MUNICIPAL CORPORATION OF GREATER MUMBAI

e-TENDER

(Percentage Rate)

NAME OF WORK :-Proposed Construction of Basement Parking below Raosaheb Patwardhan Garden, F.P. No. 488 of TPS-III Bandra,(C.T.S NO. 371A Of Village Bandra) opposite National College, Linking Road (V.P. Road), Bandra West in H/West ward Mumbai.

To be displayed by 11:00 hours on DATE 01/11/2018 at the MCGM Portal website.

Website add: - **http://portal.mcgm.gov.in**

Dy.C.E.(B.C.)W.S.'s office,

3rd floor K/East ward office bldg,

Gundavali, Andheri (E),

Mumbai 400 069.

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SECTION 1

E-TENDER NOTICE

MUNICIPAL CORPORATION OF GREATER MUMBAI

Dy.C.E. / BC / /SR /WS Date:

e-TENDER NOTICE

The Municipal Corporation of Greater Mumbai (MCGM) invites e- tender to appoint Contractor for the aforementioned work from contractors of repute, multidisciplinary engineering organizations i.e. eminent firm, Proprietary/Partnership Firms/ Private Limited Companies/ Public Limited Companies/Companies registered under the Indian companies' act 2013, the contractors registered with the Municipal Corporation of Greater Mumbai, (MCGM) in Class AA & Category C-1 as per old registration and Class I-A as per new registration and from the contractors / firms equivalent and superior classes registered in Central or State Government / Semi Govt. Organization / Central or State Public Sector Undertakings, will be allowed subject to condition that, the contractors who are not registered with MCGM will have to apply for registering their firm within three months time period from the award of contract, otherwise their Bid Security i.e. E.M.D (Earnest Money Deposit) will be forfeited/recovered and an amount equal to Registration Fee of respective class will be recovered as penalty.

Bidding Process will comprise of THREE stages.

The application form can be downloaded from MCGM's portal (http://portal.mcgm.gov.in) on payment of Rs 7350/- (Rs 7000/- + GST 5%). The applicants not registered with MCGM are mandated to get registered(Vendor Registration) with MCGM for e-tendering process & obtain login credentials to participate in the online bidding process.

i) To download the application form, for those applicants not having vendor registration, need to apply first for vendor registration at the office of Account Officer (FAR), 3rd floor, Municipal Headquarter.

ii) Followed by SRM login ID and password to be obtained from Central Purchase Department (CPD), Office at Byculla, Bakariadda, Mumbai

iii) For e-Tendering registration, enrollment for digital signature certificates and user manual, please refer to respective links provided in 'Tenders' tab. Vendors can get digital signature from any one of the Certifying Authorities (CA's) licensed by controller of certifying authorities namely, Safes crypt, IDRBT, National informatics center, TCS, CUSTOMS, MTNL, GNFC and e- Mudhra CA.

Sr. No	Name and Location of work	Contract period	Total Estimated Cost
1.	**Proposed Construction of Basement Parking below Raosaheb Patwardhan Garden, F.P. No. 488 of TPS-III Bandra,(C.T.S NO. 371A Of Village Bandra) opposite National College, Linking Road (V.P. Road), Bandra West in H/West ward Mumbai.**	**30 Months (Inclusive of monsoon)**	Rs. **87,72,41,619.00**

In terms of the 3 stage system of e-tendering, a Bidder will be required to deposit, along with its Bid, an **Earnest Money Deposit of Rs 87,72,500.00 (Rupees Eighty Seven Lacs Seventy Two Thousand Five Hundred only)** (the "EMD"), refundable in accordance to the relevant clause of bid document, from the Bid Due Date, except in the case of the selected Bidder whose Bid Security/EMD shall be retained. The Bidders will have to provide Earnest Money Deposit through the payment gateways while submitting the bids. The Bid shall be summarily rejected if it is not accompanied by the Earnest Money Deposit. The e-tender is available on MCGM portal (http://portal.mcgm.gov.in) as mentioned in the Header Data of the tender.

As per THREE Packet systems, the document for Packet A & B is to be uploaded by the bidder in vendors' document online in Packet A, B. Packet A, B & C shall be opened on dates as mentioned in header data. All the responsive and eligible bidders if they so wish can be present at the time of opening of bids, in the office of Dy. City Engineer (Building Construction)- Western Suburbs. The Packet C shall be opened if bids submission in Packet A& B satisfies/includes all the requirements and same are found acceptable to the Authority.

The Municipal Commissioner reserves the right to reject all or any of the e- tender(s) without assigning any reasons at any stage.

The dates and time for submission and opening the bids are as shown in the Header Data. If there are any changes in the dates the same will be displayed on the MCGM Portal. (http://portal.mcgm.gov.in)

The Applicants interested for the above referred works may contact the Dy. City Engineer (Building Construction)- Western Suburbs. at the following address on any working day during office hours.

Office of: Dy. City Engineer (Building Construction)- Western Suburbs., MCGM

3RD floor, K/East ward office building,

Gundavali, Andheri (E),Mumbai 400 069

The applicants may wish to visit the site under reference located at Bandra west, a part of Western Suburb Mumbai and can collect the information of the present status from the department who have invited the bids.

The MCGM reserves the rights to accept any of the application or reject any or all the application received for above works, without assigning any reasons thereof. The information regarding above subject matter is available on Website of MCGM. (http://portal.mcgm.gov.in/tenders)

---Sd---

Dy.C.Eng (Building Construction)
Western Suburb

HEADER DATA

Tender Document No	**7100137910**
Name of Organization	**Municipal Corporation of Greater Mumbai**
Subject	**Proposed Construction of Basement Parking below Raosaheb Patwardhan Garden, F.P. No. 488 of TPS-III Bandra, (C.T.S NO. 371A Of Village Bandra) opposite National College, Linking Road (V.P. Road), Bandra West in H/West ward Mumbai.**
Cost of Tender	Rs. 7350/- (Rs 7000+ GST 5%)
Cost of E-Tender (estimated cost of work)	Rs. **87,72,41,619.00**
Bid Security Deposit / Earnest Money Deposit	Rs.**87,72,500.00**
Date of issue and sale of tender	01/11/2018 from 11:00 Hours
Last date & time for sale of tender	22/11/2018 up to 12:00 Hours
Submission of Packet A,B & C (Online) and receipt of Bid Security Deposit	22/11/2018 up to 16:00 Hours
Date of Pre-Bid meeting	13/11/2018 at 12:00 Hours
Pre-Bid meeting venue	Office Of the :- City Engineer, MCGM, Head office, 3rd floor, Mahanagarpalika Marg, fort , Mumbai -400 001.
Opening of Packet A	22/11/2018 after16:01 Hours
Opening of Packet B	30/11/2018 after 15:00 Hours
Opening of Packet C	12-12-2018 after 15:00 Hours

Address for communication	Office of the:- Dy.C.E.(B.C.)W.S.'s office, 3RD floor, K/East ward office building, Gundavali, Andheri (E), Mumbai 400 069
Venue for opening of bid	On line in Dy.C. Engg. (B.C.)W.S.'s office.

This tender document is not transferable.

The MCGM reserves the rights to accept any of the application or reject any or all the application received for above subject without assigning any reason thereof.

Sd-

Dy. City Engineer
(Building Construction)W.S.

SECTION 2

ELIGIBILITY CRITERIA

ELIGIBILITY CRITERIA

1. For Regular, Routine and Maintenance works: (Not Applicable for this Tender)

Name of Dept	Deatails of Project works
City Engineer/HIC	New buildings for staff quarters/markets/school/offices etc. All dispensaries, health centers/cemeteries

1.1 Technical Capacity

The tenderer(s) in their own name should have satisfactorily executed the work of similar nature MCGM /Semi Govt. /Govt. & Public Sector Organizations during last seven (7) years ending last day of month previous to the one in which bids are invited as a prime Contractor (or as a nominated sub-Contractor, where the subcontract had involved similar nature of work as described in the scope of works in this bid document, provided further that all other qualification criteria are satisfied)

a) Three similar completed works each of value not less than the value equal to 20% of estimated cost put to tender Or

b) Two similar completed works each of value not less than the value equal to 25% of estimated cost put to tender Or

c) One similar completed work of value equal and or not less than the 40% of estimated cost put to tender

The value of completed works shall be brought to current costing level by enhancing the actual value of work at the compound rate of 10 % per annum; calculated from the date of completion to last date of receipt of application for tenders.

1.2 Financial Capacity

~~Achieved an average annual financial turnover as certified by 'Chartered Accountant' (in all classes of civil engineering construction works only) equal to 30% of the estimated cost of work in last three (3) financial years immediately preceding the Financial Year in which bids are invited.~~

~~The value of completed works shall be brought to current costing level by enhancing the actual value of work at the compound rate of 10 % per annum; calculated from the date of completion to last date of receipt of application for tenders.~~

~~1.3 Similar Experience:~~

~~For assessing the technical capacity of Regular, Routine and Maintenance works; Similar work shall mean, "any work in any Department" as mentioned hereinafter, for the completed and / or ongoing works in Building Construction OR Building Maintenance such as repairs / retrofitting / structural repairs OR construction / repairs of Asphalt / Concrete roads OR laying a sewer line alongwith alike components or laying / rehabilitation of water pipe lines in Cast Iron / M.S. pipes / HDPE / MDPE pipes OR repairs / maintenance / construction of culverts over nullah.~~

~~(Bidder can submit notarized MOU at the time of bidding and Registered MOU with the Specialized Sub Contractor shall be submitted after award of contract.)~~

2. For Original and New construction works : (Applicable for this Tender)

Name of the Dept	Details of project works
City Engineer/HIC	Housing colonies for staff quarters/Markets admeasuring more than 20000.00 sq.mts .etc. Or High Rise Buildings Or Buildings for major hospital more than 200 beds.

2.1 Technical Capacity (Project Experience):

The tenderer(s) in their own name should have satisfactorily executed the work of similar nature MCGM /Semi Govt. /Govt. & Public Sector Organizations during last seven (7) years ending last day of month previous to the one in which bids are invited as a prime Contractor (or as a nominated sub-Contractor, where the subcontract had involved similar

nature of work as described in the scope of works in this bid document, provided further that all other qualification criteria are satisfied)

a) Three similar completed works or currently executing three works of similar nature each costing 30% of estimated cost.*

OR

b) Two similar completed works or currently executing two works of similar nature each costing 40% of estimated cost.*

OR

c) One completed work or currently executing one work of similar nature of aggregate 60% of estimated cost.*

The value of completed works shall be brought to current costing level by enhancing the actual value of work at the compound rate of 10 % per annum; calculated from the date of completion to last date of receipt of application for tenders.

*In case of ongoing works to be considered, the bidder must have received payment bills of 80% of the contract sum for the work/works executed last day of month previous to the one in which bids are invited.

2.2 Financial Capacity -

Achieved an average annual financial turnover as certified by 'Chartered Accountant' (in all classes of civil engineering construction works only) equal to 30% of the estimated cost of work in last three (3) financial years immediately preceding the Financial Year in which bids are invited.

 To ascertain this, tenderer(s) shall furnish /upload the financial statement (Audited balance sheet) duly certified by Chartered Accountant.

 The turnover can be enhanced by 10% every year to bring the present level.

2.3 Similar Experience: -

Similar work shall mean, "Experience of completed and / or ongoing works in Building Construction with construction of minimum one Basement".

(Bidder can submit notarized MOU at the time of bidding and Registered MOU with the Specialized Sub Contractor shall be submitted after award of contract.)

C) Bid Capacity:

The bid capacity of the prospective bidders will be calculated as under:

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

A = Maximum value of Civil Engineering works executed in any one year (year means Financial year) during the last five years (updated to the price level of the Financial year in which bids are received at a rate of 10% per year) taking into account the completed as well as works in progress.

N = Number of years prescribed for completion of the Project/Works, excluding monsoon period, for which these bids are being invited. (E.g. 7 months = 7/12 year) For every intervening monsoon 0.33 shall be added to N.

B = Value of existing commitments (only allotted works) on the last date of submission of bids as per bidding document and on-going works to be completed during the period of completion of the Project/Works for which these bids are being invited.

Note: The statement showing the value of existing commitments and on-going works as well as the stipulated period of completion remaining for each of the works listed should be attached along with certificates duly signed by the Engineer-in Charge, not below the rank of an Executive Engineer or equivalent.

D) **Even though the bidders meet the above qualifying criteria, they are subject to be disqualified if they have: -**

- made misleading or false representation in the forms, statements and attachments submitted in proof of the qualification requirements; and/or

- Record for poor performance such as abandoning the works, not properly completing the contract, inordinate delays in completion, ~~litigation history~~, or financial failures etc

SECTION 3

DISCLAIMER

DISCLAIMER

The information contained in this e-tender document or provided to Applicant(s), whether verbally or in documentary or any other form, by or on behalf of the Municipal Corporation of Greater Mumbai (MCGM), hereafter also referred as "The Authority ", or any of its employees or advisors, is provided to Applicant(s) on the terms and conditions set out in this e-tender and such other terms and conditions subject to which such information is provided.

This e-tender includes statements, which reflect various assumptions and assessments arrived at by the Municipal Corporation of Greater Mumbai (MCGM) in relation to the Project. Such assumptions, assessments and statements do not purport to contain all the information that each Applicant may require. This e-tender may not be appropriate for all persons, and it is not possible for the Municipal Corporation of Greater Mumbai (MCGM), its employees or advisors to consider the investment objectives, financial situation and particular needs of each party who reads or uses this e-tender. The assumptions, assessments, statements and information contained in this etender may not be complete, accurate, adequate or correct. Each Applicant should therefore, conduct its own investigations and analysis and should check the accuracy, adequacy, correctness, reliability and completeness of the assumptions, assessments, statements and information contained in this e-tender and obtain independent advice from appropriate sources.

Information provided in this e-tender to the Applicant(s) is on a wide range of matters, some of which may depend upon interpretation of law. The information given is not intended to be an exhaustive account of statutory requirements and should not be regarded as a complete or authoritative statement of law. The Municipal Corporation of Greater Mumbai (MCGM) accepts no responsibility for the accuracy or otherwise for any interpretation or opinion on law expressed here.

The Municipal Corporation of Greater Mumbai(MCGM), its employees and advisors make no representation or warranty and shall have no liability to any person, including any Applicant or Bidder, under any law, statute, rules or regulations or tort, principles of restitution or

unjust enrichment or otherwise for any loss, damages, cost or expense which may arise from or be incurred or suffered on account of anything contained in this e-tender or otherwise, including the accuracy, adequacy, correctness, completeness or reliability of the e-tender and any assessment, assumption, statement or information contained therein or deemed to form part of this e-tender or arising in any way with pre-qualification of Applicants for participation in the Bidding Process.The Municipal Corporation of Greater Mumbai (MCGM) also accepts no liability of any nature whether resulting from negligence or otherwise howsoever caused arising from reliance of any Applicant upon the statements contained in this e-tender.

The Municipal Corporation of Greater Mumbai (MCGM) may, in its absolute discretion but without being under any obligation to do so, update, amend or supplement the information, assessment or assumptions contained in this e-tender.

The issue of this e-tender does not imply that the Municipal Corporation of Greater Mumbai (MCGM) is bound to select and short-list pre-qualified Applications for Bid Stage or to appoint the selected Bidder or Concessionaire, as the case may be, for the Project and the Municipal Corporation of Greater Mumbai (MCGM) reserves the right to reject all or any of the Applications or Bids without assigning any reasons whatsoever.

The Applicant shall bear all its costs associated with or relating to the preparation and submission of its Application including but not limited to preparation, copying, postage, delivery fees, expenses associated with any demonstrations or presentations which may be required by The Municipal Corporation of Greater Mumbai (MCGM) or any other costs incurred in connection with or relating to its Application. All such costs and expenses will remain with the Applicant and the Municipal Corporation of Greater Mumbai(MCGM) shall not be liable in any manner whatsoever for the same or for any other costs or other expenses incurred by an Applicant in preparation or submission of the Application, regardless of the conduct or outcome of the Bidding Process.

SECTION 4

INTRODUCTION

INTRODUCTION

1. Background:

The Municipal Corporation of Greater Mumbai covers an area of 437.71sq.kms.with a population of 1.24 Crores as per census of 2011. The metropolis accounts major portion of India's international trade and government's revenue, from being one of the foremost centers of education, science and technological research and advancement.

The Mumbai Metropolis has historic tradition of strong civic activism dedicated to the cause of a better life for all its citizens. And it's the Municipal Corporation of Greater Mumbai (MCGM), hereafter called the "corporation", the primary agency responsible for urban governance in Greater Mumbai.

MCGM (The Authority) is one of the largest local self-governments in the Asian Continent. In observance of historic traditions of strong civic activism, with the change in time and living conditions to match with the urbanization, MCGM has mainly focused in providing almost all kinds of engineering services viz, Hydraulics, storm water drain, sewerage, water supply projects, roads, bridges, solid waste management, and environmental services. Beside this, the MCGM is also providing dedicated services in various segments such as Health, Primary Education as well as the construction and maintenance of Public Markets and Slaughter Houses.

MCGM is an organization having different departments, right from engineering depts. to health depts. Moreover we have other dept. like education, market, fire brigade dept., Octroi and other such departments where quite a good number of staff members are working.

MCGM is primarily an organization, which in the interest of citizens and with the speed of urbanization deals with the variety of the infrastructure services and delivered

to the public by different departments like Water Supply Projects, Sewerage Projects, Hydraulics, Storm Water Drain/Roads and bridges and Building Construction etc.

PROJECT BRIEF

SITE LOCATION

The Raosaheb Patwardhan Garden is strategically located touching Link Road, Opposite National College, and touching proposed Metro Railway Station, at Bandra west in H/West ward. The Linking Road area is famous for street shopping, making it easily accessible for Link Road commuters.

SURROUNDINGS

The site has Linking Road (V.P. Road) at East side, TPS 32'nd &24'th Roads at South & West sides respectively. Residential Buildings at North side of the plot. BalGandharva Theatre is located on the South west boundary.

SITE CONSTRAINTS

1. The site has well maintained lawn, garden and comprised of big and medium sized trees. The big trees along boundary are saved and the basement structure is planned accordingly. Those affected due to construction activity of the structure will have to be cut or transplanted to the location decided by Garden Dept away from the site. Extreme care must be taken for not disturbing roots and trees which are to be saved.

2. Highly weathered Rock is encountered at depths typically between 4.5-6.0 m below ground surface as per borelog details.

3. The Contractor will have to take into account all the above present site conditions / constraints for access, storage of material, movement / transport of material etc while quoting his rates as well as preparing the work methodology and scheme of execution which will be the part of tender document.

4. There are two existing water mains running through the garden. HE (Const) dept has called the tenders to shift them along adjoining TP Road. The water mains in the gardens must be safeguarded until newly laid water mains are functional. Contractor has to carry out the work in co-ordination with the HE Dept's contractor of the above said work. Contractors to take note of same and quote accordingly.

5. Hon'ble High Court' in PIL no. 217 of 2009 vide its order dated 29-02-2016 directed in the matter of dumping and dispose of the solid waste and construction debris, that "the development permission / IOD shall not be granted by either MCGM or State Govt. on the applications submitted from 01-03-2016 for construction of new buildings for residential or commercial use. The condition will not be apply to all the redevelopment projects covered by DC regulation no. 33(5) to 33(10) of DCR 1991". Further connection orders / directions to dispose of construction debris, in this matter by Hon'ble Supreme Court under SLP (Civil) No. D23708 / 2017 shall be strictly followed and will be binding on the Bidder. The e-tenderer / bidder shall therefore quote his percentage accordingly, anticipating the change in the scope of work due to above orders, and no extra claim in this regard will be entertained afterwords.

SECTION 5

E-TENDERING ONLINE SUBMISSION PROCESS

E-TENDERING ONLINE SUBMISSION PROCESS

The terminology of e-Tendering is solely depending upon policies in existence, guidelines and methodology adopted since decades. The SRM is only change in process of accepting and evaluation of tenders in addition to manual. The SAP module to be used in this E-tendering is known as Supplier Relationship Module (SRM).SRM is designed and introduced by ABM Knowledge ware Ltd. who will assist MCGM in throughout the tendering process for successful implementation.

NOTE: This tendering process is covered under Information Technology ACT & Cyber Laws as applicable

(1) In e-tendering process some of the terms and its definitions are to be read as under wherever it reflects in online tendering process.

Start Date read as “Sale Date”

End Date read as “Submission Date”

Supplier read as “Contractor/bidder”

Vendor read as “Contractor/bidder”

Vendor Quotation read as “Contractors Bid/Offer”

Purchaser read as “Department/MCGM”

I. Before entering in to online tendering process, the contractors should complete the registration process so as to get User ID for E-tendering links. For this, the contractors can access through Supplier registration via MCGM Portal.

There are two methods for this registration :(II and III)

II. Transfer from R3 (registered contractors with MCGM) to SRM

a. Contractors already registered with MCGM will approach to Vendor Transfer cell.

b. Submit his details such as (name, vendor code, address, registered Email ID, pan card etc.) to Vendor transfer cell.

c. MCGM authority for Vendor Transfer, transfers the Vendor to SRM application from R3 system to SRM system.

d. Transferred Vendor receives User ID creation link on his supplied mail Id.

e. Vendor creates his User ID and Password for e-tendering applications by accessing link sent to his mail ID.

III. Online Self Registration (Temporary registration for applicant not registered with MCGM)

a. Vendor fills up Self Registration form via accessing MCGM portal.

b. Vendor Transfer cell (same as mentioned above) accesses Supplier Registration system and accepts the Vendor request.

c. Accepted Vendor receives User ID creation email with Link on his supplied mail Id.

d. Vendor creates his User ID and Password for e-tendering application.

IV. CONTRACTORS BIDDING: Applicant will Quote and Upload Tender Documents

1. Access e-tender link of SRM Portal

2. Log in with User ID and Password

3. Selects desired Bid Invitation (he wants to bid)

4. To download tender documents contractors will have to pay online Tender fee. The same can be done by accessing Pay Tender Fees option. By this one will be able to pay Tender fee through Payment Gateway-If transaction successful, Contractors can register his interest to participate. Without Registration one cannot quote for the Bid/Tender.

5. Applicant will download Tender Documents from Information from purchaser tab by accessing Purchaser document folder through collaboration 'C' folder link.

6. Applicant will upload Packet A related and Packet B related Documents in Packet A and Packet B folder respectively by accessing these folders through "My Notes" Tab and collaboration folder link.

7. All the documents uploaded have to be digitally signed and saved. Contractors can procure there digital signature from any certified CA's in India.

8. Bid security deposit/EMD and ASD, if applicable, should be paid online as mentioned in tender.

9. For commercial details (in Packet C) contractors will fill data in Item Data tab in Service Line Item via details and quotes his "Percentage Variation" (i.e.% quoted) figure.(If entered '0' it will be treated as at par. By default the value is zero only.

10. Applicants to check the bid, digitally signs & save and submit his Bid Invitation.

11. Applicants can also save his uploaded documents/commercial information without submitting the BID for future editing through 'HOLD' option.

12. Please note that "Hold" action do not submit the Bid.

13. Applicants will receive confirmation once the Bid is submitted.

14. Bid creator (MCGM) starts Bid Opening for Packet A after reaching End Date and Time and Bid Evaluation process starts.

As per Three Packet system, the document for Packet A& B are to be uploaded by the tenderer in 'Vendor's document' online in Packet A & B. Before purchasing/ downloading the tender copy, tenderer may refer to post- Qualification criteria mentioned in e-Tender Notice.

The tenderer shall pay the EMD/Bid Security through payment gateways before submission of Bid and shall upload the screenshot of receipt of payment in Packet ‘A’ instead of paying the EMD at any of the CFC centers in MCGM Ward Offices.

The e-tender is available on MCGM portal, http://portal.mcgm.gov.in, as mentioned in the Header Data of the tender. The tenders duly filled in should be uploaded and submitted online on or before the end date of submission. The Packet ‘A’, Packet ‘B’ & Packet ‘C’ of the tenderer will be opened as per the time-table shown in the Header Data in the office of C.E. / Dy.C.E.(BC)WS

The Municipal Commissioner reserves the right to reject all or any of the e-Tender(s) without assigning any reason at any stage. The dates and time for submission and opening the tenders are as shown in the Header Data. If there are any changes in the dates the same will be displayed on the MCGM Portal (http://portal.mcgm.gov.in).

SECTION 6

INSTRUCTIONS TO APPLICANTS

INSTRUCTIONS TO APPLICANTS

Scope of Application

The Authority wishes to receive Applications for Qualification in order to SELECT experienced and capable Applicants for the Bid Stage.

Eligibility of Applicants

The Municipal Corporation of Greater Mumbai (MCGM) invites e-tender to appoint Contractor for the aforementioned work from contractors of repute, multidisciplinary engineering organizations i.e. eminent firm, Proprietary/Partnership Firms/ Private Limited Companies/ Public Limited Companies/Companies registered under the Indian companies' act 2013, the contractors registered with the Municipal Corporation of Greater Mumbai, (MCGM) in Class AA & Category C-1as per old registration and Class I-A as per new registration and from the contractors/firms equivalent and superior classes registered in Central or State Government/Semi Govt. Organization/Central or State Public Sector Undertakings, will be allowed subject to condition that, the contractors who are not registered with MCGM will have to apply for registering their firm within three months' time period from the award of contract, otherwise their Bid Security i.e. E.M.D (Earnest Money Deposit) will be forfeited/recovered and an amount equal to Registration Fee of respective class will be recovered as penalty.

To be eligible for pre-qualification and short-listing, an Applicant shall fulfill the following conditions of eligibility:

~~**1. For Regular, Routine and Maintenance works: (Not Applicable for this Tender)**~~

~~Name of Dept~~	~~Deatails of Project works~~
~~City Engineer/HIC~~	~~New buildings for staff quarters/markets/school/offices etc. All dispensaries, health centers/cemeteries~~

~~1.1 Technical Capacity~~

~~The tenderer(s) in their own name should have satisfactorily executed the work of similar nature MCGM /Semi Govt. /Govt. & Public Sector Organizations during last seven (7) years ending last day of month previous to the one in which bids are invited as a prime Contractor (or as a nominated sub-Contractor, where the subcontract had involved similar nature of work as described in the scope of works in this bid document, provided further that all other qualification criteria are satisfied)~

~~a) Three similar completed works each of value not less than the value equal to 20% of estimated cost put to tender Or~

~~b) Two similar completed works each of value not less than the value equal to 25% of estimated cost put to tender Or~

~~c) One similar completed work of value equal and or not less than the 40% of estimated cost put to tender~

~~The value of completed works shall be brought to current costing level by enhancing the actual value of work at the compound rate of 10 % per annum; calculated from the date of completion to last date of receipt of application for tenders.~

~~1.2 Financial Capacity~~

~~Achieved an average annual financial turnover as certified by 'Chartered Accountant' (in all classes of civil engineering construction works only) equal to 30% of the estimated cost of work in last three (3) financial years immediately preceding the Financial Year in which bids are invited.~

~~The value of completed works shall be brought to current costing level by enhancing the actual value of work at the compound rate of 10 % per annum; calculated from the date of completion to last date of receipt of application for tenders.~

~~1.3 Similar Experience:~~

~~**For assessing the technical capacity of Regular, Routine and Maintenance works; Similar work shall mean, "any work in any Department" as mentioned hereinafter, for the completed and / or ongoing works in Building Construction OR Building Maintenance such as repairs / retrofitting / structural repairs OR construction / repairs of Asphalt / Concrete roads OR laying a sewer line alongwith alike components or laying / rehabilitation of water pipe lines in Cast Iron / M.S. pipes / HDPE / MDPE pipes OR repairs / maintenance / construction of culverts over nullah.**~~

~~**(**Bidder can submit notarized MOU at the time of bidding and Registered MOU with the Specialized Sub Contractor of Auditorium with Acoustic shall be submitted after award of contract.)~~

2. For Original and New construction works : (Applicable for this Tender)

Name of the Dept	Details of project works
City Engineer/HIC	Hosing colonies for staff quarters/Markets admeasuring more than 20000.00 sq.mts .etc. Or High Rise Buildings Or Buildings for major hospital more than 200 beds.

2.1 Technical Capacity (Project Experience):

The tenderer(s) in their own name should have satisfactorily executed the work of similar nature MCGM /Semi Govt. /Govt. & Public Sector Organizations during last seven (7) years ending last day of month previous to the one in which bids are invited as a prime Contractor (or as a nominated sub-Contractor, where the subcontract had involved similar nature of work as described in the scope of works in this bid document, provided further that all other qualification criteria are satisfied)

a) Three similar completed works or currently executing three works of similar nature each costing 30% of estimated cost.*

OR

b) Two similar completed works or currently executing two works of similar nature each costing 40% of estimated cost.*

OR

c) One completed work or currently executing one work of similar nature of aggregate 60% of estimated cost.*

The value of completed works shall be brought to current costing level by enhancing the actual value of work at the compound rate of 10 % per annum; calculated from the date of completion to last date of receipt of application for tenders.

*In case of ongoing works to be considered, the bidder must have received payment bills of 80% of the contract sum for the work/works executed last day of month previous to the one in which bids are invited.

2.2 Financial Capacity

Achieved an average annual financial turnover as certified by 'Chartered Accountant' (in all classes of civil engineering construction works only) equal to 30% of the estimated cost of work in last three (3) financial years immediately preceding the Financial Year in which bids are invited.

 To ascertain this, tenderer(s) shall furnish /upload the financial statement (Audited balance sheet) duly certified by Chartered Accountant.

 The value of completed works shall be brought to current costing level by enhancing the actual value of work at the compound rate of 10 % per annum; calculated from the date of completion to last date of receipt of application for tenders.

2.3 Similar Experience: -

Similar work shall mean, "Experience of completed and / or ongoing works in Building Construction with construction of minimum one Basement".

(Bidder can submit notarized MOU at the time of bidding and Registered MOU with the Specialized Sub Contractor shall be submitted after award of contract.)

C) Bid Capacity:

The bid capacity of the prospective bidders will be calculated as under:

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

Where, A = Maximum value of Civil Engineering works executed in any one year (year means Financial year) during the last five years (updated to the price level of the Financial year in which bids are received at a rate of 10% per year) taking into account the completed as well as works in progress.

N = Number of years prescribed for completion of the Project/Works, excluding monsoon period, for which these bids are being invited. (E.g. 7 months = 7/12 year) For every intervening monsoon 0.33 shall be added to N.

B = Value of existing commitments (only allotted works) on the last date of submission of bids as per bidding document and on-going works to be completed during the period of completion of the Project/Works for which these bids are being invited.

Note: The statement showing the value of existing commitments and on-going works as well as the stipulated period of completion remaining for each of the works listed should be attached along with certificates duly signed by the Engineer-in Charge, not below the rank of an Executive Engineer or equivalent.

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

- made misleading or false representation in the forms, statements and attachments submitted in proof of the qualification requirements; and/or

- Record for poor performance such as abandoning the works, not properly completing the contract, inordinate delays in completion, ~~litigation history~~, or financial failures etc

D) Equipment Capabilities as required for this work :-

~~a) Regular and Routine works: The successful bidder will make the arrangements of the required equipment on the day of commencement or with respect to the progress of the work in phases, as per the instructions of site in charge. The successful bidder and, to that effect he will ensure commitment on an undertaking on Rs.500 stamp paper to be submitted along with the Bid in Packet B. However, this condition in no way shall dilute the respective condition in Registration Rules of MCGM.~~ **~~(NOT APPLICABLE FOR THIS TENDER)~~**

b) New and Original Works: The bidder should, undertake their own studies and furnish with their bid, a detailed construction planning and methodology supported with assessment study of requirements of equipment/plants & machineries to allow the employer to review their proposal. The bidder will ensure his commitment to make the arrangements of the required equipment on the day of commencement or with respect to the progress of the work in phases, as per the instructions of site in charge on an undertaking on Rs.500 stamp paper to be submitted along with the Bid in Packet B. However, this condition in no way shall dilute the respective condition in Registration Rules of MCGM. **(APPLICABLE FOR THIS TENDER)**

N0ote: 1. Bidders shall submit the undertaking for equipment capability and other undertakings as such on a single Rs.500/- stamp paper.

~~c) Special Works: The concerned Ch.Eng. shall enlist the equipments in the tender document justified for the project and ensure the capacity of the bidder for the same with the approval of concerned AMC.~~ **~~(NOT APPLICABLE FOR THIS TENDER)~~**

Sr.no.	Owned/Leased Equipment's	Requirements (No. & Capacity)

Note: Attach copy of ownership /lease or assured access in form of undertaking from owner from all equipments /machinery.

E) Technical Personnel Capability -

The contractor and/or its managerial staff should have qualification/experience appropriate to the function they fulfill. The minimum standard shall be increased by asking that at least one number or more of the contractor or its managerial staff have acquired qualifications or work experience to the needs of the contract. The minimum standard may also state that the person or persons responsible for managing the works must have a minimum of no's of years' experience working on similar nature of projects.

Tenderer (s) shall supply general information on the management structure of the firm, and shall make provision of suitably qualified personnel to fill the key positions as required during the contract implementation.

Cost of work in cr	**Requirement of Technical staff of (major+minor component)**	**Minimum nos to be deployed**	**Minimum Experience (years)**	**Designation**
~~**100+ cr**~~	~~i)Graduate Engineer(Major component)~~	~~1~~	~~20~~	~~Project Manager in major discipline of engineering~~

	~~ii)Graduate Engineer~~	~~2+1~~	~~12~~	~~Deputy Project Manager i major discipline of engineering~~
	~~iii) Graduate Engineer or Diploma Engineer~~	~~4~~ ~~2~~	~~5~~ ~~10~~	~~Project/Site Engineer~~
	~~iv) Graduate Engineer~~	~~1+1~~	~~8~~	~~Quality Engineer~~
	~~v) Diploma Engineer~~	~~1~~	~~8~~	~~surveyor~~
	~~vi) Graduate Engineer~~	~~1+1~~	~~6~~	~~Project Planning/ Billing Engineer~~
More than 50 to 100 cr	i)Graduate Engineer	1	20	Project Manager
	ii)Graduate Engineer	1+1	12	Deputy Project Manager
	iii) Graduate Engineer or Diploma Engineer	2+1	5 or 10	Project/Site Engineer
	iv) Graduate Engineer	1	8	Quality Engineer
	v) Diploma Engineer	1	8	surveyor
	vi) Graduate Engineer	1+1	6	Project Planning/ Billing Engineer
~~**More than 20 to 50 cr**~~	~~i)Graduate Engineer~~	~~1~~	~~20~~	~~Project Manager~~
	~~ii) Graduate Engineer or Diploma Engineer~~	~~1+1~~ ~~1+1~~	~~5~~ ~~10~~	~~Project/Site Engineer~~

	iv) Graduate Engineer	1	8	Quality Engineer
	v) Diploma Engineer	1	8	surveyor
	vi) Graduate Engineer	1	6	Project Planning/ Billing Engineer
(B)				
10 to 20 cr	i)Graduate Engineer	1	10	Principal Technical Representative
	ii) Graduate Engineer	1	5	Technical Representative
	iii) Graduate Engineer or Diploma Engineer	2 2	2 5	Project/Site Engineer and Project Planning/ Billing Engineer
5 to 10 cr	i)Graduate Engineer	1	5	Principal Technical Representative
	ii) Graduate Engineer or Diploma Engineer	2 2	2 5	Project/Site Engineer and Project Planning/ Billing Engineer
1.5 to 5 cr	i)Graduate Engineer	1	5	Principal Technical Representative
	ii) Graduate Engineer or Diploma Engineer	1 1	2 5	Project/Site Engineer and Project Planning/ Billing Engineer
Upto 1.5 Cr	ii) Graduate Engineer or Diploma Engineer	1 1	2 5	Principal Technical Representative — Project/Site Engineer and Project Planning/ Billing Engineer

Notes- 1 “Cost of work”, in table above, shall mean the agreement amount of the work. 2. Rate of recovery in case of non-compliance of the clause be stipulated at following rates -

Sr No	Qualification / Designation	Experience Years	Rate of Recovery – per month
1	Project Manager with degree	20	Rs. 60,000/- per month
2	Deputy Project Manager with degree	12	Rs. 40,000/- per month
3	Project/Site Engineer (Degree/Diploma)	5 or 10 respectively	Rs. 25,000/- per month
4	Quality Graduate Engineer	8	Rs. 25,000/- per month
5	Surveyor	8	Rs. 15,000/- per month
6	Project Planning/ Billing Engineer	6	Rs. 20,000/- per month

The failure in providing experienced technical and /professional ability personnel and even ignoring the instruction of the Engineer-in-charge shall be linked to penalization. Such disobeying attitude of the contractor shall also be reported to Vigilance/Registration & Monitoring department.

F. TIME PERIOD OF THE PROJECT :

Entire project should be completed and delivered within 30 **(Thirty Months)** months of time from the date of award of contract that **includes/~~excludes~~ Monsoon.**

The time allowed for carrying out the work as entered in the Tender shall be strictly observed by the Contractor and shall be reckoned from the date on which the Letter of Acceptance is given to the Contractor. The work shall throughout the stipulated period of the Contract be proceeded with all due diligence as time being deemed to be the essence of the contract on the part of the Contractor. On failing to do so, the Contractor shall pay as compensation an amount which shall be governed as per Clause - 8(e) of Standard General Conditions of Contract.

The Contractor should complete the work as per phase given below :

¼ of the work in .. ¼ of the time

½ of the work in .. ½ of the time

¾ of the work in .. ¾ of the time

Full of the work in .. Full of the time

Full work will be completed in **30 months** including monsoon.

Theabove programme is indicative and need to be worked out for every project for major activities with respect to parameters such as labour, machineries, settling time, procurement and transportation of materials etc. The Dy.Chief Engineer shall approve the phase programme of the project in the Tender Document.

The programme for completion of work shall be a part of the Contract Document in the form of Bar Chart / GANTT Chart. The Contractor is supposed to carry out the work and keep the progress as per Bar Chart/GANTT Chart. The Contractor shall complete the work as per the Schedule given in the Contract and the programme submitted by the Contractor.

G. Contract Execution

All required documents for execution of the contract shall be submitted within 30 days from the date of issue of letter of acceptance. If the documents are not submitted within the stipulated time a penalty of Rs 5000/- per day will be applicable to the contractor. All contract documents need to be duly affixed with stamp duty properly signed along with evidence/proof of payment of security/contract deposit/ within 30 days from the date of letter of acceptance received by him

H. If the amount of the Contract Deposit to be paid above is not paid within 30 days from the date of issue of Letter of Acceptance, the Tender / Contractor already accepted shall be considered as cancelled and legal steps be taken against the contractor for recovery of the amounts.

I. The amount of Security Deposit retained by the MCGM shall be released after expiry of period up to which the contractor has agreed to maintain the work in good order is over. In the event of the contractor failing or neglecting to complete the rectification work within the period up to which the contractor has agreed to maintain the work in good order, the amount of security deposit retained by MCGM shall be adjusted towards the excess cost incurred by the Department on rectification work.

J. Action when whole of security deposit is forfeited:

In any case in which under any Clause of this contract, the contractor shall have rendered himself liable to pay compensation amounting to the whole of this security deposit whether paid in one sum or deducted by instalments or in the case of abandonment of the work owning to serious illness or death of the contractor or any other cause, the Engineer on behalf of the Municipal Commissioner shall have power to adopt any of the following process, as he may deem best suited to the interest of MCGM -

(a) To rescind the contract (for which recession notice in writing to the contractor under the head of Executive Engineer shall be conclusive evidence) and in that case, the security deposit of the contract shall stand forfeited and be absolutely at the disposal of MCGM.

(b) To carry out the work or any part of the work departmentally debiting the contractor with the cost of the work, expenditure incurred on tools and plant, and charges on additional supervisory staff including the cost of workcharged establishment employed for getting the un-executed part of the work completed and crediting him with the value of the work done departmentally in all respects in the same manner and at the same rates as if it had been carried out by the contractor under the terms of his contract. The certificate of the Executive Engineer as to the costs and other allied expenses so incurred and as to the value of the work so done departmentally shall be final and conclusive against the contractor.

(c) To order that the work of the contractor be measured up and to take such part thereof as shall be un-executed out of his hands, and to give it to another contractor to complete, in which case all expenses incurred on advertisement for fixing a new contracting agency, additional supervisory staff including the cost of work charged establishment and the cost of the work executed by the new contract agency will be debited to the contractor and the value of the work done or executed through the new contractor shall be credited to the contractor in all respects and in the same manner and at the same rates as if it had been carried out by the contractor under the terms of his contract. The certificate of the Executive Engineer as to all the cost of the work and other expenses incurred as aforesaid for or in getting the un-executed work done by the new contractor and as to the value of the work so done shall be final and conclusive against the contractor.

In case the contract shall be rescinded under Clause (a) above, the contractor shall not be entitled to recover or be paid any sum for any work therefor actually performed by him under this contract unless and until the Executive Engineer shall have certified in writing the performance of such work and the amount payable to him in respect thereof and he shall only be entitled to be paid the amount so certified. In the event of either of the courses referred to in Clause (b) or (c) being adopted and the cost of the work executed departmentally or through a new contractor and other allied expenses exceeding the value of such work credited to the contractors amount of excess shall be deducted from any money due to the contractor, by MCGM under the contract or otherwise, howsoever, or from his security deposit or the sale proceeds thereof provided, however, the contractor shall have no claim against MCGM even if the certified value of the work done departmentally or through a new contractor exceeds the certified cost of such work and allied expenses, provided always that whichever of the three courses mentioned in clauses (a), (b) or (c) is adopted by the Executive Engineer, the contractor shall have no claim to compensation for any loss sustained by him by reason of his having purchase or procured any materials or entered in to any engagements or made any advance on account of or with a view to the execution of the work or the performance of the contract.

K. Contract may be rescinded and security deposit forfeited for bribing a public officer or if contractor becomes insolvent -

If the contractor assigns or sublets his contracts or attempt so to do, or become insolvent or commence any proceeding to get himself adjudicated and insolvent or make any composition with his creditors, or attempt so to do or if 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 through any public officer, or person in the employ of MCGM/Govt. 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 Engineer In-charge may thereupon, by notice in writing rescind the contract and the Security Deposit of the Contractor shall thereupon stand forfeited and be absolutely at the disposal of MCGM and the same consequences shall ensure as if the contract had been rescinded under above clause J hereof; and in addition the contractor shall not be entitled to recover or be paid for any work therefore actually performed under the contract.

SUBMISSION OF TENDERS

PACKET – A

The Packet ‘A’ shall contain scanned certified copies of the following documents

Scrutiny of this packet will be done strictly with reference to only the scanned copies of Documents uploaded online in packet ‘A’

a) Valid Registration Certificate.

b) Valid Bank Solvency Certificate of Minimum Solvency amount of Rs. 1.5 Crores (Rs. One and half Crores only) as governed by Registration Rules in force for respective Class of Contractor for Civil and M&E works.

c) A document in support of GST Registration.

d) Certified copies of valid 'PAN' documents and photographs of the individuals, owners, Karta of Hindu undivided Family, firms, private limited companies, registered co-operative societies, partners of partnership firms and at least two Directors, if number of Directors are more than two in case of Private Limited Companies, as the case may be. However, in case of Public Limited companies, Semi Government Undertakings, Government Undertakings, no 'PAN' documents will be insisted.

e) Latest Partnership Deed in case of Partnership firm duly registered with Chief Accountant (Treasury) of MCGM.

f) Signed copy of Addendum, Corrigendums.

g) Signed copy of Minutes of Pre-Bid meeting.

