment shall be made as per reinforcement drawings and with theoretical weights only including all authorized laps and hooks. Unauthorized chairs, spacers and laps will not be measured and paid for. (For all heights & diameters)	0.06	M.T.		
		TOTAL STEEL REINFORCEMENT				

Construction of Landscaping of Canal Area (Zone 3) in Dholera Special Investment Region, Dholera

Canal Park – Trellis

SL.NO	SHORT DESCRIPTION	DESCRIPTION OF ITEMS	Zone-03 QTY.	UNIT	Unit Rate	Total Amount
A.	GENERAL NOTES					
I	All costs to be inclusive of :					
II	Labour, material, tools, tackles etc. *_ =					
III	Labour camp, equipment storage and security					
IV	Water & electricity for construction & water for drinking purpose.					
V	Setting out of works, levels, including the provision and erection of permanent setting out marks as directed by the Engineer from time to time. All setting out marks are to be clearly visible and fixed to immovable objects. All resources required in order to perform the above mentioned work.					
VI	All costs to be inclusive of provision, maintenance and removal of all temporary works after completion & handing over of site.					
VII	All arrangements for electricity & water to be arranged by contractor at his own costs.					
1.0	EARTH WORK					
1		Excavation for foundation upto 1.5m depth including sorting out and stacking of useful materials and disposing of the excavated stuff upto 50 metre lead. (A) Loose or soft soil :				
I		Excavating soil < 1.5 m	345.99	CuM		
II		Excavating soil > 1.5 m-3.0 m	1	CuM		
III		Excavating soil > 3.0 m -4.5 m	1	CuM		
1.2		Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers as directed including consolidating each deposited layer by ramming and watering etc complete	221.56	CuM		
		Add extra for disposing off the excavated stuff for lead of 400m to 500m	1	CuM		
		Within lead up to 500 M				

Construction of Landscaping of Canal Area (Zone 3) in Dholera Special Investment Region, Dholera

SL.NO	SHORT DESCRIPTION	DESCRIPTION OF ITEMS	Zone-03 QTY.	UNIT	Unit Rate	Total Amount
1.3		Providing, diluting and injecting chemical emulsion chlorophyriphos/ Lindane 20 % emulsifiable concentrates 1 % as per IS: 6313 (Part -II) : 2001 for pre constructional anti -termite treatment and creating a continuous chemical barrier under and around the column pits, wall trenches, basements excavation, top surface of plinth filling, junction of wall and floor along the external perimeter of the building, expansion joints over the top surface of consolidated earth on which apron is to be laid, surroundings of pipes and conduits etc. complete as per specifications. The work shall be carried out by approved agency. Plinth area of building at ground floor only shall be measured for payment.				
1.3.1		Chlorpyriphos / Lindane emulsifiable concentrate 20% with 1% concentration.	1851.4	Cum		
		TOTAL EARTHWORK				
2.0	SUB-HEAD - PLAIN / REINFORCED CEMENT CONCRETE WORK					
		PLAIN / REINFORCED CEMENT CONCRETE WORK - PROVIDING AND PLACING CONCRETE WORK INCLUDING COST OF LABOUR, MATERIALS AND EQUIPMENT FOR HANDLING, TRANSPORTATION, BATCHING, MIXING, PLACING, VIBRATING AND CURING, (EXCLUDING COST OF CENTERING, SHUTTERING AND REINFORCEMENT) COMPLETE AS PER DRAWING AND SPECIFICATIONS UNLESS SPECIFIED.				
		Supplying, Casting, vibrating and curing as per specifications. Approved additives and admixtures. Incurred costs on Concrete Mix Designs, Sample taking, testing and providing test results certificates, storing and saving of samples, and preparation of bar bending schedules and workshops.				
		1. In case of supply and pouring of concrete, civil contractor shall use batching plants, transit mixers and concrete pumps with boom placer equipment (if required) etc for all major concreting works and the rate shall include the provision for the same.				
		2. All reinforced concrete shall be done using super-plasticiser as per manufacturer's instruction and as directed by Site Engineer/				

Construction of Landscaping of Canal Area (Zone 3) in Dholera Special Investment Region, Dholera