The bidders shall categorically provide their Email-ID in packet ‘A’.

NOTE:

 If the tenderer(s) withdraw tender offer during the tender validity period, his entire E.M.D shall be forfeited.

 If it is found that the tenderer has not submitted required documents in Packet "A" then, the shortfalls will be communicated to the tenderer through e-mail only and compliance required to be made within a time period of three working days otherwise they will be treated as non-responsive.

PACKET – B

The Packet 'B' shall contain scanned certified copies of the following documents –

a) The list of similar type of works as stated in para 'A' of Post qualification successfully completed during the last Seven years in prescribed proforma, in the role of prime contractor. Information furnished in the prescribed proforma (Proforma – I) shall be supported by the certificate duly self-attested. Documents stating that it has successfully completed during the last Seven years at least one contract of similar works as stated in para 'A' of Post qualification.

b) Annual financial turnover for preceding three financial years as certified by Chartered Accountant preceding the Financial Year in which bids are invited. Copies of Applicants duly audited balance sheet and profit and loss account for the preceding three financial years preceding the Financial Year in which bids are invited. (Proforma – II)

c) Documents stating that, it has access to or has available liquid assets, unencumbered assets, lines of credit and other financial means (independent of any contractual advance payment) sufficient to meet the construction cash flow requirements for the subject contract in the event of stoppage, start-up, or other delay in payment,of the minimum 15% of the cost of the work tendered for, net of the tenderer's commitment of other contracts (Certificate from Bankers / C.A./Financial Institution shall be accepted as a evidence).

d) The bidder shall give undertaking on Rs 500/-stamp paper that it is his/their sole responsibility to arrange the required machineries either owned/on lease or hire basis, at site before start of the work

~~i) Regular and Routine works: The successful bidder shall make the arrangements of the required equipment on the day of commencement or with respect to the progress of the work in phases, as per the instructions of site in charge. The successful bidder and, to that effect he will ensure commitment on an undertaking on Rs.500 stamp paper to be submitted along with the Bid in~~

~~Packet B. However, this condition in no way shall dilute the respective condition in Registration Rules of MCGM.~~**~~(Not applicable for this tender)~~**

ii) New and Original Works: The bidder should, undertake their own studies and furnish with their bid, a detailed construction planning and methodology supported with assessment study of requirements of equipment/plants & machineries to allow the employer to review their proposal. The bidder shall ensure his commitment to make the arrangements of the required equipment on the day of commencement or with respect to the progress of the work in phases, as per the instructions of site in charge on an undertaking on Rs.500 stamp paper to be submitted along with the Bid in Packet B. However, this condition in no way shall dilute the respective condition in Registration Rules of MCGM. - (**Applicable for this Tender**)

~~iii) Special Works: The concerned Ch.Eng. shall enlist the equipments in the tender document justified for the project and ensure the capacity of the bidder for the same with the approval of concerned AMC.~~ **~~(Not applicable for this tender)~~**

iv) Details of works in hand (Proforma VI-A & VI-B) (original), along with copies of work orders & attested copies of percentage of works completed or part thereof.

v) Statement showing assessed available Bid Capacity.

vi) The undertaking of Rs.500/- stamp paper as per the proforma annexed in 'Annexure B & C' Note: Bidders shall submit the undertaking for equipment capability and other undertakings as such on a single Rs.500/- stamp paper.

vii) The tenderers shall upload work plan as per the following outline:

1. GANTT chart/ PERT/ CPM chart showing the completion of work within prescribed time period, considering major activities.

2. Organizational set up envisaged by the contractors.

3. Plant & equipment proposed to be deployed for this work.

4 .Site Offices and Laboratories proposed to be set up.

5. A note on how the whole work will be carried out (work plan including methodology).

6. Quality management plan.

7. All the activities included in the Scope of Work shall be covered in the work plan.

e) Details of Technical Personnel as per Proforma IV alongwith Scanned Attested copies of qualification certificates and details of work experience.

f) Signed Copy of Form of Tender, Annexure A & Annexure E, as per Section 14 - Appendix

g) The bidder shall disclose the litigation history in Packet 'B' under the head "Details of Litigation History".

If there is no Litigation History, the bidder shall specifically mention that there is no Litigation History against him as per the clause of Litigation History. In case there is Litigation History –

Litigation History must cover – Any action of blacklisting, debarring, banning, suspension, deregistration and cheating with MCGM, State Govt., Central Govt. or any authority under State or Central Govt./Govt. organization initiated against the company, firm, directors, partners or authorized signatory shall be disclosed for last 5 years from the date of submission of bid. Also, bidder must disclose the litigation history for last 5 years from the date of submission of bid about any action like show cause issued, blacklisting, debarring, banning, suspension, deregistration and cheating with MCGM and MCGM is party in the litigation against the company, firm, directors, partners or authorized signatory for carrying out any work for MCGM by any authority of MCGM and the orders passed by the competent authority or by any court where MCGM is a party. While taking decision on Litigation History, the concerned Chief Engineer or D.M.C. or Director, as may be the case, should consider the details submitted by bidder and take decision based on the gravity of the litigation and the adverse effect of the act of company, firm, directors, partners or authorized signatory on the MCGM works which can spoil the quality, output, delivery of any goods or any work execution and within the timeframe.

Note:

i. The Electrical / Mechanical work shall be got carried out by the civil contractors through the contractors registered with MCGM. in Electrical Category. Information about the registered contractors shall be obtained from the office of the Ch.E. (M&E)/ E.E. (Monitoring & Registration Cell). Attested scanned copy of the valid registration certificate in Electrical Category shall be uploaded with the tender along with the undertaking from the registered Electrical Contractor stating his willingness to carry out the tender work.

ii. The successful bidder shall submit valid registration certificate under E.S.I.C., Act 1948, if the tenderer has more than 10 employees /persons on his establishment (in case of production by use of energy) and 20 employees/persons on his establishment (in case of production without use of energy) to MCGM as and when demanded. In case of less employees/persons mentioned above then the successful bidder has to submit an undertaking to that effect on Rs. 200 stamp paper as per circular u/no. CA/FRD/I/65 of 30.03.2013.

iii. The successful bidder shall submit valid registration certificate under E.P.F. & M.P., Act 1952, if tenderer has more than 20 employees/persons on his establishment, to MCGM as and when demanded. In case if the successful bidder has less employees/persons mentioned above then the successful bidder has to submit an undertaking to that effect on Rs. 500 stamp paper as per circular u/no. CA/FRD/I/44 of 04.01.2013.

Note: If it is found that the tenderer has not submitted required documents in Packet "B" then, the shortfalls will be communicated to the tenderer through e-mail only and compliance required to be made within a time period of three working days otherwise they will be treated as non-responsive.

PACKET – C

Online tender filled in either percentage plus or minus (above or below), or at par. (There is no separate provision to quote % in physical form, this is a part in Header Data of online Tendering). For Packet 'C' tenderer(s) will fill data in 'Item Data Tab' in Service Line Item via Details and quotes his percentage variation figures. (If entered '0' it will be treated as 'at par'. By default the value is zero only).

Note: In case of rebate/premium of 15% and above as quoted by the tenderer, the rate analysis of major items shall be submitted by L1 and L2 bidder after demand notification by e-mail to bidders by concerned Dy.Ch.Eng. The format for rate analysis is annexed at Annexure D.

BID SECURITY OR EMD

 The Bidder shall furnish, as part of the Bid, Bid Security/EMD, in the amount specified in the Bid Data Sheet. This bid security shall be in favor of the authority mentioned in the Bid Data Sheet and shall be valid till the validity of the bid.

 The tenderers shall pay the EMD online instead paying the EMD at any of the CFC centres in MCGM Ward Offices.

 Any bid not accompanied by an acceptable Bid Security and not secured as indicated in sub-clause mentioned above, shall be rejected by the Employer as non-responsive.

 The Bid Security of the successful Bidder will be discharged when the Bidder has signed the Agreement and furnished the required Security Deposits.

 The Bid Security/ EMD of L-3 and bidder shall be refunded immediately after opening of financial bid but, the EMD/ASD submitted by the L-2 bidder will be returned after obtaining Standing Committee Resolution.

 The Bid Security may be forfeited:

a) if the Bidder withdraws the Bid after bid opening (opening of technical qualification part of the bid during the period of Bid validity;

b) in the case of a successful Bidder, if the Bidder fails within the specified time limit to:

i. sign the Agreement; and/or

ii. Furnish the required Security Deposits.

1. The cases wherein if the shortfalls are not complied by a contractor, will be informed to Registration and Monitoring Cell. Such non-submission of documents will be considered as 'Intentional Avoidance' and if three or more cases in 12 months are reported, shall be viewed

seriously and disciplinary action against the defaulters such as banning/de-registration, etc. shall be taken by the registration cell with due approval of the concered AMC.

2. No rejections and forfeiture shall be done in case of curable defects. For non-curable defects the 10% of EMD shall be forfeited and bid will be liable for rejection.

Note:

i) Curable Defect shall mean shortfalls in submission such as:

a. Non-submission of following documents,

i. Valid Registration Certificate

ii. Valid Bank Solvency

iii. Sales Tax Registration Certificate (VAT)

iv. Certified Copies of PAN documents and photographs of individuals, owners, etc v. Partnership Deed and any other documents

vi. Undertakings as mentioned in the tender document.

b. Wrong calculation of Bid Capacity,

c. No proper submission of experience certificates and other documents, etc.

ii) Non-curable Defect shall mean

a. In-adequate submission of EMD/ASD amount,

b. In-adequacy of technical and financial capacity with respect to Eligibility criteria as stipulated in the tender.

BID VALIDITY

 Bids shall remain valid for a period of **not less than one eighty (180) days after the deadline date for bid submission specified in Bid Data Sheet.** A bid valid for a shorter period shall be rejected by the Employer as non-responsive.

 In exceptional circumstances, prior to expiry of the original time limit, the Employer may request that the bidders may extend the period of validity for a specified additional period. The request and the bidders' responses shall be made in writing or by cable. A bidder may refuse the

request without forfeiting his Bid Security. A bidder agreeing to the request will not be required or permitted to modify his bid, but will be required to extend the validity of his bid security for a period of the extension.

DEFECT LIABILITY PERIOD

 The Contractor is expected to carry out the construction work in Workmen like manner so as to meet the requirement and specification for the project. It is expected that the Workmanship and materials will be reasonably fit for the purpose for which they are required.

 Defects or defective work is where standard and quality of workmanship and materials as specified in the contract is deficient. Defect is defined as a failure of the completed project to satisfy the express or implied quality or quantity obligations of the construction contract. Defective construction works are as the works which fail short of complying with the express descriptions or requirements of the contract, especially any drawings or specifications with any implied terms and conditions as to its quality, workmanship, durability, aesthetic, performance or design. Defects in construction projects are attributable to various reasons.

 Some of the defects are structural defects results in cracks or collapse of faulty defective plumbing, inadequate or faulty drainage system, inadequate or faulty ventilation, cooling or heating systems, inadequate fire systems etc. The defects could be various on accounts of different reasons for variety of the projects.

 The Engineering In charge/Project Officer shall issue the practical completion certificate for the project. During the Defect Liability Period which commences on completion of the work, the Engineering In charge shall inform or the contractor is expected to be informed of any defective works by the Employer's representative of the defects and make good at contractor's cost with an intention of giving opportunity to the contractor of making good the defects appeared during that period. It is the contractor's obligation under the contract to rectify the defects that appear during Defect Liability Period and the contractor shall within a reasonable time after receipt of such instructions comply with the same at his own cost. The Engineering In charge/Project Officer shall issue a certificate to that effect and completion of making good defects shall be deemed for

all the purpose of this contract to have taken place on the day named in such defect liability certificate.

 If defective work or workmanship or design have been knowingly covered-up or conceived so as to constitute fraud, commencement of the Defect Liability Period may be delayed. The decided period may be delayed until discover actually occurs on at least the defect could have been discovered with reasonable diligence, whichever is earlier.

 The DLP shall be as below:

Dept	**Type of works**	**DLP**
Roads / Bridge	For cement concrete road/ Mastic works	5 years
	Asphalt work	3 years
	Paver Block	3 years
	Structural work	5 years
	General works	5 years
BM/SIC/HIC / BC	**General works**	**3 years**
	Structural works	**5 years**
	Waterproofing works	**5 years**
Ward Works	All ward level works	2 years
Other Works	Pot holes and pre-monsoon bad	1 year

	patch repair work	
For other departments	HE, WSP, SP, SWD, Garden	3 years

 Also, in case of defect, the Engineer shall give notice to the Contractor of any Defects before the end of the Defects Liability Period, which begins at. The Defects Liability Period shall be extended for as long as Defects remain to be corrected. Every time notice of Defect/Defects is given, the Contractor shall correct the notified Defect/Defects within the duration of time specified by the Engineer's notice. The Engineer may issue notice to the Contractor to carry out removal of defects or deficiencies, if any, noticed in his inspection, or brought to his notice. The Contractor shall remove the defects and deficiencies within the period specified in the notice and submit to the Engineer a compliance report.

 It is the Completion Stage when the contractor has completed all of the works and fixed all of the defects that were on the list of issue by Engineer-in-charge. When this happens, the engineer must issue a 'Certificate of Completion'. On the issue of 'Certificate of Completion', the 'Defect Liability Period 'starts. The contractor also must issue a 'Certificate statement' as an acknowledgment to the engineer not later than 14 days after the 'Certificate of Completion' has been issued. During the 'Defect Liability Period', the contractor has to obey all written instructions from the engineer to carryout repairs and fix any defects which appear in the Permanent Works. If the contractor does not ,due to his own faults finish the repair works or fix the defects by the end of 'Defect Liability Period', the 'Defect Liability Period' will continue until all works instructed by engineer is done.

SECURITY DEPOSIT AND PERFOMANCE GUARANTEE

A. Security Deposit :- The security deposit shall mean and comprise of I) Contract Deposit and II) Retention Money.

I) Contract Deposit – The successful tender, here after referred to as the contractor shall pay an amount equal to two (2) percent of the contract sum shall be paid within thirty days from the date of issue of letter of acceptance.

II) Retention Money – The contractor shall pay the retention money an amount equal to five (5) percent of the Contract Sum which will be recovered from the contractors every bill i.e. interim / running / final bill. The clause of retention money will not be applicable M. & E. Department.

B. Additional Security Deposit - The additional security deposit will be applicable when a rebate of more than of 12 % at the rate of with no maximum limit. The ASD is calculated as follows:

Additional security deposit = (X/100) x office estimated cost,

Where X=percentage rebate quoted above 12%

The ASD shall be paid online in the ASD tab for bidders in e-tendering system before submission of the bid.

C. Performance Guarantee - The successful tender, here after referred to as the contractor shall pay in the form of "Performance Guarantee" at different rates for different slabs as stated below:

% quoted	Amount of performance guarantee applicable
For premium, at par and rebate less 0 to 12%	0.92 % of contract sum applicable for rebate of 12%

For Rebate of 12.01% and more	P.G. = {0.92% x contract sum applicable for rebate of 12%} +(X) x contract sum, where X= percentage rebate quoted more than 12%

Note: Contract sum shall mean amount after application of rebate/premium as quoted by the contractor with contingencies only and excluding price variation.

The PG shall be paid in one the following forms.

I) Cash (In case guarantee amount is less than Rs.10,000/-

II) Demand Draft (In case guarantee amount is less than Rs.1,00,000/-)

III) Government securities

IV) Fixed Deposit Receipts (FDR) of a Schedule Bank.

V) An electronically issued irrevocable bank guarantee bond of any Schedule bank or in the prescribed form given in Annexure.

Performance Guarantee is applicable over and above the clause of Security Deposit. Performance Guarantee will have to be paid & shall be valid till the defect liability period or finalization of final bill whichever is later.

This deposit will be allowed in the form of I to V as mentioned above and shall be paid within 15 days after receipt of Letter of Acceptance.

Note: Following exceptions shall be adopted for 'Demolition Tenders':

• Irrespective of the offer (Rebate/ at par/ premium), ASD shall be differed and only PG of 10% of contract sum be taken from the successful bidder on award of contract only.

• MCGM departments shall ensure to incorporate specific condition regarding above in bid document and e-tender notice.

D. Refund of Security Deposit

I. Refund of Contract Deposit

The Contract Deposit shall be released within 30 days after completion of 3rd year of DLP (in case of 5 years DLP) and after issue of 'Defect Liability Certificate' (in case of 1 or 2 or 3 years DLP) subject to no recoveries are pending against the said work, provided that the Engineer is satisfied that there is no demand outstanding against the Contractor. No claim shall be made against the Balance Contract Deposit after the issue of Defects Liability Certificate.

II. Refund of Retention Money

One-half (50%)of the Retention Money shall be released within 30 days of issue of 'Certificate of Completion' with respect to the whole of the Works. In the event the Engineer issues a Taking-over Certificate for a section or part of the Permanent Works, only such proposition thereof as the Engineer determines (having regard to the relative value of such section or part of the Works) shall be considered by the Engineer for payment to the Contractor.

The balance Retention Money shall be released within 30 days after completion of 3rd year of DLP (in case of 5 years DLP) and after issue of 'Defect Liability Certificate' (in case of 1 or 2 or 3 years DLP) provided that the Engineer is satisfied that there is no demand outstanding against the Contractor. In the event of different Defects Liability Periods have been specified or become applicable to different sections or parts of the Permanent Works, the said moneys will be released within 30 days on expiration of the latest of such Defects Liability Periods. Payment of the above mentioned 50% is exclusive of the amounts to be withheld as stated in and that amount shall be paid as per condition stated therein.

III. Refund of Additional Security Deposit

The additional security deposit shall be released within 30 days of issue of 'Certificate of Completion' with respect to the whole of the Works. In the event the Engineer issues a Taking-over Certificate for a section or part of the Permanent Works, only such proposition thereof as the Engineer determines (having regard to the relative value of such section or part of the Works) shall be considered by the Engineer for payment to the Contractor.

IV. Refund of Performance Guarantee

The Deposit on account of performance guarantee shall be released within 30 days of completion of Defects Liability Certificate subject finalization of final bill whichever is later and no recoveries are pending against the said work, provided that the Engineer is satisfied that there is no demand outstanding against the Contractor.

 Summary of time of Refund of deposit is tabulated as follows:

a) Time of Refund for works having 5 years DLP

Deposits refunded after completion	After 3 yrs of DLP	After Completion of DLP
ASD + 50% of RM	CD+50% of RM	PG

b) Time of Refund for works having 1 or 2 or 3 years DLP

Deposits refunded after completion	After Completion of DLP
ASD + 50% of RM	CD+50% of RM+PG

*Note: a) It shall be clearly mentioned that the BG shall be applicable for individual work/contract and clubbing of various contracts of the said contractor will not be allowed. In case of obtaining Bank Guarantee, it is necessary to mention that the same shall be valid further 6 months from the completion of defect liability period/ warranty period.

b) It shall be the responsibility of the bidder to keep the submitted B.G. "VALID" for the stipulated time period in the tender & in case of its expiry it will attract penalization.

c) Bank Guarantee should be issued by way of General Undertaking and Guarantee issued on behalf of the Contractor by any of the Nationalized or Scheduled banks or branches of foreign banks operating under Reserve Bank of India regulations located in Mumbai uptoVirar&Kalyan. List of approved Banks is appended at the end of Instructions to Bidders (ITB). The Bank Guarantee issued by branches of approved Banks beyond Kalyan and Virar can be accepted only if the said Bank Guarantee is countersigned by the Manager of a Regional Branch of the same bank within the Mumbai City Limit categorically endorsing thereon that the said Bank Guarantee is binding on the endorsing Branch of the Bank or the Bank itself within Mumbai Limits and is liable to be enforced against the said Branch of the Bank or the bank itself in case of default by the Contractors furnishing the Bank Guarantee. The Bank Guarantee shall be renewed as and when required and/or directed from time to time until the Contractor has executed and completed the works and remedied any defects therein.

E. Legal + Stationary Charges: (As per applicable circular)

Successful tender shall pay the Legal Charges +Stationary charges

Contract value						**Legal + Stationary Charges**
Upto	Rs	3,00,000/-		Rs	-------	Nil
From	Rs	3,00,001/-	To	Rs	20,00,000/-	Rs. 830/-
		20,00,001/-			1,00,00,000/-	Rs. 3240/-
		1,00,00,001/-			Any Amount	Rs. 8070/-
						(Maximum)

The tenderers are requested to note that stationary charges as given in the table above will be recovered from the successful tenderer for supply of requisite prescribed forms for preparing certificate bills in respect of the work.

F. Stamp Duty: (As per applicable circular)

It shall be incumbent on the successful tenderer to pay stamp duty on the contract.

i. As per the provision made in Article 63, Schedule I of Bombay Stamp Act 1958, stamp duty is payable for "works contract" that is to say, a contract for works and labour or services involving transfer of property in goods (whether as goods or in some other form) in its execution and includes a sub-contract, as under :

a	Where the amount or value set forth in such contract does not exceed rupees ten lakh.	Five Hundred rupees stamp duty
b	Where it exceeds rupees ten lakhs	Five hundred rupees plus 0.1% of the amount above rupees ten lakh subject to the maximum of rupees Twenty Five lakh stamp duty.
c	Stamp Duty on B.G	0.5% of the B.G amount

ii. The successful bidder shall enter into a contract agreement with M.C.G.M. within 30 days from the date of issue of Work Order and the same should be adjudicated for payment of Stamp Duty by the successful bidder.

iii. Further shortfall if any, in amount of stamp duty paid as against prescribed amount for the documents executed in Mumbai City & Mumbai Suburban District be recovered from the concerned work contractors and to deposit the deficit or unpaid Stamp Duty and penalty by two separate Demand Draft or Pay Order in favour of "Superintendent of Stamp, Mumbai" within 15 days from intimation thereof.

iv. All legal charges and incidental expenses in this respect shall be borne and paid by the successful tenderer.

IMPORTANT DIRECTIONS

1. All the information uploaded shall be supported by the corroborative documents in absence of which the information uploaded will be considered as baseless and not accepted for qualification criteria. All the documents shall be uploaded with proper pagination. The page No. shall be properly mentioned in the relevant places.

The information shall be uploaded in the sequence as asked for with proper indexing etc. The Bidder shall be fully responsible for the correctness of the information uploaded by him.

2. Applicants/Bidders shall refer portal.mcgm.gov.in\tenders for "The Manual of Bid Submission for Percentage Rate/Item Rate Tender Document." The detail guidelines for creation and submission of bid are available in the referred document.

Any queries or request for additional information concerning this TENDER shall be submitted by e-mail to **1) sidanusun@yahoo.com, 2) exe01civil@mcgm.gov.in .** The subject shall clearly bear the following identification/ title: "Queries/ Request for Additional Information: TENDER for **Proposed Construction of Basement Parking below Raosaheb Patwardhan Garden, F.P. No. 488 of TPS-III Bandra,(C.T.S NO. 371A Of Village Bandra) opposite National College, Linking Road (V.P. Road), Bandra West in H/West ward Mumbai.** Any changes in mail ID will be intimated on the portal.

3. In case of Equal Percentage of lowest bidders (L1), the allotment of work shall be done by giving 48 hrs (2 working days) from the day of opening of packet C on same BID-Document number for re-quoting and such development needs to done by IT department in MCGM's SRM system. Till such development is made; 'Sealed Bids' shall be called from the bidders quoting the same rates i.e. L1.

In case of equal percentage of lowest bidders is obtained even after re-quoting, then the successful bidder will be decided by lottery system by concerned Ch.Eng.

The bidder shall need to submit the additional ASD if applicable within 7 days after receipt of notification issued by concerned Chief Engineer. Also, the Performance Guarantee shall be paid in 15 days after receipt of Letter of Acceptance.

SECTION 7

SCOPE OF WORK

SCOPE OF WORK :

The Consulting Architect M/s Architect Hafeez Contractor had prepared drawings mainly consists of Garden with land scape at Ground floor level and Car & two wheeler Parking at Lower Ground floor, Upper & Lower Basements. Further, it is informed by Consulting Architect that the detailed estimate for the Civil and Mechanical & Electrical works along with structural design is prepared are based on the architectural drawings submitted to B.P. (Special Cell) for their approval.

Summary of Parking spaces is as tabulated below -

Floor	Bus	Big Car	Small Car	Two Wheelers
Total number of parking at Ground Floor, Lower Ground Floor, Upper & lower Basement Floor-	09	560		221

.Excavation for basement / foundation of structure, Shore piling along basement line to retain existing structures and trees nearby / soil as per structural engineers design.

.Tree transplant / tree cutting have been proposed as per requirement & availability of open spaces.

.The building will be constructed as RCC framed structure, Grade of concrete and Reinforcement as per Structural Engineers design & specifications.

.Water proofing treatment to basement by HDPE sheet membrane, cementious based membrane treatment.

.All electrical works will be carried out as per electrical layout drawings. Electrical scope will include concealed cabling, Light, ventilation system, storm & water pumps to be provided at parking area, DG Set, CCTV, Fire fighting works such as alarms, sprinklers, smoke detectors etc. to be carried out as per Chief Fire Officer's No Objection certificate (NOC) which is awaited.

.Flooring - Trimix Concrete floor with Epoxy / Polyurathane coating for Parking area, Vitrified tiles for toilets, Granite for Lobby area, Kota stone in Staircase.

.Parking area should be provided with Thermoplastic Road marking paints strips & arrows, Signage, Speed Breakers etc as directed.

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Note:

1) All the works contained in the scope of work shall be carried out strictly as per the relevant specifications applicable as attached or referred to in this e -tender document.

2) The above is general description of the scope of work & actual work shall be governed by B.O.Q. and as directed by the Engineer.

3) If there are multiple works under this e – tender / contract then all works should be started simultaneously by the contractor.

4) Applicable MCGM Fair Market Schedules: The Unified Schedule of Rates are applicable which are available on MCGM portal : http://portal.mcgm.gov.in.

SECTION 8

BILL OF QUANTITIES

 Projection of Estimated Cost:

(Separately Attached with this Tender as Volume II)

SECTION 9

GENERAL CONDITIONS OF CONTRACT

General Conditions of Contract

A. General

1. Definitions

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

The "Contract" shall mean the tender and acceptance thereof and the formal agreement if any, executed between the Contractor, Commissioner and the Corporation together with the documents referred to therein including these conditions and appendices and any special conditions, the specifications, designs, drawings, price schedules, bills of quantities and schedule of rates. All these documents taken together shall be deemed to form one Contract and shall be complementary to one another.

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

The "Contractor" shall mean the individual or firm or company whether incorporated or not, whose tender has been accepted by the employer and the legal successor of the individual or firm or company, but not (except with the consent of the Employer) any assignee of such person.

The Bidder is a person or corporate body who has desired to submit Bid to carry out the Works, including routine maintenance till the tender process is concluded.

The Contractor's Bid is the completed bidding document submitted by the Contractor to the Employer.

The "Contract Sum" means the sum named in the letter of acceptance including Physical contingencies subject to such addition thereto or deduction there-from as may be made under the provisions hereinafter contained.

Note : The contract sum shall include the following – • In the case of percentage rate contracts the estimated value of works as mentioned in the tender adjusted by the Contractor's percentage.

• In the case of item rate contracts, the cost of the work arrived at after finalisation of the quantities shown in schedule of items / quantities by the item rates quoted by the tenderers for various items and summation of the extended cost of each item.

• In case of lumpsum contract, the sum for which tender is accepted.

• Special discount / rebate / trade discount offered by the tenderer if any and accepted by the Corporation.

• Additions or deletions that are accepted after opening of the tenders.

The "Contract Cost" means the Contract Sum plus Price Variation. This cost shall be included in the letter of acceptance.

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

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

Drawings means all the drawings, calculations and technical information of a like nature provided by the Engineer to the Contractor under the Contract and all drawings, calculations, samples, patterns, models, operation & maintenance manual and other technical information of like nature submitted by the Contractor and approved by the Engineer.

The Authority shall mean Municipal Corporation of Greater Mumbai (MCGM)

The "Employer" shall mean the Municipal Corporation for Greater Mumbai / Municipal Commissioner for Greater Mumbai, for the time being holding the said office and also his successors and shall also include all "Additional Municipal Commissioners, Director (Engineering Services & Projects)" and the Deputy Municipal Commissioner, to whom the powers of Municipal Commissioner, have been deputed under Section 56 and 56B of the Mumbai Municipal Corporation Act.

The Engineer in-charge shall mean the Executive Engineer in executive charge of the works and shall include the superior officers of the Engineering department i.e. Dy.Ch.Eng/Ch.Eng. and shall mean and include all the successors in MCGM

The Engineer's Representative shall mean the Assistant Engineer, Sub. Engineer/Jr. Engineer in direct charge of the works and shall include Sub Eng./ Jr. Eng of Civil section/ Mechanical section/ Electrical section appointed by MCGM.

The "Engineer" shall mean the City Engineer / the Hydraulic Engineer / the Chief Engineer / the Special Engineer, appointed for the time being or any other officer or officers of the Municipal Corporation who may be authorized by the commissioner to carry out the functions of the City Engineer / the Hydraulic Engineer / the Chief Engineer / the Special Engineer or any other competent person appointed by the employer and notified in writing to the Contractor to act in replacement of the Engineer from time to time.

Contractor's Equipment means all appliances and things of whatsoever nature required for the execution and completions of the Works and the remedying of any defects therein, but does not include plant material or other things intended to form or forming part of the Permanent Works.

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

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

Materials are all supplies, including consumables, used by the Contractor for incorporation in the Works and works of routine maintenance.

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

Routine Maintenance is the maintenance of activities of the competed structure for five years as specified in the Contract Data.

The "Site" shall mean the land and other places including water bodies more specifically mentioned in the special conditions of the tender, on, under in or through which the permanent works or temporary works are to be executed and any other lands and places provided by the Municipal Corporation for working space or any other purpose as may be specifically designated in the contract as forming part of the site.

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

"Specification" shall mean the specification referred to in the tender and any modification thereof or addition or deduction thereto as may from time to time be furnished or approved in writing by the Engineer.

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

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

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

Variation means a change to the:-

i) Specification and /or Drawings (if any) which is instructed by the Employer.

ii) Scope in the Contract which is instructed by the Employer.

iii) Price in the Contract which is instructed by the Employer.

The Works, as defined in the Contract Data, are what the Contract requires the Contractor to construct, install, maintain, and turn over to the Employer. Routine maintenance is defined separately.

Jurisdiction: In case of any claim, dispute or difference arising in respect of a contract, the cause of action thereof shall be deemed to have arisen in Mumbai and all legal proceedings in respect of any claim, dispute or difference shall be instituted in a competent court in the City of Mumbai only.

2. Interpretation

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

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

2.3 The documents forming the Contract shall be interpreted in the following documents: (1) Agreement, (2) Letter of Acceptance, (3) Notice to Proceed with the Work , (4) Contractor's Bid, (5) Contract Data, (6) Special Conditions of Contract Part (7) General Conditions of Contract Part I, (8) Specifications, (9) Drawings, (10) Bill of Quantities, and (11) Any other document listed in the Contract Data.

3 . Engineer's Decisions

3.1 Except where otherwise specifically stated, the Engineer will decide contractual matters between the Employer and the Contractor in the role representing the Employer. However, if the Engineer is required under the rules and regulations and orders of the Employer to obtain prior approval of some other authorities for specific actions, he will so obtain the approval, before communicating his decision to the Contractor.

3.2 Except as expressly stated in the Contract, the Engineer shall not have any authority to relieve the Contractor of any of his obligations under the contract.

4. Delegation

4.1 The Engineer, with the approval of the Employer, may delegate any of his duties and responsibilities to other person(s), except to the Adjudicator, after notifying the Contractor, and may cancel any delegation after notifying the Contractor.

5. Communications

All certificates, notices or instructions to be given to the Contractor by Employer/ Engineer shall be sent on the address or contact details given by the Contractor of Bid. The address and contact details for communication with the Employer/ Engineer shall be as per the details given in Contract Data. Communications between parties that are referred to in the conditions shall be in writing. The Notice sent by facsimile (fax) or other electronic means shall be effective on confirmation of the transmission. The Notice sent by Registered post or Speed post shall be effective on delivery or at the expiry of the normal delivery period as undertaken by the postal service.

6. Subcontracting

The Main contractor should get the specialized works executed through nominated sub-contractor duly approved by the Engineer-in-charge / Consultants whose qualifying criteria are as follows, as suggested by the Consultants :

i) Plumbing work - The nominated agency should have license issued by Government of Maharashtra/MCGM or equivalent. The nominated Agency should have experience in constructing & commissioning of plumbing systems, huge capacity FIRE TANK & advanced Fire Fighting systems of high rise public/ semi public buildings.

ii) Electrical Works - Municipal registered electrical contractors in Class “AA” under old registration rules 1992 & having validity of registration upto 31.12.2016 or municipal registered electrical contractors in Class “AA” & above as per new registration rules 2015. The contractor shall have valid PWD’s electrical contractors license.

Iii) Fire Fighting & Fire Alarm System - Firms dealing in the line of installations of fire fighting and detection systems enlisted with Directorate of Maharashtra fire services as eligible (as

on the date of invitation on tender) licensing agency for SITC of fire fighting and detection systems. The nominated agency should have a license issued by the Government of Maharashtra / MCGM. or equivalent.

iv) HVAC Works :- The firm shall be manufacturer of chiller or their authorised dealer or dealing in line of supply, installation, testing and commissioning of HVAC work. The Tenderer shall have Service center facility in Mumbai/ Thane / Navi Mumbai and it should be in existence and operation.

v) IBMS System, Networking, Telecom System - The firm/agency shall be manufacturer/their authorised dealer or both,dealing in line of supply Installation, Testing, & commissioning of IBMS networking& telecom system Mainly system integrator.

6.1 Unless specifically mentioned in the contract subletting will not be allowed. Subletting, where otherwise provided by the contract shall not be more than 25% of the contract price.

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

a. the sub-contracting of any part of the Works for which the Subcontractor is named in the Contract;

b. the provision for labour, or labour component.

c. the purchase of Materials which are in accordance with the standards specified in the Contract.

6.3 Beyond what has been stated in clauses 6.1 and 6.2, if the Contractor proposes sub contracting any part of the work during execution of the Works, because of some unforeseen circumstances to enable him to complete the Works as per terms of the Contract, the Employer will consider the following before according approval:

a. The Contractor shall not sub-contract the whole of the Works.

b. The permitted subletting of work by the Contractor shall not establish any contractual relationship between the sub-contractor and the MCGM and shall not relieve the Contractor of any responsibility under the Contract.

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

a. the circumstances warrant such sub-contracting; and

b. the sub-Contractor so proposed for the Work possesses the experience, qualifications and equipment necessary for the job proposed to be entrusted to him.

7. Other Contractors

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

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

8. Personnel

8.1 The Contractor shall employ for the construction work and routine maintenance the key personnel including technical personnel named in the Contract Data or other personnel approved by the Engineer. The Engineer will approve any proposed replacement of technical personnel only if their relevant qualifications and abilities are substantially equal to those of the personnel stated in the Contract Data.

8.2 The Contractor's personnel shall appropriately be qualified, skilled and experienced in their respective trades or occupations. The Engineer shall have authority to remove, or cause to be removed, any person employed on the site or works, who carries out duties incompetently or negligently and persists in any conduct which is prejudicial to safety, health or the protection of the environment.

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

8.4 The Contractor shall not employ any retired Gazetted officer who has worked in the Engineering Department of the MCGM /State Government and has either not completed two years after the date of retirement or has not obtained MCGM/State Government's permission to employment with the Contractor.

9. Employer's and Contractor's Risks

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

10. Employer's Risks

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

11. Contractor's Risks

11.1 All risks of loss of or damage to physical property and of personal injury and death which arise during and in consequence of the performance of the Contract other than the excepted risks, referred to in clause 11.1, are the responsibility of the Contractor.

12. Insurance

12.1 The Contractor at his cost shall provide, in the joint names of the Employer and the Contractor, insurance cover from the Start Date to the end of Defects Liability Period, in the amounts and deductibles stated in the Contract Data for the following events which are due to the Contractor's risks:

a) Loss of or damage to the Works, Plant and Materials;

b) Loss of or damage to Equipment;

c) Loss of or damage to property (other than the Works, Plant, Materials, and Equipment) in connection with the Contract; and

d) Personal injury or death.

12.2 Insurance policies and certificates for insurance shall be delivered by the Contractor to the Engineer for the Engineer's approval before the Start Date. All such insurance shall provide for compensation to be payable in the types and proportions of currencies required to rectify the loss or damage incurred.

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

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

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

13. Site Investigation Reports

13.1 The Contractor, in preparing the Bid, may rely, at his own risk, on any Site Investigation Reports referred to in the Contract Data, supplemented by any other information available to him, before submitting the bid.

14. Queries about the Contract Data

14.1 The Engineer will clarify queries on the Contract Data.

15. Contractor to Construct the Works and Undertake Maintenance (if specified in the tender)

15.1 The Contractor shall construct, and install and maintain the Works in accordance with the Specifications and Drawings and as per instructions of the Engineer.

15.2 The Contractor shall construct the works with intermediate technology, i.e., by manual means with medium input of machinery required to ensure the quality of works as per specifications. The Contractor shall deploy the equipment and machinery as required in the contract.

15.3 The Contractor shall take all reasonable steps to protect the environment on and off the Site and to avoid damage or nuisance to persons or to property of the public or others resulting from pollution, noise or other causes arising as a consequence of his methods of operation.

During continuance of the contract, the Contractor and his sub-contractors shall abide at all times by all existing enactments on environmental protection and rules made there under, regulations, notifications and byelaws of the State or Central Government, or local authorities and any other law, bye-law, regulations that may be passed or notification that may be issued in future by the State or Central Government or the local authority. Salient features of some of the major laws that are applicable are given below:

- The Water (Prevention and Control of Pollution) Act, 1974, this provides for the prevention and control of water pollution and the maintaining and restoring of wholesomeness of water. 'Pollution' means such contamination of water or such alteration of the physical, chemical or biological properties of water or such discharge of any sewage or trade effluent or of any other liquid, gaseous or solid substance into water (whether directly or indirectly) as may, or is likely to, create a nuisance or render such water harmful or injurious to public health or safety, or to domestic, commercial, industrial, agricultural or other legitimate uses, or to the life and health of animals or plants or of aquatic organisms.

- The Air (Prevention and Control of Pollution) Act, 1981, this provides for prevention, control and abatement of air pollution. 'Air Pollution' means the presence in the atmosphere of any 'air pollutant', which means any solid, liquid or gaseous substance (including noise) present in the atmosphere in such concentration as may be or tend to

be injurious to human beings or other living creatures or plants or property or environment.

- The Environment (Protection) Act, 1986, this provides for the protection and improvement of environment and for matters connected therewith, and the prevention of hazards to human beings, other living creatures, plants and property. 'Environment' includes water, air and land and the interrelationship which exists among and between water, air and land, and human beings, other living creatures, plants, micro-organism and property.

- The Public Liability Insurance Act, 1991, This provides for public liability insurance for the purpose of providing immediate relief to the persons affected by accident occurring while handling hazardous substances and for matters connected herewith or incidental thereto. Hazardous substance means any substance or preparation which is defined as hazardous substance under the Environment (Protection) Act 1986, and exceeding such quantity as may be specified by notification by the Central Government.

16. The Works and Routine Maintenance to be completed by the Intended Completion Date

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

17. Approval by the Engineer

17.1 The Contractor shall submit Specifications and Drawings showing the proposed Temporary Works to the Engineer, who is to approve them if they comply with the Specifications and Drawings.

17.2 The Contractor shall be responsible for design and safety of Temporary Works.

17.3 The Engineer's approval shall not alter the Contractor's responsibility for design and safety of the Temporary Works.

17.4 The Contractor shall obtain approval of third parties to the design of the Temporary Works, where required.

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

18. Safety

18.1 The Contractor shall be responsible for the safety of all activities on the Site. He shall comply with all applicable safety requirements and take care of safety of all persons entitled to be on the site and the works. He shall use reasonable efforts to keep the site and the works, both during construction and maintenance, clear of unnecessary obstruction so as to avoid danger to the persons and the users.

- Workers employed on mixing asphaltic materials, cement and lime mortars shall be provided with protective footwear and protective goggles.
- Stone breaker shall be provided with protective goggles and protective clothing and seated at sufficiently safe intervals.
- The area should be barricaded or cordoned off by suitable means to avoid mishaps of any kind. Power warning signs should be displayed for the safety of the public whenever cleaning works are undertaken during night or day.
- The workers engaged for cleaning the manholes/sewers should be properly trained before allowing working in the manhole.

18.2 **Safety Programs:-**

I. Have adequate safety supervision in place to ensure that safety programs set up by the firms/agencies are in compliance with prevalent laws and regulations.

II. Review safety programs developed by each of the trade firms, prepare and submit a comprehensive safety program.

III. Monitor day to day implementation of safety procedures.

18.3 **First Aid Facilities: -**

i. At every work place there shall be provided and maintained, so as to be easily accessible during working hours, first-aid boxes at the rate of not less than one box for 150 contract labour or part thereof ordinarily employed.

ii. The first-aid box shall be distinctly marked with a red cross on white back ground.

iii. Adequate arrangements shall be made for immediate recoupment of the equipment when necessary.

iv. Nothing except the prescribed contents shall be kept in the First-aid box.

v. The first-aid box shall be kept in charge of a responsible person who shall always be readily available during the working hours of the work place.

vi. A person in charge of the First-aid box shall be a person trained in First-aid treatment, in the work places where the number of contract labour employed is 150 or more.

19. Discoveries

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

20. Possession of the Site

20.1 The Employer shall handover complete or part possession of the site to the Contractor 7 days in advance of construction programme. At the start of the work, the Employer shall handover the possession of at-least 75% of the site free of all encumbrances, the remaining 25 % of the possession as per contractor’s construction programme.

21. Access to the Site

21.1 The Contractor shall allow access to the Site and to any place where work in connection with the Contract is being carried out, or is intended to be carried out to the Engineer and any person/persons/agency authorized by: a. The Engineer b. The Employer or authorized by the Employer.

22. Instructions

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

22.2 The Contractor shall permit the appointed and/or authorized persons to inspect the Site and/or accounts and records of the Contractor and its subcontractors relating to the performance of the Contract, and to have such accounts and records audited by auditors appointed, if so required. The Contractor's attention is invited to Clause of 'Fraud and Corruption', which provides, inter alia, that acts intended to materially impede the exercise of the inspection and audit rights provided for under the Clause & constitute a obstructive practice subject to contract termination.

22.3 Engineer to have power to issue further drawings or instructions:

The Engineer shall have the power and authority from time to time and at all times to make and issue such further drawings and to give such further instructions and directions as may appear to him necessary or proper for the guidance of the contractor and the good and sufficient execution of the works according to terms of the specifications and Contractor shall receive, execute, obey and be bound by the same, according to the true intent and meaning thereof, as fully and effectually as though the same had accompanied or had been mentioned or referred to in the specification, and the Engineer may also alter or vary the levels or position of nature of works contemplated by the specifications, or may order any of the works contemplated thereby to be omitted, with or without the substitution of any other works in lieu thereof, or may order any work or any portion of work executed or partially executed, to be removed, changed or altered, added if needful, may order that other works shall be substituted instead thereof and difference of expense occasioned by any such diminution or alteration so ordered and directed shall be added to or deducted from the amount of this Contract, as provided under condition no.10(a) hereinafter.

No work which radically changes the original nature of the Contract shall be ordered by the Engineer and in the event of any deviation being ordered which in the opinion of the Contractor changes the original nature of Contract he shall nevertheless carry it out and disagreement as to the nature of the work and the rate to be paid therefore shall be resolved in accordance with condition no.13d.

The time for completion of the Works, shall be in even of any deviations resulting in additional cost over the contract price being ordered, be extended or reduced reasonably by the Engineer. The Engineer's decision in this case shall be final.

B. Time Control

23. Programme:

23.1 Within the time stated in the contract Data, the Contractor shall submit to the Engineer for approval a Programme, including Environment Management Plan showing the general methods, arrangements, order and timing for all the activities in the Works, along with monthly cash flow forecasts for the construction of works.

After the completion of the construction works, the programme for the Routine Maintenance Work, showing the general methods, arrangements, order and timing for all the activities involved in the Routine Maintenance will also be submitted by the Contractor to the Engineer for approval if specified in the tender. The programme for Routine Maintenance will be submitted in each year for the period of Maintenance.

23.2 The Contractor shall submit the list of equipment and machinery being brought to site, the list of keys personnel being deployed, the list of machinery/equipments being placed in field laboratory and the location of field laboratory along with the programme. The Engineer shall cause these details to be verified at each appropriate stage of the programme.

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

23.4 The Contractor shall submit to the Engineer for approval an updated Programme at intervals no longer than the period stated in the Contract Data. If the Contractor does not submit an updated Programme within this period, the Engineer may withhold the amount stated in the Contract Data from the next payment certificate and continue to withhold this amount until the next payment after the date on which the overdue programme has been submitted.

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

24. Extension Of Time In Contracts : Subject to any requirement in the contract as to completion of any portions or portions of the works before completion of the whole, the contractor shall fully and finally complete the whole of the works comprised in the contract (with such modifications as may be directed under conditions of this contract) by the date entered in the contract or extended date in terms of the following clauses:

a)Extension attributable to MCGM

(i) Extension Due To Modification: If any modifications have been ordered which in the opinion of the Engineer have materially increased the magnitude of the work, then such extension of the contracted date of completion may be granted as shall appear to the Engineer to be reasonable in the circumstances, provided moreover that the Contractor shall be responsible for requesting such extension of the date as may be considered necessary as soon as the cause thereof shall arise and in any case should not be less than 30 days before the expiry of the date fixed for completion of the works.

(ii) Extension For Delay Due To MCGM: In the event of any failure or delay by the MCGM to hand over the Contractor possession of the lands necessary for the execution of the works or to give the necessary notice to commence the works or to provide the necessary drawings or instructions or any other delay caused by the MCGM due to any other cause whatsoever, then such failure or delay shall in no way affect or vitiate the contract or alter the character thereof or entitle the contractor to damages or compensation therefore, but in any such case, the MCGM may grant such extension(s) of the completion date as may be considered reasonable.

Note: For extension of time period as governed in (i) and (ii) above, any modifications in design/drawings, specifications, quantities shall be needed to be justified with recorded reasons with approval of Ch.Eng. for not anticipating the same while preparing estimates and draft tender.

(b) Extension Of Time For Delay Due To Contractor :

The time for the execution of the work or part of the works specified in the contract documents shall be deemed to be the essence of the contract and the works must be completed no later than the date(s) / the programme for completion of work as specified in the contract. If the contractor fails to complete the works within the time as specified in the contract for the reasons other than the reasons specified in above as (a.i) and (a.ii), the MCGM may, if satisfied that the works can be completed by the contractor within reasonable short time thereafter, allow the contractor for further extension of time as the Engineer may decide. On such extension the MCGM will be entitled without prejudice to any other right and remedy available on that behalf, to recover the compensation as governed by Clause 8(e) of GCC.

For the purpose of this Clause, the contract value of the works shall be taken as value of work as per contract agreement including any supplementary work order/contract agreement issued.

Further, competent authority while granting extension to the currency of contract under Clause (b) of as above may also consider levy of penalty, as deemed fit based on the merit of the case. Also, the reasons for granting extension shall be properly documented.

25. Delays Ordered by the Engineer

25.1 The Engineer may instruct the Contractor to delay the start or progress of any activity within the Works. Delay/delays totaling more than 30 days will require prior written approval of the DMC/AMC.

26. Management Meetings

26.1 The Engineer may require the Contractor to attend a management meeting. The business of a management meeting shall be to review the plans for progress of the Works.

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

C. Quality Control

27.1. Work to be open to Inspection and 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 to the inspection and supervision of the Eng-in-charge and his subordinates and the contractor shall at all times during the usual working hours, at all other times, during the usual working hours and at all other times at which reasonable notice of the intention of the Eng-incharge and his subordinates to visit the works shall have been given to the contractor, either himself be present to receive orders and instruction or have responsible agent duly accredited in writing present for that purpose. Order given to the contractors' duly authorized agent shall be considered to have the same force and effect as if they had been given to the contractor himself.

27.2. Notice To Be Given Before Work Is Covered Up

The contractor shall givenot less than ten days' notice in writing to the Eng-In-Charge or his subordinate incharge 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 dimension thereof taken before the same is so covered up or placed beyond the reach of measurements and shall not cover up or place beyond the reach of measurement any work without the consent in writing of the Eng-In-Charge or his subordinate incharge 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 contractors expenses, and in default thereof no payment or allowance shall be made for such work or for the materials with which the same was executed

27.3 Works to be executed in accordance with specifications / drawings / orders etc. :

The contractor shall execute the whole and every part of the work the most substantial and workman like manner and both has regards material and every other respect in strict accordance with specifications. The contractor shall also confirm exactly, fully and faithfully to the designs, drawings and instructions in writing relating to the work signed by the Engineer In-charge and lodged in his office and to which the contractor shall be entitled to have access for the purpose of inspection at such office, or on the site or work during office hours. The contractor shall be entitled to receive three sets of contract drawings and working drawings as well as one certified copy of the accepted tender along with the work order free of cost.

27.4 Ready Mix Concrete/ Asphalt Mix

i) The contractor shall have to arrange Ready Mix concrete (RMC)/Asphalt from RMC/ASPHALT producing plants registered with MCGM

ii) The contractor shall, within a 7 days of award of the work, submit a list of at least three RMC/Asphalt producers with details of such plants including details and number of transit, mixers & pumps etc. to be deployed indicating name of owner/company, its location, capacity, technical establishment.

The Engineer-in-charge will reserve right to inspect at any stage and reject the concrete if he is not satisfied about quality of product at the user's end.

iii) The Engineer-in-charge reserves the right to exercise control over the:-

a) Calibration check of the RMC/Asphalt plant.

b) Weight and quantity check on the ingredients, water and admixtures added for batch mixing for RMC plants

c) Time of mixing of concrete/grade of asphalt.

d) Testing of fresh concrete/asphalt mix, recording of results and declaring the mix fit or unfit for use. This will include continuous control on the work ability during production and taking corrective action, if required.

e) For exercising such control, the Engineer-in-charge shall periodically depute his authorized representative at the RMC/Asphalt plant. It shall be responsibility of the contractor to ensure that all necessary equipment, manpower & facilities are made available to Engineer-in-charge and or his authorized representative at RMC/Asphalt plant.

f) All required relevant records of RMC/Asphalt mix shall be made available to the Engineer-in-charge or his authorized representative. Engineer-in-charge shall, as required, specify guidelines & additional procedures for quality control & other parameters in respect of material production& transportation of concrete mix which shall be binding on the contractor & the RMC/Asphalt plant. Only concrete as approved in design mix by Engineerin-charge shall be produced in RMC plant and transported to the site.

g) The contactor shall have to produce a copy of chalan receipts/SCADA reports/VTS reports as issued by the RMC/Asphalt plant as a documentary proof in lieu of supply of RMC/Asphalt mix before releasing payment.

28. Identifying Defects

28.1 The Engineer shall check the Contractor's work and notify the Contractor of any Defects that are found. Such checking shall not affect the Contractor's responsibilities. The Engineer may instruct the Contractor to search for a Defect and to uncover and test any work that the Engineer considers may have a Defect.

28.2 The Contractor shall permit the Employer’s technical person(s) to check the Contractor’s work and notify the Engineer and Contractor if any defects that are found.

29. Tests

29.1 For carrying out mandatory tests as prescribed in the specifications, the Contractor shall establish field laboratory at the location decided by Engineer. The field laboratory will have minimum of equipments as specified in the Contract Data. The contractor shall be solely responsible for:

a. Carrying out the mandatory tests prescribed in the Specifications, and

b. For the correctness of the test results, whether preformed in his laboratory or elsewhere.

29.2 If the Engineer instructs the Contractor to carry out a test not specified in the Specification/ Quality Assurance Handbook to check whether any work has a Defect and the test shows that it does, the Contractor shall pay for the test and any samples. If there is no defect, the test shall be a compensation event.

When required by the Engineer-in-charge the contractor(s) shall supply for the purpose of testing samples of all materials proposed to be used in the works. Samples submitted either to govern bulk supplies or required for testing before use shall be in suitable packages to contain them and shall be provided free of charge by the contractor. The cost of testing shall be borne by the contractor even if the result of the sample confirm or do not confirm to the relevant BIS code specifications.

i. All expenditure required to be incurred for taking the samples conveyance, packing shall be borne by the contactor himself.

ii. The failed material shall be removed from the site by the contractor at his own cost within a week time of written order of the Engineer-in-charge.

29.3 Setting of Site Laboratories:

Contractors shall set up a laboratory at site before commencement of work at their cost for performing various tests and at least the following machines and equipments shall be provided therein –

1. Set of Sieves as per I.R.C. /I.S.
2. Compressive Testing Machine (For new works)
3. Oven, Electrically Operated
4. Weighing Balance (20 kg capacity)
5. 3 m straight edge
6. Sieve shaker
7. First Aid Box
8. Measuring Jar (for silt content)
9. Any Other Machines/apparatus as may be directed by the Engineer
10. Vernier Caliber / Micrometer
11. Level / Theodolite
12. Steel tapes
13. Silt jars – Glass measuring cylinders.
14. Slump cone
15. Cube mould
16. Concrete test hammer – Cube testing machine

17. Handy electronic calculators / Scientific calculators

18. Cement testing kit – Viccat apparatus.

19. Drawing office equipments& instruments.

20. Volt meter

21. Ammeter (clip on)

22. Insulation tester

23. Transformer oil insulation tester

24. Frequency tester.

25. Electronic thermometer calibrated at least upto 250 degree Celsius.

26. Field density bottle alongwith cutting tray, hammer and standard sand.

27. Kerosene/ gas stove or electric hot plate.

All the test records shall be maintained in the site office and made available as and when required. The laboratory must be established within 15 days from the date of receipt of the orders from Engineer In charge. On failure to do so, a penalty of Rs 1000/- per day shall be imposed.

The contractor shall install testing equipment at site. The contractor shall ensure and certify the calibration of the equipment so installed and shall maintain the same in working order throughout the period of construction. The contractor shall also provide necessary technically qualified experienced trained staff for carrying out such tests for using such equipment. The tests shall be carried out under the supervision of the Engineer-in-charge. The calibration shall be checked every twelve months as directed by Engineer-in-charge.

30. Correction of Defects noticed during the Defects Liability Period.

30.1 (a) The Engineer shall give notice to the Contractor of any Defects before the end of the Defects Liability Period, which begins at Completion and ends after five years. The Defects Liability Period shall be extended for as long as Defects remain to be corrected.

(b) Every time notice of Defect/Defects is given, the Contractor shall correct the notified Defect/Defects within the duration of time specified by the Engineer's notice.

(c) The Engineer may issue notice to the Contractor to carry out removal of defects or deficiencies, if any, noticed in his inspection, or brought to his notice. The Contractor shall remove the defects and deficiencies within the period specified in the notice and submit to the Engineer a compliance report.

31. Uncorrected Defects and Deficiencies

31.1 If the Contractor has not corrected a Defect pertaining to the Defect Liability Period under clause and deficiencies in maintenance, to the satisfaction of the Engineer, within the time specified in the Engineer's notice, the Engineer will assess the cost of having the Defect or deficiency corrected, and the Contractor shall pay this amount, on correction of the Defect or deficiency by another agency.

D. Cost Control

32. Variations

The Engineer shall, having regard to the scope of the Works and the sanctioned estimated cost, have power to order, in writing, Variations within the scope of the Works he considers necessary or advisable during the progress of the Works. Such Variations shall form part of the Contract and the Contractor shall carry them out and include them in updated Programmes produced by the Contractor. Oral orders of the Engineer for Variations, unless followed by written confirmation, shall not be taken into account.

33. Payments for Variations

33.1 If rates for Variation items are specified in the Bill of Quantities, the Contractor shall carry out such work at the same rate.

33.2 The rate for Extra/Excess shall be governed by clause 10.A of Standard General Condition of Contract

34. Cash Flow Forecasts

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

35. Payment Certificates

The payment to the Contractor will be as follows for construction work:

(a) A bill shall be submitted by the Contractor monthly or before the date fixed by the Engineer In-charge for all works executed in the previous month, and the Engineer In-charge shall take or cause to be taken requisite measurement for the purpose of having the same verified and the claim, so far as it is admissible, shall be adjusted, if possible, within 10 days from the presentation of the bill. If the contractor does not submit the bill within the time fixed as aforesaid, the Engineer In-charge may depute a subordinate to measure up the said work in the presence of the contractor or his duly authorized agent whose counter signature to the measurement list shall be sufficient warrant, and Engineer In-Charge may prepare a bill from such list which shall be binding on the contractor in all respects.

(b) The Engineer shall check the Contractor's fortnightly/monthly statement within 14 days and certify the amount to be paid to the Contractor.

(c) The value of work executed shall be determined, based on measurements by the Engineer.

(d) The value of work executed shall comprise the value of the quantities of the items in the Bill of Quantities completed.

(e) The value of work executed shall also include the valuation of Variations and Compensation Events.

(f) The Engineer may exclude any item certified in a previous certificate or reduce the proportion of any item previously certified in any certificate in the light of later information.

(g) The contractor shall submit all bills on the printed forms at the office of Engineer In-charge. The charges to be made in the bills shall always be entered at the rates specified in tender.

36. Payments

36.1 Payments shall be adjusted for deductions for advance payments, retention, security deposit, other recoveries in terms of the Contract and taxes at source, as applicable under the law. The Employer shall pay the Contractor the amounts certified by the Engineer within 15 days of the date of each certificate.

36.2 All sums payable by a contractor by way of compensation under any of these conditions, shall be considered as a reasonable compensation to be applied to the use of MCGM without reference to the actual loss or damage sustained and whether any damage has or has not been sustained.

36.3 No payment shall be made for any work estimated to cost less than Rupees One Thousand till after the whole of work shall have been completed and the certificate of completion given. But in the case of works estimated to cost more than Rs. One Thousand, the contractor shall on submitting a monthly bill therefore be entitled to receive payment proportionate to the part of the work than approved and passed by the Engineer In-charge, 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 payments only and not as payments for work actual done and completed and shall not preclude the Engineer In-charge from requiring any bad, unsound, imperfect or unskillful work to be removed or taken away and reconstructed or re-erected nor shall any such payment be considered as an admission of the due performance of the contract or any part thereof in any respect or the offering of any claim not shall it conclude, determine or effect in any other way, the powers of the Engineer Incharge as to the final settlement and adjustment of the accounts or otherwise, or in any other way vary or effect the contract. The final bill shall be submitted by the Contractor within one month of

the date fixed for the completion of the work otherwise the Engineer Incharge's certificate of the measurements and of the total amount payable for the work shall be final and binding on all parties.

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

38. Tax

G.S.T. and other state levies / cess which are not subsumed under GST will be applicable. The tenderer shall quote inclusive of all taxes. It is clearly understood that MCGM will not bear any additional liability towards payment of any Taxes & Duties.

Wherever the services to be provided by the Tenderers falls under **Reverse Charge Mechanism,** the price quoted shall be exclusive of GST, but inclusive of taxes / duties / cess other than GST, if any.

Rates accepted by MCGM shall hold good till completion of work and no additional individual claim shall be admissible on account of fluctuations in market rates; increase in taxes / any other levies / tolls etc. Except that payment / recovery for overall market situation shall be made as per price variation.

Further, all the provisions of GST Act will be applicable to the tender."

Chapter XXI-Miscellaneous, Section 171(1) of GST Act, 2017 governs the 'Anti Profiteering Measure' (APM).

As per the provision of this section, 'Any reduction in rate of tax on any supply of goods or services or the benefit of input tax credit shall be passed on to the recipient by way of commensurate reduction in prices'

Accordingly, the contractor should pass on the complete benefit accruing to him on account of reduced tax rate or additional input tax credit, to MCGM.

Further, all the provisions of GST Act will be applicable to the tender."

39. Currencies

All payments will be made in Indian Rupees.

40. Liquidated Damages

Both, the Contractor and the Employer have agreed that it is not feasible to precisely estimate the amount of losses due to delay in completion of works and the losses to the public and the economy, therefore, both the parties have agreed that the Contractor shall pay liquidated damages to the Employer and not by way of penalty, at the rate per week or part thereof stated in the Contract Data for the period that the Completion Date is later than the Intended Completion Date. Liquidated damages at the same rates shall be withheld if the Contractor fails to achieve the milestones prescribed in the Contract Data. However, in case the Contractor achieves the next milestone, the amount of the liquidated damages already withheld shall be restored to the Contractor by adjustment in the next payment certificate. The Employer and the contractor have agreed that this is a reasonable agreed amount of liquidated damage. The Employer may deduct liquidated damages from payments due to the Contractor. Payment of liquidated damages shall not affect the Contractor's other liabilities.

41. Cost of Repairs

Loss or damage to the Works or Materials to be incorporated in the Works between the Start Date and the end of the Defects Correction periods shall be remedied by the Contractor at his cost if the loss or damage arises from the Contractor's acts or omissions

E. Finishing the Contract

42. Completion of Construction and Maintenance

42.1 The Contractor shall request the Engineer to issue a certificate of completion of the construction of the works, and the Engineer will do so upon deciding that the works is completed. This shall be governed as per clause no.8(g) of Standard General Conditions of Contract.

43. Taking Over

43.1 The Employer shall take over the works within seven days of the Engineer issuing a certificate of completion of works. The Contractor shall continue to remain responsible for its routine maintenance during the maintenance period if specified in the contract.

44. Final Account

Final joint measurement alongwith the representatives of the contractor should be taken recorded and signed by the Contractors. Contractors should submit the final bill within 1 month of physical completion of the work.

If the contractor fails to submit the final bill within 1 month, the MCGM staff will prepare the final bill based on the joint measurement within next 3 months.

Engineer's decision shall be final in respect of claims for defect and pending claims against contractors.

No further claims should be made by the Contractor after submission of the final bill and these shall be deemed to have been waived and extinguished. Payment of those items of the bills in respect of which there is no dispute and of items in dispute, for quantities and rates as approved by the Commissioner shall be made within a reasonable period as may be necessary for the purpose of verification etc.

After payment of the final bill as aforesaid has been made, the contractor may, if he so desires, reconsider his position in respect of a disputed portion of the final bills and if he fails to do so within 84 days, his disputed claim shall be dealt with as provided in the contract.

A percentage of the retention money, over and above the actual retention money as indicated below shall be held back from payments till the finalization of final bill to be submitted as per above and will be paid within 30 days of acceptance of the final bill.

Sr No.	Amount of Contract Cost	Minimum Payable Amount in final bill
1	Upto Rs.5 Crs	Rs.10 Lacs or final bill whichever is more
2	Upto Rs.25 Crs.	Rs.1 Crore or final bill amount whichever is more
3	UptoRs. 50 Crs	Rs.2 Crores or final bill amount whichever is more
4	Upto Rs.100 Crs.	Rs.4 Crore or final bill amount whichever is more
5	More than Rs.100 Crs	Rs.7 Crore or final bill amount whichever is more

The contractor have to submit the bill for the work carried out within 15 days from the date of completion of the work to the respective executing department. If the contractor fails to submit their bills to concerned executing department, penalty or action as shown below will be taken for each delayed bill:-

After 15 days from the date of completion/running bill upto certain date, upto next 15 days i.e. upto 30 days	Equal to 5% of bill amount
Next 15 days upto 45 days from the date of completion/running bill upto specified date	Equal to 10% of bill amount
If not submitted witin 45 days from the date of completion/ R.A. bill	Bill will not be admitted for payment

45. Operating and Maintenance Manuals

45.1 If "as built" Drawings and/or operating and maintenance manuals are required, the Contractor shall supply them by the dates stated in the Contract Data.

45.2 If the Contractor does not supply the Drawings and/or manuals by the dates stated in the Contract Data, or they do not receive the Engineer's approval, the Engineer shall withhold the amount stated in the Contract Data from payments due to the Contractor.

46. Termination

46.1 The Employer or the Contractor may terminate the Contract if the other party causes a fundamental breach of the Contract.

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

a) the Contractor stops work for 30 days when no stoppage of work is shown on the current Programme and the stoppage has not been authorized by the Engineer;

b) the Contractor is declared as bankrupt or goes into liquidation other than for approved reconstruction or amalgamation;

c) the Engineer gives Notice that failure to correct a particular Defect is a fundamental breach of Contract and the Contractor fails to correct it within a reasonable period of time determined by the Engineer;

d) the Contractor does not maintain a Security, which is required;

e) the Contractor has delayed the completion of the Works by the number of days for which the maximum amount of liquidated damages can be paid, as defined in relevant clause.

f) the Contractor fails to provide insurance cover as required under relevant clause .

g) if the Contractor, in the judgment of the Employer, has engaged in the corrupt or fraudulent practices as defined in GCC in competing for or in executing the Contract.

h) if the Contractor fails to set up a field laboratory with the prescribed equipment, within the period specified in the Contract Data; and

i) any other fundamental breaches as specified in the Contract Data.

j) if the Contractor fails to deploy machinery and equipment or personnel as specified in the Contract Data at the appropriate time.

46.3 When either party to the contract gives notice of a breach of contract to the Engineer for a cause other than those listed above, the Engineer shall decide whether the breach is fundamental or not.

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

46.5 If the Contract is terminated, the Contractor shall stop work immediately, make the Site safe and secure, and leave the Site as soon as reasonably possible.

47. Payment upon Termination

47.1 If the Contract is terminated because of a fundamental breach of Contract by the Contractor, the Engineer shall issue a certificate for value of the work done and materials ordered less liquidated damages, if any, less advance payments received up to the date of the issue of the certificate and less the percentage to apply to the value of the work not completed, as indicated in the Contract Data. If the total amount due to the Employer exceeds any payment due to the Contractor, the difference shall be recovered from the security deposit, and performance security. If any amount is still left un-recovered it will be a debt due from the Contractor to the Employer

47.2 If the Contract is terminated at the Employer's convenience, the Engineer shall issue a certificate for the value of the work done, the reasonable cost of removal of Equipment, repatriation of the Contractor's personnel employed solely on the Works, and the Contractor's costs of protecting and securing the Works and less advance payments received up to the date of the certificate, less other recoveries due in terms of the Contract, and less taxes due to be deducted at source as per applicable law.

48. Property

48.1 All Materials on the Site, Plant, Equipment, Temporary Works, and Works shall be deemed to be the property of the Employer for use for completing balance construction work if the Contract is terminated because of the Contractor's default, till the Works is completed after which it will be transferred to the Contractor and credit, if any, given for its use.

49. Release from Performance

If the Contract is frustrated by the outbreak of war or by any other event entirely outside the control of the Employer or the Contractor, the Engineer shall certify that the Contract has been

frustrated. The Contractor shall make the Site safe and stop work as quickly as possible after receiving this certificate and shall be paid for all work carried out before receiving it and for any work carried out afterward to which a commitment was made.

A) Other Conditions of Contract

50. Labour

50.1 The Contractor shall, unless otherwise provided in the Contract, make his own arrangements for the engagement of all staff and labour, local or other, and for their payment, housing, feeding and transport.

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

51. Compliance with Labour Regulations

(a) During continuance of the Contract, the Contractor and his sub-Contractors shall abide at all times by all existing labour enactments and rules made there under, regulations, notifications and bye laws of the State or Central Government or local authority and any other labour law (including rules), regulations, bye laws that may be 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.

(b) Furthermore, the Contractor shall keep the Employer indemnified in case any action is taken against the Employer by the competent authority on account of contravention of any of the provisions of any Act or rules made there under, regulations or notifications including amendments. If the Employer is caused to pay or reimburse, such amounts as may be necessary to cause or observe, or for non-observance of the provisions stipulated in the notifications / bye laws / Acts / Rules / regulations including amendments, if any, on the part of the Contractor, the Engineer/Employer shall have the right to deduct any money due to the Contractor including his

amount of performance guarantee. The Employer / Engineer shall also have right to recover from the Contractor any sum required or estimated to be required for making good the loss or damage suffered by the Employer.

(c) The Contractor shall require his employees to obey all applicable laws, including those concerning safety at work.

(d) The employees of the Contractor and the Sub-Contractor in no case shall be treated as the employees of the Employer at any point of time.

52. Drawings and Photographs of the Works

52.1 The Contractor shall do photography/video photography of the site firstly before the start of the work, secondly mid-way in the execution of different stages of work as required by Engineer In-charge and lastly after the completion of the work. No separate payment will be made to the Contractor for this.

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

53. The Apprentices Act, 1961

The Contractor shall duly comply with the provisions of the Apprentices Act 1961 (III of 1961), the rules made there under and the orders that may be issued from time to time under the said Act and the said Rules and on his failure or neglect to do so, he shall be subject to all liabilities and penalties provided by the said Act and said Rules.

54 Contract Document

The documents forming the contract are to be taken as mutually explanatory of one another. Unless otherwise provided in the contract, the priority of the documents forming the contract shall be, as follows:

1) Contract Agreement (if completed)

2) The letter of Acceptance

3) The Bid:

4) Addendum to Bid; if any

5) Tender Document

6) The Bill of Quantities:

7) The Specification:

8) Detailed Engineering Drawings

9) Standard General Conditions of Contracts (GCC)

10) All correspondence documents between bidder / contractor and MCGM.

55 Conflict of Interest

The Applicant shall not have a conflict of interest (the "Conflict of Interest") that affects the Bidding Process. Any Applicant found to have a Conflict of Interest shall be disqualified. An Applicant shall be deemed to have a Conflict of Interest affecting the Bidding Process, if

1. A constituent of such Applicant is also a constituent of another Applicant; or

2. Such Applicant has the same legal representative for purposes of this Application as any other Applicant; or

3. Such Applicant, or any Associate thereof has a relationship with another Applicant, or any Associate thereof, directly or through common third party/ parties, that puts either or both of

them in a position to have access to each other's information about, or to influence the Application of either or each other; or

4. The Applicant shall be liable for disqualification if any legal, financial or technical adviser of the Authority in relation to the Project is engaged by the Applicant, its Member or any Associate thereof, as the case may be, in any manner for matters related to or incidental to the Project. For the avoidance of doubt, this disqualification shall not apply where such adviser was engaged by the Applicant, its Member or Associate in the past but its assignment expired or was terminated 6 (six) months prior to the date of issue of this TENDER. Nor will this disqualification apply where such adviser is engaged after a period of 3 (three) years from the date of commercial operation of the Project.

56. Applications and costs thereof

No Applicant shall submit more than one Application for the Project. An applicant applying individually shall not be entitled to submit another application either individually. The Applicant shall be responsible for all of the costs associated with the preparation of their Applications and their participation in the Bid Process. The Authority will not be responsible or in any way liable for such costs, regardless of the conduct or outcome of the Bidding Process.

57. Acknowledgment by Applicant

It shall be deemed that by submitting the Application, the Applicant has:

a. made a complete and careful examination of the tender;

b. received all relevant information requested from the Authority;

c. accepted the risk of inadequacy, error or mistake in the information provided in the tender or furnished by or on behalf of the Authority relating to any of the matters referred; and

d. Agreed to be bound by the undertakings provided by it under and in terms hereof. "The Authority" shall not be liable for any omission, mistake or error in respect of any of the above or on account of any matter or thing arising out of or concerning or relating to the TENDER or the Bidding Process, including any error or mistake therein or in any information or data given by the Authority.

58. Right to accept or reject any or all Applications/ Bids

Notwithstanding anything contained in this TENDER, "The Authority" reserves the right to accept or reject any Application and to annul the Bidding Process and reject all Applications/ Bids, at any time without any liability or any obligation for such acceptance, rejection or annulment, and without assigning any reasons therefore. In the event that the Authority rejects or annuls all the Bids, it may, in its discretion, invite all eligible Bidders to submit fresh Bids hereunder.

"The Authority" reserves the right to reject any Application and/ or Bid if:

(a) at any time, a material misrepresentation is made or uncovered, or

(b) the Applicant does not provide, within the time specified by the Authority, the supplemental information sought by the Authority for evaluation of the Application.

In case it is found during the evaluation or at any time before signing of the Agreement or after its execution and during the period of subsistence thereof including the concession thereby granted by "The Authority", that one or more of the pre-qualification conditions have not been met by the Applicant, or the Applicant has made material misrepresentation or has given any materially incorrect or false information, the Applicant shall be disqualified forthwith if not yet appointed as the Successful Bidder either by issue of the LOA (Letter of Approval) or entering into of the Agreement, and if the Applicant has already been issued the LOA or has entered into the Concession Agreement, as the case may be, the same shall, notwithstanding anything to the contrary contained therein or in this TENDER, be liable to be terminated, by a communication in writing by "The Authority" to the Applicant, without the Authority being liable in any manner whatsoever to the Applicant and without prejudice to any other right or remedy which the

Authority may have under this TENDER, the Bidding Documents, the Concession Agreement or under applicable law.

"The Authority" reserves the right to verify all statements, information and documents submitted by the Applicant in response to the TENDER. Any such verification or lack of such verification by the Authority shall not relieve the Applicant of its obligations or liabilities hereunder nor will it affect any rights of the Authority there under.

59 The bid shall be rejected if the bidder-

a. Stipulates the validity period less than 180 days.

b. Stipulates own condition/conditions.

c. Does not fill and (digital) sign undertaking forms, which are incorporated, in the document.

60 Clarifications

Applicants requiring any clarification on the tender may notify "the Authority" in writing or by fax or e-mail. They should send in their queries before the date specified in the header data. "The Authority" shall Endeavor to respond to the queries within the period specified therein. The responses will be sent by fax and/or e-mail. The Authority will forward all the queries and its responses thereto, to all purchasers of the TENDER without identifying the source of queries.

"The Authority" shall Endeavor to respond to the questions raised or clarifications sought by the Applicants. However, the Authority reserves the right not to respond to any question or provide any clarification, in its sole discretion, and nothing in this Clause shall be taken or read as compelling or requiring the Authority to respond to any question or to provide any clarification, but not later than the date provided in header data.

"The Authority" may also on its own motion, if deemed necessary, issue interpretations and clarifications to all Applicants. All clarifications and interpretations issued by the Authority shall

be deemed to be part of the tender. Verbal clarifications and information given by Authority or its employees or representatives shall not in any way or manner be binding on the Authority.

61 Amendment of tender

At any time prior to the deadline for submission of Application, the Authority may, for any reason, whether at its own initiative or in response to clarifications requested by an Applicant, modify the tender by the issuance of Addendum. Any Addendum thus issued will be sent in writing/ Fax/ Email to all those who have purchased the tender. In order to afford the Applicants a reasonable time for taking an Addendum into account, or for any other reason, the Authority may, in its sole discretion, extend the Application Due Date.

Preparation and Submission of Application

62 Language

The Application and all related correspondence and documents in relation to the Bidding Process shall be in English language. Supporting documents and printed literature furnished by the Applicant with the Application may be in any other language provided that they are accompanied by translations of all the pertinent passages in the English language, duly authenticated and certified by the Applicant. Supporting materials, which are not translated into English, may not be considered. For the purpose of interpretation and evaluation of the Application, the English language translation shall prevail.

63 Format and signing of Application

The Applicant shall provide all the information sought under this TENDER. The Authority will evaluate only those Applications that are received in the required formats and complete in all respects. Incomplete and /or conditional Applications shall be liable to rejection. The Applicant will upload bid in One Folder in electronic form which shall contain the scanned certified copies of the documents given below and the documents uploaded has to be digitally signed by the bidder. These copies shall be certified by Practicing Notary approved by the Govt. of Maharashtra or Govt.

of India with his stamp, clearly stating his name & registration number, except where original documents are demanded

64 Marking of Applications

The Applicant shall submit the Application in the format specified at Appendix-I, together with the documents, upload in folder as "VENDOR" together with their respective enclosures Applications submitted by fax, telex, telegram shall not be entertained and shall be rejected outright.

65 Late Applications

Applications received by the Authority after the specified time on the Application Due Date shall not be eligible for consideration and shall be summarily rejected.

66 Confidentiality

Information relating to the examination, clarification, evaluation, and recommendation for the short-listed qualified Applicants shall not be disclosed to any person who is not officially concerned with the process or is not a retained professional adviser advising the Authority in relation to or matters arising out of, or concerning the Bidding Process. The Authority will treat all information, submitted as part of Application, in confidence and will require all those who have access to such material to treat the same in confidence. The Authority may not divulge any such information unless it is directed to do so by any statutory entity that has the power under law to require its disclosure or is to enforce or assert any right or privilege of the statutory entity and/ or the Authority or as may be required by law or in connection with any legal process.

67 Clarification Of Financial Bids

To assist in the examination, evaluation and comparison of Bids, the Engineer may, at his discretion, ask any bidder for clarification of his Bid, including breakdown of unit rates. The request for clarification and the response shall be in writing or by post/facsimile/email. No Bidder shall contact the Engineer on any matter relating to his bid from the time of the bid opening to the time the contract is awarded. Any effort by the Bidder to influence the Engineer in the Engineer's

bid evaluation, bid comparison or contract award decisions may result in the rejection of the Bidder's bid.

68 Inspection of site and sufficiency of tender:

1. The Contractor shall inspect and examine the site and its surrounding and shall satisfy himself before submitting his tender as to the nature of the ground and subsoil (so far as is practicable), the form and nature of the site, the quantities and nature of the work and materials necessary for the completion of the works and means of access to the site, the accommodation he may require and in general shall himself obtain all necessary information as to risk, contingencies and other circumstances which may influence or affect his tender. He shall also take into consideration the hydrological and climatic conditions.

2. The Employer may make available to the Contractor data on hydrological and subsurface conditions as obtained by or on his behalf from investigations relevant to the works but the Contractor shall be responsible for his own interpretation thereof. The contractor shall engage his investigating agency with prior approval of the Engineer from the approved list of such agencies by MCGM or Govt at his cost initially before commencing actual work and which shall be reimbursed immediately subject to satisfaction of the Engineer for faithful compliance and submission of required data regarding such investigation within specified time.

3. The Contractor shall be deemed to have satisfied himself before tendering as to the correctness and sufficiency of his tender for the works and of the rates and prices quoted in the schedule of works / items / quantities, or in Bill of Quantities, which rates and prices shall, except as otherwise provided cover all his obligations under the Contract and all matters and things necessary for proper completion and maintenance of the works. No extra charges consequent on any misunderstanding.

4. **Not Foreseeable Physical Obstructions or Conditions:** If, however, during the execution of the Works the Contractor encounters physical obstructions or physical conditions, other than climatic conditions on the Site, which obstructions or conditions were, in his opinion, not foreseeable by an experienced contractor, the Contractor shall forthwith give notice thereof to the Engineer. On receipt of such notice, the Engineer shall, if in his opinion such obstructions or

conditions could not have been reasonably foreseen by an experienced contractor, after due consultation with the Contractor, determine:

 any extension of time to which the Contractor is entitled and

 The amount of any costs which may have been incurred by the Contractor by reason of such obstructions or conditions having been encountered, which shall be added to the Contract Price.

 and shall notify the Contractor accordingly. Such determination shall take account of any instruction which the Engineer may issue to the Contractor in connection therewith, and any proper and reasonable measures acceptable to the Engineer which the Contractor may take in the absence of specific instructions from the Engineer. However such costings shall be got approved by the competent authority as governed vide rules prevailing with authority.

5. Office for the Engineer (Works costing upto Rs.50 Lakhs)

The Contractor shall at his own cost and to satisfaction of the Engineer provide a small temporary office, at the work-site which will include tables, chairs and lockers for keeping the records. He shall also make necessary arrangements for drinking water, telephone with a pre-requisite of e-governance and electronic communication. These offices are not to be allowed on public roads without the written instruction of the Engineer. These offices should be preferably located within 50 to 500 m of the work site. In case the office is more than 500m away from the work site, the contractor is to provide conveyance for Municipal Staff.

6. Office for the Engineer (Works costing above Rs.50 lakhs)

The Contractor shall at his own cost and to satisfaction of the Engineer provide a temporary office at the work-site which will include tables, chairs and lockers for keeping the records. He shall also make necessary arrangements for drinking water, latrines, with doors, windows, locks, bolts and fastenings sufficient for security for the Engineer, and his subordinates, as close to the works from time to time in progress as can be conveniently arranged, and shall at his own cost

furnish the office with such chairs, tables, lockers, locks and fastenings as may be required by the Engineer, and no expense of any kind in connection with the erection or upkeep of the offices or fittings shall be borne by the Corporation, but all such work shall be carried out by the Contractor and the expenses thereof defrayed by him. The Contractor shall also make water connections and fit up stand pipe with a bib tap at each office. The latrines and the water connections shall be subject to all the conditions herein elsewhere laid down for temporary water connection and latrines generally with all requisite equipments for e-governance and electronic and digital communication. These offices are not to be allowed on public roads without the written instruction of the Engineer. These offices should be preferably located within 50 to 500 m of the work site. In case the office is more than 500m away from the work site, the contractor is to provide conveyance. Also, for staff working beyond working hours the contractor has to provide conveyance.

7. Permission for provision and removal of office on completion of work:

The tenderer shall obtain permission for provision of site office, cement go-down, store, etc. on payment of necessary cost implication. The cement go-down, Watchman cabins, etc. shall be provided as directed and shall be removed by the Tenderers on completion of the work at their cost. It is binding on the Tenderer to fulfill requirements of Environmental Authorities. The location of such office shall be finalized and got approved from the Engineer before erection/commencement work.

8. Contractor's office near works: The Contractor shall have an office near the works at which notice from the Commissioner or the Engineer may be served and shall, between the hours of sunrise and sunset on all working days, have a clerk or some other authorized person always present at such office upon whom such notices may be served and service of any notices left with such clerk or other authorized person or at such office shall be deemed good service upon the Contractor and such offices shall have pre-requisite facilities for e-governance.

69 Official Secrecy:

The Contractor shall of all the persons employed in any works in connection with the contract that the India Official Secrets Act 1923 (XIX of 1923) applies to them and will continue to apply

even after execution of the said works and they will not disclose any information regarding this contract to any third party. The contractor shall also bring into notice that, any information found to be leaked out or disclosed the concern person as well as the Contractor will be liable for penal action; further the Corporation will be at liberty to terminate the contract without notice.

70 Subsequent Legislation:

If on the day of submission of bids for the contract, there occur changes to any National or State stature, Ordinance, decree or other law or any regulation or By-laws or any local or other duly constituted authority or the introduction of any such National or State Statute, Ordinance, decree or by which causes additional or reduced cost to the Contractor, such additional or reduced cost shall, after due consultation with the Contractor, be determined by the concerned Engineering Department of MCGM and shall be added to or deducted from the Contract Price with prior approval of competent authority and the concerned Engineering Department shall notify the Contractor accordingly with a copy to the Employer. MCGM reserve the right to take decision in respect of addition / reduction of cost in contract.

71 Patent, Right and Royalties:

The contractor shall save harmless and indemnify the Corporation from and against all claims and proceedings for or on account of infringement of any Patent rights, design trademark or name of other protected rights in respect of any constructional plant, machine work, or material used for or in connection with the Works or any of them and from and against all claims, proceedings, damages, costs, charges and expenses whatsoever in respect thereof or in relation thereto. Except where otherwise specified, the contractor shall pay all tonnage and other royalties, rent and other payments or compensation, if any, for getting stone, sand, gravel, clay or other materials required for the works or any of them.

72 Payments, Tax and Claims:

 The limit for unforeseen claims Under no circumstances whatever the contractor shall be entitled to any compensation from MCGM on any account unless the contractor shall have submitted a claim in writing to the Engineer-in-change within 1 month of the case of such claim occurring.

 No interest for delayed payments due to disputes, etc: It is agreed that the Municipal Corporation of Greater Mumbai or its Engineer or Officer shall not be liable to pay any interest or damage with respect of any moneys or balance which may be in its or its Engineer's or officer's hands owing to any dispute or difference or claim or misunderstanding between the Municipal Corporation of Greater Bombay or its Engineer or Officer on the one hand and the contractor on the other, or with respect to any delay on the part of the Municipal Corporation of Greater Bombay or its Engineer or Officers in making periodical or final payments or in any other respect whatever

73 Settlement of Disputes:

 Termination of contract for death

If the Contractor is an individual or a proprietary concern and the individual or the proprietor dies and if the Contractor is a partnership concern and one of the legal representative of the individual Contractor or the proprietor of the proprietary concern and in case of partnership, the surviving partners, are capable of carrying out and completing the contract, the Commissioner shall be entitled to cancel the contract as to its uncompleted part without the Corporation being in any way liable to payment of any compensation to the estate of the deceased Contractor and or to the surviving partners of the Contractor's firm on account of the cancellation of the contract. The decision of the Commissioner that the legal representative of the deceased Contractor or surviving partners of the Contractor's firm cannot carry out and complete the contract shall be final and binding on the parties. In the event of such cancellation the Commissioner shall not hold estate of the deceased Contractor and or surviving partners of the Contractor's firm liable in damages for not completing the contract.

 Settlement of Disputes:

If any dispute or differences of any kind whatsoever other than those in respect of which, the decision of any person is, by the Contract, expressed to be final and binding) shall arise between the Employer and the Contractor or the Engineer and the Contractor in connection with or arising out of the Contract or carrying out of the Works (Whether during the progress of the Works or after their completion and whether before or after the termination, abandonment or breach of the

Contract) it, the aggrieved party may refer such dispute within a period of 7 days to the concerned Addl. Municipal Commissioner who shall constitute a committee comprising of three officers i.e. concerned Deputy Municipal Commissioner or Director (ES&P), Chief Engineer other than the Engineer of the Contract and concerned Chief Accountant. The Committee shall give decision in writing within 60 days. Appeal on the Order of the Committee may be referred to the Municipal Commissioner within 7 days. Thereafter the Municipal Commissioner shall constitute a Committee comprising of three Addl. Municipal Commissioners including Addl. Municipal Commissioner in charge of Finance Department. The Municipal Commissioner within a period of 90 days after being requested to do so shall give written notice of committee's decision to the Contractor. Save as herein provided such decision in respect of every matter so referred shall be final and binding upon both parties until the completion of the works, and shall forthwith be given effect to by the Contractor who shall proceed with the works with due diligence, whether he requires arbitration as hereinafter provided or not. If the Commissioner has given written notice of the decision to the Contractor and no Claim to arbitration has been communicated within a period of 90 days from receipt of such notice the said decision shall remain final and binding upon the Contractor.