SL.NO	SHORT DESCRIPTION	DESCRIPTION OF ITEMS	Zone-03 QTY.	UNIT	Unit Rate	Total Amount
		Consultant.				
		Note: 1) Cement for all concrete works shall be Portland puzzolana cement (fly ash based) confirming to IS: 1489 with minimum 15% of fly-ash. It can be Portland slag cement conforming to is: 455 or sulphate resisting Portland cement conforming to IS: 12330 or high alumina cement conforming to is: 6452 without any extra cost as directed by the Site Engineer/Consultant. 2) The consumption of cement (per cum. of concrete) shall be as per recommended/approved concrete design mix subject to minimum requirement of IS 456 Specifications/ Approved drawing (whichever is higher). However no extra claim shall be entertained on account of excess cement consumption as per the actual design mix to achieve required target strength & other parameters.				
2.1		Providing & laying in position plain cement concrete of specified grade in raft, bases of column footing, Brick walls footing, base of floor, as screed over areas to make up levels or to form slopes, laid to required levels and grade at all locations, consolidated finished fair and cured including side forms as required complete in all respects.				
2.1.1		Providing and Laying CC 1:2:4 (1 cement :2 coarse sand : 4 graded stone aggregate 20mm nominal size) and curing complete excluding cost of form work .	33.564	CuM		
	DESIGN MIX					
2.2		Providing and laying in position machine mixed and machine vibrated Design Mix cement concrete conforming to IS:456 & IS 10262-2009 for reinforced concrete works with coarse sand and graded hard stone aggregate of 20mm nominal size in superstructure at any level above finished floor level, any shape, position or thickness etc complete including use of plasticizers/ superplasticizer conforming to IS:9103 (latest) to achieve required slump in concrete all complete as per specification & drawing for the following grade (Rate of formwork to be excluded)				
2.2.1		M25 in column (foundation)	1.68	CuM		
2.2.2		M25 in Footing	83.04	CuM		

Construction of Landscaping of Canal Area (Zone 3) in Dholera Special Investment Region, Dholera

SL.NO	SHORT DESCRIPTION	DESCRIPTION OF ITEMS	Zone-03 QTY.	UNIT	Unit Rate	Total Amount
2.2.3		M25 in Slabs, Beams, Columns (Superstructure)	7.83	CuM		
2.3		Fair faced finish (exposed concrete in super structure) for reinforced concrete works of grade M-25 Grade in Columns and piers of any shape and profile, Walls, Beams, lintels, ties, brackets, ribs, gutter beams, plinth beams, pergola beams, shear walls, string courses, Slabs, suspended slabs, floor and roof projections, canopies, chajjas, landing slabs, planting box bottoms, copings, sills, and such other elements .Important: 12 mm square groove , bolt holes to be made as per the drawing details.		CuM		
		TOTAL RCC/PCC				
3.0	SUB-HEAD - SHUTTERING					
		Providing, fixing and removing form work at any elevations for all structures, as per specifications and including all labour, material, scaffoldings and centering complete including pockets etc. complete as per drawing, specifications and as per direction of engineer in charge for the following.				
3.1		Providing formwork of ordinary timber plankings so as to give a rough finish including centering,shuttering, struting and propping etc. Height of propping and centering below supporting floor to ceiling not exceeding 4 m and removal of the same for concrete and plain concrete works.				
3.1.1		Shuttering for Columns, foundation, beams , slabs and other R.C.C works	365.44	Sqm		
3.1.2		Extra for providing form work with sheating of steel sheets so as to give a fair finish (For all items under NBO No. 3.1 above)		Sqm		
		TOTAL SHUTTERING				
4.0	SUB-HEAD – STEEL REINFORCEMENT					
4.1		Supply, fabrication, hoisting and placing in position HYSD reinforcement bars conforming to IS 1786 - Latest Edition Grade FE 500 as per detailed drawing and specifications including cutting, bending and tying with 18 SWG binding wire complete. The rates shall be applicable for all heights and depths. Payment shall be made as per reinforcement drawings and with theoretical weights only including all authorized laps and hooks. Unauthorized chairs, spacers and laps will not be	10.18	M.T.		

Construction of Landscaping of Canal Area (Zone 3) in Dholera Special Investment Region, Dholera

SL.NO	SHORT DESCRIPTION	DESCRIPTION OF ITEMS	Zone-03 QTY.	UNIT	Unit Rate	Total Amount
		measured and paid for. (For all heights & diameters)				
		TOTAL STEEL REINFORCEMENT				
5.0	SUB-HEAD – MISC WORK					
5.1		Steel work welded in built up sections, framed work including cutting, hoisting fixing in position and applying a priming coat or red lead paint (A) In beams and joists, channels angles, tees, flats with connecting plates or angle cleats as in main and cross beams, hip and jack rafters, purlins connected to common rafters and the like.				
		Using MS structural sections like angle, joist, Tee, Flats, Channel, Plates etc. for columns, trusses, purlins and other framed work.	47872.29	KG		

Construction of Landscaping of Canal Area (Zone 3) in Dholera Special Investment Region, Dholera