74 Arbitration and Jurisdiction:

If the Commissioner shall fail to give notice of the decision as aforesaid within a period of 90 days after being requested as aforesaid, or if the Contractor be dissatisfied with any such decision, then and in any such case the Contractor may within 90 days after receiving notice of such decision or within 90 days after the expirations of the first named period of 90 days (as the case may be) require that the matter or matters in dispute be referred to arbitration as hereinafter provided. All disputes or differences in respect of which the decision (if any) of the Commissioner has not become final and binding as aforesaid shall be finally settled by Arbitration as follows:

Arbitration shall be effected by a single arbitrator agreed upon the parties. The arbitration shall be conducted in accordance with the provisions of the Arbitration Act, 1996 or any statutory modifications thereof, and shall be held at such place and time within the limits of Brihan Mumbai as the arbitrator may determine. The decision of the arbitrator shall be final and binding upon the parties hereto and the expense of the arbitration shall be paid as may be determined by the arbitrator. Performance under the Contract shall, if reasonably be possible, continued during the

arbitration proceedings and payment due to the Contractor by the Employer shall not be withheld unless they are the subject matter of arbitration proceedings. The said arbitrator shall have full power to open up, review and revise any decision, opinion, direction, certification or valuation of the Commissioner and neither party shall be limited in the proceedings before such arbitrator to the evidence or arguments put before the Commissioner for the purpose of obtaining his said decision. No decision given by the Commissioner in accordance with the foregoing provisions shall disqualify him from being called as a witness and giving evidence before the arbitrator on any matters whatsoever relevant to the disputes or difference referred to the arbitrator as aforesaid. All awards shall be in writing and for claims equivalent to Rs. 5,00,000/- or more such awards shall state reasons for amounts awarded. The expenditure of arbitration shall be paid as may be determined by arbitrator.

In case of any claim, dispute or difference arising in respect of a contract, the cause of action thereof shall be deemed to have arisen in Mumbai and all legal proceedings in respect of any claim, dispute or difference shall be instituted in a competent court in the City of Mumbai only.

75 Copyright:

The copyright of all drawings and other documents provided by the Contractor under the contract shall remain vested in the Contractor or his sub-contractors as the case may be the employer shall have a license to use such drawings and other documents in connection with the design, construction, operation, maintenance of the works. At any time the Employer shall have further license without additional payment to the Contractor to use any such drawings or documents for the purpose of making any improvement of the works or enlargement or duplication of any part thereof, provided that such improvement, enlargement, or duplication by itself or in conjunction with any other improvements, enlargements or duplications already made in accordance with the further license does not result in the duplication of the whole works.

76. Receipts to be signed in firm's name by any one of the partners:

Every receipt for money which may become payable or for any security which may become transferable to the Contractor under these present shall, if signed in the partnership name by any one of the partners, be a good and sufficient discharge to the Commissioner and Municipal Corporation in respect of the money or security purporting to be acknowledged thereby, and in the event of death of any of the partners during the pendency of this contract, it is hereby expressly agreed that every receipt by any one of the surviving partners shall, if so signed as aforesaid, be good and sufficient discharge as aforesaid provided that nothing in this clause contained shall be deemed to prejudice or effect any claim which the Commissioner or the Corporation may hereafter have against the legal representatives of any partners so dying or in respect of any breach of any of the conditions thereof, provided also that nothing in this clause contained shall be deemed prejudicial or affect the respective rights or obligations of the Contractors and of the legal representatives of any deceased Contractors interest.

77 Proprietary data

All documents and other information supplied by the Authority or submitted by an Applicant to the Authority shall remain or become the property of the Authority. Applicants are to treat all information as strictly confidential and shall not use it for any purpose other than for preparation and submission of their Application. The Authority will not return any Application or any information provided along therewith.

78 Correspondence with the Applicant

Save and except as provided in this TENDER, the Authority shall not entertain any correspondence with any Applicant in relation to the acceptance or rejection of any Application.

79 Price Variation Clause

The Contractor shall be reimbursed or shall refund to the Corporation as he case may be the variation in the value of the work carried out from time to time, depending on whether the prices of material and labour as a whole rise or fall, and the method adopted for such computations shall be as given below, it being clearly understood that the contractor shall have no claim for being

reimbursed on the ground that the price of a particular material or group of materials have risen beyond the limits of the presumptions made in the following paras, however, **no price variations shall be made applicable for contracts upto 12 months:**

A) Controlled materials: Price variations shall be permitted in respect of these materials the price level of which is controlled by the Government or its agency. The rate ruling on the date of submission of the tender shall be considered as the basic price of such material for adjustment. Any variation in this rate shall be considered for reimbursement to the contractor or refund to be claimed from the contractor as the case may be. The contractor shall, for the purpose of adjustment submit in original the relevant documents from the suppliers.

B) Labour and other materials: For the purpose of this contract and for allowing reimbursement of refund on account of variation of prices of (i) labour, and (ii) materials other than materials mentioned in A above, computation will be based on the formula enunciated below which is based on the presumptions that :

i) The general price level of labour, rises or falls in proportion to the rise or fall of consumer price index number 9 (general) for working class in Mumbai.

ii) The general price level of materials rises or falls in proportion to rise or fall of whole-sale price index as published by 'Economic Adviser to Govt. of India'.

iii) And that the component of labour is to the extent of 30 percent of 88 percent and the component of materials is to the extent of 70 percent of 88 percent of the value of the work carried out. The remaining 12 percent being the presumptive profit of the contractor.

a) Formula for Labour component: $VL = (0.88\ R) \times 30 / 100 \times (I - I_O) / I_O$

b) Formula for Material component: $VM = (0.88R \times 70\text{-}C)/100 \times (W - W_O)/W_O$

Where –

VL = Amount of price variation to be reimbursed or claimed as refund on account of general rise or fall of index referred to above.

I = Consumer Price Index number of working class for Mumbai (declared by the Commissioner of Labour and Director of Employment, Mumbai) applicable to the period under reference (base year ending 2004-05 as 100 i.e. new series of indices).

I_O = Consumer price index number for working class for Mumbai (declared by the Commissioner of labour and Director of Employment, Mumbai) prevailing, on the day of 28 days prior to the date of submission of the tender.

VM = The amount of price variation to be reimbursed or claimed as refund on account of general rise or fall of wholesale price index for period under reference.

W = Average wholesale price index as published by Economic Adviser to Govt. of India applicable to the period under reference.

W_O = Wholesale price index as stated above prevailing on the day of 28 days prior to the date of submission of the tender.

R = Total value of the work done during the period under reference as recorded in the Measurement Book excluding water charges and sewerage charges but including cost of excess in respect of item upto 50 percent

C = Total value of Controlled materials used for the works as recorded in Measurement Book and paid for at original basic rate plus the value of materials used .

i) The quantity of the Controlled material adopted in working out the value of 'C' shall be inclusive of permitted wastages as / if mentioned in specifications.

ii) The basic rate for the supply of controlled material shall be inclusive of all the components of cost of materials excluding transport charges incurred for bringing the material from place of delivery to the site.

Computations based on the above formula will be made for the period of each bill separately and reimbursement will be made to (when the result is plus) and refund will claimed from (when the result is minus) the contractor's next bill. The above formulae will be replaced by the formulae in Annexure-I as and when mentioned in special conditions of contract. The operative period of the

contract for application of price variation shall mean the period commencing from the date of commencement of work mentioned in the work order and ending on the date when time allowed for the work order and ending on the date when time allowed for the work specified in the contract for work expires, taking into consideration, the extension of time, if any, for completion of the work granted by Engineer under the relevant clause of the conditions of contract in cases other than those where such extension is necessitated on account of default of the contractor. The decision of the Engineer as regards the operative period of the contract shall be final and binding on the contractors.

iii) Where there is no supply of controlled items to contractor the component 'C' shall be taken as zero.

C) Adjustment after completion: If the Contractor fails to complete the works within the time for completion adjustment of prices thereafter until the date of completion of the works shall be made using either the indices or prices relating to the prescribed time for completion, or the current indices or prices whichever is more favorable to the employer, provided that if an extension of time is granted, the above provision shall apply only to adjustments made after the expiry of such extension of time.

D) Price variation will be calculated similarly and separately for extra items and / or excess quantities and provisional sums calculated under Sub Clause 10 (b)A (i)&(ii) and Sub Clause 10 (b) B(ii) based on the above formula / formulae in Annexure-I as and when mentioned in Special conditions of contract; I_O and W_O being the indices applicable to the date on which the rates under Sub Clause 10 (a)A (i)&(ii) and Sub Clause 10 (a) B(iii) are fixed. No price variation shall be admissible for FAIR items created during execution.

80. The maximum Price Variation shall be as follows -

Time Period of Project	Maximum limit of Price Variation
Up to 12 months	No variation allowed

Above12 months to 24 months	5%
Above 24 months	10%

*Approval of AMC/MC shall be obtained before invitation of tender in case of any changes in above.

Note: 1) The extension in time period for the projects originally estimated including monsoon results in change of price variation slabs as mentioned above i.e.from first slab to second slab or from second slab to third slab, then the maximum limit of original slab will prevail. 2) Operative period shall mean original or extended time period of contract.

For example:

Extension of Time period	Maximum Price Variation
If original period of 11 months including monsoon extends to 16. The operative period will be 11+5 months.	No variation allowed
If original period of 11 months excluding monsoon extends to 16. The operative period will be 11+5 months.	Maximum 5% variation allowed

Price Variation during Extended Period of Contract:

(i) Extension Due To Modification & Extension for delay due to MCGM: The price variation for the period of extension granted shall be limited to the amount payable as per the Indices in case the indices increases or decreases, above/below the indices applicable, to the last month of the original or extended period vide clause8 (l) (a)(i) and (ii) of standard GCC.

(ii) Extension of Time for Delay Due To Contractor:

(a) The price variation for the period of extension granted shall be limited to the amount payable as per the Indices in case the indices increase, above the indices applicable, to the last month of the original completion period or the extended period vide above clause.8 (l) (a)(i) and (ii) of standard GCC. **However, the price variation shall not be paid in any case for the extended period on account of delay due to contractor.**

(b) The price variation shall be limited to the amount payable as per the indices, in case the indices decrease or fall below the indices applicable, to the last month of original / extended period of completion period vide above clause 8 (l) (a)(i) and (ii) of standard GCC, then lower indices shall be adopted.

(iii) Extension of Time for Delay due to reasons not attributable to MCGM and Contractor (Reference Cl. 8(d) of Standard GCC):

The price variation for the period of extension granted shall be limited to the amount payable as per the Indices in case the indices increases or decreases, above/below the indices applicable, to the last month of the original period.

81. Payment:

Interim Payment :

i) Interim bills shall be submitted by the Contractor from time to time (but at an interval of not less than one month) for the works executed. The Engineer shall arrange to have the bills verified by taking or causing to be taken, where necessary, the requisite measurement of work.

ii) Payment on account for amount admissible shall be made on the Engineer certifying the sum to which the Contractor is considered entitled by way of interim payment for all the work executed, after deducting there from the amount already paid, the security deposit / retention money and such other amounts as may be deductible or recoverable in terms of the contract.

iii) On request, the contractor will be paid upto 75 percent of the value of the work carried out as an adhoc payment in the first week of next month after deducting there from recoveries on account of advances, interest, retention money, income tax etc. The balance payment due will be paid thereafter.

iv) No interim payment will be admitted until such time the Contractor have fully complied with the requirement of the Condition no.8 (g) and 8 (h) concerning submission and approval of Network Schedule for the works, as detailed in Condition 8 (h). A fixed sum shall be held in abeyance at the time of next interim payment for non-attainment of each milestone in the network and shall be released only on attainment of the said milestone.

v) An interim certificate given relating to work done or material delivered may be modified or corrected by a subsequent interim certificate or by the final certificate. No certificate of the Engineer supporting an interim payment shall of itself be conclusive evidence that any work or materials to which it relates is / are in accordance with the contract.

82. Banning / De-Registration of Agencies of Construction works in MCGM

 The regulations regarding Demotion / Suspension Banning for specific period or permanently / De-Registration shall be governed as per the respective condition in Contractor Registration Rules of MCGM.

83. JOINT VENTURE (Not Applicable for this tender)

~~In case if Joint Venture is allowed for the Project, the guidelines for JV as follows shall be incorporated in the Tender Document:~~

~~a) Joint Venture should be allowed only when the number of identifiable different works is more than one and/or the estimated cost of tender is more than Rs.100 Crores. JV shall also be allowed for complex technical work below Rs.100 Crores with the approval of concerned AMC~~

~~b) Separate identity/name shall be given to the Joint Venture firm.~~

c) Number of members in a JV firm shall not be more than three in normal circumstances, if the work involves only one discipline (say Civil or Electrical). If number of members in JV is required to be more than three, then approval of concerned AMC needs to be sought.

d) A member of JV firm shall not be permitted to participate either in individual capacity or as a member of another JV firm in the same tender.

e) The tender form shall be purchased and submitted in the 'name of the JV firm or any constituent member of the JV.

f) Normally EMD shall be submitted only in the name of the JV and not in the name of constituent member. However, EMD in the name of lead partner can be accepted subject to submission of specific request letter from lead partner stating the reasons for not submitting the EMD in the name of JV and giving written confirmation from the JV partners to the effect that the EMD submitted by the lead partner may be deemed as EMD submitted by JV firm.

g) One of the members of the JV firm shall be the lead member of the JV firm who shall have a majority (at least 51%) share of interest in the JV firm. The other members shall have a share of not less than 20% each in case of JV firms with up to three members and not less than 10% each in case of JV firms with more than three members. In case of JV firm with foreign member(s), the lead member has to be an Indian firm with a minimum share of 51%.

h) A copy of Letter of Intent or Memorandum of Understanding (MoU) executed by the JV members shall be submitted by the JV firm along with the tender. The complete details of the members of the JV firm, their share and responsibility in the JV firm etc. particularly with reference to financial technical and other obligation shall be furnished in the agreement.

i) Once the tender is submitted, the agreement shall not be modified/altered/terminated during the validity of the tender. In case the tenderer fails to observe/comply with this stipulation, the full Earnest Money Deposit (EMD) shall be forfeited. In case of successful tenderer, the validity of this agreement shall be extended till the currency of the contract expires.

j) Approval for change of constitution of JV firm shall be at the sole discretion of the MCGM. The constitution of the JV firm shall not be allowed to be modified after submission of the tender

bid by the JV firm except when modification becomes inevitable due to succession laws etc. and in any case the minimum eligibility criteria should not get vitiated. In any case the Lead Member should continue to be the Lead Member of the JV firm. Failure to observe this requirement would render the offer invalid.

k) Similarly, after the contract is awarded, the constitution of JV firm shall not be allowed to be altered during the currency of contract except when modification become inevitable due to succession laws etc. and in any case the minimum eligibility criteria should not get vitiated. Failure to observe this stipulation shall be deemed to be breach of contract with all consequential penal action as per contract condition.

l) On award of Contract to J.V. Firm, a single performance guarantee shall be required to be submitted by the J.V. firm **or by the Lead Partner**, as per tender conditions. All the Guarantees like performance guarantee, Bank Guarantee for mobilization advance, Machinery advance etc. shall be accepted only in the name of the J.V. Firm **or by the Lead Partner** and no splitting of Guarantees amongst the members of the J.V. Firm shall be permitted.

m) On issue of LOA, an agreement among the members of the JV firm (to whom the work has been awarded) has to be executed and got registered before the Registrar of the Companies under Companies Act or before the Registrar / Sub-Registrar under the Registration Act, 1908. This agreement shall be submitted by the JV firm to the MCGM before signing the contract agreement for the work. (This agreement format should invariably be part of the tender condition). In case the tenderer fails to observe/comply with this stipulation, the full Earnest Money Deposit (EMD) shall be forfeited and other penal actions due shall be taken against partners of the JV and the JV. This joint venture agreement shall have, inter-alia, following clauses:

i. Joint and several liability - The members of the JV firm to which the contract is awarded, shall be jointly and severally liable to the Employer (MCGM) for execution of the project in accordance with General and Special conditions of the contract. The JV members shall also be liable jointly and severally for the loss, damages caused to the MCGM during the course of execution of the contract or due to no execution of the contract or part thereof.

ii. Duration of the Joint Venture Agreement -It shall be valid during the entire period of the contract including the period of extension if any and the maintenance period after the work is completed.

iii. Governing Laws - The Joint Venture Agreement shall in all respect be governed by and interpreted in accordance with Indian Laws.

iv. Authorized Member -Joint Venture members shall authorize one of the members on behalf of the Joint Venture firm to deal with the tender, sign the agreement or enter into contract in respect of the said tender, to receive payment, to witness joint measurement of work done, to sign measurement books and similar such action in respect of the said tender/contract. All notices/correspondences with respect to the contract would be sent only to this authorized member of the JV firm.

No member of the Joint Venture firm shall have the right to assign or transfer the interest right or liability in the contract without the written consent of the other members and that of the employer in respect of the said tender/contract.

n. Documents to be enclosed by the JV firm along with the tender:

i. In case one or more of the members of the JV firm is/are partnership firm(s), following documents shall be submitted:

a. Notary certified copy of the Partnership Deed,

b. Consent of all the partners to enter into the Joint Venture Agreement on a stamp paper of appropriate value (in original).

c. Power of Attorney (duly registered as per prevailing law) in favor of one of the partners to sign the MOU and JV Agreement on behalf of the partners and create liability against the firm.

ii. In case one or more members is/are Proprietary Firm or HUF, the following documents shall be enclosed:

a. Affidavit on Stamp Paper of appropriate value declaring that his Concern is a Proprietary Concern and he is sole proprietor of the Concern OR he is in position of "KARTA" of Hindu Undivided Family and he has the authority, power and consent given by other partners to act on behalf of HUF.

iii. In case one or more members is/are limited companies, the following documents shall be submitted:

a. Notary certified copy of resolutions of the Directors of the Company, permitting the company to enter into a JV agreement, authorizing MD or one of the Directors or Managers of the Company to sign MOU, JV Agreement, such other documents required to be signed on behalf of the Company and enter into liability against the company and/or do any other act on behalf of the company.

b. Copy of Memorandum and articles of Association of the Company.

c. Power of Attorney (duly registered as per prevailing law) by the Company authorizing the person to do/act mentioned in the para (a) above.

o. All the members of the JV shall certify that they have not been black listed or debarred by MCGM from participation in tenders/contract in the past either in their individual capacity or the JV firm or partnership firm in which they were members / partners.

p. Credentials & Qualifying criteria: Technical and financial eligibility of the JV firm shall be adjudged based on satisfactory fulfilment of the following criteria:

Technical eligibility criteria: In case of Work involving single discipline, the Lead member of the JV firm shall meet at least 35% requirement of technical capacity as stipulated in tender document.

OR

In case of composite works (e.g. works involving more than one distinct component such as Civil Engineering works, M&E works, Electrical works, etc. and in the case of major bridges, substructure and superstructure etc.), atleast one member should have satisfactorily completed 35% of the value of any one component of the project work so as to cover all the components of project

~~work or any member having satisfactorily completed 35% of the value of work of each component during last seven financial years.~~

~~**In such cases, what constitutes a component in a composite work shall be clearly defined as part of the tender condition without any ambiguity.**~~

~~**Financial eligibility criteria:** The contractual payments received by the JV firm or the arithmetic sum of contractual payments received by all the members of JV firm in any one of the previous three financial years and shall be at least 100% of the estimated value of the work as mentioned in the tender.~~

84. Compensation for delay:

If the Contractor fails to complete the works and clear the site on or before the Contract or extended date(s) / period(s) of completion, he shall, without prejudice to any other right or remedy of Municipal Corporation on account of such breach, pay as agreed compensation, amount calculated as stipulated below (or such smaller amount as may be fixed by the Engineer) on the contract value of the whole work or on the contract value of the time or group of items of work for which separate period of completion are given in the contract and of which completion is delayed for every week that the whole of the work of item or group of items of work concerned remains uncompleted, even though the contract as a whole be completed by the contract or the extended date of completion. For this purpose the term 'Contract Value' shall be the value of the work at Contract Rates as ordered including the value of all deviations ordered:

• Completion period for projects (originally stipulated or as extended) not exceeding 6 months : **to the extent of maximum 1 percent per week**.

• Completion period for projects (originally stipulated or as extended) exceeding 6 months and not exceeding 2 years: **to the extent of maximum ½ percent per week.**

• Completion period for projects (originally stipulated or as extended) exceeding 2 years :**to the extent of maximum ¼ percent per week.**

When the delay is not a full week or in multiple of a week but involves a fraction of a week the compensation payable for that fraction shall be proportional to the number of days involved.

Provided always that the total amount of compensation for delay to be paid this condition shall not exceed the under noted percentage of the Contract Value of the item or group of items of work for which a separate period of completion is given.

i) Completion period (as originally stipulated or as extended) not exceeding 6 months: **10 percent.**

ii) Completion period (as originally stipulated or as extended) exceeding 6 months and not exceeding 2 years :**7½ percent.**

iii) Completion period (as originally stipulated or as extended) exceeding 2 years :**5 percent**.

The amount of compensation may be adjusted set off against any sum payable to the contractor under this or any other contract with the Municipal Corporation.

85. Action And Compensation Payable In Case Of Bad Work And Not Done As Per Specifications

All works under or in course of execution or executed in pursuance of the contract, shall at all times be open and accessible to the inspection and supervision of the Engineer-in-charge, his authorized subordinates in charge of the work and all the superior officers, officer of the Vigilance Department of the MCGM or any organization engaged by the MCGM for Quality Assurance and the contractor shall, at all times, during the usual working hours and at all other times at which reasonable notice of the visit of such officers has 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 agent shall be considered to have the same force as if they had been given to the contractor himself.

If it shall appear to the Engineer-in-charge or his authorized subordinates in-charge of the work or to the officer of Vigilance Department, that any work has been executed with unsound, imperfect or unskillful workmanship or with materials of any inferior description, or that any materials or articles provided by him for the execution of the work are unsound or of a quality inferior to that contracted for or otherwise not in accordance with the contract, the contractor shall, on demand in writing which shall be made within twelve months of the completion of the work from the Engineer-in-Charge specifying the work, materials or articles complained of notwithstanding that the same may have been passed, certified and paid for forthwith rectify, or

remove and reconstruct the work so specified in whole or in part, as the case may require or as the case may be, remove the materials or articles so specified and provide other proper and suitable materials or articles at his own charge and cost. In the event of the failing to do so within a period specified by the Engineer-in-Charge in his demand aforesaid, then the contractor shall be liable to pay compensation at the same rate as under clause 8.e. of the general condition of contract in section 9 of tender document (for Compensation for delay) for this default. In such case the Engineer-in Charge may not accept the item of work at the rates applicable under the contract but may accept such items at reduced rates as the Engineer in charge may consider reasonable during the preparation of on account bills or final bill if the item is so acceptable without detriment to the safety and utility of the item and the structure or he may reject the work outright without any payment and/or get it and other connected and incidental items rectified, or removed and re-executed at the risk and cost of the contractor. Decision of the Engineer-inCharge to be conveyed in writing in respect of the same will be final and binding on the contractor.

If the penalisation amount exceeds maximum limit with respect to Clause 8.e of Standard General Conditions of Contract, then a show cause notice shall necessarily be issued to the contract as to why the contract should not be terminated.

The above clause is summarized to make it easy to understand as follows:

1. The Engineer-in-charge shall issue notice to the contractor for rectifying the defects or redoing of the work if necessary, within specific time to achieve the desired quality and quantity of the work and this should be governed by clause 8.f and 9.b of Standard General Conditions of Contract.

2. If the contractor fails to comply the same, only then, the contractor shall be liable to pay compensation at the same rate as under clause 8.e of the Standard General Condition of Contract (for Compensation for delay) for this default.

3. If the penalization amount exceeds the maximum limit, then the contractor will be liable for being banned/ deregistered from business dealings with MCGM and this shall be governed by relative provision in Registration Rules of MCGM and Standard General Conditions of Contract.

4. This penalization shall be levied only on account of delay in work, unsound, imperfect or unskillful workmanship or with materials of any inferior description, or that any materials or articles provided by him for the execution of the work are unsound or of quality inferior to that contracted for or otherwise not in accordance with the contract.

86. Contractors remain liable to pay compensation:

In any case in which any of the powers conferred upon the Engineer In-charge by the relevant clauses in documents that form a part of contract as exercised or is exercisable in the event of any future case of default by the Contractor, he is declared liable to pay compensation amounting to the whole of his security deposit. The liability of the Contractor for past and future compensation shall remain unaffected. In the event of the Executive Engineer taking action against these relevant clauses, he may, if he so desires, take possession of all or any tools and plant, materials and stores in or upon the work of 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 paying or allowing for the same in account at the contract rates, or in the case of contract rates not being applicable at current market rates to be certified by the Executive Engineer, may after giving notice in writing to the Contractor or his staff of the work or other authorized agent require him to remove such tools and plants, 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 requisition, the Executive Engineer may remove them at the contractors expense of sell them by auction or private sell on account of the Contractor at his risk in all respects and certificate of the Executive Engineer as to the expense of any such removal and the amount of the proceeds an expense of any such sell be final and conclusive against the Contractor.

87. No Claim To Any Payment Or Compensation Or Alteration In Or Restriction Of Work

(a) If at any time after the execution of contract documents, the Engineer shall for any reason whatsoever, desires that the whole or any part of the works specified in the Tender should be suspended for any period or that the whole or part of the work should not be carried out, at all, he shall give to the Contractor a Notice in writing of such desire and upon the receipt of such notice, the Contractor shall forthwith suspend or stop the work wholly or in part as required after having due regard to the appropriate stage at which the work should be stopped or suspended so as not to

cause any damage or injury the work already done or endanger the safety thereof, provided that the decision of the Engineer as to the stage at which the work or any part of it could be or could have been safely stopped or suspended shall be final and conclusive against the contractor.

The Contractor shall have no claim to any payment or compensation whatsoever by reason of or in pursuance of any notice as aforesaid, on account of any suspension, stoppage or curtailment except to the extent specified hereinafter.

(b) Where the total suspension of Work Order as aforesaid continued for a continuous period exceeding 90 days the contractor shall be at liberty to withdraw from the contractual obligations under the contract so far as it pertains to the un-executed part of the work by giving 10 days prior notice in writing to the Engineer within 30 days of the expiry of the said period of 90 days, of such intention and requiring the Engineering to record the final measurement of the work already done and to pay final bill. Upon giving such Notice, the Contractor shall be deem to have been discharged from his obligations to complete the remaining unexecuted work under his contract. On receipt of such notice the Engineer shall proceed to complete the measurement and make such payment as may be finally due to the contractor within a period of 90 days from the receipt of such Notice in respect of the work already done by the contractor. Such payment shall not in any manner prejudice the right of the contractor to any further compensation under the remaining provisions of this clause.

(c) Where the Engineer required to Contractor to suspend the work for a period in excess of 30 days at any time or 60 days in the aggregate, the Contractor shall be entitled to apply to the Engineer within 30 days of the resumption of the work after such suspension for payment of compensation to the extent of pecuniary loss suffered by him in respect of working machinery remained ideal on the site of on the account of his having and to pay the salary of wages and labour engaged by him during the said period of suspension provided always that the contractor shall not be entitled to any claim in respect of any such working machinery, salary or wages for the first 30 days whether consecutive or in the aggregate or such suspension or in respect of any such suspension whatsoever occasion by unsatisfactory work or any other default on his part, the decision of the Engineer in this regard shall be final and conclusive against the contractor.

88. Contractor to supply plant, ladder, scaffolding, etc and is liable for damages arising from non provision of lights, fencing, etc.

The Contractor shall supply at his own cost all material, plant, tools, appliances, implements, ladders, cordage, tackle scaffolding and temporary works requisite or proper for the proper execution of the work, whether, in the original altered or substituted form and whether included in the specification of other documents forming part of the contract or referred to in these conditions or not and which may be necessary for the purpose of satisfying or complying with the requirements of the Eng-In-Charge as to any matter as to which under these conditions is entitled to be satisfied, or which is entitled to require together with the carriage therefore to and from the work.

The Contractor shall also supply without charge, the requisite number of person with the means and materials necessary for the purpose of setting out works and counting, weighing and assisting in the measurements of examination at any time and from time to time of the work or materials, failing which the same may be provided by the Engineer In-charge at the expense of the contractor and the expenses may be deducted from any money due to the contractor under the contract or from his security deposit or the proceeds of sale thereof, or offers sufficient portion thereof.

The contractor shall provide all necessary fencing and lights required to protect the public from accident and shall also be bound to bear the expenses of defense of every suit, action or other legal proceedings, that may be brought by any person for injury sustained owing to neglect of the above precautions and to pay any damages and cost which may be awarded in any such suit action or proceedings to any such person or which may with the consent of the contractor be paid for compromising any claim by any such person.

89. Prevention of Fire :

The contractor shall not set fire to any standing jungle, trees, brushwood or grass without a written permit from the Engineer In-charge. When such permit is given, and also in all cases when destroying cut or dug up trees brushwood, grass, etc., by fire, the contractor shall take necessary

measure to prevent such fire spreading to or otherwise damaging surrounding property. The Contractor shall make his own arrangements for drinking water for the labour employed by him.

90. Compensation for all damages done intentionally or unintentionally by contractor's labour whether in or beyond the limits of MCGM property including any damage caused by spreading the fire shall be estimated by the Engineer In-charge or such other officer as he may appoint and the estimate of the Engineer in-charge to the decision of the Dy. Chief Engineer 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 or deducted by the Engineer In-charge from any sums that may be due or become due from MCGM to contractor under this Contract or otherwise. Contractor shall bear the expenses of defending any action or other legal proceedings that may be brought to prevent the spread of fire and he shall pay any damages and costs that may be awarded by the Court in consequence.

91. In the case of Tender by partners, any change in the constitution of the firm shall be forthwith, notified by the contractor through the Engineer In-charge for his information.

92. Action where no specifications :

In the case of any class of work for which there is no such specifications, such works shall be carried out in accordance with the specifications and in the event of there being no such specifications, then in such case, the work shall be carried out in all respects in accordance with all instructions and requirements of the Engineer Incharge.

93. Safety and medical help :

(i) The Contractor shall be responsible for and shall pay the expenses of providing medical help to any workmen who may suffer a bodily injury as a result of an accident. If such expenses are incurred by MCGM, the same shall be recoverable from the contractor forthwith and be included without prejudice to any other remedy of MCGM from any amount due or that may become due to the Contractor.

(ii) The contractor shall provide necessary personal safety equipment and first-aid box for the use of persons employed on the site and shall maintain the same in condition suitable for immediate use at any time.

(iii) The workers shall be required to use the safety equipments so provided by the contractor and the contractor shall take adequate steps to ensure the proper use of equipments by those concerned.

(iv) When the work is carried on in proximity to any place where there is risk or drawing all necessary equipments shall be provided and kept ready for use and all necessary steps shall be taken for the prompt rescue of any person in danger.

94. No compensation shall be allowed for any delay caused in the starting of the work on account of acquisition of land or in the case of clearance of works, on account of ant delay in according to sanction of estimates.

95. Anti-malaria and other health measures:

Anti-Malaria and other health measures shall be taken as directed by the Executive Health Officer of MCGM. Contractor shall see that mosquitogenic conditions are created so as to keep vector population to minimum level. Contractor shall carry out anti-malaria measures in the area as per the guidelines issued by the Executive Health Officer of MCGM from time to time.

In case of default, in carrying out prescribed anti-malaria measures resulting in increase in malaria incidence, contractor shall be liable to pay MCGM on antimalaria measures to control the situation in addition to fine.

SECTION 10

SPECIFICATIONS & SELECTION OF MATERIAL

SPECIFICATIONS & SELECTION OF MATERIAL

The tender is prepared on the basis of Unified Schedule of Rates and specifications 2013/2018. The specifications of the items of USOR are available on MCGM portal http://portal.mcgm.gov.inunder the Tender tab. Hence the deserving contractor shall either download the same from MCGM portal or the same may be collected in the soft copy format at the time of purchasing the tender from this office. Specifications for Fair Items are separately attached with tender.

Civil - USOR-2018/2013 and existing uploaded fair items in SAP
Electrical and Garden - USOR-2013

SELECTION OF MATERIAL

1. All materials brought on the site of work and meant to be used in the same, shall be the best of their respective kinds and to the approval of the Engineer. The Engineer or his representative will accept that the materials are really the best of their kinds, when it is proved beyond doubt that no better materials of the particular kind in question are available in the market.

2. The contractor shall obtain the approval of the Engineer of samples of all materials to be used in the works and shall deposit these samples with him before placing an order for the materials with the suppliers. The materials brought on the works shall conform in every respect to their approved samples. Fresh samples shall be deposited with the Engineer whenever the type or source of any material changes.

3. The contractor shall check each fresh consignment of materials as it is brought to the site of works to see that they conform in all respects to the Specifications of the samples approved by the Engineer, or both.

4. The Engineer will have the option to have any of the materials tested to find out whether they are in accordance with the Specifications and the Contractor will bear all expenses for such testing. All B bills, vouchers and test certificates, which in the opinion of the Engineer or his representative

are necessary to convince him as to the quality of the materials or their suitability shall be produced for his inspection when required.

5. Any materials that have not been found to conform to the specifications will be rejected forthwith and shall be removed from the site by the contractor at his own cost within 24 hours.

6. The Engineer shall have power to cause the Contractors to purchase and use such materials from any particular source, as may in his opinion be necessary for the proper execution of the work.

7. Notwithstanding the source, the sand shall be washed using sand washing machine before use.

SECTION 11

FRAUD

AND

CORRUPT

PRACTICES

FRAUD AND CORRUPT PRACTICES

 The Applicants and their respective officers, employees, agents and advisers shall observe the highest standard of ethics during the Bidding Process. Notwithstanding anything to the contrary contained herein, the Authority may reject an Application without being liable in any manner whatsoever to the Applicant if it determines that the Applicant has, directly or indirectly or through an agent, engaged in corrupt practice, fraudulent practice, coercive practice, undesirable practice or restrictive practice in the Bidding Process.

 Without prejudice to the rights of the Authority under relevant Clause here in above, if an Applicant is found by the Authority to have directly or indirectly or through an agent, engaged or indulged in any corrupt practice, fraudulent practice, coercive practice, undesirable practice or restrictive practice during the Bidding Process, such Applicant shall not be eligible to participate in any tender or RFQ issued by the Authority during a period of 2 (two) years from the date such Applicant is found by the Authority to have directly or indirectly or through an agent, engaged or indulged in any corrupt practice, fraudulent practice, coercive practice, undesirable practice or restrictive practice, as the case may be.

 For the purposes of this Clause, the following terms shall have the meaning hereinafter respectively assigned to them:

A. "corrupt practice" means the offering, giving, receiving, or soliciting, directly or indirectly, of anything of value to influence the actions of any person connected with the Bidding Process (for avoidance of doubt, offering of employment to, or employing, or engaging in any manner whatsoever, directly or indirectly, any official of the Authority who is or has been associated in any manner, directly or indirectly, with the Bidding Process or the LOA or has dealt with matters concerning the Concession Agreement or arising there from, before or after the execution thereof, at any time prior to the expiry of one year from the date such official resigns or retires from or otherwise ceases to be in the service of the Authority, shall be deemed to constitute influencing the actions of a person connected with the Bidding Process); or

save and except as permitted under the relevant sub clause, engaging in any manner whatsoever, whether during the Bidding Process or after the issue of the LOA or after the execution of the

Concession Agreement, as the case may be, any person in respect of any matter relating to the Project or the LOA or the Concession Agreement, who at any time has been or is a legal, financial or technical adviser of the Authority in relation to any matter concerning the Project;

B. "fraudulent practice" means a misrepresentation or omission of facts or suppression of facts or disclosure of incomplete facts, in order to influence the Bidding Process ;

C. "coercive practice" means impairing or harming or threatening to impair or harm, directly or indirectly, any person or property to influence any persons participation or action in the Bidding Process;

D. "undesirable practice" means (i) establishing contact with any person connected with or employed or engaged by the Authority with the objective of canvassing, lobbying or in any manner influencing or attempting to influence the Bidding Process; or (ii) having a Conflict of Interest; and

E. "Restrictive practice" means forming a cartel or arriving at any understanding or arrangement among Applicants with the objective of restricting or manipulating a full and fair competition in the Bidding Process.

F. If the Employer/Financier determines that the Contractor has engaged in corrupt, fraudulent, collusive, coercive or obstructive practices, in competing for or in executing the Contract, then the Employer may, after giving 14 days' notice to the Contractor, terminate the Contractor's employment under the Contract and expel him from the Site, and the provisions of relevant Clause shall apply as if such expulsion had been made.

G. Should any employee of the Contractor be determined to have engaged in corrupt, fraudulent, collusive, coercive, or obstructive practice during the execution of the Works, then that employee shall be removed in accordance with relevant Clause.

For the purposes of this Sub-Clause:

i. "corrupt practice" is the offering, giving, receiving to soliciting, directly or indirectly, of anything of value to influence improperly the actions of another party;

ii. “another party” refers to a public official acting in relation to the procurement process or contract execution. In this context, “public official” includes Financer staff and employees of other organizations taking or reviewing procurement decisions.

iii. “fraudulent practice” is any act or omission, including a misrepresentation, that knowingly or recklessly misleads, or attempts to mislead, a party to obtain a financial or other benefit or to avoid an obligation;

iv. “collusive practice” is an arrangement between two or more parties designed to achieve an improper purpose, including to influence improperly the actions of another party;

v. “coercive practice” is impairing or harming, or threatening to impair or harm, directly or indirectly, any party or the property of the party to influence improperly the actions of a party;

vi. “obstructive practice” is deliberately destroying, falsifying, altering or concealing of evidence material to the investigation or making false statements to investigators in order to materially impede the Financier investigation into allegations of a corrupt, fraudulent, coercive or collusive practice; and/or threatening, harassing or intimidating any party to prevent it from disclosing its knowledge of matters relevant to the investigation or from pursuing the investigation; or

vii. acts intended to materially impede the exercise of the Financer’s inspection and audit rights provided .

viii. “party” refers to a public official; the terms “benefit” and “obligation” relate to the procurement process or contract execution; and the “act or omission” is intended to influence the procurement process or contract execution.

ix. ”parties” refers to participants in the procurement process (including public officials) attempting to establish bid prices at artificial, noncompetitive levels.

x. a “party” refers to a participant in the procurement process or contract execution.

SECTION 12

PRE BID MEETING

PREBID MEETING

Pre-bid meeting of the interested parties shall be convened at the designated date, time and place. A maximum of three representatives of each Applicant shall be allowed to participate on production of authority letter from the Applicant.

During the course of Pre-bid meeting, the Applicants will be free to seek clarifications and make suggestions for consideration of the Authority. The Authority shall Endeavour to provide clarifications and such further information as it may, in its sole discretion, consider appropriate for facilitating a fair, transparent and competitive Bidding Process.

SECTION –13

LIST OF APPROVED BANKS

LIST OF APPROVED BANKS

1. The following Banks with their branches in Greater Mumbai and in suburbs and extended suburbs up to Virar and Kalyan have been approved only for the purpose of accepting Banker's guarantee from 1997-98 onwards until further instructions.

2. The Bankers Guarantee issued by branches of approved Banks beyond Kalyan and Virar can be accepted only if the said Banker's Guarantee is countersigned by the Manager of a branch of the same Bank, within the Mumbai Limit categorically endorsing thereon that said bankers Guarantee is binding on the endorsing Branch of the bank within Mumbai limits and is liable to be on forced against the said branch of the Bank in case of default by the contractor/supplier furnishing the bankers Guarantee.

List of approved Banks:-

	A. S.B.I and its subsidiary Banks
1	State Bank Of India.
2	Deleted
3	State Bank Of Hyderabad.
4	State Bank Of Mysore.
5	State Bank Of Patiyala.
6	State Bank Of Saurashtra.
7	State Bank Of Travankore.
	B. Nationalized Banks
8	Alahabad Bank.
9	Andhra Bank.

10	Bank Of Baroda.
11	Bank Of India.
12	Bank Of Maharashtra.
13	Central Bank Of India.
14	Dena Bank.
15	Indian Bank.
16	Indian Overseas Bank.
17	Oriental Bank Of Commerce.
18	Punjab National Bank.
19	Punjab & Sindh Bank.
20	Syndicate Bank.
21	Union Bank Of India.
22	United Bank Of India.
23	UCO Bank.
24	Vijaya Bank.
24 A	Corporation Bank.
C. Scheduled Commercial Banks	
25	Bank Of Madura Ltd.
26	Bank Of Rajasthan Ltd.
27	Banaras State Bank Ltd.

28	Bharat Overseas Bank Ltd.
29	Catholic Syrian Bank Ltd.
30	City Union Bank Ltd.
31	Development Credit Bank.
32	Dhanalakshmi Bank Ltd.
33	Federal Bank Ltd.
34	Indsind Bank Ltd.
35	I.C.I.C.I Banking Corporation Ltd.
36	Global Trust Bank Ltd.
37	Jammu & Kashmir Bank Ltd.
38	Karnataka Bank Ltd.
39	KarurVysya Bank Ltd.
40	Laxmi Vilas Bank Ltd.
41	Nedugundi Bank Ltd.
42	Ratnakar Bank Ltd.
43	Sangli Bank Ltd.
44	South Indian Bank Ltd.
45	S.B.I Corporation &Int Bank Ltd.
46	Tamilnadu Mercantile Bank Ltd.
47	United Western Bank Ltd.

48	Vysya Bank Ltd.
D. Schedule Urban Co-op Banks	
49	Abhyudaya Co-op Bank Ltd.
50	Bassein Catholic Co-op Bank Ltd.
51	Bharat Co-op Bank Ltd.
52	Bombay Mercantile Co-op Bank Ltd.
53	Cosmos Co-op Bank Ltd.
54	Greater Mumbai Co-op Bank Ltd.
55	JanataSahakari Bank Ltd.
56	Mumbai District Central Co-op Bank Ltd.
57	Maharashtra State Co-op Bank Ltd.
58	New India Co-op Bank Ltd.
59	North Canara G.S.B. Co-op Bank Ltd.
60	Rupee Co-op Bank Ltd.
61	Sangli Urban Co-op Bank Ltd.
62	Saraswati Co-op Bank Ltd.
63	ShamraoVithal Co-op Bank Ltd.
64	Mahanagar Co-op Bank Ltd.
65	Citizen Bank Ltd.
66	Yes Bank Ltd.

E. Foreign Banks	
67	ABM AMRO (N.Y.) Bank.
68	American Express Bank Ltd.
69	ANZ Grindlays Bank Ltd.
70	Bank Of America N.T. & S.A.
71	Bank Of Tokyo Ltd.
72	Bankindosuez.
73	BanqueNationale de Paris.
74	Barclays bank.
75	City Bank N.A.
76	Hongkong& Shanghai banking Corporation.
77	Mitsui Taiyokbe Bank Ltd.
78	Standard Chartered Bank.
79	Cho Hung Bank.

SECTION –14

APPENDIX

FORM OF TENDER

To,

The Municipal Commissioner for Greater Mumbai

Sir,

I/ We have read and examined the following documents relating to the construction of _____

_____

_____

i. Notice inviting tender.

ii. Directions to tenderers (General and special)

iii. General condition of contract for Civil Works of the Municipal Corporation of Greater Mumbai as amended up to date.

iv. Relevant drawings

v. Specifications.

vi. Special directions

vii. Annexure A and B.

viii. Bill of Quantities and Rates.

1A. I/We_____ (full name in capital letters, starting with surname), the Proprietor/ Managing Partner/ Managing Director/ Holder of the Business, for the establishment / firm / registered company, named herein below, do hereby offer to ……
……
……..
……..……..……

…… Referred to in the specifications and schedule to the accompanying form of contract of the rates entered in the schedule of rates sent herewith and signed by me/ us" (strike out the portions which are not applicable).

1B. I/We do hereby state and declare that I/We, whose names are given herein below in details with the addresses, have not filled in this tender under any other name or under the name of any other establishment /firm or otherwise, nor are we in any way related or concerned with the establishment /firm or any other person, who have filled in the tender for the aforesaid work."

2. I/We hereby tender for the execution of the works referred to in the aforesaid documents, upon the terms and conditions, contained or referred to therein and in accordance with the specifications designs, drawings and other relevant details in all respects.

* At the rates entered in the aforesaid Bill of Quantities and Rates.

3. According to your requirements for payment of Earnest Money amounting to Rs._____/- (Rs._____ _____) I/We have deposited the amount through online payment gateways with the C.E. of the Corporation not to bear interest

4. I/We hereby request you not to enter into a contract with any other person/s for the execution of the works until notice of non/acceptance of this tender has first been communicated to me/us, and in consideration of yours agreeing to refrain from so doing I/we agree not to withdraw the offer constituted by this tender before the date of communication to me/us of such notice of non/acceptance, which date shall be not later than ten days from the date of the decision of the Standing Committee or Education Committee of the Corporation, as may be required under the Mumbai Municipal Corporation Act, not to accept this tender.(Subject to condition 5 below).

5. I/We also agree to keep this tender open for acceptance for a period of 180 days from the date fixed for opening the same and not to make any modifications in its terms and conditions which are not acceptable to the Corporation.

6. I/We agree that the Corporation shall, without prejudice to any other right or remedy, be at liberty to forfeit the said earnest money absolutely, if.

a. I/We fail to keep the tender open as aforesaid.

b. I/We fail to execute the formal contract or make the contract deposit when called upon to do so.

c. I/we do not commence the work on or before the date specified by the Engineer in his work order.

7. I/We hereby further agree to pay all the charges of whatsoever nature in connection with the preparation, stamping and execution of the said contract.

8. I/We further agree that, I/we shall register ourselves as 'Employer' with the Bombay Iron and Steel Labour Board' and fulfill all the obligatory provisions of Maharashtra Mathadi, Hamal and other Manual workers (Regulation of Employment and Welfare) Act 1969 and the Bombay Iron and Steel unprotected workers Scheme 1970.

9. "I/We…….. have failed in the accompanying tender with full knowledge of liabilities and, therefore, we will not raise any objection or dispute in any manner relating to any action, including forfeiture of deposit and blacklisting, for giving any information, which is found to be incorrect and against the instructions and directions given in this tender.

10. "I/We further agree and undertake that in the event it is revealed subsequently after the allotment of work/contract to me/us, that any information given by me/us in this tender is false or incorrect, I/We shall compensate the Municipal Corporation of Greater Mumbai for any such losses or inconvenience caused to the Corporation in any manner and will not resist any claim for such compensation on any ground whatsoever. I/we agree and undertake that I/we shall not claim in such case any amount by way of damages or compensation for cancellation of the contract given to me/us or any work assigned to me/us or is withdrawn by the Corporation,"

Address Yours faithfully,

…….

……

Digital Signature of the Tenderer or the Firm

1.…….

2.…….

3.…….

4.…….

5.…….

Full Name and private residential address of all the partners constituting the Firm

…….

A/c No….. …….

1. …….. Name of Bank

2. …….. ……

3. …….. Name of Branch

4. …….. …….

5. …….. Vender No. ……

AGREEMENT FORM

Tender / Quotation dated ……. 20…

Standing Committee / Education Committee Resolution No. ……..…….. CONTRACT FOR THE WORKS ……..……..……..…… ……...…….…… ……. ……...……This agreement made this day of ……. ……. ……. ……. Two thousand……...…..……..……..…… …… …… Between ……...……...…… ……..……..…… ……. ……. ……..……..……..……..… inhabitants of Mumbai, carrying on business at……...…..…… …… ……...…… ……..… ……. in Bombay under the style and name of Messrs ……..…… …… ……...…… …… (Hereinafter called "the contractor of the one part and Shri …… ……. ……..……. the Director(E.S.&P.) (hereinafter called "the commissioner" in which expression are included unless the inclusion is inconsistent with the context, or meaning thereof, his successor or successors for the time being holding the office of Director (E,S.& P)of the second part and the Municipal Corporation of Greater Mumbai (hereinafter called "the Corporation") of the third part, WHEREAS the contractor has tendered for the construction, completion and maintenance of the works described above and his tender has been accepted by the Commissioner (with the approval of the Standing Committee/Education Committee of the Corporation NOW THIS THIS AGREEMENT WITNESSETH as follows:-

1) In this agreement words and expressions shall have the same meanings as are respectively assigned to them in the General Conditions of Contract for works hereinafter referred to:-

2) The following documents shall be deemed to form and be read and constructed as a part of this agreement viz.

a) The letter of Acceptance

b) The Bid:

c) Addendum to Bid; if any

d) Tender Document

e) The Bill of Quantities:

f) The Specification:

g) Detailed Engineering Drawings

h) Standard General Conditions of Contracts (GCC)

i) All correspondence documents between bidder and MCGM

3) In consideration of the payments to be made by the Commissioner to the contractor as hereinafter mentioned the contractor hereby covenants with the Commissioner to construct, complete and maintain the works in conformity in all respects with the provision of the contract.

4) The Commissioner hereby covenants to pay to the Contractor in consideration of the construction, completion and maintenance of the works the contract sum, at times and in the manner prescribed by the contract.

IN WITNESS WHERE OF the parties hereto have caused their respective common seals to be herein to affixed (or have hereunto set their respective hands and seals) the day and year above written.

Signed, Sealed and delivered by the contractors

In the presence of

Full Name

Address

Signed by the Director (ES&P) in the presence of

Trading under the name and style of

Contractors

Ex. ……. City/ WS/ ES

_____

_____

Director (ES&P)

The Common seal of the Municipal Corporation

of Greater Mumbai was hereunto affixed on the

……..... 20 in the presence of two members

of the Standing Committee.

1.

2.

And in the presence of the Municipal Secretary

1.

2.

Municipal Secretary

ANNEXURE " A "

Name of work :**Proposed Construction of Basement Parking below Raosaheb Patwardhan Garden, F.P. No. 488 of TPS-III Bandra,(C.T.S NO. 371A Of Village Bandra) opposite National College, Linking Road (V.P. Road), Bandra West in H/West ward Mumbai.**

City Engineer

1. The Engineer for this work: Dy.City.Eng.(Building Construction)WS

Exe.Eng.(Building Construction)WS

2. Estimated cost of Tender:

Sr No	Description of Work	Total Amount Rs.
1	Cost of civil work Vol-I	**70,92,16,273.60**
2	Cost of electrical works Vol-I	**11,06,93,651.20**
3	Cost of Electrical CSMC	**22,02,372.00**
4	Cost of Garden & Landscaping	**3,10,83,506.00**
5	Cost of Garden CSMC (3 Years)	**2,40,45,816.00**
6	**Total Amount**	**87,72,41,618.80**
	Say	**87,72,41,619.00**

3. Earnest Money (1% of the Estimated cost) **-Rs. 87,72,500.00**

4. Time Period -

1. Contract as a whole Period completion	**30 (Thirty) Months inclusive of monsoon**
2. Part or Groups of items	
i)	i)
ii)	ii)
iii)	iii)

5. Percentage to be charged as supervision charges for the work got executed through other means 10 percent.

The "Actual cost of the work" shall mean in the case of percentage rate contracts the actual cost of the work executed at the rates as mentioned in the Contract Schedule adjusted by the Contractor's percentage rate and cost of extra and excess, but excluding the cost on account of Water Charges and Sewerage Charges if any, payable by the contractor and also excluding cost on account of price variation claims as provided in price variation clause as amended up to date.

6. In case of item rate contracts the actual cost calculated for the work executed at the rates mentioned in the contract schedule for different items including cost of excess and extra items of the work excluding the cost of water charges and sewerage charges if any, payable by the contractor and excluding cost on account of price variation claims as provided in extra excess conditions as amended up to date.

7. In case of lump sum contract the cost of the work actually carried out as per break up and programme of the work and the schedule of payment included in the contract including cost of any excess and/or extra items, of the work, excluding the cost on account of water charges and sewerage charges and also excluding cost on account of price variation claims as provided in extra excess conditions as amended up to date.

Annexure- B

PRE-CONTRACT INTEGRITY PACT

The Bidder commits himself to take all measures necessary to prevent corrupt practices, unfair means and illegal activities during any stage of his bid or during any pre-contract or post-contract stage in order to secure the contract or in furtherance to secure it and in particular commits himself to the following:-

1. The Bidder will not offer, directly or through intermediaries, any bribe, gift, consideration, reward, favour, any material or immaterial benefit or other advantage, commission, fees, brokerage or inducement to any official of the MCGM, connected directly or indirectly with the bidding process, or to any person, organization or third party related to the contract in exchange for any advantage in the bidding, evaluation, contracting and implementation of the Contract.

2. The Bidder further undertakes that he has not given, offered or promised to give, directly or indirectly any bribe, gift, consideration, reward, favour, any material or immaterial benefit or other advantage, commission, fees, brokerage or inducement to any official of the MCGM or otherwise in procuring the Contract or forbearing to do or having done any act in relation to the obtaining or execution of the Contract or any other Contract with the Government for showing or forbearing to show favour or dis-favour to any person in relation to the Contract or any other Contract with the Government.

3. The Bidder will not collude with other parties interested in the contract to impair the transparency, fairness and progress of the bidding process, bid evaluation, contracting and implementation of the contract.

4. The Bidder will not accept any advantage in exchange for any corrupt practice, unfair means and illegal activities.

5. The Bidder, either while presenting the bid or during pre-contract negotiations or before signing the contract, shall disclose any payments he has made, is committed to or intends to make to officials of the MCGM or their family members, agents, brokers or any other

intermediaries in connection with the contract and the details of services agreed upon for such payments.

6. The Bidder shall not use improperly, for purposes of competition or personal gain, or pass on to others, any information provided by the MCGM as part of the business relationship, regarding plans, technical proposals and business details, including information contained in any electronic data carrier. The Bidder also undertakes to exercise due and adequate care lest any such information is divulged.

7. The Bidder commits to refrain from giving any complaint directly or through any other manner without supporting it with full and verifiable facts.

8. The Bidder shall not instigate or cause to instigate any third person to commit any of the actions mentioned above.

9. The Bidder and their respective officers, employees, agents and advisers shall observe the highest standard of ethics during the Bidding Process. Notwithstanding anything to the contrary contained herein, the Authority may reject an Application without being liable in any manner whatsoever to the Applicant if it determines that the Applicant has, directly or indirectly or through an agent, engaged in corrupt practice, fraudulent practice, coercive practice, undesirable practice or restrictive practice in the Bidding Process

For the purposes of this Clause 9, the following terms shall have the meaning herein after respectively assigned to them:

1. “fraudulent practice” means a misrepresentation or omission of facts or suppression of facts or disclosure of incomplete facts, in order to influence the Bidding Process ;

2. “coercive practice” means impairing or harming or threatening to impair or harm, directly or indirectly, any person or property to influence any persons participation or action in the Bidding Process;

3. “undesirable practice” means (i) establishing contact with any person connected with or employed or engaged by the Authority with the objective of canvassing, lobbying or in any manner influencing or attempting to influence the Bidding Process; or (ii) having a Conflict of Interest; and

4. “restrictive practice” means forming a cartel or arriving at any understanding or arrangement among Applicants with the objective of restricting or manipulating a full and fair competition in the Bidding Process.

Signature of Tenderer/Bidder

Annexure- C

(On Rs. 500/- Stamp Paper)

DECLARATION CUM INDEMNITY BOND

I, _____ of _____, do hereby declared and undertake as under.

1. I declare that I have submitted certificates as required to Executive engineer

(Monitoring) at the time of registration of my firm/company _____ and there is no change in the contents of the certificates that are submitted at the time of registration.

2. I declare that I _____ in capacity as Manager / Director /Partners /Proprietors of _____ has not been charged with any prohibitory and /or penal action such as banning (for specific time or permanent) / de-registration or any other action under the law by any Government and/or Semi Government and/or Government undertaking.

3. I declare that I have perused and examined the tender document including addendum, condition of contract, specifications, drawings, bill of quantity etc. forming part of tender and accordingly, I submit my offer to execute the work as per tender documents at the rates quoted by me in capacity as _____ of _____.

4.I further declare that if I am allotted the work and I failed to carry out the allotted work in accordance with the terms and conditions and within the time prescribed and specified, MCGM is entitled to carry out the work allotted to me by any other means at my risk and cost, at any stage of the contract.

5. I also declare that I will not claim any charge /damages /c ompensation for non availability of site for the contract work at any time.

6. I declare that I will positively make the arrangements of the required equipment on the day of commencement or with respect to the progress of the work in phases, as per the instructions of site in charge.

Signature of Tenderer/Bidder

BANKERS GURANTEE IN LIEU OF CONTRACT DEPOSIT

THIS INDENTURE made this _____day of _____ BETWEEN

THE _____BANK incorporated under the English / Indian Companies Acts and carrying on business in Mumbai (hereinafter referred to as 'the bank' which expression shall be deemed to include its successors and assigns)of the first part

_____ _____

inhabitants carrying on business at _____ in Mumbai under the style and name of Messer's _____ (hereinafter referred to as 'the consultant') of the second part Shri. _____

THE MUNICIPAL COMMISSIONER FOR GREATER MUMBAI (hereinafter referred to as 'The Commissioner' which expression shall be deemed, also to include his successor or successors for the time being in the said office of Municipal Commissioner) of the third part and THE MUNICIPAL CORPORATION OF GREATER MUMBAI (hereinafter referred to as 'The Corporation') of the fourth part WHEREAS the consultants have submitted to the Commissioner tender for the execution of the work of "_____and the terms of such tender /contract require that the consultants shall deposit with the Commissioner as/contract deposit/ earnest money and /or the security a sum of Rs._____(Rupees _____) AND WHEREAS if and when any such tender is accepted by the Commissioner, the contract to be entered into in furtherance thereof by the consultants will provide that such deposit shall remain with and be appropriated by the Commissioner towards the Security deposit to be taken under the contract and be redeemable by the consultants, if they shall duly and faithfully carry out the terms and provisions of such contract and shall duly satisfy all claims properly chargeable against them there under AND WHEREAS the consultants are constituents of the Bank and in order to facilitate the keeping of the accounts of the consultants, the Bank with the consent and concurrence of the consultants has requested the Commissioner to accept the undertaking of the Bank hereinafter contained, in place of the contractors depositing with the Commissioner the said sum as earnest money and /or security as aforesaid AND WHEREAS accordingly the Commissioner has agreed to accept such undertaking NOW THIS AGRREMENT

WITHNESSES that in consideration of the premises, the Bank at the request of the consultants (hereby testified) UNDERTAKES WITH the commissioner to pay to the commissioner upon demand in writing, whenever required by him, from time to time, so to do, a sum not exceeding in the whole Rs._____(Rupees_____) under the terms of the said tender and /or the contract. The B.G. Is valid upto _____"Notwithstanding anything what has been stated above, our liability under the above guarantee is restricted to Rs._____only and guarantee shall remain in force upto _____ unless the demand or claim under this guarantee is made on us in writing on or before _____all your right under the above guarantee shall be forfeited and we shall be released from all liabilities under the guarantee thereafter"

IN WITNESS WHEREOF

WITNESS(1) _____

Name and _____

address _____

WITNESS(2)_____

Name and _____ the duly constituted Attorney Manager

address _____

the Bank and the said Messer's _____

_____ (Name of the Bank)

WITNESS(1)_____

Name and _____

address _____

WITNESS(2)_____

Name and _____

For Messer's _____

address _____

have here into set their respective hands the day and year first above written.

The amount shall be inserted by the Guarantor, representing the Contract Deposit in Indian Rupees.

Annexure- D

Rate Analysis

Item Description

Sr No	Description of Rate Analysis parameters	Unit	Quantity	Rate	Amount
1	Basic Material (Rate should be inclusive of all taxes)				
2	Machinery Hire Charges				
3	Labour Type		(labour components)		
4	Total of all components				
5	Overhead &Proffit 15% on 4				
6	Total Rate (4+5)				
7	Per unit rate				

Sign & Seal of the Tenderer

PROFORMAS -

PROFORMA – I

The list of similar works as stated in para 'A' of Post qualification during last Seven years–

Sr. No.	Name of the Project	Name of the Employer & his e-mail ID	Stipulated Date of Completion	Actual Date of Completion	Actual cost of work done
1	2	3	4	5	6

NOTE:

j. Scanned Attested copies of completion/performance certificates from the Engineer-in-Charge for each work should be annexed in the support of information furnished in the above proforma.

k. Works shall be grouped financial year-wise.

PROFORMA – II

Yearly turnover of Civil Engineering Construction Works as stated in Proforma-I during the last Five (05) years,

Sr. No.	Financial Year	Annual Turnover of Civil Engineering Works	Updated value to current year	Average of last five years	Page No.
1					
2					
3					
4					
5					
		Total			

NOTE: The above figures shall tally with the audited balance sheets uploaded by the tenderers duly certified by Chartered Accountant.

PROFORMA – III

At least similar work, as stated in para 'A' of Post qualification,.

Name of the Project	Name of the Employer & his e-mail ID	Cost of the Project	Date of issue of work Order	Stipulated Date of Completion	Actual Date of Completion	Actual cost of work done	Updated value to current year	Remarks explaining reasons for delay, if any.
1	2	3	4	5	6	7	8	9

Note: Scanned Attested copies of completion/performance certificates from the Engineer-in-charge for each work should be annexed in support of information furnished in the above proforma. Works shall be grouped financial year-wise.

PERSONNEL: PROFORMA – IV

Sr. No.	Post	Name	Qualification	Work Experience	
		(Prime Candidate/ Alternate)		**No. of Years**	**Name of Projects**

NOTE: Scanned Attested copies of qualification certificates and details of work experience shall be submitted /uploaded

MACHINERY (for special work only) :

PROFORMA – V/A

Sr No	**Equipment's**	**(No. & Capacity)**	**Owned/Leased/ Assured Access**

PROFORMA – V/B

Sr No	**Equipment's**	**(No. & Capacity)**	**Owned**

Note: The tenderer(s) shall furnish/upload the requisite Scanned Attested documents of ownership/leased of machineries. The undertaking from the suppliers will not be accepted.

PROFORMA - VI / A

Details of Existing Commitments and ongoing works -

Description of work	Place	Contract No. & Date	Name & Addresses of employer & his e-mail ID	Value of Contract in Rs.	Scheduled date of completion	Value of work remaining to be completed	Anticipated date of completion
1	2	3	4	5	6	7	8

Note: Scanned Attested copies of completion/performance certificates from the Engineer-in-Charge for each work should be annexed in the support of information furnished in the above proforma.

PROFORMA - VI / B

Details of works for which bids are already uploaded –

Description of work	Place	Name & Addresses of employer	Value of Contract in Rs.	Time Period	Date on which decision is expected	Remarks
1	2	3	4	5	6	7

Note: Scanned Attested copies of certificates from the Engineer-in-charge for each work shall be annexed.

Annexure – E

Tender No:……..

To,

The Municipal Commissioner,

For the Municipal Corporation of Greater Mumbai

Sir,

Bid No……..

"I/ We ……..……
(full name in capital letters, starting with surname), the proprietor/ Managing Partner/ Managing Director/ Holders of the Business/ Manufacturer/ Authorised Dealer, for the establishment/ firm/ registered company, name herein below, do hereby, state and declare that I/We ……..whose names are given herein

below in details with the addresses have not filled in this tender under any other name or under the name of any other establishment /firm or otherwise, nor are we in any way related or concerned with any establishment/ firm or any other person, who have filled in the tender for the aforesaid work."

"I/ We do hereby further undertake that, we have offered the best prices for the subject supply/ work as per the present market rates**. Further, We do hereby undertake and commit that we have not offered /supplied the subject product/ similar product/ systems or sub systems in the past one year in the Maharashtra state for quantity variation upto -50% or + 10% at a price lower than the offered in the present bid to any other outside agencies including Govt./Semi Govt. Agencies and within M.C.G.M. also.** Further, we have filled in the accompanying tender with full knowledge of the above liabilities and therefore we will not raise any objection or dispute in any manner relating to any action, including forfeiture of deposit and

blacklisting, for giving any information which is found to be incorrect and against the instruction and direction given in this behalf in this tender.

I/ We further agree and undertake that in the event, if it is revealed subsequently after the allotment of work/ contract to me/ us, that any information given by me/ us in this tender is false or incorrect, I/ We shall compensate the Municipal Corporation of Greater Mumbai for any such losses or inconvenience caused to the corporation in any manner and will not raise any claim for such compensation on any ground whatsoever, I/ We agree and undertake that I/ We shall not claim in such case any amount, by way of damages or compensation for cancellation of the contract given to me/ us or any work assigned to me/ us or is withdrawn by the Corporation.

However, in case of price difference, if it is result of different tax structures, Different Dollar value of Rupee, considering this aspect, before invoking the penalty, blacklisting etc., I/We will be given a reasonable opportunity of being heard by representing our case as to why such price variation/ differential has arisen.

In case, if the explanation submitted by me/us is unsatisfactory then action as stated above including forfeiture of deposit and blacklisting may be taken against me/us.

TENDERER'S FULL SIGNATURE

WITH FULL NAME & RUBBER STAMP

(Note: This affidavit should be given on Rs.500/- stamp paper duly notarized by notary with red seal and registration number.)

Annexure – F

Irrevocable Undertaking

(on Rs. 500/- Stamp Paper)

I Shri/Smt……. Aged,…….Years Indian Inhabitant. Proprietor/Partner/Director of M/s……. resident at …….. do hereby give Irrevocable undertaking as under;

1) I say & undertake that as specified in section 171 of CGST Act, 2017, any reduction in rate of tax on supply of goods or services or the benefit of input tax credit shall be mandatorily passed on to MCGM by way of commensurate reduction in prices.

2) I further say and undertake that I understand that in case the same is not passed on and is discovered at any later stage, MCGM shall be at liberty to initiate legal action against me for its recovery including, but not limited to, an appeal to the Screening Committee of the GST Counsel.

3) I say that above said irrevocable undertaking is binding upon me/my partners/com pany/other Directors of the company and also upon my/our legal heirs,assignee, Executor, administrator etc.

4) If I fail to compliance with the provisions of the GST Act, I shall be liable for penalty/pun ishment or both as per the provisions of GST Act.

Whatever has been stated here in above is true & correct to my/our own Knowledge & belief.

Solemnly affirmed at DEPONANT

This day of BEFORE ME

Interpreted Explained and Identified by me.

SECTION –15

SPECIAL DIRECTIONS TO E-TENDERERS

SPECIAL DIRECTIONS TO E-TENDERERS

(1) The Bill of Quantities shall be read in conjunction with the Instructions to Bidders, General and Special Conditions of Contract, Technical Specifications and Unified Schedule of Rates uploaded on MCGM website, Drawings, Appendix and Addendum, etc.

(2) The amounts set out in the Pricing Schedules attached to this Schedule of Payments shall include all taxes, duties, and other charges imposed outside the Employer's country on the production, manufacture, sale and transport of the Contractor's Equipment, materials and supplies to be used on or furnished under the Contract, and also on the works and services to be performed under the Contract. The percentage quoted shall include the cost of any unforeseen item of work connected with the work in question required for the proper execution of the work. The tenderer will not be reimbursed any taxes/ charges/ etc. Which is in force or in force in future.

(3) The amounts entered into the Pricing Schedules shall be inclusive of all levies, taxes and other duties including but not limited to custom duty and all other import and export duties, GST, and other charges that the Contractor may incur within the Employer's country in respect of the performance of the Contract. No provision in the Contract shall relieve the Contractor from his responsibility to pay any tax that may be levied in the Employer's country on profits made by the Contractor in respect of the Contract.

(4) The rates and prices bid in the priced Bill of Quantities shall, except insofar as it is otherwise provided under the Contract, include, but not limited to, all Constructional Plant, machinery, scaffolding, Centering, labour supervision, materials, erection, maintenance, insurance, establishment, profit, all taxes and duties, together with all general risks, liabilities, and obligations set out or implied in the Contract.

(5) The quantities given in the Bill of Quantities are estimated and provisional and are given to provide a common basis for bidding. The basis of payment will be the actual quantities of work ordered and carried out, as measured by the Contractor and verified by the Engineer

and valued at the rates and prices bid in the priced Bill of Quantities, where applicable, and otherwise at such rates and prices as the engineer may fix within the terms of the Contract.

(6) The percentage rate inserted below shall hold good for all work done under this contract without reference to quantities or location of the work.

(7) Quantity of each item for works mentioned in the Schedule should be observed and the percentage rate should be well scrutinized with the consideration of specification before submitting the tender as no variation in rates etc. will be allowed on any ground such as mistake misunderstanding etc., after the tender has been submitted.

(8) Tenderers while quoting the tenders shall note that in the case of the tenders for the water proofing the existing buildings, special care shall be taken to see that no leakage of water takes place on the Lower floors of the existing structure, while carrying out the tender work. Any leakage, if occurred shall be stopped by the contractors immediately. And nothing extra on account of these works for stopping water leaking to lower floors shall be paid. If sufficient precautions are not taken to stop the leakage the same will be carried out at the risk and cost of the Contractors. In this regard, the contractors shall be fined for any lapse. In addition, any further action including degradation of the contractor shall be taken as deemed fit.

(9)

Firm with common proprietor / partner or connected with one another either financially or as principal and agent or as master and servant or with proprietor / partners closely related to each other such as husband, wife, father, mother and minor son / daughter and brother / sister and minor brother / sister, shall not tender separately under different names for the same contract.

(10) (a) If it is found that firms as described in clause above have tendered separately under different names of the same contract, all such tender (s) shall stand rejected and tender deposit of each such firm / establishment shall be forfeited. In addition such firm / establishment shall be liable at the discretion of the Municipal Commissioner for further penal action including blacklisting.

(b)If it is found that closely related persons as in clause herein above have submitted separate tenders / quotations under different names of firm / establishment but with common address for establishments / firms and / or if such establishments / firms though they have different addresses are managed or governed by the same person / persons jointly or severally, such tenders shall be liable for action against the firm / establishment concerned.

(c)If after award of contract, it is found that the accepted tenderer violated any of the clauses, the contract shall be liable for cancellation at any time during its currency in addition to penal action against the contractor as well as related firm/ establishments.

(11) It is mandatory for the contractors to open a Bank Account in any of the banks approved by MCGM for easy and quick payments. All payments under the contract will be made only on this Bank Account through Electronic Clearing System/ RTGS/ NEFT/ CBS

(12) Insurance : Before commencing execution of work, contractor should ensure at his cost against any damage, loss or injury that may occur to any property including any of their personal and employee of Municipal Corporation by an arising of contract.

All insurances to be effected by the successful tenderer shall be taken up with the Director of Insurance, Maharashtra State only.

(13) Jurisdiction:

In the event of dispute between parties, the dispute would be subjected to the jurisdiction of Court in Mumbai.

(14) The tenderer shall furnish the names & qualifications of the staff who will be deputed on this work and the names of other officers with their telephone numbers with whom MCGM Engineer may require to get in touch with. The Site Engineer must have MCGM Supervisor License and the copy of license have to be submitted in Dy.C.E. (B.C.) W.S's office before commencing the work.

(15) The Municipal Commissioner does not bind himself to accept the lowest or any tender.

(16) While carrying out any works, contractor shall take adequate care / safety measures to prevent any accident. The tenderer shall indemnify and keep indemnified the MCGM against all damages or compensation payable by law in respect or in consequence, if any, accident or injury to any workman or any other person, women in employment of the contractor or any other sub-contractor against all claims. The Contractor shall also indemnify and keep indemnified the Employer against all losses and claims for injuries or damage to any person or any property whatsoever which may arise out of or in consequence of the construction of the works and against all claims, demands, proceedings, damages, costs, charges and expenses whatsoever in respect of or in relation thereto.

(17) The successful tenderer shall have to furnish a free maintenance guarantee on Rs500/- stamp paper for DLP Period, from the date of completion of the work for any manufacturing defects and / or faulty workmanship. If any defect is noticed within the guarantee period and on intimation to the contractors, they will rectify the same free of cost.

(18) Income-tax Clearance Certificate in original shall be submitted as and when demanded

(19) The percentage quoted shall include the cost of any small part, essential for proper execution of the work if it remained to be included in the specifications of the main items.

(20) Tenderer / contractor shall note that first class quality of material and workmanship is expected.

(21) The materials used shall conform to the related ISI specifications (Bureau of Indian Standards) as well as M.C.G.M. specified specification wherever applicable. Directives of the Engineer concerned will be binding.

(22) General notes in the F.M.B. schedule, F.M.R. schedule, 'A' Schedule and F.M.E Schedule, USR schedule are applicable to all items of this work. The detail description of various items, the units of payment and the rates thereof as mentioned in the Bill of Quantities below shall be as per the MCGM - USOR 2013/ USOR-2018 and Fair rates.

(23) The tenderer / contractor will have to make good, without any extra payment any damage or loss to the Municipal property / private property while executing the work.

(24) General conditions of Contract for civil works w.e.f. 15-10-2016 and electrical / mechanical shall be applicable to the work

(25) The sequence of work shall be as approved and directed by the Engineer before starting the work. The contractor shall submit his programme of carrying out the work for approval of the Engineer. Work shall be carried out as per priority fixed by the Engineer.

(26) The water supply to the user department shall not be disturbed during execution of the work. Contractor shall make alternate arrangement for providing equivalent capacity tank to restore water supply at their own cost.

(27) Maximum care should be taken to the satisfaction of the Engineer to provide and maintain adequate protection to all electrical and mechanical installations. No extra payment will be made on this account under any circumstances.

(28) Contractor will have to make their own arrangement for getting the electric supply on site for fabrication and allied works at their own cost.

(29) The contractor shall intimate the concerned authorities before starting the work and execute the work as per priority fixed by the Engineer.

(30) Wherever and whenever necessary as directed by the Engineer, the unserviceable materials will have to be removed from the site to any location as directed by the Engineer within the time period as directed.

(31) The Corporation will not be responsible for any delay that may be caused due to unforeseen circumstances and no compensation on this account will be paid.

(32) No separate payment will be made for dewatering the water seepage in the trenches and foundation pits opened while executing excavation and other foundation works. The possibility of high water table should be kept in mind while quoting the percentage, hence contractor has to make their own arrangement for dewatering by mechanical means

though the excavation item includes manual dewatering. No extra payment will be made for dewatering by mechanical means.

(33) While excavating the trenches for foundation utmost care shall be taken that the foundation of adjoining structures will not be disturbed. If done, the same will be rectified by the contractor at his own cost to the satisfaction of the Engineer.

(34) Materials brought on the site or debris will not be allowed to be stacked in passages or in the car parking area.

(35) The tenderer / contractor will have to make adequate shielding arrangement by putting necessary hoardings, screen or gunny bags, etc. so as to avoid any accident or nuisance to the occupants during the work without any extra payment.

(36) After completion of the waterproofing work, the leakage test shall be carried out after impounding the water and plugging the openings at least for ten days, without any extra cost.

(37) Plumbing and sanitary works will have to carried out through licensed plumber as per drawings and as directed by the Engineer. Contractor to obtain all necessary permission remarks, completion from concern department of M.C.G.M. (i.e. 'P' form, Drainage Approval / Completion, Water main connection, Dry fittings & street connection, Road work permission / N.O.C. etc.) as required for plumbing, sanitary & drainage & water supply work.

(38) Notwithstanding the source, the sand shall be washed using electrically operated sand washing machine, before use.

(39) Reinforcement bars shall be purchased from such manufacturer's or their authorized dealers who manufacture the steel with the basic process. The steel bars shall be embossed with manufacturer's name. Original manufacturer's test certificate shall be insisted for reinforcement bars in the form of half embossed and half printed. Test certificate in photocopy or other form will not be accepted. Engineer's decision regarding make of the steel will be final and binding on the contractors.

(40) The centering shall be insisted only in double stage self-supporting steel scaffolding and M S pipe adjustable props for which no extra payment will be made.

(41) City Engineer reserves the right to delete any item, alter / reduce the scope of the work, no extra claim in this respect will be allowed.

(42) In case of any discrepancy between the plans and B.O.Q items, items to be operated shall be decided by the Engineer and the same shall be binding on the contractors without paying any extra cost.

(43) The propping shall be done to the existing structure wherever necessary before taking up the demolition without any extra items. All the safety measures for structures/workers/supervisors/machineries shall be taken by the contractor at his own cost.

(44) Staircase / lift will not be allowed for transport of materials and contractor will have to provide mechanical lift or pulley at their own cost. No extra payment will be made for this arrangement.

(45) If directed by the Engineer, the contractor shall have to arrange to carry out the work during night time also as per urgency of the work, at no extra cost.

(46) After completion of the proposed work, the tenderer / contractor will have to hand over the site in neat and clean condition to the User Department of MCGM; for which no extra payment will be made.

(47) Contractor shall ensure that the Municipal Office / Maintenance Activities running on site presently in the building / structures are not hampered during the execution of work. If necessary, this buildings / structures shall also be provided with sufficiently wide, temporary access road (Water Bound Macadam) with adequate size compound gate as directed by the Engineer to his satisfaction without any extra cost.

(48) M.C.G.M. has appointed private Architectural Consultants for comprehensive architectural services for above said project. Contractors shall have to co-ordinate with the Architects or their representative or all consultants appointed by the Architect for above work. He shall follow up the matter with them, whenever and wherever necessary, for the smooth / speedy execution of the work in the best possible manner.

(49) Looking to the water supply requirements, the tenderer may be required to provide quite a large number of Polyethylene Plastic water storage tanks including required fittings as directed by the Engineer. No extra cost for this shall be paid.

(50) Basements for parking is proposed. The R.C.C. columns in basement, R.C.C slab and beams at plinth level are considered as R.C.C columns in superstructure and R.C.C slabs and beams at floor level respectively in the estimate and shall be paid as per the relevant items in B.O.Q Nothing extra shall be paid.

(51) The contractors has to procure ready mix cement concrete of the required grade from one of the approved ready mix batching plants on the approved list of the M.C.G.M. With the approval of the Engineer on site, mixing of concrete (instead of Ready Mix Concrete) may be allowed only in rare cases when the total quantity of Reinforced Cement Concrete / Cement Concrete does not exceed 5.0 m^3 on that particular day. However, in such cases, the concrete shall be as per mix design and machine mixed.

(52) While excavation contractor may encounter foundations of existing buildings. Contractor will have to execute all such works under relevant items of excavation in B.O.Q without claiming any extra charge.

(53) The Contractor shall have to co-ordinate with / and provide all necessary facilities to; all other contractors appointed by MCGM as may be necessary from time to time for any works related to the property / in the property.

(54) The tenderer shall study the terms & conditions sought by the State level Environment Impact Assessment Authority (SEIAA) available with M.C.G.M. & comply with all the requirement mentioned there in.

(55) **Rates of respective items shall be inclusive of all the payments to be made towards Royalty for excavation etc. & no separate payment or reimbursement of payment made towards royalty shall be made, Contractors to obtain necessary permissions from the**

Collector Office. The contractor shall pay necessary royalties and submit documentary evidences of such payments to the Engineer for information and records. If and when royalties becomes payable to the Government Authority on excavated material as per statutory requirements, the payment shall be made by the contractor.

(56) Rates of items, involving compliance stated in permissions obtained from solid waste management department, conditions of Environmental Clearances from Ministry of Environment and Forest New Delhi and Precautions to be taken as per requirement of Environment Management plan, shall be inclusive of all such mitigation measures specified in the N.O.C. and no extra shall be payable on this account.

(57) The rates quoted in the tender shall include all charges for clearing of site before commencement as well as after scaffolding, watching and lighting, by night as well as day including Sundays and Holidays, temporary plumbing and electric supply, protection of the public and safety of adjacent roads, walls, houses, buildings and all other erections, matters or things and the Contractor shall take down and remove any or all such scaffolding, staging, as occasion shall require or when ordered so to do, and fully reinstate and make good all matters and things disturbed during the execution of work and to the satisfaction of the Engineer. The rates quoted shall be deemed to be for the finished work to be measured at site. The rates shall also be firm and shall not be subject to exchange variation, labour conditions, freights or any conditions whatsoever unless otherwise mentioned elsewhere in the Tender documents. Tenderers must include in their rates, Insurance against Fire, Theft, damages by Oriental Insurance Company or any other Government Insurance Company for the period of 5 years from the date of commencement and duly or other levy levied by the Central Government or any State Government or any local authority, if applicable and prevalent during the entire contract period.

(58) If it is observed that Contractors carrying out the work fail to comply with the instructions given by the AMC / MC during execution of work twice, the work shall be deemed to have been terminated and will be carried out at the risk & cost of the Contractors and penal action will be taken against them. This decision shall not be arbitral at all. The above condition will be in addition to the relevant conditions in General Conditions of Contract regarding cancellation

of full or part of the work, finality of the decisions on the disputes, differences or claims raised by the Contractors relating to any matter arising out of the contract.

(59) The noise level shall be maintained within the permissible limit in silence zone area during construction activity by the contractor as per notification dated 14.02.2000 issued by the Ministry of Environment and Forest and maintain the Noise level during the construction activity within the permissible limits as prescribed by MCGM as per circular under no. CE/PD/7788/I dt. 05/11/2008.

(60) The tenderer shall submit the information in respect of contractors, works on daily wages, part time workers, full time workers, employed for the contract work, time to time during the execution of work to the Labour Office of the MCGM and Govt.authorities i.e. Assistant Commissioner, Provident Fund regional officer, Mumbai through Dy.C.E.(B.C.) City/E.S./W.S.

(61) **Tenderer shall pay building & other building worker welfare cess @ 1% of construction cost as per Maharashtra State building & other building welfare cess act 1996 to the M.C.G.M. in consultation with C.A.(finance)**

(62) Tenderer/bidders shall take proper care while carrying out repairing work of electrical cabins as switchgears & other electrical items needs to be shifted carefully to avoid any mishap, theft & to have continuous supply on site in consultation with Ch .E (M & E) & GMD.

(63) No labour below the age of 18 years shall be employed in the work. The contractor shall comply with all industrial &labour rules & regulations, which are in force from time to time. The CONTRACTOR has to follow strictly the government labour acts, which are in force at present & at all future times & all necessary arrangements for labour will have to be made by the CONTRACTOR.

(64) The Contractor shall in connection with the works provide and maintain at his own cost all lights, guards, fencing and watching when and where necessary or required by the Client or Consultant’s Representative or by any duly constituted authority for the protection of the works

or for the safety and convenience of the public or others. The security & safe keeping of the contractor's material, equipment, tools, etc. shall be the sole responsibility of the contractor.

(65) All statutory requirements, Factories Act, ESI, Workmen Compensation, Bonus Act, Provident Fund & Gratuity Act, Industrial Dispute Act, etc., wherever applicable and where contributions / compensation / payments are to be made the same shall be borne by the contractor either during the term of contract or after. Approval shall be taken from the consultants prior to covering of any work.

(66) All necessary tests for verification of quality of material used for the work; as may be deemed fit by the consultants shall be carried out by the contractor at his cost. No separate payments will be made on this account.

(67) All permissions from the various government agencies, police, traffic department etc. as may be required during the execution of the project shall be arranged by the contractor at his cost. No delay in execution shall be accepted on account of delays in getting the same from the concerned departments.

(68) The serviceable materials obtained on demolition of existing structures, such as wooden planks/ logs, doors & windows, M.S. Grills, truss etc shall be hand over in the custody of concerned AE(Maint) of concerned ward by taking & maintaining proper inventories of serviceable materials with them.

(69) The tenderer shall note that the shore pile has to be bored around basement line.

(70) The successful tenderer should provide sufficient number of security guards on site for 24 x 7 till the completion of work without any charges & remuneration. The tenderer shall note that during construction and up till handing over of the entire building contractor should provide their own security force from registered / licensed security agencies. The contractor shall be solely responsible for security of entire building (for which no extra payment will be made). No complaints will be entertained afterward for stealing of any articles / appliances.

(71) Tenderer shall note that the lifts shall be installed as per the specification mentioned but the make of company shall be either KONE / OTIS / SCHINDLER / Mitsubishi / Johnson make no other make will be entertained, as per circular u/no. ChE / M&E / 4813 of 26-09-2016

(72) Obtaining permanent power supply, all necessary approvals / permissions / NOC from the service provider/ all competent authority is the sole responsibility of the prime contractor / sub contractor. Also obtaining NOC from PWD / competent authority for electrical installation, DG sets, High rise, Lift licenses etc. will be responsibility of prime contractor / sub contractor. No extra claims will be entertained in this regard. As regard for all M & E systems contractor has to maintain and operate systems free of cost up to DLP after handing over of entire building to user department. Bidder to note this point accordingly.

(73) Considering possibility of the part occupancy of the new building, the contractor has to carry out the comprehensive service and maintenance along with House keeping work free of charge till the completion and handing over of entire building to user department plus further three months, and no compensation / reimbursement will be made by MCGM. It will be responsibility of Contractors to obtain part occupation Certificate as well as Completion Certificate from concerned department.

(74) The contractor which expression shall include any person or group of persons representing the contractor who are required to handle iron and steel materials shall register themselves as employer with the Mumbai Iron and Steel Labour board and shall completely fulfill all the obligatory provisions of the Maharashtra Mathadi, Hamal other Manual Workers (Regulation of employment and Welfare) Act 1969, and theMumbai Iron and Steel Unprotected Workers (Regulation of employment and Welfare) Scheme 1970. The consequences of failure of compliance of any of these provisions will entirely be the liability and responsibility of the Contractors.

(75) Tenderer(s) should note that if any deposits are required to be paid to Government Agency/Authorities etc, for obtaining any permission from them, an amount equivalent to the said deposit shall be withheld from the contractors bill, till the contractors fulfill all the conditions laid down by Government Agency/Authorities and obtain certificate to that effect from them and the tenderers shall take cognizance of the same, before quoting for the tender.

(76) On receipt of the work order, an amount equivalent to 1/2% (half percent) of contract cost or Rs. 10,000/-, whichever is less, shall have to be deposited on demand by Ward Office where the work site is situated, towards deposit for removal of debris from the site. This amount will be adjusted towards the debris which has not been removed from the site by the contractors in time and removed by the Ward Staff.

(77) The successful tenderers shall have to bear the testing charges for the tests carried out by the Municipal Material Testing Laboratory or any other approved testing laboratory as directed by the engineer as per the schedule of fees in force in respect of the various tests carried out by the Municipal Laboratory. The tenderers shall take this into account while quoting their rates. No extra payment on account of this will be made to the contractors.

(78) The contractor has instructed not to provide/install site chowky, labourer's hut, godownetc on roads, carriageway/footpath. Any chowky/labourer's hut /site godowns found on footpath/carriageway without a contract stating condition of permission by M.C.G.M., shall fined Rs.10,000/-a day for first month and Rs.1,00,000/-a day thereafter.