Canal Park - Walls

SL.NO	SHORT DESCRIPTION	DESCRIPTION OF ITEMS	Zone-03 QTY.	UNIT	Unit Rate	Total Amount
A.	GENERAL NOTES					
I	All costs to be inclusive of :					
II	Labour, material, tools, tackles etc.					
III	Labour camp, equipment storage and security					
IV	Water & electricity for construction & water for drinking purpose.					
V	Setting out of works, levels, including the provision and erection of permanent setting out marks as directed by the Engineer from time to time. All setting out marks are to be clearly visible and fixed to immovable objects. All resources required in order to perform the above mentioned work.					
VI	All costs to be inclusive of provision, maintenance and removal of all temporary works after completion & handing over of site.					
VII	All arrangements for electricity & water to be arranged by contractor at his own costs.					
1.0	EARTH WORK					
1		Excavation for foundation upto 1.5m depth including sorting out and stacking of useful materials and disposing of the excavated stuff upto 50 metre lead. (A) Loose or soft soil :				
I		Excavating soil < 1.5 m	688.70	CuM		

Construction of Landscaping of Canal Area (Zone 3) in Dholera Special Investment Region, Dholera

SL.NO	SHORT DESCRIPTION	DESCRIPTION OF ITEMS	Zone-03 QTY.	UNIT	Unit Rate	Total Amount
II		Excavating soil > 1.5 m-3.0 m	481.95	CuM		
III		Excavating soil > 3.0 m-4.5 m	136.01	CuM		
1.2		Filling available excavated earth (excluding rock) in trenches, plinth, sides of foundations etc. in layers as directed including consolidating each deposited layer by ramming and watering etc complete	1076.47	CuM		
		Add extra for disposing off the excavated stuff for lead of 400m to 500m	230.19	CuM		
		Within lead up to 500 M				
1.3		Providing, diluting and injecting chemical emulsion chlorophyriphos/ Lindane 20 % emulsifiable concentrates 1 % as per IS: 6313 (Part -II) : 2001 for pre constructional anti -termite treatment and creating a continuous chemical barrier under and around the column pits, wall trenches, basements excavation, top surface of plinth filling, junction of wall and floor along the external perimeter of the building, expansion joints over the top surface of consolidated earth on which apron is to be laid, surroundings of pipes and conduits etc. complete as per specifications. The work shall be carried out by approved agency. Plinth area of building at ground floor only shall be measured for payment.				
		Chlorpyriphos / Lindane emulsifiable concentrate 20% with 1% concentration.	4102.03	CuM		
		TOTAL EARTHWORK				
2.0	SUB-HEAD - PLAIN / REINFORCED CEMENT CONCRETE WORK					
		PLAIN / REINFORCED CEMENT CONCRETE WORK - PROVIDING AND PLACING CONCRETE WORK INCLUDING COST OF LABOUR, MATERIALS AND EQUIPMENT FOR HANDLING,				

Construction of Landscaping of Canal Area (Zone 3) in Dholera Special Investment Region, Dholera

SL.NO	SHORT DESCRIPTION	DESCRIPTION OF ITEMS	Zone-03 QTY.	UNIT	Unit Rate	Total Amount
		TRANSPORTATION, BATCHING, MIXING, PLACING, VIBRATING AND CURING, (EXCLUDING COST OF CENTERING, SHUTTERING AND REINFORCEMENT) COMPLETE AS PER DRAWING AND SPECIFICATIONS UNLESS SPECIFIED.				
		Supplying, Casting, vibrating and curing as per specifications. Approved additives and admixtures. Incurred costs on Concrete Mix Designs, Sample taking, testing and providing test results certificates, storing and saving of samples, and preparation of bar bending schedules and workshops.				
		1. In case of supply and pouring of concrete, civil contractor shall use batching plants, transit mixers and concrete pumps with boom placer equipment (if required) etc for all major concreting works and the rate shall include the provision for the same.				
		2. All reinforced concrete shall be done using super-plasticiser as per manufacturer's instruction and as directed by Site Engineer/ Consultant.				
		Note: 1) Cement for all concrete works shall be Portland puzzolana cement (fly ash based) confirming to IS: 1489 with minimum 15% of fly-ash. It can be Portland slag cement conforming to is: 455 or sulphate resisting Portland cement conforming to IS: 12330 or high alumina cement conforming to is: 6452 without any extra cost as directed by the Site Engineer/Consultant. 2) The consumption of cement (per cum. of concrete) shall be as per recommended/approved concrete design mix subject to minimum requirement of IS 456 Specifications/ Approved drawing (whichever is higher). However no extra claim shall be entertained on account of excess cement consumption as per the actual design mix to achieve required target strength & other parameters.				
2.1		Providing & laying in position plain cement concrete of specified grade				