(79) 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 as one sum or deducted by installments) or in the case of abandonment of the work owing to serious illness or death of the contractor or any other cause, the Dy.CE.(BC)WS on behalf of the Brihan Mumbai Mahanagarpalika shall have power to adopt any of the following courses, as he may deem best suited to the interest of the Corporation:-

(a) To rescind the contract (of which rescission notice in writing to the contractor under the hand of the C.E. 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 Corporation.

(b) To employ labour paid by the Municipal Corporation and to supply materials to carry out the work or any part of the work, debiting the contractor with the cost of the labour and the price of the materials (as to correctness of which cost and price the certificate of the Dy.CE.(BC)WS shall be final and conclusive against the contractor) and crediting him that the value of the work done, in all respects in the same manner and at the rates as if it had been carried out by the contractor under the terms of his contract, and in that case the certificate of the Executive Engineer as to the value of the work done shall be final and conclusive against the contractors.

(c) To order that the work of the contractor be measured up and to take such part thereof, as shall be unexecuted out of his 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 of which excess expenses the certificate in writing of the Dy.CE.(BC)WS shall be final and conclusive shall be borne and paid by the original contractor and shall be deducted from any more money, due to him by Corporation under the contract or otherwise or from his security deposit or the proceeds of sale thereof, or a sufficient part thereof.

(d) In the event of any of the above courses, being adopted by the Dy.CE.(BC)WS, the contractor shall have no claim to compensation for any loss sustained by him by reason of his having purchased, or procured any materials, or entered into any engagements, or made any advances on account of or with a view to the execution, of the work or the performances 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 actually performed by him under this contract unless and until the Dy.CE.(BC)WS shall have certified in writing the performance of such work and the amount payable to him in respect hereof and shall only be entitled to be paid the amount so certified.

(80) Contract Labour (Regulation and Abolition Act 1970) : The Tenderer(s) should specifically note that the successful tenderer shall have to strictly comply with all the statutory requirement under the provision of the Contract Labour (Regulation and Abolition Act 1970 and with the Maharashtra State Contract Labour (Regulation and Abolition) Rules 1971 and indemnify the Corporation against any claim(s) whatsoever. It is mandatory on the part of the contractor to

submit Registration Certificate issued by the office of Commissioner of Labouralongwith the documents for execution of written contract.

(81) The successful bidder are liable to pay cess to the Government as per the notification issued by Industry, Energy and labour department is applicable from time to time and challan of amount remitted shall be submitted to the department.

(82) All circulars published by MCGM from time to time will be applicable to the Contractor.

(83) The contractor has to maintain site muster for his laborers / staff and shall issue ID's to all workers for security reasons.

(84) It should be clearly understood that, for the purpose of determination of the contract period, the monsoon period will be taken only as from 10'th June to 30'th September, and all works shall be recommenced on 1'st October, irrespective of whether there are intervening festivals and / or rains etc.

(85) Extra / excess items – Latest Circular is applicable. (Dir / ES&P / 324 dated 15-07-2015)

(86) Patent Rights and Royalties – The Contractor shall save harmless and indemnify the Employer from and against all claims and proceedings for or on account of infringement of any Patent rights, design trademark or name of other protected rights in respect of any Plant or Materials and from and against all claims, proceedings, damages, costs, charges and expenses whatsoever in respect thereof or in relation thereto.

(87) Tenderers shall note that they should execute the work as per the requirement of Indian Electricity Act, Fire Brigade, I.S., Building Bye Laws of Corporation, Minimum Wages Act, and Factories Act. They should also fulfill all requirements of Supply Companies and any other statutory bodies, which are applicable in Mumbai.

(88) i)The Contractor appointed for Municipal works shall make his own arrangement for disposal - unloading C & D waste, silt, excavated earth generated at the time of carrying out Municipal works either on the abandoned quarry land in Mumbai city, thane or new Mumbai or a private land, where the permission is granted by concerned authority. This c & d waste will not be

permitted to unload at regular SWM dumping ground unless it is required by the operator and permitted by the concerned A.M.C.

(ii.) On the basis of condition no. (i) above, the Contractor shall get the debris management plan approved prior to commencement of actual work to be submitted.

(iii.) In case of non-abiding with the condition no.(i) by any of the contractor, heavy penalty will be imposed as per the Greater Mumbai Cleanliness and Sanitation Byelaws updated till date, which may finally lead to termination of the contract.(Circular no.DY.Ch.Eng./2591/SWM/Project of 5.2.2008.)

(89) (a) All contractors are mandated to undertake site correction so as to ensure immediately that conditions, resulting in breeding of mosquito, such as stagnant water etc. are removed immediately and are henceforth kept free of conditions resulting in mosquito breeding. All contractors are mandated to ensure hygienic site conditions for sewerage construction labourers.

- All contractors are mandated to ensure the services of qualified medical practitioner at pre announced fixed timings at construction sites for construction workers.
- The said Doctor and/or Surveillance staff will ensure blood examination of all construction labourers, constitute a baseline survey and every 15 days thereafter.
- The labourers detected positive for malaria shall be immediately reported to health authorities and treated on priority basis.
- All contractors are mandated to provide insecticide impregnated nets as mandated by the Central Govt. under the National Vector Borne Disease Control Programme.

(90) M.C.G.M will not supply cement to contractors. They shall have to purchase cement from open market. The cement shall conform to the relevant IS codes (latest). Cement shall have to be got tested at Municipal Laboratory at contractor's cost or from one of the institutions as i) V.J.T.I Matunga ii) S.P. College of Engineering, Andheri iii) I.I.T Powai at Contractor's cost before its use for each batch. In case the cement test results are not

available before its use, same may be permitted for other works such as masonry, lean concrete, plaster, etc. but not for R.C.C work subject to a written request from the contractors to that effect and subject to condition that in case the test result is not satisfactory, the contractors will remove the work done entirely at their cost and redo with fresh cement of required quality. If during the execution of work, the bags are required to be weighed and any shortage is required to be made up by putting extra cement, in the short bags, no compensation shall be paid to the contractors for this shortage whether the contractors receive their cement from the supplier or directly from the companies as stated above.

(91) Portland slag cement conforming to IS 455 for chemical properties and conforming to IS 8112 (1989) simultaneously for physical properties or O.P.C of 43 grade will be allowed to be used, as per the directions of the Engineer. Contractors shall provide one independent cement godowns with capacity of 500 cement bags under double lock system with one lock of contractors and other Municipal Corporation of Greater Mumbai. Cement from locked godowns will be released only after getting satisfactory test results as per Clause 1 above. Advance bills as per rules for cement brought at site and duly tested can be entertained only after getting satisfactory cement / test results. Arrangement for special type of cement if required shall have to be made by the contractors at their own cost.

(92) Epoxy coating, if specified, shall be carried out by the contractors from approved MCGM firms only and strictly in accordance with the provisions of relevant latest IS codes. Extra payment for transportation of steel from one place to another required for epoxy coating shall not be made. All the Laboratory test records shall be meticulously maintained in the site laboratory by the contractors and made available as and when required.

(93) Even though it is an obligatory duty of the contractors to have an upto-date laboratory at site and carry out the necessary test in this laboratory, he shall submit at least, once in month, 3 cubes of cement concrete work for testing at the M.C.G.M laboratory or any other renowned laboratory as directed by the Engineer. The charges for the testing of cubes shall be paid by the contractors.

The cubes shall also be tested for 7 days and 14 days strength at the contractor's laboratory in the presence of Engineer-in-charge of the work.. Whenever the material cubes are required to be sent to the Municipal Laboratory, the same shall be transported to the Municipal Laboratory by contractors at their cost. However, the contractors shall cast 9 cubes during concreting and test the cubes at site laboratory for 7 days and 14 days strength and also separately for 28 days at Municipal Laboratory. Besides any other tests are required to be carried out on concrete samples, the same shall be done as directed by the Engineer.

(94) The tenderer shall submit a programme with Bar Chart / PERT / CPM Chart / Milestone Chart or any advance project management tool in the relevant Packet while submitting the tender and shall complete the project strictly in accordance with the same

(95) The rates proposed in this tender for all concrete and allied works are inclusive of water cost. The contractors shall have to make their own arrangements at their cost for bringing adequate water for mixing concrete, curing, etc. For this no extra payment will be made. The water brought for concreting and curing etc shall be got tested from Municipal Testing Laboratory (situated at G/North Ward Office) to verify whether it is suitable for above purposes, whenever directed. This testing will be done at contractor's cost.

(96) The Contractor will have to design the concrete mix to ensure the strength of the concrete is as required by the design stipulations as directed by the Engineer. Sieve analysis of coarse and fine aggregates shall invariably be performed whenever source of the aggregate is changed at such intervals as directed by the Engineer.

(97) Contractor's Engineers should be qualified and experienced and well conversant with concrete mix-design and should be thoroughly acquainted with the construction of large scale R.C.C. works. Contractors not employing such qualified Engineers shall not be allowed to commence with the work and the days lost on this account shall be counted as working days.

(98) Cement is to be used in the mix by weighing on 'Avery' or similar such weighing machine approved by the Engineer. For any R.C.C work, the coarse and fine aggregates and water also will be weighed.

(99) In case the cube test for 28 days period fails, reconstruction of the structural members for which the cubes were taken will be carried out by the contractors at their cost to the satisfaction of the Engineer. This will be subject to provisions in the clause No.15 of the acceptance criteria of IS 456 of 2000.

(100) Sand shall be of approved quality with fineness modulus between 2.4 to 3.5. The sand will have to be screened and washed to reduce the silt content below 5% by volume after one hour and to bring it within the permissible range of fineness modulus. Blending of sand of fine and coarse quality may be permitted to achieve the required FM if it is found, to give desired results. In case stone dust is required to be used for mixing with the sand, for bringing the admixture within the desired range of fineness modulus, such stone dust shall be of approved quality with fines passing through 75 mm micron sieve limited to 15% or less. In case percentage of fines in stone dust is found to be more than 15% prescribed under IS code 383 of 1970 the same will have to be washed and screened so as to bring it within the permissible range. The fine aggregate will be tested and retested as directed by the Engineer, till it satisfies the required norms as per IS codes and as specified above.

(101) After completion of the work, the contractors shall submit two sets of completion drawings with Reproduceable Transparent Film/CD showing therein 'As built' work.

(102) The contractors has to procure ready mix cement concrete of the required grade from one of the approved ready mix batching plants on the approved list of the M.C.G.M.

(103) The vacant lift shafts shall not be used for throwing the debris, failing which the contractor will be penalized as deemed fit. The contractors will provide refuse chute of required nos. as directed without claiming any extra payment.

(104) Supply of steel M.S. Round bars, HYSD bars with FBE, M.S. Flats, plates & structural steel.

a) The contractor shall note that all the above steel required on the work shall conform to relevant code of BIS (Bureau of Indian Standards) and will have to be procured by them from the open market from the reputed/approved manufacturers. Rebars shall be of VIZAG / TATA/ SAIL or any other approved make and shall clearly bear the mark of the manufacturer.

b) Original manufacturer's test certificate shall be submitted for any quantity of steel to be used for the work.

c) The steel will not be allowed to be utilized until the satisfactory test result is re ceived.

d) All steel brought on site shall be stored in proper manner as approved by the Engi neer so as to avoid distortion, deterioration and corrosion. The contractor shall have to maintain proper record of the steel brought on site.

(105) The Municipal Corporation is not liable to supply any non-controlled article or any controlled articles, however, if available in the stores, the Corporation may supply the same in the interest of the work. In that case, the contractor shall be charged at the current market rates or their book values whichever may be higher in addition; the contractor shall be charged Municipal Supervision charges at 10%. The material, however, will have to be transported by the contractor of his cost from Municipal Store anywhere in Greater Mumbai.

(106) All the materials, supplied to the contractor, shall be stacked or stored at the site of work as directed and used only on the work in question and any materials remaining surplus shall not be disposed off or removed by the contractor without obtaining the written permission of the Engineer for the disposal of surplus materials at the original – purchase price. The contractor shall maintain a register account of the receipts and use of materials to the satisfaction of the Engineer and supply monthly statement of such accounts to the Engineer.

(107) All the materials, where advance payment is made to the contractor under respective clause of G.C.C of civil works, shall remain the absolute property of the MCGM and shall on, no account be removed from the site of the work and shall at all times be opened to inspection by the Engineer.

(108) The contractors will take all necessary precautions to abate air and noise pollution so as not to disturb the nearby locality. The contractors will take following measures in particular in this regard at their own cost.

A) Air, Dust particles pollution.

1. Providing curtains / covering around the structure.

2. Providing enclosure to concrete mixing machine, air, compressors, etc.

3. Water spraying around cement mixing, concrete mixing & metal unloading sites.

4. Providing dust / collector / section fan during cement mixing to avoid air pollution.

B) Noise pollution: Providing enclosure to noise making equipments.

C) Vibration: Providing rubber pads at compressor/ pump base to minimize vibration / noise.

D) Sewage: Temporary sewage connection to manhole or sewer line for disposal of wastewater.

E) Debris: Providing temporary storage arrangement / container facility for debris at construction site and providing transportation arrangement for removal of debris. The contractor has to make all these arrangement without claiming any extra payment. No complaint / compensation will be entertained. This shall be noted while quoting the percentage.

(109) The contractors have to submit the quality assurance manual at the time of actual starting of the work. Non-compliance of this condition is liable for penalty of Rs.1000/- per day. If any laps are observed in observance of this manual, a penalty of Rs.5000/- for first default

and Rs.10000/- for subsequent defaults will be levied. The contractor shall note this condition in particular.

(110) The contractors shall take all necessary precautions so as not to damage existing services of Municipal offices.

(111) The R.M.C brought on site by the contractors will be payable as per the exact quantity in the respective structural members such as beam, columns, slab, staircase, water tank, footing, pile, etc. and shall be measured as per the linear measurement of the members shown in structural drawings. Under no circumstances, any extra claim on this account shall be entertained and payable.

(112) The contractor has to place R.M.C in position by using placer beam whenever directed. No relaxation will be allowed on any account which shall be noted.

(113) Ready mixed concrete to be used must confirm to the requirements specified in IS: 4926:1976 (second revision) and shall also satisfy the conditions of IS:456:2000 and additional condition / direction refer page Technical specification.

(114) PROTECTION OF ENVIRONMENT:

The contractor shall take all reasonable steps to protect the environment on and off the Site and to avoid damage or nuisance to persons or to property of the public or others resulting from pollution, noise or other causes arising as a consequence of his methods of operation.

During continuance of the contract, the contractor and his sub-contractors shall abide at all times by all existing enactments on environmental protection and rules made there under, regulations, notifications and bye-laws of the State or Central Government, or local authorities and any other law, bye-law, regulations that may be passed or notification that may be issued in this respect in future by the State or Central Government or the local authority.

Salient features of some of the major laws that are applicable are given below:

The Water (Prevention and Control of Pollution) Act, 1974, This provides for the prevention and control of water pollution and the maintaining and restoring of wholesomeness of water.

'Pollution' means such contamination of water or such alteration of the physical, chemical or biological properties of water or such discharge of any sewage or trade effluent or of any other liquid, gaseous or solid substance into water (whether directly or indirectly) as may, or is likely to, create a nuisance or render such water harmful or injurious to public health or safety, or to domestic, commercial, industrial, agricultural or other legitimate uses, or to the life and health of animals or plants or of aquatic organisms.

The Air (Prevention and Control of Pollution) Act, 1981. This provides for prevention, control and abatement of air pollution. 'Air Pollution' means the presence in the atmosphere of any 'air pollutant', which means any solid, liquid or gaseous substance (including noise) present in the atmosphere in such concentration as may be or tend to be injurious to human beings or other living creatures or plants or property or environment.

The Environment (Protection) Act, 1986, This provides for the protection and improvement of environment and for matters connected therewith, and the prevention of hazards to human beings, other living creatures, plants and property. 'Environment' includes water, air and land and the inter-relationship which exists among and between water, air and land, and human beings, other living creatures, plants, micro-organism and property.

The Public Liability Insurance Act, 1991, This provides for public liability insurance for the purpose of providing immediate relief to the persons affected by accident occurring while handling hazardous substances and for matters connected herewith or incidental thereto. Hazardous substance means any substance or preparation which is defined as hazardous substance under the Environment (Protection) Act 1986, and exceeding such quantity as may be specified by notification by the Central Government.

The noise level shall be maintained within the permissible limit in silence zone during construction activities by the contractor as per the notification dated 14.02.2000 issued by the Ministry of Environment and Forest. (Circular No. CE/PD/7788/I of 05/11/08.)

Discharge of Water into Existing Watercourse -

The Contractor shall make provision for the discharge or disposal from the Works of all water and waste products howsoever arising and the method of disposal shall be to the satisfaction

of the Engineer and of any Authority or person having an interest in any system (drainage or sewers), land or watercourse in which waste may be so discharged. Before discharging any surplus water, the Contractor shall obtain the necessary written approvals.

The Contractor shall be permitted to discharge rain water and clean groundwater to adjacent nallahs and storm water drains (SWD), However, no pollutants, soils, bentonite, or mud of any sort shall be permitted to be discharged to nallahs or SWDs.

The Contractor shall make his own arrangements for trapping of the silt, separating lubricants, bentonite, drilling mud, or other pollutants before disposal. The water discharged from any source in connection with the construction shall comply with the requirement of the discharge norms stipulated under the Environment Protection Rules (under Environment Protection Act 1985) and the regulations laid down by the Maharashtra Pollution Control Board (MPCB). The parameters to be monitored include pH values, temperature and suspended solids.

Dust Disturbance

Dust generation at the site shall be suppressed by suitable methods, such as periodic water spray, to the satisfaction of the Engineer. Trucks carrying excavated muck shall be adequately covered to prevent any spillage of muck on the roads while transporting the same to the locations of disposal.

The Contractor shall comply with the requirements of The Air (Prevention and Control of Pollution) Act 1981 and all associated Rules and Notifications.

The Contractor shall take adequate measures to control the emission of dust from the Site.

Such measures shall include sprinkling of surfaces, revegetation and delayed stripping of vegetative cover where practical.

The Contractor shall cover or water stockpiles and storage areas to prevent dust pollution.

The Contractor shall also cover trucks transporting construction materials to minimise spills and shall not overload vehicles.

The Contractor shall not cause any dust nuisance to third parties or to the Engineer's offices or Employer's facilities.

The Contractor shall tune and service regularly all construction and transportation equipment in order to prevent air pollution.

(115) HEALTH AND SAFETY REQUIREMENTS

The Contractor shall comply at all times during the Contract with all relevant Indian health and safety legislation, and all amendments thereto and also IS 18001:2007 Occupational Health and Safety (OH&S) Management System.

115.1 Safe Systems of Work –

The Contractor shall be responsible for all safety systems on site. Throughout the Contract Period the Contractor shall:

i) at all times maintain a safe system of working and shall comply with all enactments, regulations and working rules relating to safety, security, health and welfare of all persons who may be affected by his work

ii) ensure that only persons who are properly trained for their duties are employed, that the correct tools and procedures are used and that adequate personal protective equipment is provided to all persons who may be affected by the work

iii) carry out toolbox talks for all Contractor's Personnel at least once per week

iv) erect suitable warning signs, barriers, etc. as necessary for the activity which is being carried out – the Contractor shall maintain such signs, barriers, etc for the duration of such activities

v) submit to the Engineer, no later than 28 days before work commences on the Site, his Health and Safety Plan containing comprehensive proposals relating to the management of health, safety and welfare of all his personnel on the Site and all persons who may be affected by his work.

The Contractor shall be responsible for the safety of all his personnel and other persons directly or indirectly employed for the Works and shall take all measures at his own expense

necessary to ensure their safety. In particular such measures to be taken by the Contractor shall include the following:

i) Provision of proper safety and emergency plans and regulations; fire, gas and electric shock precautions, stretchers and first aid box together with rescue facilities generally for each place of working;

ii) Provision of appropriate and effective safety work gear, including certified safety helmets and certified work boots for all personnel including the Engineer and each of his staff and any authorized visitors to the Site (see further data in Appendix D);

iii) Safe control of the water table, including provision of ample standby generating and pumping plant to maintain dry conditions;

iv) Provision and maintenance of suitable lighting to provide adequate illumination of works with appropriate spares and standby equipment;

v) Provision and maintenance of safe, sound mechanical equipment, each item of plant having an up-to-date testing certificate;

vi) Provision and maintenance of safe, sound ropes, slings, pulleys and other lifting tackle, each appliance having an up-to-date testing certificate, where appropriate;

vii) Provision of notices on weather-proof boards measuring 1.25m x 1.5m in size, written in bold letters in English, Marathi and Hindi to be erected on existing footpaths and at points of access likely to be used by the public, which shall warn the public of the existence of the Works. These notices shall be in addition to any statutory requirements demanded of the Contractor.

viii) Suitable scaffolds shall be provided for workmen for all activities that cannot be safely executed from the ground, or from solid construction except such short period work as can be done safely from ladders. When a ladder is used, an extra person shall be engaged for holding the ladder and if the ladder is used for carrying materials as well, suitable footholds and handholds shall be provided on the ladder and the ladder shall be given an inclination not steeper than ¼ to 1 (¼ horizontal and 1 vertical);

ix) Scaffolding or staging 1 more than 3.25m above the ground or floor, swung or suspended from an overhead support, or erected with stationary support, shall have a guard rail properly attached, bolted, braced and otherwise secured at least 1 metre above the floor or platform of such scaffolding or staging and extending along the entire length of the outside and ends thereof with only such openings as may be necessary for the delivery of materials. Such scaffolding or staging shall be so fastened as to prevent it from swaying from the building or structure;

x) Working platforms, gangways and stairways shall be so constructed that they do not sag unduly or unequally, and if the height of a platform or stairway is more than 3.25 metres above ground level or floor level, it shall be closely boarded, have adequate width and be suitably fenced;

xi) Every opening in the floor of a building or in a working platform shall be provided with suitable means to prevent fall of persons or materials by providing suitable fencing or railing with a minimum height of 1 metre;

xii) Safe means of access shall be provided to all working platforms and other working areas.

Every ladder shall be securely fixed. No portable single ladder shall be over 3 metres in length.

xiii) The Contractor shall take adequate precautions to prevent danger from electrical equipment. No material on the Site shall be so stacked or placed as to cause danger or inconvenience to any person or the public.

xiv)Excavation and trenching: All trenches 1.5 metres or more in depth shall be considered confined spaces and shall at all times be supplied with at least one ladder every 30 metres, or fraction thereof. Ladders shall be extended from bottom of trench to at least 1 metre above surface of the ground. Sides of a trench which is 1.5 metres or more in depth shall be stepped back to give suitable slope, or securely held by timber bracing, to avoid the danger of sides collapsing. Excavated material shall not be placed within 1.5 metres of the edge of a trench, or half of the depth of the trench, whichever is more. Cutting shall be done from top to bottom. Under no circumstances shall undermining or undercutting be done.

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

a) All roads and open areas adjacent to the work Site shall either be closed or suitably protected.

b) No electric cable or apparatus which is liable to be a source of danger other than a cable or apparatus being used by an operator shall remain electrically charged.

c) The Contractor shall take all practical steps to prevent danger to persons employed from risk of fire or explosion, and the Contractor shall ensure that no part of a building shall be so overloaded with debris or materials as to render it unsafe.

xvi)All necessary personal safety equipment shall be provided by the Contractor for use by persons employed on the Site and maintained in a condition suitable for immediate use, and the Contractor shall take adequate steps to ensure proper use of equipment by those concerned:

a) Workers employed on mixing asphaltic material, cement and lime mortars / concrete shall be provided with protective footwear, gloves and goggles.

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

c) Those engaged in welding works shall be provided with welder's protective eyeshields.

d) Stone breakers shall be provided with protective goggles and protective clothing and seated at sufficiently safe intervals.

e) Those working with loud machinery or near loud activities shall be provided with appropriate ear protection such as ear muffs.

f) When workers are employed in sewers and manholes, which are in use, the Contractor shall ensure that manhole covers are opened and manholes are ventilated by mechanical means for at least one hour before workers are allowed entry. Manholes so opened shall be cordoned off with suitable railing and provided with warning signals or boards to prevent accident to public.

xvii) When work is done near any place where there is a risk of drowning, all necessary equipment shall be provided by the Contractor and kept ready for use and all necessary steps taken for prompt rescue of any person in danger and adequate provision made for prompt first aid treatment of all injuries likely to be sustained during the course of the work;

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

a) These shall be of good mechanical construction, sound material and adequate strength and free from patent defects and the Contractor shall keep same in good repair and in good working order.

b) Every rope used in hoisting or lowering materials or as a means of suspension shall be of durable quality and adequate strength, and free from patent defects.

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

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

e) The Contractor shall notify safe working load of each machine to the Engineer whenever he brings it to Site.

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

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

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

xxii) To ensure effective enforcement of the rules and regulations relating to safety precautions, arrangements made by the Contractor shall be open to inspection by the Engineer and any safety inspection officer.

xxiii) All movement of vehicles to and from the sites shall comply with the Traffic Management Plan and in the Traffic Management Requirements

Notwithstanding the above provisions, the Contractor is not exempted from the requirements of any other Laws in force. The Contractor shall submit to the Engineer for review detailed proposals under (i) above in conjunction with detailed construction and installation method statements for each element of work to be undertaken. When accepted by the Engineer, and before the work is started, the Contractor shall distribute copies in English or in other language as appropriate to all his employees and to the Engineer.

The Contractor shall ensure that all his employees are fully conversant with the plans and regulations and the Contractor shall enforce the rule that any employee committing a serious breach of such plans and regulations shall be instantly dismissed and shall not be reemployed.

115.2 Paint

Paint or other products containing lead shall not be used.

115.3 First Aid and Life-saving apparatus

The Contractor shall provide on the Site such life-saving apparatus as may be appropriate and shall provide, equip and maintain at the Site of Works first aid boxes as directed and shall be subject to approval by the Engineer for the use of his own as well as Engineer’s Personnel on Site.

In addition, the Contractor shall instruct an adequate number of persons permanently employed at the Site in the use of the apparatus and equipment. The Contractor shall advise the Engineer of measures to be taken in the event of a serious accident. The Contractor shall post a list of emergency telephone numbers (including ambulance) at several locations on site.

115.4 Electrical Safety

While any electrical equipment is being installed or tested, the Contractor shall ensure that all necessary precautions are taken to safeguard personnel working on Site. If necessary, this shall include fencing off areas that are considered to pose a risk, and erecting warning notices.

The Contractor shall ensure that the installation of electrical equipment is carried out by suitably trained competent personnel and that the work is carried out in a safe manner. No electrical cables shall be laid across rebar. No joints or repairs shall be made to cables except by suitably trained competent personnel using appropriate protective equipment. All power sockets used on the Site shall be protected by a residual current service.

The Contractor shall be responsible for the operation on the Site of a permit to work system during the period of electrical equipment installation and testing. This system shall regulate the installation, the energising and the use of electrical Plant installed and the method of work adopted.

115.5 Asbestos

The Contractor shall not use any product that contains crocidolite (blue asbestos). Prior to use of any asbestos materials, whether in permanent works or temporary works, the Contractor shall submit to the Engineer for review evidence that his insurance policies permit the use of asbestos. The Contractor shall notify the Engineer of the presence of asbestos on site throughout the entire Contract Period, including the Operation Service Period. When handling any asbestos materials he shall comply with all appropriate national and internationally accepted regulations and codes of practice relating to the handling and disposal of asbestos.

115.6 Supply of Potable Water and Sanitation Facilities

The Contractor shall, having regard to local conditions, provide on the Site an adequate supply of fresh and chlorinated potable water suitable for drinking and other water for the use of the

Contractor’s staff on a daily basis. The Contractor shall also provide sanitation facilities for his staff employed on the site for the duration of the Contract.

115.7 Measures against Insect and Pest Nuisance

The Contractor shall at all times take the necessary precautions to protect the Contractor’s staff employed on the Site from insect and pest nuisance, and to reduce their danger to health. The Contractor shall comply with all the regulations of the local health authorities, including use of appropriate insecticide.

115.8 Measures against Sunburn and Heat Exhaustion

The Contractor shall at all times take the necessary precautions to protect the Contractor’s staff employed on the Site from sunburn and heat exhaustion including provision of adequate breaks.

115.9 Alcoholic Liquor or Banned Substances

The Contractor shall not allow alcoholic liquor or banned substances on site. The Contractor shall not import, sell, give barter or otherwise dispose of any alcoholic liquor or drugs, or permit or allow importation, sale, gift barter or disposal thereto by Contractor's staff.

115.10 Arms and Ammunition

The Contractor shall not allow arms and ammunition of any kind on the site. The Contractor shall not give, barter, or otherwise dispose of, to any person, any arms or ammunition of any kind, or allow Contractor's staff to do so.

(116) **Festivals and Religious Customs**

The Contractor shall respect the Country's recognized festivals and religious or other customs.

(117) ~~All the works in the Auditorium i.e. Acoustical, Sound system, Stage lighting, Fire fighting, Audio, False Ceiling, Plumbing, Other related services etc. shall be executed without claiming any extra payment on account of scaffolding height that may required to complete the work~~.

(118) As per Circular u/no. CE / 2215 dated 09-05-2016, the Contractors shall compulsory appoint the Labours on construction site who are registered under the provision of ESI act, 1948. The separate register of the Labours shall be maintained on site and the Contractor shall submit the details of all laboures working on site periodically alongwith each Running Bills in the prescribed format as mentioned below -

Sr No	Labour Name	PF Code	ESI Code

~~(119) A passenger Lift of Minimum 06 persons capacity should be provided during construction period for Supervision staff of MCGM, Architects, Consultants with proper safety arrangements, for which no extra payment will be made to the Contractors.~~

(120) Obtaining permanent power supply, all necessary approvals / permissions / NOC from the service provider/ all competent authority is the sole responsibility of the prime contractor / sub contractor. Also obtaining NOC from PWD/ competent authority for electrical installation, DG sets, High rise, Lift licenses etc. will be responsibility of prime contractor / sub contractor. No extra claims will be entertained in this regard.

(121) Municipal Corporation of Greater Mumbai do not have site available for disposal of Debris / Demolition material / excavated earth. The Contractor shall dispose these materials properly at his own risk & cost. The contractor shall quote the tender keeping these in mind. No separate payment shall be made for disposal of these Debris / Demolition material / excavated earth / material.

(122) Bidder should adhere and ensure that the concrete finish quality for this project should be confirming to Grade F-3. Bidder shall adopt the desired type of shuttering / formwork system to achieve the same.

(123) Hon'ble High Court' in PIL no. 217 of 2009 vide its order dated 29-02-2016 directed in the matter of dumping and dispose of the solid waste and construction debris, that "the development permission / IOD shall not be granted by either MCGM or State Govt. on the applications submitted from 01-03-2016 for construction of new buildings for residential or

commercial use. The condition will not be apply to all the redevelopment projects covered by DC regulation no. 33(5) to 33(10) of DCR 1991". Further connection orders / directions to dispose of construction debris, in this matter by Hon'ble Supreme Court under SLP (Civil) No. D23708 / 2017 shall be strictly followed and will be binding on the Bidder. The e-tenderer / bidder shall therefore quote his percentage accordingly, anticipating the change in the scope of work due to above orders, and no extra claim in this regard will be entertained afterwords.

(124) The e-Tender for the work of Basement Parking at RaosahebPatwardhan Garden, Bandra west, is prepared and submitted subject to approval to plans by the B.P. (Spl. Cell) office and Hon'ble M.C.'s approval thereat. It is also to be stated here that Fair items included in BOQ are not yet approved, NOC from CFO, Traffic Dept, SWDetc are not yet received, hence the items were considered as per proposed plans by the Consultants. Under the circumstances, it is likely that the the scope of work, plans, estimates and BOQ are required to be changed / modified. The e-tenderer / bidder shall therefore quote their percentage accordingly, anticipating the change in the scope of work if any due to above facts, and no extra claim in this regard will be entertained afterward.

(125) The MCGM has appointed Architectural Consultants M/s Architect Hafeez Contractor, and they are in charge and responsible for periodical supervision on site till completion of project, to verify and certify the bills of the Contractors, to approve the samples of various elements and components and shop drawings etc. as per their appointment of letter.

(126) There are two existing water mains running through the garden. HE (Const) dept has called the tenders to shift them along adjoining TP Road. The water mains in the gardens must be safeguarded until newly laid water mains are functional. Contractor has to carry out the work in co-ordination with the HE Dept's contractor of the above said work. Contractors to take note of same and quote accordingly.

(127) The MOEF/Environment Remarks / NOC is not yet received. The scope of the work may change / reduce depending upon the MOEF remarks / NOC. The e-tenderer / bidder shall therefore quote his percentage accordingly, anticipating the change in the scope of work if any, and no extra claim / compensation in this regard will be entertained afterwords.

(128) The successful bidder /contractor shall be ready with necessary arrangement for disposal of surplus excavated material/construction debris from the premises completely in accordance with prevailing policies, at his own risk and cost before acceptance of work order. No separate payment or any claim in this regard will be entertained in future.

(129) Barricading shall be provided free of cost as per circular vide u/no.MGC/F/6342 dated 5.5.2018 and as per Annexure I, II and III of standard drawings and specifications with slogans and department wise colour codes.

(130) The guidelines issued by Supreme Court under order u/no SLP (CIVIL) No.D 23708/2017 dated 15/03/2018 in Dumping Ground matter and the Circulars issued by MCGM in this regards u/no. DMC / SWM / 67 dated 6-4-2018, ChE / DP / 674 / Gen dated 6-4-2018, ChE / DP / 2373 / Gen dated 25-4-2018 and the prevailing procedure adopted by MCGM will be applicable to this tender. All the requirement given by Supreme Court / MCGM shall be complied by the successful bidder. The e-tenderer / bidder shall therefore quote his percentage accordingly, anticipating the change in the scope of work due to above orders, and no extra claim in this regard will be entertained afterwards.

Guidelines regarding above stated Circulars -

i) The successful Bidder shall deposit Bank Guarantee (in addition to B.G. required as per GCC) of requisite amount with M.A. / User department as per the policy circular dt. 06.04.2018 & 25.04.2018 in view of Hon'ble Supreme Court's order dt 15.03.2018 in regards to disposal of construction & demolition waste generated from Construction activity.

ii) The successful bidder shall obtain S.W.M N.O.C before start of the work. For this, the circular regarding C&D waste at designated unloading site & procedure to be followed for designated unloading site uploaded on mcgm.gov.in website shall be scrupulously followed.

iii) The successful bidder shall make provision of adequate safeguards in consultation with S.W.M department for preventing dispersal of particles through air and the construction debris generated shall be deposited in specific sites inspected & approved by M.C.G.M.

iv) The successful bidder shall comply with all the conditions & directions specified in the Hon'ble Supreme Court order in S.L.P (Civil) No D23708/2017 dt. 15.03.2018 in the case of dumping ground and all the conditions shall be complied with before starting demolition of structure &/or starting any excavation work / Construction work.

v) The successful bidder shall handle and transport all the construction & demolition waste to the designated unloading site as per the N.O.C. issued by E.E.(S.W.M.).

vi) The successful bidder shall maintain the record of C&D waste generated, transported and unloaded at designated unloading site on the construction site and shall submit this report monthly on AutoDCR system. Also, the unloading challans or receipts shall be uploaded while updating the transportation details (Annexure A). In this regards, S.W.M. department's detailed remarks shall be obtained by the successful bidder.

vii) Any breach of condition regarding debris disposal will entitle the cancellation of the work order and the work will be stopped immediately.

viii) The successful bidder shall revalidate the S.W.M N.O.C & Bank Guarantee from time to time.

ix) The successful bidder shall make all the available records to the Monitoring committee for inspection. In this regards, it is to mention that, the requirement of the C&D waste management are monitored along with the compliance in the requisite format of S.W.M. in order to notice the breach if any.

x) The successful bidder shall note that in the event for any reason whatsoever, the consent given by the disposal site owner/authority is revoked and/or in the event the time limit during which the disposal site was available has expired, the relevant construction activity will be stopped after issuance of a Show Cause notice and till such period that the revised S.W.M./ N.O.C is issued by E.E.(SW.M.).

(131) Circulars issued by MCGM u/no. Dy.Ch.E/SWM3957/OD / dated 28.09.208 shall be strictly followed and will be binding on the Bidder. The e-tenderer / bidder shall quote his percentage accordingly.

(132) **A. LIST OF APPROVED BUILDING MATERIALS**

Only ISI Marked brands will be allowed to be used with the prior written permission of the Engineer, for the individual work. The Contractors should distinctly understand that it will not be their prerogative to insist for using particular make/brand from the following list. The final selection will have to be done with the approval of Engineer.

Note: This list of approved building materials supersedes the earlier list of approved building materials. All the conditions mentioned in the letter of approval shall be scrupulously adhered to by the engineering staff. In case of ISI marked brands, the latest valid BIS endorsement shall be insisted from the manufacturer. The valid list of approved Building Materials at the time of execution of works can be obtained from the Dy.Ch.Eng. (HIC & WPU)'s office.

B. LIST OF ASPHALT PLATS REGISTERED WITH MCGM -

Contractor shall arrange to bring asphalt mixes from above approved plants registered with M.C.G.M., during the execution of the work.

The valid list of approved asphalt plants at the time of execution of works to be obtained from the Dy.City.Engineer (BC) / P & D's office / Road Deptt. of M.C.G.M.

The Municipal Site Engineer to ensure the validity of registration certificate of asphalt plant and compliance of conditions laid down in the registration certificate issued to the asphalt plant owner before receiving asphalt mixes.

C. LIST OF MANUFATURER OF INTERLOCKING PAVER BLOCKS REGISTERED WITH MCGM -

The updated list of approved paver blocks manufacturers at the time of execution of works shall be obtained from the Dy.City.Engineer (BC) / Road Deptt. of M.C.G.M.

D. LIST OF R.M.C. PLANTS REGISTERED WITH MCGM -

The contractor shall supply R.M.C. from approved suppliers during execution of the work. The approved suppliers shall be selected from the list i.e. circulated by office of Dy. Ch E.(Roads)W.S (time to time).

The Municipal Site Engineer to ensure the validity of registration certificate of R.M.C. plant and compliance of conditions laid down in the registration certificate issued to the R.M.C. plant owner before receiving R.M.C. mixes.

E. LIST OF THE MANUFACTURERS REGISTERED WITH MCGMFOR SUPPLYING PRECAST ITEMS TO THE WORKS OF MCGM.

The contractor shall supply precast items from approved suppliers during execution of the work. The approved suppliers shall be selected from the list i.e. circulated by office of Dy. Ch E.(Roads)W.S (time to time).

The Municipal Site Engineer to ensure the validity of registration certificate of precast items plant and compliance of conditions laid down in the registration certificate issued to the precast items owner before receiving precast items.

F. LIST OF LABORATORY REGISTERED WITH MCGM -

The updated list at the time of execution of works can be obtained from the Dy.Ch.Eng. (BM)'s office.

Note: The tests to be carried out in the above laboratory shall be restricted to maximum 20% per project.

G. LIST OF APPROVED ELECTRICAL MATERIALS -

The updated list at the time of execution of works can be obtained from the Ch.Eng. (M&E)'s office.

PATWARDHAN PARK AT MUMBAI		Architect Hafeez Contractor 29,bank street,Sonawala bldg.,Fort Mumbai-23	
SUMMARY OF PRICED BILLS OF QUANTITIES			
SR. NO.	***PARTICULARS***		***TOTAL AMOUNT***
#	**CIVIL**		
A	**SHORING WORK**		88,065,250.00
B	**EARTH WORK**		96,420,270.00
C	**STRUCTURAL WORK**		365,409,149.60
D	**MASONRY WORK**		3,249,028.00
E	**PLASTERING WORK**		13,100,631.00
F	**FLOORING WORK**		64,946,978.00
G	**JOINERY & METAL WORK**		3,556,140.00
H	**WATERPROOFING WORK**		42,781,455.00
I	**PAINTING WORK**		4,136,077.00
J	**MISCELLANEOUS WORK**		18,533,133.00
K	**DISMANTLING & DEMOLISHING WORKS**		692,061.00
L	**SIGNAGES**		5,712,889.00
M	**PLUMBING WORK**		2,613,212.00
	TOTAL COST OF CIVIL WORK		**709,216,273.60**
N	**ELECTRICAL WORK**		62,848,545.00
O	**FIRE-FIGHTING WORK**		19,211,812.00
P	**HVAC**		17,219,438.00
Q	**ELEVATORS**		5,510,002.00
S	**GARDEN DEVELOPMENT**		5,903,854.20
	TOTAL COST OF ELECTRICAL WORK		**110,693,651.20**
T	**ELEVATORS CSMS**		**2,202,372.00**
U	**TOTAL COST OF GARDEN & LANDSCAPING**		**31,083,506.00**
V	**TOTAL COST OF GARDEN CSMC**		**24,045,816.00**
	TOTAL	**Rs.**	**877,241,618.80**
	TOTAL Say	**Rs.**	**877,241,619.00**

CIVIL BOQ

PATWARDHAN PARK AT MUMBAI						
		PRICED BILLS OF QUANTITIES				
SR.NO.	***ITEM NO.***	***PARTICULARS***	***UNIT***	***RATE***	***QUANTITY***	***AMOUNT***
		USR ITEMS				
A	**CS-PLG**	**SHORING WORK**				
A.1	R2-CS-PLG-1-1					
A.1.1	R2-CS-PLG-1-1-b	Providing and Casting RCC bored cast in-situ Vertical as per IS 2911 (Part 1, Section 2) by boring through all kinds of soils/ Sand /Rock by rotary hydraulic rigs using temporary casing up to stable strata / bentonite mud circulation as specified, from tip to cut-off elevation of piles. Reinforced Cement Concrete work of filling the bore (after placement of reinforcement cage as per drawing) with M25 grade Ready Mix Concrete using 43 Grade Ordinary Portland Cement confirming to IS : 8112, of approved make and brand with minimum cement content of 400 kg/m3 and with water -cement ratio, including the water contained in aggregates (10mm to max 20mm size), not exceeding 0.45, with approved plasticizer as specified, including placing of concrete from tip to minimum of 600mm above the specified cut-off level, breaking pile head to cutoff level and exposing pile reinforcement for embedment in pile cap, Disposing & levelling of bored/excavated material suitably at locations approved by the local authorities including all lead and lifts, all complete for piles having diameter of (Pile will be measured for payment for length between pile tip to cut-off level along the pile axis. Reinforcement shall be paid separately) : 600mm	Rmt	5,125.00	9706	49,743,250.00
A.1.2	R2-CS-PLG-1-1-d	Providing and Casting RCC bored cast in-situ Vertical as per IS 2911 (Part 1, Section 2) by boring through all kinds of soils/ Sand /Rock by rotary hydraulic rigs using temporary casing up to stable strata / bentonite mud circulation as specified, from tip to cut-off elevation of piles. Reinforced Cement Concrete work of filling the bore (after placement of reinforcement cage as per drawing) with M25 grade Ready Mix Concrete using 43 Grade Ordinary Portland Cement confirming to IS : 8112, of approved make and brand with minimum cement content of 400 kg/m3 and with water -cement ratio, including the water contained in aggregates (10mm to max 20mm size), not exceeding 0.45, with approved plasticizer as specified, including placing of concrete from tip to minimum of 600mm above the specified cut-off level, breaking pile head to cutoff level and exposing pile reinforcement for embedment in pile cap, Disposing & levelling of bored/excavated material suitably at locations approved by the local authorities including all lead and lifts, all complete for piles having diameter of (Pile will be measured for payment for length between pile tip to cut-off level along the pile axis. Reinforcement shall be paid separately) : 900 mm	Rmt	10,906.00	1254	13,676,124.00
A.1.3	R2-CS-PLG-5.0	Supply and placing in position high strength deformed steel bars reinforcement of grade Fe-500 conforming to IS:1786 (latest version) for RCC Cast-in-situ piles for full length of pile including transporting the same from source to site of work, straightening, cleaning, decoiling, cutting, bending to required shape and lengths as per details, binding with 16 SWG black soft annealed binding wire, supplying and placing with proper cover blocks, supports, chairs, spacers, welding, if required, to form a grid cage etc., complete as per instruction of the Engineer-in-Charge (steel supplied by contractor at his own cost and duly approved by Engineer in charge	MT	64,518.00	382	24,645,876.00
		TOTAL OF SHORING WORK				**88,065,250.00**
1	**CS-EW**	**EARTH WORK**				

PATWARDHAN PARK AT MUMBAI						
		PRICED BILLS OF QUANTITIES				
SR.NO.	ITEM NO.	PARTICULARS	UNIT	RATE	QUANTITY	AMOUNT
1.1	R2-CS-EW-1	Excavation for foundations, substructures, basements, tanks, sumps, walls, chambers, manholes, trenches, poles, pits & general building works in all types of soils, vegetable earth, soft murum, runnin g sand, shingle, turf clay, loam, peat, ash, shale, slag, chalk, garbage, muddy/ marshy/ slushy soil, marine clay, reclaimed land etc. for depths/lifts upto 1.5M measured from the ground level, including dressing/ trimming the sides, leveling and ramming of bottoms, manual dewatering, removing rank vegetation, backfilling in layers not more than 200mm thickness, watering, consolidating, compacting to achieve not less then 97% Modified Proctor density conforming to relevant IS, stacking the selected material in measurable heaps for future use within owners space or disposing within an initial lead of 150m as directed, loading, unloading, leveling excluding shoring, strutting etc. complete as directed by Engineer in Charge. Note: 1) The rate includes the handling/supporting the existing utilities such as cables, drains, pipes, water mains etc. 2) It also includes the royalty and other taxes applicable if any. For more details refer General Notes.	Cum	307.00	41100	12,617,700.00
1.2	R2-CS-EW-2-a	Extra over above item CS EW 1 for lift from 1.5m to 3.0m.	Cum	71.00	13220	938,620.00
1.3	R2-CS-EW-2-B	Extra over above item CS-EW-1 for lift from 3.0m to 4.5m	Cum	106.00	13220	1,401,320.00
1.4	R2-CS-EW-2-C	Extra over above item CS-EW-1 for lift from 4.5m to 6.0m	Cum	171.00	1385	236,835.00
1.5	R2-CS-EW-3	Excavation for foundation, substructures, basements, tanks, sumps, walls, chambers, manholes, trenches, poles, pits & general building works in soft/ disintegrated rock, sand stone, stiff clay, gravel, cobblestone, hard laterite, water bound macadam, wet mix macadam, asphalt mix carpet of any type, pitching, soling, paths and hardcore, lime oncrete, plain cement concrete, stone masonry and all types of brick/ block masonry below ground level, rock boulders, etc. for depths/ lifts upto 1.5M measured from the ground level, including dressing/ trimming the sides, leveling of bottoms, manual dewatering, removing rank vegetation, backfilling in layers not more than 200mm thickness, watering, consolidating, compacting to achieve not less then 97% Modified Proctor density conforming to relevant IS, stacking in measurable heaps for future use within owners space or disposing within an initial lead of 150m as directed, loading, unloading, leveling excluding shoring, strutting etc. complete as directed by Engineer-in-Charge. Note: 1) The rate includes the handling/supporting the existing utilities such as cables, drains, pipes, water mains etc. 2) It also includes the royalty and other taxes if any.	Cum	500.00	38275	19,137,500.00
1.6	R2-CS-EW-4	Excavation by chiseling by manual operations, pneumatic breaker, hammer, drilling, compressor breaker, jack hammer etc. for foundations, substructures, basements, tanks, sumps, walls, chambers, manholes, poles, pits & general building works in hard rock, reinforced concrete, Bituminous macadam for depths/lifts upto 1.5M, including dressing/trimming the sides, leveling of bottoms, manual dewatering, removing rank vegetation, backfilling in layers not more than 200mm thickness, watering, consolidating, compacting to achieve not less then 97% Modified Proctor density conforming to relevant IS, stacking in measurable heaps for future use within owners space or disposing within an initial lead of 150m as directed, unloading, leveling excluding shoring, strutting etc. complete as directed by Engineer-in-Charge, loading. Note: 1) The rate includes the handling/supporting the existing utilities such as cables, drains, pipes, water mains etc. 2) It also includes the royalty and other taxes if any.	Cum	1,054.00	8820	9,296,280.00

PATWARDHAN PARK AT MUMBAI						
		PRICED BILLS OF QUANTITIES				
SR.NO.	***ITEM NO.***	***PARTICULARS***	***UNIT***	***RATE***	***QUANTITY***	***AMOUNT***
1.7	R2-CS-EW-7-c	Extra over the items CS-EW-03 to CS-EW-06 for lift from 4.5m to 6.0m.	Cum	327.00	13220	4,322,940.00
1.8	R2-CS-EW-7-d	Extra over the items CS-EW-03 to CS-EW-06 for lift from 6.0m to 7.5m.	Cum	427.00	13220	5,644,940.00
1.9	R2-CS-EW-7-e	Extra over the items CS-EW-03 to CS-EW-06 for lift from 7.5m to 9.0m.	Cum	528.00	11835	6,248,880.00
1.10	R2-CS-EW-7-f	Extra over the items CS-EW-03 to CS-EW-06 for lift from 9.0m to 10.5m.	Cum	628.00	8820	5,538,960.00
1.11	R2-CS-EW-11	"Filling in plinth, floors, trenches, pits with approved excavated materials, murum / good earth in layers not exceeding 200mm including breaking of clods, watering, consolidating each layer in filled up area by rolling and compacting with roller/ plate compactor as required to achieve not less than 97% modified proctor density conforming to relevant IS etc. complete as directed by Engineer In charge. Note: 1) The rate includes the royalty and other taxes if any."	Cum	183.00	100	18,300.00
1.12	R2-CS-EW-12	"Filling in plinth, floors, trenches, pits with approved contractor s murum in layers not exceeding 200mm including breaking of clods,watering, consolidating each layer in filled up area by rolling and compacting with roller/ plate compactor as required to achieve not less than 97% modified proctor density conforming to relevant IS etc. complete as directed by Engineer In charge. The rate includes necessary soil testing charges at laboratory & field as per relevant I.S. codes, royalty, octroi and other taxes if any. (Note: Borrow areas selected by CONTRACTOR shall be got approved from Engineer In Charge, before executing the work) 1) The rate includes the royalty and other taxes if any."	Cum	1,244.00	5775	7,184,100.00
1.13	R2-CS-EW-26	"Providing & Laying dry stone Rubble Soling with average 230 mm size hard stone set in regular lines, handpacked and interstices thoroughly filled with small chips including filling in with good quality murum brought from outside, compacting with iron rammers, watering, sand spreading 12mm thk. layer of grit on top etc complete as directed by Engineer In Charge. (Note The rate includes the royalty and other taxes if any)"	Cum	2,231.00	10	22,310.00
1.14	R2-CS-AT-1	Providing Pre-constructional anti-termite treatment conforming to IS-6313 (part II) using chloropyrifos EC 20 Emulsion or equivalent of 1% concentration by weight for creating barrier under and all around foundation pits, wall trenches, basement excavation, backfill in immediate contact with foundation and treating the top surface of plinth filling, junction of wall & floor, along the external per imeter of building, expansion joints, surrounding of pipes, water conduits and at places suggested and as directed by Engineer-In-Chargecovering 10 years guaranty. (plinth area should be considered for measurement and payment.)	Cum	159.00	8815	1,401,585.00
1.15	PTW-CIVIL-1	Providing and fixing of Rock Anchors of 125mm dia. drill hole and confirmation of anchor capacity and anchoring depth by Geotech consultant and getting it approved from IIT Mumbai. However anchor capacity not to reduce from 60 T and anchorage depth with minimum depth embedment in rock upto 5m by drilling/boring and inserting 3 nos. of 32mm dia. Tor steel bar of 6.25m long in to the bores & as per required at site and doing 10% pullout test of anchor bars. Rate to include providing and injecting Neat Cement Grout with Cebex 100 admixture, cost of confirmation from geotech consultant and approval from approved agency and getting the tests done.	Nos.	18,000.00	1245	22,410,000.00
		TOTAL OF EARTH WORK				**96,420,270.00**
C	**CS-CW**	**STRUCTURAL / CONCRETE WORK**				

PATWARDHAN PARK AT MUMBAI						
		PRICED BILLS OF QUANTITIES				
SR.NO.	***ITEM NO.***	***PARTICULARS***	***UNIT***	***RATE***	***QUANTITY***	***AMOUNT***
2.1	R2-CS-CW-1	Providing and laying in position plain cement concrete of specified grade with trap/granite/quartzite/gneiss metal mixing in concrete mixer including bailing out water, compacting, finishing surface, curing and including the cost of centering and shuttering at all level :				
2.1.1	R2-CS-CW-1-b	Nominal Mix of 1:2:4 (1 cement : 2 coarse sand : 4 graded stone aggregate 20 mm nominal size)	Cum	6,821.00	10	68,210.00
2.2	R2-CS-CW-1	Providing and laying in position plain cement concrete of specified grade with trap/granite/quartzite/gneiss metal mixing in concrete mixer including bailing out water, compacting, finishing surface, curing and including the cost of centering and shuttering at all level :				
2.2.1	R2-CS-CW-1-a	Nominal Mix of 1:1.5:3 (1 cement : 1.5 coarse sand : 3 graded stone aggregate 20 mm nominal size)	Cum	7,062.00	659	4,653,858.00
2.3	R2-CS-CW-3	Providing and laying in position ready mixed plain cement concrete, with cement content as per approved design mix by Engineerincharge and manufactured in fully automatic batching plant and transported to site of work in transit mixer for all leads, having continuous agitated mixer, manufactured as per mix design of specified grade for plain cement concrete work, including pumping of R.M.C. from transit mixer to site of laying and curing, including the cost of centering, shuttering and finishing, including cost of curing, admixtures in recommended proportions as per IS : 9103 to accelerate/ retard setting of concrete, improve workability without impairing strength and durability as per direction of the Engineer - in - charge.				
2.3.1	R2-CS-CW-3-a	All works upto plinth level.				
2.3.1.1	R2-CS-CW-3-a-2	M-15 grade plain cement concrete (cement content considered @ 240 kg/cum as per IS 456 table showing minimum cement content).	Cum	6,764.00	3095	20,934,580.00
2.4	R2-CS-CW-7	Providing and laying in position ready mixed design mix M-20 grade cement concrete for reinforced cement concrete work, using cement content as per approved design mix, including pumping of concrete to site of laying and the cost of centering, shuttering, finishing and excluding reinforcement, including admixtures in recommended proportions as per IS: 9103 to accelerate, retard setting of concrete, improve workability without impairing strength and durability as per direction of Engineer-in-charge.The Mix design as per particular specfications shall be got approved by Engineer-in-Charge before execution of the item.The rate shall include cost of all specified materials and operations at all levels and heights, including the cost of centering, shuttering and and excluding reinforcement which shall be paid under relevant item.(Note :- Cement content considered in this item is @ 300 kg/cum as per IS 456 table showing minimum cement content. No extra will be paid nor any amount will recovered on account of variation of cement in mix design as per specifications for controlled concrete).				
		All works (including Centering & Shuttering)				
2.4.1	R2-CS-CW-7-a	Foundations, footings, bases of columns, rafts, pilecap.	Cum	7,515.00	3400	25,551,000.00
2.4.2	R2-CS-CW-7-b	Walls (any thickness) including attached butteresses, retaining wall, shear wall, diaphragm wall , trench,pit walls,Tank walls etc.	Cum	10,518.00	3930	41,335,740.00
2.4.3	R2-CS-CW-7-c	Slabs, Suspended floors, roofs, landings, balconies, canopy, ramps and access platform.	Cum	11,790.00	7827	92,280,330.00
2.4.4	R2-CS-CW-7-d	Lintels, beams, plinth beams, girders, floor beam, coping.	Cum	9,556.00	385	3,679,060.00
2.4.5	R2-CS-CW-7-e	Columns, Pillars, Piers, Posts and Struts.	Cum	11,184.00	940	10,512,960.00
2.4.6	R2-CS-CW-7-f	Stairs (waist slab), folded slab, inclined slab	Cum	11,059.00	45	497,655.00
2.4.7	R2-CS-CW-7-h	Extra for shuttering in circular work arches, columns (20% of respective centering and shuttering items).	Cum	2,055.00	195	400,725.00
2.5	R2-CS-CW-16	Extra and over for providing richer RMC of M-25 grade cement concrete instead of M20 (Note :- Cement content considered in thisitem is @ 330 kg/cum as per IS 456 table showing minimum cement content.)	Cum	266.00	2110	561,260.00

PATWARDHAN PARK AT MUMBAI						
		PRICED BILLS OF QUANTITIES				
SR.NO.	***ITEM NO.***	***PARTICULARS***	***UNIT***	***RATE***	***QUANTITY***	***AMOUNT***
2.6	R2-CS-CW-17	Extra and over for providing richer RMC of M-30 grade cement concrete instead of M20 (Note :- Cement content considered in this item is @ 340 kg/cum as per IS 456 table showing minimum cement content.)	Cum	532.00	3340	1,776,880.00
2.7	R2-CS-CW-18	Extra and over for providing richer RMC of M-35 grade cement concrete instead of M20 (Note :- Cement content considered in this item is @ 350 kg/cum as per IS 456 table showing minimum cement content.)	Cum	798.00	10945	8,734,110.00
		REINFORCEMENT STEEL				
2.9	R2-CS-CW-35	Providing and fixing in position steel bars reinforcement of various diameters for R.C.C. pile, pile caps, footings, raft, retaining wall, shear wall, lift wall, foundations, slabs, beams, columns, canopies, staircases, newels, chajjas, lintels, pardies, coping, fins, arches, etc.as per detailed designs, drawings and bar bending schedules, including straightening, cutting, bending, hooking the bars, binding with wires or tack welding, supporting as required etc. all complete at all levels.				
2.9.1	R2-CS-CW-35-c	Thermo-Mechanically Treated steel bars. (Fe 500 D)	MT	76,770.00	1920	147,398,400.00
2.10	WS3-08-001-123	Providing and laying Polythene sheet of 500 gauge of approved make and quality on binding layer with 100mm overlap etc., complete	Sqm	52.92	8080	427,593.60
2.11	R2-CS-SS-04	Providing, detailing, composite fabricating members like Trusses, Ngirders, girders, bracings, supports, purlins, runners, and similar structural steel members fabricated using M.S. hollow tubular steel sections (circular & rectangular pipes), of TATA Structura Make or equivalent conforming to IS 1239 part 1 and 2 and of grade Fe 250 as per specifications and approved fabrication drawings (which are to be prepared by Contractor and got approved from Engineer), including transportion of the same to site, erection of structural steel members for all heights & at all levels, provision of necessary erection bolts, fixing bolts, nuts, washers, cleats, stiffeners, gussets, base plate, and all necessary operations like preheating as per specifications, straightening, bending, cutting, drilling, grinding, machining if specified, welding, grinding, removing the welding burr and preparing surface for painting with wire brush cleaning and applying two coats of epoxy red oxide zinc phosphate primer of 30 microns each and two coats of Epoxy Corrosion Resistant Enamel paint of 30 microns after fabrication including touching up with spray painting after erection etc complete as directed by Engineer In Charge.	MT	82,427.00	44	3,626,788.00
2.12	R2-CS-RM-105	Drilling with core cutting machine in RCC slabs, walls etc. wherever required in buildings, manholes, ducts, water tanks, pits etc. for laying pipes, sleeves and making good the same to give an even finish. The rate shall include the cost of drilling core, providing EPOXY based water proofing compound for sealing the joints around the pipes, nominal reinforcement wherever required, scaffolding and labour charges for working at all levels, leads and heights. (Maximum thickness of RCC members shall be 300mm) and as directed by Engineer-In-Charge. g) Above 150 mm to 200mm dia	Each	990.00	3000	2,970,000.00
		TOTAL OF STRUCTURAL WORK				**365,409,149.60**
D	**CS-MW**	**MASONRY WORK**				
3.1	R2-CS-MW-16	Brick work with clay flyash F.P.S. (non modular) brick of class designation 3.5 and above in superstructure above plinth level up to floor five level in :				
3.1.1	R2-CS-MW-1-c	Cement mortar 1:6 (1 cement : 6 coarse sand)	Cum	5,584.00	201	1,122,384.00
3.2	R2-CS-MW-16	Brick work with clay flyash F.P.S. (non modular) brick of class designation 3.5 and above in superstructure above plinth level up to floor five level in				
3.2.1	R2-CS-CS-MW-16-a	Cement mortar 1:4 (1 cement : 4 coarse sand)	Cum	6,511.00	10	65,110.00
3.2.2	R2-CS-CS-MW-16-b	Cement mortar 1:6 (1 cement : 6 coarse sand)	Cum	6,287.00	10	62,870.00

PATWARDHAN PARK AT MUMBAI						
		PRICED BILLS OF QUANTITIES				
SR.NO.	***ITEM NO.***	***PARTICULARS***	***UNIT***	***RATE***	***QUANTITY***	***AMOUNT***
3.3	R2-CS-CS-MW-11	Half brick masonry with common burnt clay F.P.S. (non modular) bricks of class designation 3.5 and above in superstructure above plinth level up to floor V level.				
3.3.1	R2-CS-MW-11-a	Cement mortar 1:3 (1 cement : 3 coarse sand)	Cum	806.00	10	8,060.00
3.3.2	R2-CS-MW-11-b	Cement mortar 1:4 (1 cement : 4 coarse sand)	Cum	781.00	18	14,058.00
3.4	R2-CS-MW-33	Providing and laying autoclaved aerated (cellular) cement blocks masonry with more than 100 mm thick AAC blocks in cement mortar 1:4 (1 cement : 4 coarse sand) including RCC stiffeners. The rate includes providing and placing in position 2 Nos 6 mm dia M.S. bars at every third course of masonry work, racking of joints, scaffolding and curing,etc. completed as directed by Engineer-in-Charge.	Cum	6,911.00	286	1,976,546.00
		TOTAL OF MASONRY WORK				**3,249,028.00**
E	**CS-PL**	**PLASTERING WORK**				
4.1	R2-CS-PL-03	Providing and applying 6 mm thick internal ceiling plaster in single coat in cement mortar 1:3 with white cemetecious wall putty (Birla white or equivalent) finish at all heights and locations for concretesurfaces including hacking of concrete surface, watering, finishing, curing, scaffolding etc. complete.	Sqm	304.00	24386	7,413,344.00
4.2	R2-CS-PL-06	Providing and applying 12 mm thick internal plaster in one coat in cement mortar 1:3 with white cementicious wall putty (Birla or equivalent) at all heights and locations for masonry (except stone masonry) and concrete surfaces including racking out joints, hacking of concrete surface, watering, finishing, curing, scaffolding etc. complete.	Sqm	352.00	13759	4,843,168.00
4.3	R2-CS-PL-14	Providing and applying 12 mm thick sand faced external cement plaster for soffit of slabs & stair, beams, columns, chajja etc. upto 10m from ground level and at all locations in cement mortar as specified below including providing water proofing compound to the first coat of plaster as per manufacturers specification, hacking of concrete surface, finishing, curing, scaffolding etc complete as directed By Engineer In Charge.				
4.3.1	R2-CS-PL-14-c	In cement mortar 1:3	Sqm	283.00	998	282,434.00
4.4	CS-PL-15	Providing and applying 20 mm thick external sand faced cement plaster upto 10m from ground level and at all locations in cement mortar proportion specified below in two coats for masonry (except stone masonry) and concrete surfaces including providingwater proofing compound to the first coat of plaster as per manufacturers specification, racking out joints, hacking of concrete surface, finishing, curing, scaffolding, etc complete as directed By Engineer In Charge.				
4.4.1	R2-CS-PL-15-a	In cement mortar 1:3	Sqm	462.00	1145	528,990.00
4.5	R2-CS-PL-35	Extra for providing and mixing polypropylene fibers in mortar of internal and external plaster. The dose of 6mm long fibers shall be 125gms per 50 kg of cement bag or as per the manufactures specifications etc complete as directed by Engineer In Charge	Kg	65.00	503	32,695.00
		TOTAL OF PLASTERING WORK				**13,100,631.00**
F	**CS-FL**	**FLOORING WORK**				
		Notes: 1) All the rates are include all necessary conveyance and delivery, handling, unloading, storing, fabrication, hoisting, scaffolding, lead, lift, all labour for finishing to required shape and size, setting, fitting and fixing in position, straight cutting and waste, return of package and other incidental operations.				

PATWARDHAN PARK AT MUMBAI						
		PRICED BILLS OF QUANTITIES				
SR.NO.	***ITEM NO.***	***PARTICULARS***	***UNIT***	***RATE***	***QUANTITY***	***AMOUNT***
5.1	R2-CS-FL-01	Providing and laying polished natural stone as specified below (Machine cut) of an approved quality and size for paving /flooring in plain and/or diamond /approved pattern including cement mortar bedding of 25 mm thick in 1:4 proportion, cement float, machine cutting, dressing, leveling, jointing, filling the joints with neat cement slurry or with required pigment, machine polishing at site, curing, finishing, etc complete as directed by Engineer In Charge.				
5.1.1	R2-CS-FL-01-c	25 to 30 mm thk. Kota stone of size 0.430m x0.56m (17"x22")	Sqm	1,179.00	244	287,676.00
5.1.2	R2-CS-FL-01-l	18 mm thk. Steel Gray Granite tiles/slab	Sqm	2,275.00	60	136,500.00
5.2	R2-CS-FL-21	Providing and fixing polished natural stone tiles /slab as specified below of approved quality, pattern and colour for flush/projected skirting and risers including preparing the surface and levelling in the desired line, backing of 20 thk. cement mortar in porportion 1:3, square cut top edge or chamfered top edge in cement mortar 1:3, cement float, machine cutting, leveling, jointing, filling the joints with neat cement or pigment mixed with cement, polishing, finishing, curing etc complete as directed by Engineer In Charge.				
5.2.1	R2-CS-FL-21-d	15 to 20mm thk. Kota stone for height upto 150 mm	Rmt	234.00	927	216,918.00
5.2.2	R2-CS-FL-21-k	15 to 20 mm thk. Steel Gray Granite for height upto 150mm	Rmt	377.00	51	19,227.00
5.3	R2-CS-FL-28	Providing and fixing polished natural stone tiles as specified below of approved quality, pattern and colour for dado including preparing the surface and levelling in the desired line, backing of 20 thk. cement mortar in porportion 1:3, square cut top edge or chamfered top edge in cement mortar 1:3, cement float, machine cutting, leveling, jointing, filling the joints with neat cement or pigment mixed with cement, polishing, finishing, curing etc complete as directed by Engineer In Charge.				-
5.3.1	R2-CS-FL-28-m	18mm thk. Steel gray Granite tiles/slab	Sqm	2,510.00	2834	7,113,340.00
5.3.2	R2-CS-FL-28-l	18mm thk. Ruby red, jet black, Hasan green Granite	Sqm	2,510.00	424	1,064,240.00
5.4	R2-CS-FL-38	Providing and fixing polished natural stone slab as specified below of approved quality, pattern and colour for treads including preparing the surface and levelling in the desired line, in cement mortar 14, cement float, machine cutting, leveling, jointing, smooth cement plastering along the sides to match the existing surface in cement mortar 13, filling the joints with neat cement or pigment mixed with cement, polishing, finishing, curing etc complete as directed by Engineer In Charge.				
5.4.1	R2-CS-FL-38-d	Providing and fixing polished natural stone slab as specified below of approved quality, pattern and colour for treads including preparing the surface and levelling in the desired line, in cement mortar 1:4, cement float, machine cutting, leveling, jointing, smooth cement plastering along the sides to match the existing surface in cement mortar 1:3, filling the joints with neat cement or pigment mixed with cement, polishing, finishing, curing etc complete as directed by Engineer In Charge.15 to 20mm thk. Kota stone for width upto 300 mm	Rmt	664.00	533	353,912.00
5.5	R2-CS-FL-40	Providing and fixing polished natural stone tiles as specified below of approved quality, pattern and colour for sill and jambs including preparing the surface and levelling in the desired line, cement mortar 1:3 bedding or backing, cement float, machine cutting, leveling, jointing, smooth cement plastering along the sides to match the existing surface in cement mortar 1:3, filling the joints with neat cement or pigment mixed with cement, finishing, curing etc complete as directed by Engineer In Charge.				
5.5.1	R2-CS-FL-40-j	do--18mm thk. Ruby red, jet black, Hasan green Granite for width upto 150 mm	Rmt	377.00	149	56,173.00

PATWARDHAN PARK AT MUMBAI						
		PRICED BILLS OF QUANTITIES				
SR.NO.	***ITEM NO.***	***PARTICULARS***	***UNIT***	***RATE***	***QUANTITY***	***AMOUNT***
5.6	R2-CS-FL-8	Providing and laying 600 x 600 x 8 mm thk. vitrified tiles as specified below conforming to I.S.15622- 2006 with water absorbtion less than 0.08% for flooring of an approved, quality, make and pattern /design for flooring including cement mortar bedding of 25 mm thick in 1:4 proportion, cutting, leveling, jointing, filling the joints by neat cement slurry or approved colour grout, curing, finishing etc complete as directed by Engineer In Charge.				
5.6.1	R2-CS-FL-8-C	Light coloured antiskid / matt vitrified tiles	Sqm	1,608.00	173	278,184.00
5.7	R2-CS-FL-13	Providing and laying Indian patent stone flooring 40 mm thick with M-15 grade concrete using 6 mm to 20 mm metal over bedding laid in proper grade and slope or over the slab, including compaction, marking lines, to give appearance of tiles as per the approved pattern, finishing smooth with cement slurry as mentioned below, curing etc. complete.				
5.7.1	R2-CS-FL-13-a	In plain natural/ grey colours.	Sqm	437.00	88	38,456.00
5.8.1	R2-CS-FL-46-c	"Providing and constructing raised platform of 750 mm wide and 600 to 750mm high using minimum 40mm thick polished kadappa stone slab base with minimum 15mm thk. polished stone top as specified below of approved quality, colour and texture, supported by both side polished, 40mm thk. and minimum 700mm wide kadappa spaced at not more than 1200mm clear, including polished facia of min. 100mm height as specified below with champhered/ rounded at the top edges, jointing in approved adhesives, machine cutting, making opening for sink andfixing the same in position, leveling, smooth cement plastering along the sides to match the existing surface in cement mortar, filling the joints with pigment mixed with cement, cleaning, finishing, curing etc complete as directed by Engineer In Charge. (The cost of providing the sink shall be paid extra as per plumbing items) Ruby red / jet black / Hasan green Granite slab at top and facia"				
			Rmt	3,949.00	31	122,419.00
5.9	R2-CS-CW-24	Providing and laying C.C. floor of mix M-20 with ready mixed concrete from RMC. The ready mixed concrete shall be laid and vibrated with a poker vibrator and finished with screed board vibrator, vacuum dewatering process and finally finished by floating, brooming with wire brush etc. complete as per specifications and directions of Engineer-in-charge. The channel shuttering spaced 4m apart shall be included in this item.)	Cum	7,132.00	2363	16,852,916.00
5.10	RW-4-01	Providing & Fixing kerb stones 30 cm.to 40 cm. long., 15 cm. wide, 38 cm. deep medium dressed in all exposed surfaces, set in cement mortar 1:2 on a 15 cm. thick and 25 cm. wide RMC M-20 C.C. bed including filling the joints with 1:2 C.M. pointing, curing etc. complete.	Rmt	506.00	100	50,600.00
5.11	RW-3-17	Providing & fixing in the footpath, 60 mm thick Lacquer coated (Reflective) interlocking gray cement concrete pavers in red (Terra Cotta) Black, Brown, Lemon Yellow or any colour with vermeticular or any antiskid texture on top surface of approved pattern/ shape and colour having average crusting strength 40 N/mm^2 manufactured in double layer precast concrete blocks. The top layer of paver block should be 12 to 15mm thick and consist cubical shape stone aggregate 8 mm size sieve 100% passing and retain on 4.75 mm size sieve , silica sand and with pure iron oxide ultra voilete stabilized pigment @ 5% by weight of cement and should be coated with lacquer having hard, high abrasive resistance and water repellent. The bottom layer should be 45 to 48 mm thick having 12 mm size sieve 100% passing aggregate as per technical specification placed on uniformly graded river sand cushioning of average compacted thickness 25 mm properly compacted with mechanical compactor with required level, grade and camber etc. complete as specified and as directed by the Engineer.	Sqm	938.00	100	93,800.00

PATWARDHAN PARK AT MUMBAI						
		PRICED BILLS OF QUANTITIES				
SR.NO.	***ITEM NO.***	***PARTICULARS***	***UNIT***	***RATE***	***QUANTITY***	***AMOUNT***
5.12	FMB-3.16	Providing and laying dry rubble stone packing 150 to 230 mm thick hand set in regular lines, interstices being filled in with small pieces of stones, throughly rammed, consolidated and watered complete as directed and specified, with municipal rubble.	Sqm	79.00	4657	367,903.00
5.13	R2-CS-FL-31	Providing and fixing 6mm thk. ceramic tiles as specified below conforming to I.S. 15622-2006 of approved quality, pattern and colour for dado in the wet area including preparing the surface and levelling in the desired line, backing of 20 thk. cement mortar in porportion 1:3 with approved waterproofing compound, square cut top edge or chamfered top edge in cement mortar 1:3, cement float, machine cutting, leveling, jointing, filling the joints with neat cement slurry or approved colour grout, finishing, curing etc complete as directed by Engineer In Charge.				
5.13.1	R2-CS-FL-31-C	Light coloured antiskid / matt ceramic tiles	Sqm	1,480.00	534	790,320.00
5.14	R2-CS-PN-25	Providing and applying antifungal self leveling 3mm EPU system including coving at floor wall junction, necessary surface preparation by cleaning and de-dusting. The System shall be executed in three stages, firstly by applying a solvent free epoxy primer which has a volumetric ratio of mixing @ 200 microns dft,then laying 1.8mm self leveling epoxy based screed and finally applying a solvent free EPU (epoxy-polyurethane), self leveling coating to yield a dft of 1000 microns. The EPU coating shall be a two component with volumetric ratio of mixing. No fillers shall be added at the site while laying the self leveling EPU including Aisle or zone marking in different colours etc. complete as per manufacturers specifications and as directed & approved by Engineer In-Charge.	Sqm	1,360.00	23375	31,790,000.00
5.15	R2-CS-RM-69	Supplying and installing jogging track (EPDM granules method) terracotta made of two layered water permeable all weather material of 2mm sprayed coat top with EPDM (Ethylene Propylene Diene Monomer) granules on 12mm in-situ polyurethane bonded rubber granulate sub-base layer of longer life and better UV resistance laid on IPS/PCC surface free from paint, wax, grease, oil, dust and dirt. The item includes cost of material, cleaning the IPS/PCC surface before installation and installation of the 2 layered track with proper slopes.Preparation of IPS/PCC will be paid seperately under relevant items.	Sqm	3,626.00	1307	4,739,182.00
5.16	R2-CS-FL-30	Providing and fixing 25 to 35mm thk. red sand stone tiles of approved quality, pattern, size and colour for dado including preparing the surface and levelling in the desired line, backing of 20 thk. cement mortar in porportion 1:3, square cut top edge or chamfered top edge in cement mortar 1:3, fixed with metal clamp and brass pins, cement float, machine cutting, leveling, jointing, filling the joints with neat cement or pigment mixed with cement, finishing, cleaning and washing with diluted solution of muriatic acid, curing etc complete as directed by Engineer In Charge.	Sqm	1,641.00	269	441,429.00
5.17	R2-CS-FL-57	Rounding the edge in half round shape of the stonework specified below including high gloss machine polishing as directed by Engineer In Charge.				
5.17.1	R2-CS-FL-57	Rounding the edge in half round shape of the stonework specified below including high gloss machine polishing as directed by Engineer In Charge. Shahbad stone/ Kadappa stone/ Tandur stone/Kota stone/Any type of marble/ Any type of Granite stone	Rmt	204.00	533	108,732.00
5.18	R2-CS-FL-59	2 to 3mm wide and 3mm deep grooving on the stone work specified below as directed by Engineer In Charge.				
5.18.1	R2-CS-FL-59	2 to 3mm wide and 3mm deep grooving on the stone work specified below as directed by Engineer In Charge. Shahbad stone/ Kadappa stone/ Tandur stone/Kota stone/ Any type of marble/ Any type of Granite stone	Rmt	47.00	533	25,051.00
		TOTAL OF FLOORING WORK				**64,946,978.00**

PATWARDHAN PARK AT MUMBAI						
		PRICED BILLS OF QUANTITIES				
SR.NO.	***ITEM NO.***	***PARTICULARS***	***UNIT***	***RATE***	***QUANTITY***	***AMOUNT***
G		**JOINERY & METAL WORK**				
		WOOD WORK				
6.1	R2-CS-WW-01	Providing and fixing best quality C.P. Teak wood frame for doors, windows and ventilators size greater than 50mm x 50mm including intermittent supports if required, all moulding, rebating, jointing, hold fasts of MS flats of minimum size 25 x 3 mm, having length of 225 mm for doors & 150 mm for windows and finishing with 3 coats of French polish or one coat of primer and synthetic enamel paint in two coats as directed etc. complete as directed.	Cum	76,096.00	1	76,096.00
6.2	R2-CS-WW-06	Providing and fixing superior quality single leaf B.W.P. grade solid core flush door shutters of standard make conforming to IS:2202- 1991 (Part I & II) including one coat of primer, putty and 2 coats of synthetic enamel paint on both faces etc. with 12 mm thk teak wood lipping all around all around etc. complete (Hinges, aldrop & standard door hardware to be paid separately)				
6.2.1	R2-CS-WW-06-d	40mm thick shutter	Sqm	2,354.00	53	124,762.00
6.3	R2-CS-RM-131	Proviidng & fixing 1 mm thick laminate to flush doors instead of synthetic enamel painting including all material and labour.	Sqm	807.00	106	85,542.00
6.4	R2-CS-WW-13	Providing and fixing vision panel of size 300mm x 300mm in any type of door with 6mm thick glass including T.W. beading etc. complete as directed bt Engineer in charge.	Nos.	254.00	10	2,540.00
		HARDWARE WORK				
6.5	R2-CS-HW-01	Providing and fixing mortise lock of approved make manufactured as per IS:2209 and 6607 and as described below for doors with necessary fixtures and materials and labour etc. complete.				
6.5.1	R2-CS-HW-01-c	Chromium plated Brass mortice latch and lock with round knob	Nos	1,359.00	47	63,873.00
6.6	R2-CS-HW-04	Providing and fixing butt hinges as described below, manufactured as per relevant IS for door & windows with necessary materials and labour costs etc. complete.				
6.6.1	R2-CS-HW-04-e	E] Standard Stainless Steel hinges with ball bearing				
6.6.2	R2-CS-HW-04-e-2	100 mm Long	Nos	73.00	145	10,585.00
6.7	R2-CS-HW-06	Providing and fixing aldrops of 16 mm diameter bars manufactured as per IS:2681-1991, wherever they apply for doors and windows with necessary materials and labour etc. complete.				
6.7.1	R2-CS-HW-06-d	Standard Stainless Steel make Aldrop				
6.7.2	R2-CS-HW-06-d-2	300 mm long.	Nos	381.00	46	17,526.00
6.8	CS-HW-06	Providing and fixing aldrops of 16 mm diameter bars manufactured as per IS:2681-1991, wherever they apply for doors and windows with necessary materials and labour etc. complete.				
6.8.1	R2-CS-HW-06-C	Standard Anodized Aluminium make				
6.8.2	R2-CS-HW-06-C-1	250 mm long.	Nos	336.00	10	3,360.00
6.9	R2-CS-HW-09	Providing and fixing handles as described below, manufactured as per IS:208-1992 for doors and windows and with necessary materials and fixtures like screws etc. and all labour etc. complete				
6.9.1	R2-CS-HW-09-d	D] Standard Stainless Steel				
6.9.2	R2-CS-HW-09-d-5	300 mm long.	Nos	161.00	76	12,236.00
6.10	R2-CS-HW-11	Providing and fixing hydraulic door closer of approved make manufactured as per IS:3564 for doors with necessary materials and labour cost etc. complete.				
6.10.1	R2-CS-HW-11-b	Medium (for shutter weighting from 36 – 60kg)	Nos	822.00	46	37,812.00
6.10.2	R2-CS-HW-11-c	Heavy (for shutter weighting from 61 – 80 kg)	Nos	1,019.00	10	10,190.00
6.11	R2-CS-HW-13	Providing and fixing magnetic type floor door stopper of approved make including necessary screws, fixtures, materials and labour etc. complete.	Nos	84.00	10	840.00
6.12	R2-CS-HW-8	Providing and fixing tower bolts as described below conforming to IS204-1992 (Part I,II) for doors & windows with necessary materials and labour etc. complete.C] Standard stainless steel				
6.12.1	R2-CS-HW-08-c-3	200mm long	Nos.	293.00	28	8,204.00

PATWARDHAN PARK AT MUMBAI						
		PRICED BILLS OF QUANTITIES				
SR.NO.	***ITEM NO.***	***PARTICULARS***	***UNIT***	***RATE***	***QUANTITY***	***AMOUNT***
6.13	R2-CS-SS-18	Providing, fabricating, welding and fixing 1.0m high MS pipe hand railing, weight 10 to 12 kg per Rmt including all necessary fixtures, holdfasts, supports and painting with one coat of red oxide zinc chromate primer and two coats of approved synthetic enamel paint etc complete as directed by Engineer In Charge.	Rmt	983.00	256	251,648.00
6.14	FA-2014-MA-09	Providing and fixing Toilet Mirror of required size, cwith 6mm thick mirror of float glass of approved make, and fixed over 12 mm thick marine ply for backing, including brass plates [KAN] 4 nos. to hold the mirrors on the wall fixed with S.S. screws, Complete asper as per the instructions of the Engineer in charge. (Minimum size 750mm X 750mm)	Sqm	3,532.00	27	95,364.00
6.15	R2-CS-SS-09	Providing and fixing G.I. barbed wire fencing of 14guage having 2 ply and 4 points at 75mm c/c in the rows and with vertical supports as specified below embeded 0.45m in the concrete block of size 0.3x0.3x0.5m, and 1.55 m above the same spaced at 2.5m c/c within clined stays of the same material at 20m c/c fixed in M15 grade cement concrete base block having dimension 0.3x0.3x0.5m, including cross wires in each bay, necessary excavation, backfilling and curing etc. complete as directed by Engineer In Charge.				
6.15.1	R2-CS-SS-09-a	With MS Angle 45x45x6mm including painting with one coat of anti-corrosive paint, and two coats of approved enamel paint.and 10 rows of Barbed wire.	Rmt	784.00	297	232,848.00
6.16	R2-CS-SS-16	Providing, detailing, and fabricating as per specifications, transporting to site and erecting MS Openable / Sliding / Ornamental Entrance Gates including track and wheel, locking arrangement, fixing bolts, nuts, washers, cleats, stiffeners, gussets decorative balusters, arrow heads etc. and all necessary operations like traightening, bending, cutting, drilling, grinding, machining if specified, welding etc. complete weighing 60 to 65 kg/Sqm, including cleaning, Grinding and removing the welding burr and preparing surface and applying one coat of red oxide zinc chromate primer and one coat of Synthetic Enamel paint after fabrication and second coat of Synthetic Enamel paint after erection, with approved colour, shade and brand etc. including touching up with primer etc. complete as directed by Engineer In Charge.	Sqm	7,834.00	80	626,720.00
6.17	R2-CS-WW-31	Providing and fixing fire doors with 2 hour fire rating conforming to IS: 3614 (Part 2), BS 476 (Parts 20 & 22), ISO 834 ; 45 mm thick fully flush, double skin door shell with lock seam joints at stile edges made from 1.25 mm thick galvanized steel sheet including door frames made from 1.6 mm thick galvanized steel sheet formed to double rebate profile of size 143 mm x 57mm as per manufacturer's instructions, door frames and shutter primed with Zinc Phosphate stoving Primer and finished with Polyurethane Aliphatic grade or epoxy paint including ironmongery consisting of stainless steel ball bearing butt hinges 3 mm thick fixed flush to the frame and shutter, full width horizontal handles (panic bar), concealed flush bolts, door closers, other standards fixtures and fasteners, etc. complete for the following clear opening sizes: Item to include all necessary fixtures and fastenings [fire rated] including heavy duty SS hinges min 4 per shutter, tower bolts, door stoppers, handles, mortise lock, push plates, kick plates, door closers, etc. Complete. Single leaf shutter without glass vision panel.	Sqm	24,564.00	54	1,326,456.00

PATWARDHAN PARK AT MUMBAI						
		PRICED BILLS OF QUANTITIES				
SR.NO.	***ITEM NO.***	***PARTICULARS***	***UNIT***	***RATE***	***QUANTITY***	***AMOUNT***
6.18	R2-CS-SL-05	Providing and fixing rolling shutters made out of 18 gauge steel sheets for curtains, including bottom rail, 100 mm wide guide channels for opening width up to 4.0m and 150mm wide guide channel for opening width more than 4.0m, lock plates, locking arrangement on both sides, fixing bolts, pulling handles, MS hood of appropriate size, rolling arrangement, standard make springs in brackets etc. including fixing of frames with rag bolts, grouting of parts in position etc. and also including two coats of red oxide zinc chromate primer and two coats of synthetic enamel paint of approved colour, shade and brand etc. complete as per IS:6248 / specifications and as directed by Engineer In Charge. The shutter should withstand wind pressure of 47meters per second.	Sqm	3,534.00	75	265,050.00
6.19	R2-CS-AW-18	Designing, fabricating, testing, installing and fixing in position Curtain Wall with Aluminium Composite Panel Cladding, with open grooves for linear as well as curvilinear portions of the building , for all heights and all levels etc. including: a) Structural analysis & design and preparation of shop drawings for pressure equalisation or rain screen principle as required, proper drainage of water to make it watertight including checking of all the structural and functional design. b) Providing, fabricating and supplying and fixing panels of aluminium composite panel cladding in pan shape in metalic colour of approved shades made out of 4mm thick aluminium composite panel material consisting of 3mm thick FR grade mineral core sandwiched between two Aluminium sheets (each 0.5mm thick). The aluminium composite panel cladding sheet shall be coil coated, with Kynar 500 based PVDF / Lumiflon based fluoropolymer resin coating of approved colour and shade on face # 1 and polymer (Service) coating on face # 2 as specified using stainless steel screws, nuts, bolts, washers, cleats, weather silicone sealant, backer rods etc. c) The fastening brackets of Aluminium alloy 6005 T5 / MS with Hot Dip Galvanised with serrations and serrated washers to arrest the wind load movement, fasteners, SS 316 Pins and anchor bolts of approved make in SS 316, Nylon separators to prevent bi-metallic contacts all complete required to perform as per specification and drawing The item includes cost of all material & labour component, the cost of all mock ups at site, cost of all samples of the individual components for testing in an approved laboratory, field tests on the assembled working curtain wall with aluminium composite panel cladding, cleaning and protection of the curtain wall with aluminium composite panel cladding till the handing over of the building for occupation. Base frame work for ACP cladding is payable under the relevant aluminium item.s The Contractor shall provide curtain wall with aluminium composite panel cladding, having all the performance characteristics all complete , as per the Architectural drawings, as per item description, as specified, as per the approved shop drawings and as directed by the Engineer-in-Charge. However, for the purpose of payment, only the actual area on the external face of the curtain wall with Aluminum Composite Panel Cladding (including width ofgroove) shall be measured in sqm. up to two decimal places.	Sqm	4,228.00	68	287,504.00
		Note : The following performance test are to be conducted on ACP system if area of ACP system exceeds 4500 Sqm from the certified laboratories accreditated by NABL (National Accreditation Board for Testing and Calibration Laboratories), Department of Science & Technologies, India. The NIT approving authority will decide the necessity of testing on the basis of cost of the work, cost of the test and importance of the work.				