Construction of Landscaping of Canal Area (Zone 3) in Dholera Special Investment Region, Dholera

SL.NO	SHORT DESCRIPTION	DESCRIPTION OF ITEMS	Zone-03 QTY.	UNIT	Unit Rate	Total Amount
		in raft, bases of column footing, Brick walls footing, base of floor, as screed over areas to make up levels or to form slopes, laid to required levels and grade at all locations, consolidated finished fair and cured including side forms as required complete in all respects.				
2.1.1		Providing and Laying CC 1:2:4 (1 cement :2 coarse sand : 4 graded stone aggregate 20mm nominal size) and curing complete excluding cost of form work .	54.66	CuM		
	DESIGN MIX					
2.2		Providing and laying in position machine mixed and machine vibrated Design Mix cement concrete conforming to IS:456 & IS 10262-2009 for reinforced concrete works with coarse sand and graded hard stone aggregate of 20mm nominal size in superstructure at any level above finished floor level, any shape, position or thickness etc complete including use of plasticizers/ superplasticizer conforming to IS:9103 (latest) to achieve required slump in concrete all complete as per specification & drawing for the following grade (Rate of formwork to be excluded)				
2.2.1		M25 in column (foundation)	36.62	CuM		
2.2.2		M25 in Footing	66.13	CuM		
2.2.3		M25 in Slabs, Beams, Columns (Superstructure)	45.49	CuM		
		TOTAL RCC/PCC				
3.0	SUB-HEAD - SHUTTERING					
		Providing, fixing and removing form work at any elevations for all structures, as per specifications and including all labour, material, scaffoldings and centering complete including pockets etc. complete as per drawing, specifications and as per direction of engineer in charge for the following.				

Construction of Landscaping of Canal Area (Zone 3) in Dholera Special Investment Region, Dholera

SL.NO	SHORT DESCRIPTION	DESCRIPTION OF ITEMS	Zone-03 QTY.	UNIT	Unit Rate	Total Amount
3.1		Providing formwork of ordinary timber plankings so as to give a rough finish including centering,shuttering, struting and propping etc. Height of propping and centering below supporting floor to ceiling not exceeding 4 m and removal of the same for concrete and plain concrete works.				
3.1.1		Shuttering for Columns, foundation, beams , slabs and other R.C.C works	1113.66	Sqm		
3.1.2		Extra for providing form work with sheating of steel sheets so as to give a fair finish (For all items under NBO No. 3.1 above)	1	Sqm		
		TOTAL SHUTTERING				
4.0	SUB-HEAD – MASONARY WORK					
		BRICK MASONRY SUB STRUCTURE				
4.1		Providing and laying 230 mm thick Brick work using common burnt clay building bricks having crushing strength not less than 35 kg/sq.cm. in foundation and plinth in C.M.1:5 (1 cement :5 fine sand) conventional bricks	72.79	CuM		
		BRICK MASONRY SUPER STRUCTURE				
4.2		Providing and laying 230 mm thick Brick work using common burnt clay building bricks having crushing strength not less than 35 kg/sq.cm. in Superstructure (above Plinth level) in C.M.1:5 (1cement :5 fine sand) conventional bricks	344.81	CuM		
		TOTAL MASONRY WORK				
5.0	SUB-HEAD – WALL FINISHES					
		Note : Cement for all plastering works shall be Portland				

Construction of Landscaping of Canal Area (Zone 3) in Dholera Special Investment Region, Dholera

SL.NO	SHORT DESCRIPTION	DESCRIPTION OF ITEMS	Zone-03 QTY.	UNIT	Unit Rate	Total Amount
		puzzolana cement (fly ash based) confirming to IS: 1489 with minimum 15% of fly-ash				
5.1		Providing and laying 15mm thick cement plaster in single coat on wall for interior plastering finished even and smooth in cement mortar 1:4 (1 cement : 4 fine sand)	1422.94	Sqm		
		TOTAL WALL FINISHES				
6.0	SUB-HEAD – STEEL REINFORCEMENT					
6.1		Supply, fabrication, hoisting and placing in position HYSD reinforcement bars conforming to IS 1786 - Latest Edition Grade FE 500 as per detailed drawing and specifications including cutting, bending and tying with 18 SWG binding wire complete. The rates shall be applicable for all heights and depths. Payment shall be made as per reinforcement drawings and with theoretical weights only including all authorized laps and hooks. Unauthorized chairs, spacers and laps will not be measured and paid for. (For all heights & diameters)	16.31	M.T.		
		TOTAL STEEL REINFORCEMENT				