PATWARDHAN PARK AT MUMBAI						
		PRICED BILLS OF QUANTITIES				
SR.NO.	*ITEM NO.*	*PARTICULARS*	*UNIT*	*RATE*	*QUANTITY*	*AMOUNT*
6.20	R2-CS-AW-04	Providing and fixing in position aluminum louvered window with anodised aluminum frame of approved make and of size 40mm x 20mm x 2.0mm (wt. 0.605 kg/Rm) including adjustable aluminum frame, 4 to 6mm thk. frosted glass, fixtures and fastenings etc. complete as directed by by Engineer In Charge.	Sqm	4,246.00	4	16,984.00
		TOTAL OF JOINERY & METAL WORK				**3,556,140.00**
H	**CS-WP**	**WATERPROOFING WORK**				
7.1	R2-CS-WP-25	Providing and installing crystalline waterproofing treatment to inside surfaces of the water retaining structures	Sqm	2,537.00	922	2,339,114.00
		VERTICAL SURFACES :				
		a) Treatment shall consist of preparation of surfaces including 'V' grooves at junctions and joints, pressure grouting the same and curing for specified period.				
		b) Applying two coats of approved crystalline waterproofing compound at specified intervals as recommended by manufacturer and as directed by Engineer-in charge and allowed to cure.				
		c) Plastering of walls and finishing smooth with 15 mm thick cement mortar 1:4 (1 cement : 4 fine sand) admixed with approved waterproofing compound in recommended proportions.				
		HORIZONTAL SURFACES :				
		d) Laying of 30 mm average thick cement concrete of mix 1:2:4 (1 cement : 2 coarse sand : 4 coarse aggregate of 12.5mm nominal size) admixed with approved waterproofing compound in recommended proportions, on floors to required gradient, including rounding of corners / junctions with walls and floors etc., and finished smooth and cured.				
		Tank shall be tested by filling with water for required depth and maintaining it for 72 hrs. for checking the leakages. The rate includes giving 10 year guarantee for waterproofing on a Rs.100/- stamp paper in approved proforma.				
7.2	R2-CS-WP-3	Providing and laying water proofing treatment to vertical and horizontal surfaces of depressed portions of W.C., kitchen and the like consisting of : (i) Ist course of applying cement slurry @ 4.4 kg/sqm mixed with water proofing compound conforming to IS 2645 in recommended proportions including rounding off junction of vertical and horizontal surface. (ii) IInd course of 20 mm cement plaster 1:3 (1 cement : 3 coarse sand) mixed with water proofing compound in recommended proportion including rounding off junction of vertical and horizontal surface. (iii) IIIrd course of applying blown or residual bitumen applied hot at 1.7 kg. per sqm of area. (iv) IVth course of 400 micron thick PVC sheet. (Overlaps at joints of PVC sheet should be 100 mm wide and pasted to each other with bitumen @ 1.7 kg/sqm).	Sqm	994.00	369	366,786.00

PRICED BILLS OF QUANTITIES

SR.NO.	*ITEM NO.*	*PARTICULARS*	*UNIT*	*RATE*	*QUANTITY*	*AMOUNT*
7.3	R2-CS-WP-22	Providing and filling AAC bats (of size 40-60 mm) with cement mortar mixed in the ratio 1:3:6 (1 cement : 3 coarse sand : 6 block bats) including mixing of approved water proofing compound in recommended proportion for W.C., bath and kitchen. The laid brick bat mix shall be well rammed and compacted as required. Further surfaces shall be screeded with cement concrete mix 1:1.5:3 (1 cement : 1.5 coarse sand : 3 stone grit of size 6 mm and below by volume) admixed with approved integral water proofing compound in recommended proportion, laid to an average thickness of 25mm and finished smooth or ready to receive finish material as specified. Care shall be taken prior to filling all pipes passing through sunk portion such that the pipes are pressure tested by maintaining pressure for 24 hours and junctions of pipes passing through walls, slabs are well grouted and sealed. This shall be tested by ponding water for required depth and maintaining for 7 days.(Rate includes cost of brick bats, cement mortar, top screed, labour charges for working at all levels, leads and heights). For payment the area of sunken slab and the depth of filling including the thickness of screed shall be measured.	Cum	13,300.00	26	345,800.00
7.4	PTW-CIVIL-2	Designing, providing, installing Membrane waterproofing system below RCC foundation / raft / Retaining wall. System should create 100% water tight and chemical barrier around the structure. All complete to approval of Engineer in-charge and system shall be guaranteed for 10 years on approved stamp paper. System recommended and specified are as under.	Sqm	1,300.00	15065	19,584,500.00
		Providing and laying a positive side waterproofing treatment to basement rafts & confined retaining walls after proper surface preparation over PCC, removing loose concrete, foreign material, standing water and providing lean RCC wall against shore pile surface to make the surface uniform before applying a 1.2mm thick, pre-applied, fully bonded HDPE sheet membrane having UV exposure limit of 56 days of approved make to convenient length by cutting wherever necessary, carefully align the membrane over blind concrete and fix on vertical shuttering using appropriate flat heading fixing sealed later with double sided adhesive tape and roll it out with removable plastic release liner side facing uppermost (against which fresh liquid concrete shall be poured) and white HDPE face towards leveled substrate (PCC fro Raft & Uniform Lean wall/Plum concrete surface for confined retaining wall), lay adjacent sheets by keeping overlap of standard 75 mm, end overlaps to be treated using double sided coated adhesive tape etc. complete. "Mechanically bonded membranes/Membrane with mesh or geotextile on top not permitted ".				
		Membrane shall form integral and permmanent bond to poured concrete and capable of preventing water migration between membrane and structural concrete, be chemically resistant in all types of soil or water, has zero permenance to moisture, is solar reflective to reduce heat gain while exposed, shall not activate prematurely due to wet conditions and remain unaffected by ground settlement beneath slabs.The membrane along with ancillaries shall be BBA Certified for basement Grades 1,2&3 to BS 8102:2009. All systems to be installed as per manufacturer's recommendations, etc. complete with all lead and lift for all materials and labour and as directed by Engineer in-charge.				

PATWARDHAN PARK AT MUMBAI						
		PRICED BILLS OF QUANTITIES				
SR.NO.	***ITEM NO.***	***PARTICULARS***	***UNIT***	***RATE***	***QUANTITY***	***AMOUNT***
		The fully bonded HDPE sheet waterproofing membrane shall have following minimum properties : 1) Resist hydrostatic pressure of > 70 m head of water (as per ASTM D5385 modified) 2) Peel adhesion to concrete- 880 N/mm (as per ASTM D903 modified) 3) Puncture Resistance – 950 N minimum (as per ASTM E154) 4) Tensile Strength, Film – 27 MPa minimum (as per ASTM D412) 5) Elongation - 300% minimum (as per ASTM D412 modified)				
		Also rate shall inclusive of followings				
		Sealing of Pressure- Release Pipes: The Pressure-Release Pipes penetrations will be sealed all around on the HDPE sheet membrane at PCC level with a 2 component asphalt modified urethane liquid membrane, hydrophilic water stop & a double sided adhesive tape (applied by original manufacturer's approved installer), as per drawing. All systems to be installed as per manufacturer's recommendations, etc. complete with all lead and lift for all materials and labour and as directed by Engineer in-charge.				
		Sealing of pre-stressing ground anchor penetration, 32 mm diameter all around on the HDPE membrane with a 2 component asphalt modified urethane liquid membrane, (applied by original manufacturer's approved installer). All systems to be installed as per manufacturer's recommendations, etc. complete with all lead and lift for all materials and labour and as directed by Engineer in-charge.				
		Supply and installing Elastomer & hydrophilic resin based water stop of (20 x 10) mm fixed with nailing or MS Polymer adhesive, having good all-round chemical resistance, capable of delayed initial swelling and reversible swelling in case of wet-dry cycles, (installed by original manufacturer's approved installer) at required locations such as (i) Junction of raft/retaining wall & (ii) at all other locations as mentioned in drawings All systems to be installed as per manufacturer's recommendations, etc. complete with all lead and lift for all Materials and labour and as directed by Engineer in-charge.				
7.5	R2-CS-WP-26	Providing & applying membrane waterproofing treatment to podium / landscape area consisting of following operations:	Sqm	2,301.00	8755	20,145,255.00
		a) Cementious based chemical waterproofing coating (two or more coats) of approved make, including preparation of surfaces to receive chemicals, treatment and curing.				
		b) Light weight concrete of density 450 kg/cum (for non traffic area) and of minimum 75 mm thickness at draining point and rest area sloped to drain water as detailed in drawing.				
		c) Slope shall be developed with required density mix to suite the type of traffic expected.				
		d) 3.0 mm thick APP Polymer modified polyester black finished reinforced with glass fibre matt sheet, laid over a coat of bitumen primer having density 0.87-0.89 kg/litre and Viscosity 70- 160cps at 25 degrees C, @ 0.4 litre / sqm. Over the primer coat the layer of membrane shall be laid using Butane Torch and sealing all joints etc., and preparing the surface to receive top protective coat, complete.				
		e) Top protective layer comprising of 30 mm thick water proof screed in 1:4 cement mortar mix (1 Cement :4 Coarse sand) admixed with approved water proofing compound as specified by the manufacturer or as directed by E-I-C, spread over entire terrace area and finished to receive Architectural finish.				
		f) The vertical vertical surfaces shall be plastered with 12 mm thick cement mortar 1:4 (1 Cement :4 Fine sand).				

SR.NO.	*ITEM NO.*	*PARTICULARS*	*UNIT*	*RATE*	*QUANTITY*	*AMOUNT*
		g) Work shall include adding Polypropylene mesh fibers with Microban to mortar in proportion recommended by the manufacturer with use of approved products and work carried out as per manufacturer's specifications and directions of Engineer-in charge. The rate shall include cost of all materials specified above, preparation of the surface, its application, testing by ponding of water for 72 hours etc. and labour charges for working at all leads and heights. The rate includes giving guarantee for 10 years on Rs.100/- Stamp paper in approved proforma .				
		TOTAL OF WATERPROOFING WORK				**42,781,455.00**
I	**CS-PN**	**PAINTING WORK**				
8.1	R2-CS-PN-3	Providing and applying first single coat of approved primer and two coats of acrylic distemper (oil bound distemper) of an approved make and colour as per manufacturers specifications to any surface, at all height and locations as directed including scaffolding, cleaning and preparing surfaces for painting with broom by any approved means, etc. complete as directed by Engineer-in-charge. (Location: Internal walls & Ceiling)	Sqm	98.00	41155	4,033,190.00
8.2	R2-CS-PN-4-a	Providing and applying first single coat of approved primer and two coats of synthetic enamel paint/flat oil paint of an approved make and colour as per manufacturers specifications to surfaces specifird below, at all height and locations as directed including scaffolding,cleaning and preparing surfaces for painting by any approved means etc. complete as directed by Engineer-incharge.	Sqm	153.00	50	7,650.00
8.3	R2-CS-PN-7	Providing and applying single coat of an approved make primer for waterproof cement paint as per manufacturers specifications to the smooth surface, upto 10m height from ground level and at all locations as directed including preparing surfaces for painting by any approved means, watering, scaffolding, cleaning and curing etc. complete as directed by Engineer-in-charge. (Location: Ducts)	Sqm	55.00	998	54,890.00
8.4	R2-R2-CS-PN-12	Providing and applying first single coat of approved primer and two coats of anti-algal, anti-fungal, exterior paint as specified below of an approved make and colour as per manufacturers specifications to any surface, upto 10m height from ground level and at all locations as directed including preparing surfaces for painting by any approved means, watering, scaffolding, cleaning and curing etc. complete as directed by Engineer-in-charge.				
8.4.1	R2-CS-PN-12-a	By using acrylic based exterior paint	Sqm	177.00	211	37,347.00
8.5	CE3-05-001-8.1	Providing and applying synthetic enamel paint or flat oil paint in any requiered shade in 3 coats over a primer coat as per manufacturers specifications including scrapping, cleaning the surface etc. Complete. (Location : Rain Water Harvesting Tank)	Sqm	60.00	50	3,000.00
		TOTAL OF PAINTING WORK				**4,136,077.00**
J		**MISCELLANEOUS WORK**				
		Corner Guard				
9.1	CE1-7-18-2P5B	Providing and fixing brush SS vertical corner protection guard along the convex corner edges of the columns, walls, partitions as directed, of the section of size 50mmx50mm, heavy gauge thickness, upto 1320 mm length with SS countersunk screws including making the wall surface good etc. complete.	Rmt	2,100.00	2074	4,355,400.00

PATWARDHAN PARK AT MUMBAI						
		PRICED BILLS OF QUANTITIES				
SR.NO.	***ITEM NO.***	***PARTICULARS***	***UNIT***	***RATE***	***QUANTITY***	***AMOUNT***
9.2	PTW-CIVIL-3	Design, Manufacture, Supply and Installation of dpi system, a complete assembly of co-extruded UV protected 22mm thick multi-layered polycarbonate panels with angular walls incorporated into a complete system in roof skylights / canopy areas. Panels shall have 7 layers with angular walls in opaque and translucent clear combination as per required Lux Level inside the building. Panels shall be with grip-lock notch standing seam running lengthwise to accommodate the connectors. Panel system shall be assembled & installed on MS Structure (paid separately) with self-drilling screws in a continuous dual-web aluminium I-beam with gripping the panel width on both sides with a snap on aluminium connector on top. The system shall ensure the mechanical strength, water tightness and air tightness of the roof as per below: Panel length: 11980mm (Max.) Width: 1200 mm Inclination: 5 degrees (Min.)	Sqm	7,074.00	282	1,994,868.00
		Dual web Aluminium I-beam assembly shall have a pull-out load of 21 KN (min) when tested as per ISO 6892:1998 and IS 1608:2005. Panels shall pass dart drop impact test as per IS 14443-97, shall show no sign of breakage on olycarbonate sheets which have been exposed to UV for a min. of 500 Hours as per ASTM G 155. Panels shall not have Yellowness Index as per ASTM D 1925 of 15 units when tested on a sample exposed to UV for 500 Hours as per ASTM G 155.Panel shall be with additional End cap/Aluminium U / F Profile / Glazing Bar (mill finish) for ends as required. Panel shall be fixed over MS structural steel / MS purlin (paid separately) conforming to the detail technical specifications as per approved architectural drawings.				
9.3	PTW-CIVIL-14	Providing and fixing Emergency exit servokat recess cover suitable for A 15 load class of size 1500 x 4500 mm. made up of Galvanised steel as shown in the drawing	Nos.	3,355,116.00	3	10,065,348.00
9.4	CE4-16-007-FA-130	Providing & fixing Speed breakers width of 350mm made with high quality rubber and fixing firmly with surface benith by screwing of appropriate size screw with caps at the both ends and fixed at desired locations at per the instructions.	Rmt	3,140.00	360	1,130,400.00
9.5	RT-16-39	Supplying / fixing of Retro reflective road studs conforming to ASTM D-4280 designated 'H'; two way reflective marker in any colour inclusive of fixing on road surface with the use of adhesive as per specifications etc. complete, anywhrere in Greater Mumbai as directed by the Engineer	Each	355.00	2400	852,000.00
9.6	PTW-CIVIL-4	Suppy and Installation of CONVEX Mirror (Unbreakable) 32 Inch or 800mm with company fitting accessories Body ABS Mirror Polycarbonate with wall fitting Pole as directed by Engineer in-charge	Each	5,663.00	10	56,630.00
9.7	R2-CS-PS-175	Providing M.S. foot rests including fixing in manholes with 20x20x10 cm cement concrete blocks 1:3:6 (1 cement : 3 coarse sand : 6 graded stone aggregate 20 mm nominal size) as per standard design :				
	R2-CS-PS-175-b	With 20 mm diameter round bar	each	316.00	66	20,856.00
9.8		,				
	R2-CS-PS-178-III	Supplying and fixing C.I. cover without frame for manholes : 560 mm diameter C.I. cover (heavy duty) the weight of the cover to be not less than 108 kg	each	6,079.00	5	30,395.00
9.9	HE-11-8	Washing, Cleaning, Placing, Laying of 20mm metal/ aggregate etc.completed in all respect considering 25% loss of material and as directed by engineer.	Cum	969.00	11	10,659.00
9.10	HE-11-9	Washing, Cleaning, Placing, Laying of coarse sand 4.75 to 12 mm thick etc. completed in all respect considering 25% loss of material and as directed by engineer.	Cum	1,507.00	11	16,577.00
		TOTAL OF MISCELLANEOUS WORKS				**18,533,133.00**
K		**DISMANTLING & DEMOLISHING WORKS**				

PRICED BILLS OF QUANTITIES

SR.NO.	*ITEM NO.*	*PARTICULARS*	*UNIT*	*RATE*	*QUANTITY*	*AMOUNT*
10.1	R2-CS-DD-2	Demolishing R.C.C. work manually/ by mechanical means including stacking of steel bars and disposal of unserviceable material within 50 metres lead as per direction of Engineer - in-charge.	Cum	1,837.00	221	405,977.00
10.2	R2-CS-DD-3	Demolishing brick work in lime or cement mortar including plaster, paint, etc. manually/ by mechanical means including stacking of serviceable material and disposal of unserviceable material within 50 metres lead as per direction of Engineer-in-charge.	Cum	484.00	76	36,784.00
10.3	R2-CS-DD-21	Dismantling stone slab flooring laid in cement mortar including stacking of serviceable material and disposal of unserviceable material within 50 metres lead.	Sqm	150.00	1662	249,300.00
		TOTAL OF DISMANTLING & DEMOLISHING WORKS				**692,061.00**
M		**SIGNAGE**				
		GENERAL SIGNAGE				
11.1	PTW-CIVIL-05	Providing & fixing of heavy guage thick 2.5" x 2.5" MS Square Sections welded as Main frame as per design shape and pu coated with Pantone Black. Additional Framing 0.5" x 0.5" MS Square Sections claded over main frame from sides.Entire MS structure (Frame) shall be hot dipped galvanized after complete fabrication.1.2mm thick 316 Grade Horizontal brushed finished Stainless Steel claded over MS Frame from all the sides (as per design.Content Text as etched and reverse etched filled with PU 90% Black as per artwork on Stainless Steel plate.Fixing of signage with 8mm thick MS base plate with appropriate nos. of anchor fasteners & nut bolts to required size of concrete footing.Aluminum edges also to be Pu coated. Sided - Double Sided	Sq Inch	47.00	59724	2,807,028.00
11.2	PTW-CIVIL-06	Providing & fixing of 2" x 2" Alumium Sections joined as Main frame as per design shape. 1.2mm thick 316 Grade Horizontal brushed finished Stainless Steel claded over MS Frame from all the sides as per design. Content Text as etched and reverse etched filled with PU 90% Black as per artwork on Stainless Steel plate.Fixing of signage with key hole & L clamp fixing details. Sided - Single Sided	Sq Inch	33.00	1440	47,520.00
11.3	PTW-CIVIL-07	Providing & fixing of 2.5" x 2.5" Aluminium Square Sections joined as Main frame along with Additional Aluminium sections as required. 4mm thick Yellow ACP with 3M brand external grade Yellow Reflective claded over Aluminium Section framing from all the sides Hanging Strip as 2.5" x 2.5" x 96" Aluminum Section White pu coated with content and trips in Red reflective vinyl.Content Text and Symbols as 3M brand external grade Plotercut Reflective vinyl pantone as per design. Black non reflective 3M Brand external Grade Vinyl. Fixing of signage with L clamp and Key hole fixing details. Sided – Single sided Sign	Sq Inch	24.00	39600	950,400.00
11.4	PTW-CIVIL-08	Providing & fixing of base plate is 5mm thick Aluminum with Visible edges PU coated (Pantone match to 90% Black). 1.2mm thick 316 Grade Horizontal Brushed finished Stainless Steel plate with finished edges fixed over the Aluminum base with content etched .Content Text as etched and reverse etched filled with PU 90% Black as per artwork on Stainless Steel plate.Fixing of signage with Reverse Screw Fixing details. Aluminum edges also to be Pu coated. Sided - Single sided	Sq Inch	34.00	2560	87,040.00

PATWARDHAN PARK AT MUMBAI						
		PRICED BILLS OF QUANTITIES				
SR.NO.	***ITEM NO.***	***PARTICULARS***	***UNIT***	***RATE***	***QUANTITY***	***AMOUNT***
11.5	PTW-CIVIL-09	Providing & fixing of base is 5mm thick White Acrylic with plotter cut photominiscent sheet (with 8 hour + backup)pasted over the same.)content text & Symbol in 3M brand High grade Plottercut Green Vinyi Match to Pantone (Brilliant Green : is Shade 221). Protective coat of lacquer coating to be done after vinyl pasting.crylic edges also to be Pu coated.If the surface is rough then 2mm thick sunboard to be screw at the base and then signage to be fixed on the same.Content of the signage shall change as per floor and usage. Fixing of signage with 3M Double sided Tape	Sq Inch	19.00	1920	36,480.00
11.6	PTW-CIVIL-10	Providing & fixing of heavy guage thick 2.5" x 2.5" MS Square Sections welded as Main frame as per design shape and pu coated with Pantone Black. Additional Framing 0.5" x 0.5" MS Square Sections claded over main frame from sides.Entire MS structure (Frame) shall be hot dipped galvanized after complete fabrication.1.2mm thick 316 Grade Horizontal brushed finished Stainless Steel claded over MS Frame from all the sides as per design.Content Text as etched and reverse etched filled with PU 90% Black as per artwork on Stainless Steel plate.Fixing of signage with 8mm thick MS base plate with appropriate nos. of anchor fasteners & nut bolts to required size of concrete footing. Aluminum edges also to be Pu coated. Sided – Single sided	Sq Inch	42.00	13824	580,608.00
11.7	PTW-CIVIL-11	Providing & fixing of 4" x 4" Aluminium Square Sections joined as Main frame along with Additional Aluminum sections if required. 4mm Thick external grade ACP (Pantone Black) shall be cladded over Entire frame with external High Grade 3M Brand Reflective Vinyl (Pantone Yellow) pasted over front face of signage.Content Text in external High Grade 3M Brand Reflective Vinyl (Pantone Black).Appropriate Quantity And Quality Of Rope Wire To Be Used For Fixing To Withhold The Signage With Ceiling Considering Weather And Site Background Conditions.Fixing to be rechecked as per site conditions.	Sq Inch	29.00	33552	973,008.00
11.8	CE-16-ABSA-VJU-142	SITC of Providing LED Based Fire Exit Signages with Battery Pack & associated accessories, Photoumiscent Autoglow Green Colour with Marking FIRE EXIT or Directional Arrow. 24V DC driven. Shall Operate on 230 V AC. Battery back up 1.5 hours. Signage to be approved from client/architect/PMC	NOS	9,243.00	15	138,645.00
11.9	PTW-CIVIL-12	Providing & fixing of Base plate is 4mm thick Aluminum with Primer and PU Coat (Pantone match to 90% Black) coated on visible front surface and side edges.2mm thick Aluminum with Primer and PU coated (Pantone Signal Red : IS Shade 537) on Visble side edges of the plate. Plottercut Photoluminiscent sheet (8 hours backup) Pasted over top plate and content in reverse screen print (Pantone Signal Red : IS Shade 537) as per design printed over same. content / artwork shall be reverse screen printed with precised matching of color Red (Signal Red : IS Shade 537) the same shall be coated with protective glossy lacquer coating. The signage shall be fixed with reverse screw fixing details.Edges to be colored as per given details and material brands to used as per shared details.	Sq Inch	46.00	1440	66,240.00

PATWARDHAN PARK AT MUMBAI						
		PRICED BILLS OF QUANTITIES				
SR.NO.	***ITEM NO.***	***PARTICULARS***	***UNIT***	***RATE***	***QUANTITY***	***AMOUNT***
11.10	PTW-CIVIL-13	Providing & fixing of 4mm thick External Grade ACP (Pantone Match to 90% Black) is claded over MS Square Section Frame. The Edges are well finished. 2" x 2" MS Square Section Section joined as frame along with additional MS Square Section frame as required. 3mm thick Aluminum with Primer and PU coated (Pantone Green - Brilliant Green : IS Shade 221) on Visble side edges of the plate. Plottercut Photoluminiscent sheet (8 hours backup) Pasted over top plate and content in reverse screen print (Pantone Green - Brilliant Green : IS Shade 221) as per design printed over same. Content / artwork shall be reverse screen printed with precised matching of color Green - Brilliant Green : IS Shade 221 as per design) the same shall be coated with protective glossy lacquer coating Signage shall be fixed with Key hole fixing details.Sided – Double Sided	Sq Inch	18.00	1440	25,920.00
		TOTAL OF SIGNAGES				**5,712,889.00**
N		**PLUMBING WORK**				
1.1	R2-CS-PS-243	P/F white wall hung WC hindware with necessary cantilever/chair bracket with nut bolt etc. complete directed by EIC..(White color Wall Hung EWC Model No. 20024 OR consider equivalent make	Nos	10088	11	110,968.00
1.2	R2-CS-PS-295	White Vitreous China of 'Hindustan & Parryware' make or equivalen under counter type Oval wash basin of size 550 x 480mm with CI brackets suitable for mounting below granite counter including waste fitting with CP brass bottle trap, angle valve with CP connection etc as specified. Oval Wash Basin Model No.10051 OR consider quivalent make.	Nos	8192	16	131,072.00
1.3	R2-CS-PS-246	Supplying & Fixing Hindware make flat back Urinal rear inlet with urinal flush valve of Jaquar make including CP SS dome shaped grating C.P. west coupling, CP spreader, CP `P' trap.(Urinal White color Model no.60002, Jaquar Make Push Type Valve Cat.No.PRS-077 OR consider equivalent make)	Nos	7267	8	58,136.00
1.4	R2-CS-PS-130-a	Providing and fixing C.P. brass stop cock (concealed) of standard design and of approved make conforming to IS:8931.15 mm nominal bore	Nos	950	18.00	17,100.00
1.5	R2-CS-PS-247	Providing and fixing JAQUAR MAKE, PRESSMATIC Taps Model No. 031 Pillar cock Auto closing system etc complete	Nos	2834	16	45,344.00
1.6	R2-CS-PS-302	Providing & fixing 2-way Bib cock JAQUAR MAKE, ORNAMIX Model No. 10041 etc. complete.	Nos	2578	50	128,900.00
1.7	R2-CS-PS-204	Providing and fixing Health Faucet with one metre long easy flex tube in chrome finish and wall flange.	Nos	1513	16.00	24,208.00
1.8	R2-CS-PS-1-a	White Vitreous china Orissa pattern W.C. pan of size 580x440mm with integral type foot rests.	Nos	6314	1	6,314.00
1.8	R2-CS-PS-257	Providing and fixing GLITTERS MAKE, SLOPE series Robe hook etc complete	Nos	788	16	12,608.00
1.9	R2-CS-PS-259	Providing & Fixing 100mm diameter Nahani trap Jali in steel finish with necessary fixing required to make the item well functional.	Nos	356	21.00	7,476.00
110	R2-CS-PS-68-a	Providing and fixing PTMT Bottle Trap for Wash basin and sink Bottle trap 31 mm single piece moulded with height of 270mm, effective length of tail pipe 260mm from the centre of the waste coupling 77mm breadth with 25mm minimum water seal, weighing not less than 260gms.	EA	408	16	6,528.00

PATWARDHAN PARK AT MUMBAI						
		PRICED BILLS OF QUANTITIES				
SR.NO.	***ITEM NO.***	***PARTICULARS***	***UNIT***	***RATE***	***QUANTITY***	***AMOUNT***
2.0		**WATER SUPPLY SYSTEM**				
2.1		**Piping**				
2.1.1	R2-CS-PS-85	Providing and fixing Chlorinated Polyvinyl Chloride (CPVC) pipes, having thermal stability for hot & cold water supply, including all CPVC plain & brass threaded fittings, including fixing the pipe with clamps at 1.00 m spacing. This includes jointing of pipes & fittings with one step CPVC solvent cement and testing of joints complete as per direction of Engineer in Charge.				
2.1.1.1	R2-CS-PS-85-a	15mm nominal outer dia Pipes	Rm	206	50	10,300.00
2.1.1.2	R2-CS-PS-85-b	20mm nominal outer dia Pipes	Rm	261	60	15,660.00
2.1.1.3	R2-CS-PS-85-c	25mm nominal outer dia Pipes	Rm	279	60	16,740.00
2.1.1.4	R2-CS-PS-85-d	32mm nominal outer dia Pipes	Rm	374	35	13,090.00
2.1.1.5	R2-CS-PS-85-e	40mm nominal outer dia Pipes	Rm	567	15	8,505.00
2.1.2	HE-7-1	Supplying G.I C Class Pipes having embossed ISI mark on it and Conforming to IS: 1293part (Latest Edition) of the following diameter including all local and central taxes,octroi,inspection charges, transportation to stores etc complete in all respect as directed by Engineer in Charge. Note : Only MCGM approved GI pipe brands shall be used, all pipe and pipe fittings shall be C class (heavy grade) having ISI marking				
2.1.2.1	HE-7-1-H	80mm	Rm	651	100	65,100.00
2.1.3		Supply & installation of Ball valve				
2.1.3.1	ME-9-41-e	15mm	Nos	1861	2	3,722.00
2.1.3.2	CE4-07-089-F25	20mm	Nos	1528	3	4,584.00
2.1.3.4	SG-FA-FF-39	32mm	Nos	950	4	3,800.00
2.1.3.5	ME-9-41-c	40mm	Nos	3100	3	9,300.00
2.1.4	FAIR-PN-94	SITC of water level regulator for water pumps with high level and low level water float switches, sensor electrical and mechanical accessories as per attached specifications.of P/North ward office building at C.S. no.769(pt.) of Malad division at Adarsh Society road & Mamlatdar Road, Liberty garden, Malad (West), Mumbai-67.	Nos	31838	4	127,352.00
2.1.5	CE4-07-010-C596	Providing and fixing approved ISI marked make CI flanged water meters direct reading type calibrated in litres & kilolitres tested and approved by MCGM with dirt box (strainer) including making necessary flanged joints, testing etc. complete for 50mm size.	Nos	16000	1	16,000.00
		50 mm size				
2.2		**Miscellaneous**				
2.2.1	CE4-07-060-FA2-773	Providing and fixing best Indian make CP brass air valves with isolation valve fixed on GI lines:20mm n.b air valve with 20 mm isolation valve.	No	800	2	1,600.00

PATWARDHAN PARK AT MUMBAI						
		PRICED BILLS OF QUANTITIES				
SR.NO.	***ITEM NO.***	***PARTICULARS***	***UNIT***	***RATE***	***QUANTITY***	***AMOUNT***
2.2.2	HE8-14-030.001.F6	Supply of 5000 liter capacity HDPE water Tank. Mounting structure material of 5 meter height with accessories like M.S., G.I pipes, elbow, Tee, Nipple, S.S. Clamp etc for water supply to chowkey,W.C. unit, Bath rooms. as mentioned in the detail technical specification.	No	76500	1	76,500.00
3.0		**INTERNAL DRAINAGE SYSTEM**				
3.1		**Soil & waste systems**				
3.1.1		Providing and laying in position to required gradient UPVC soil and waste line with necessary specials as per IS. Pipes to be hung from floor slab to required slope with enough strong brackets / suspendures as directed by Engineer in charge.				
3.1.1.1	CE4-09-044.FA257	100 dia	Rm	750	65	48,750.00
3.1.1.2	CE4-09-044.FA258	75 dia	Rm	520	115	59,800.00
3.1.1.3	CE4-09-044.FA259	50 dia	Rm	275	78	21,450.00
3.1.1.5	CE4-09-044-FA82A	32 mm	Rm	761	35	26,635.00
3.1.2		Supplying, lowering, laying and jointing in trenches C.I. Class 'LA' , S/S pipes conforming to IS:1536 with CI / MS specials of following diameter including chamfering cut edges of pipes for specials and fixing with Styrene Butadiene Rubber (SBR) gaskets conforming to IS:5382 & IS:12820 in proper position, grade and alignment etc complete in all respect and as directed by Engineer in Charge including conveyance of material from any municipal stores in Greater Mumbai to site of work, including cost of jointing materials and rubber rings labour, giving hydraulic testing upto 6 kg/sqm pressure etc complete as directed by Engineer in Charge				
3.1.2.1	HE-1-3-b	100 mm	Rm	1346	550	740,300.00
3.1.3	SO4-07-016-02-357	Providing and fixing C.P. Brass heavy quality gratings (3mm thick) for floor drains of ACO GeMTRany make including making necessary recessment grouting with neat cement all complete to the satisfaction and direction of the Engineer-in-charge.	Nos	1150	100.00	115,000.00
3.1.4		Providing and fixing cast brass clean out plugs with suitable inset keys screwed to CI sockets in CI LA class/C I Centri pipes lines complete as per specification.				
3.1.4.1	CE4-09-036-FAE453	100 mm dia	Each	1000	5	5,000.00
3.1.4.2	CE4-09-036-FAE454	75 mm dia	Each	650	10	6,500.00
4.0		**Rain water system**				
4.2		Providing and laying non-pressure NP2 class (light duty) R.C.C. pipes with collars jointed with stiff mixture of cement mortar in the proportion of 1:2 (1 cement : 2 fine sand) including testing of joints etc. complete				
4.2.1	R2-CS-PS-168b	150mm dia. R.C.C. pipe	Rm	473	400.00	189,200.00
4.2.2	R2-CS-PS-168c	250 mm dia. R.C.C. pipe	Rm	813	590.00	479,670.00
4.4						
		TOTAL OF PLUMBING WORK				**2,613,212.00**

ELECTRICAL
BOQ

	ABSTRACT OF COST FOR ELECTRICAL WORKS					
Item No	**Item Code**	**Description of Item**	**Unit**	**Qty**	**Total Rate**	**Total Amount**
		2	**3**	**4**		
1		**Compact Sub Station**				
		Compact Sub Substation will have the following equipments:				
	FAIR-PN-59	**Compact Sub Station (CSS)**	Each	1	3,254,906.00	3,254,906.00
		HT SWITCHGEAR [SF6 Insulated VCB Switchgear]				
		11kV 400Amps 21KA/3 sec. Non-Extensible Ring Main Unit Compact switchgear with Copper busbar consisting of (1 ICOG) manual operation in robotically welded having IP67 in SF6 encapsulated stainless steel 304 grade enclosure of thickness 2.5mm. with series trip, self powered microprocessor based numerical over current and earth fault relay protection				
		Relay (50,50N,51,51N) with RS 485 Port.				
		IDMT RELAY– Self Powered, Microprocessor based numerical 3 Nos. O/C +1 No. E/F (with inbuilt tripping mechanism - my top or equivalent) with LCD display - ON/OFF/Trip. (Incomer breakers shall have bidirectional protection)				
		Protection CT shall be 100/1A 2.5VA 5P10.				
		Fault Passage Indicator for LBS with Short Circuit and Earth Fault Indication				
		Manometer and signal (1NO) from pressure indicator				
		Voltage Presence Indicator (L1, L2, L3) for each Module				
		Operating Handle				
		24V DC battery & Charger 12Ah Capacity				
		11KV Air insulating metering Panel of class 1.0 Accuracy.				
		Metering CT shall be 40/1A 2.5VA Class 1.0 Accuracy				
		Metering PT: 11000/root3/110v/root 3 50VA Class 1.0 Accuracy.				
		Digital Multifunction Meter with Class 1.0 Accuracy with RS 485 port				
		Space Heater in HT compartment				
	B	**TRANSFORMER**				
		630KVA 11KV/433V DYn11 Copper Wounded Cast Resin Dry Type Transformer with Off load tap links of +5% to -5% @2.5% with WTI scanner. Class of Insulation: H, Losses (Complying to ECBC norms).				
		LVS PANEL - 1000 AMPS ALUMINUM BUSBAR (100% FOR PHASE & 50% FOR NEUTRAL, CURRENT DENSITY- 0.8AMP/SQMM)				
	C	**INCOMER FROM TRANSFORMER**				
		1000Amps 415V 50KA 4P MCCB with microprocessor based release for over current ,short circuit and earth fault protection.				
		Digital Multifunction Meter with Class 0.5 Accuracy with RS 485 port				
		R,Y,B,ON/OFF/TRIP Indications.				
	D	**OUTDOOR ENCLOSURE**				
		Outdoor type enclosure housing above items (A,B&C) having construction of Galvanised Sheet Steel with combination of 2mm thickness for load bearing member and 1.5mm with Non Load bearing member with 4mm HRCA base frame. The Enclosure shall have IP54 degree of protection for HT & LT switchgear compartment & IP23 degree of protection for Transformer compartment. The enclosure shall be Powder Coated (Colour Light Gray). Each compartment will be provided with the door and pad locking arrangement. The Compartment illumination lamp with door operated switch shall be provided for MV & LV compartment. Seperate Switch operated Bulket lamp + Hooter in transfromer compartment.				
	E	**INTERCONNECTION AND EARTHING**				
		Interconnection Between HT switchgear & Transformer using 1Cx3x95 Sq.mm XLPE Single core Aluminium cable & Interconnection between Transformer & LT switchgear using AL. Busbars. Internal earthing connections by using 50 x 6mm GI strips including Transformer neutral.				
	Notes					
	1	Packge Sub-Station is outdoor plinth mounted type. Erection , and Civil work for package substation will part of client scope however foundation details will be furnished by vendor.				
	2	Package Sub-staion will be complete with the internal interconnections & earthing. Accessories required for the external connections of HT & LT cables like termination kits, lugs, glands etc.				
1A	**MR**	**DIESEL GENERATING SET**				
1.1	PTW-ELE- 1	Supply, installation, testing and commissioning of : 500 KVA / 400 KW at 0.8 PF 415V 3 Ph 50 Hz Diesel Generating Set in AE continuously rated for unlimited no. of hours @ 75% load factor and meeting the requirements laid down the data sheets & specifications including all accessories complete with:	Each	1	4,177,200	**4,177,200**
		i) High efficiency residential duty silencer, connecting piping, insulation and cladding, flexible connections				
		ii) Integral microprocessor based engine control				
		iii) Starting battery & leads.				
		iv) Vibration isolators & pads as specified and shown on data sheets 'and drawings.				

Item No	Item Code	Description of Item	Unit	Qty	Total Rate	Total Amount
		2	3	4		
		v) Acoustic enclosure				
		vi) 1000A TP Isolator				
		Note: Complete DG Set as a whole, is to be mounted on a heavy duty steel common skid with designated lifting points				
1.2	PTW-ELE- 2	150mm dia exhaust chimney M.S complete with	Mtr	4	2,360	**9,440**
		i) Self supporting base with access door				
		ii) Discharge cowl.				
		iii) Connections to engine exhaust pipe				
		iv) Lightning conductor				
		v) Drain pipe				
1.3	PTW-ELE- 3	100mm thick white wool insulation with aluminium cladding over the exhaust duct / chimney as specified	Mtr	4	1,180	**4,720**
2.0		**MV PANELS**				
2.1		Supply, installation, testing and commissioning of cubicle type panels as per specifications and shown on drawing. i) Main busbars with bar type feeder connections & all internal wiring and connections. ii) Earthing all components, frame etc. to a common internal earth bar. iii) Painting all sheet metal works. iv) All accessories & supporting structure. v) Brass glands for sending and receiving ends suitable for cable sizes mentioned in SLD. (Crimping lugs forming part of the termination) vi) All ammeters with C.T's and voltmeter and energy meters with necessary fuses. (All meters shall be digital) vii) Panel components as specified. viii) MS base frame. ix) All switch gear to have short circuit levels as specified. x) Space heaters with thermostat. xi) Bus bars shall be designed for easy extension in future on either side.				
2.1.1	PTW-ELE- 4	**Main LT Panel** complete as specified & shown in the drawing L571-E-501	Each	1	1,716,900	1,716,900
2.1.2	PTW-ELE- 5	**Capacitor Power Panel** for Main LT Panel complete as specified & shown in the drawing L571-E-501	Each	1	244,850	244,850
2.1.3	PTW-ELE- 6	**Normal Lighting and Small Power Panel** complete as specified & shown in the drawing L571-E-501	Each	1	96,170	96,170
2.1.4	PTW-ELE- 7	**Emergency lighting Power Panel**-**Lower ground** complete as specified & shown in the drawing L571-E-501	Each	1	33,630	33,630
2.1.5	PTW-ELE- 8	**Landscape Lighting Panel**- **Ground** complete as specified & shown in the Drawing L571-E-501	Each	1	77,290	77,290
2.1.6	PTW-ELE- 9	**Emergency Landscape Lighting Panel**-**Ground** complete as specified & shown in the drawing ABC-EL-606	Each	1	53,867	53,867
2.1.7	PTW-ELE- 10	**Landscape Lighting Feeder Pillar**- **Ground** complete as specified & shown in the Drawing L571-E-501	Each	4	56,050	224,200
2.1.8	PTW-ELE- 11	**DG Panel** complete as specified & shown in the drawing L571-E-501	Each	1	697,734	697,734
2.1.9	PTW-ELE- 12	**PHE Panel** complete as specified & shown in the Drawing L571-E-501	Each	1	286,150	286,150
2.1.10	PTW-ELE- 13	**FIRE Pump Panel** complete as specified & shown in the Drawing L571-E-502	Each	1	418,310	418,310
2.1.11	PTW-ELE- 14	**sump Pump Panel** complete as specified & shown in the Drawing L571-M-201	Each	7	45,666	319,662
3.00		**ISOLATORS / SWITCHES:**				
3.1		Supply, installation, testing and commissioning of circuit breakers / isolator / SFU complete with i) Galvanised & painted steel enclosure to IP44 ii) SC rating as specified iii) Suitable for connecting cables as shown in SLD at incoming & outgoing side as specified & shown on drgs. L501-E-501				
3.1.1	PTW-ELE- 15	32A 4P ELMCB (100mA)	No.	2	3,481	6,962
3.1.2	PTW-ELE- 16	32A 4P MCB (10KA)	No.	2	2,891	5,782
4.00		**DISTRIBUTION BOARDS**				

Item No	Item Code	Description of Item	Unit	Qty	Total Rate	Total Amount
		2	3	4		
4.1		Supply, installation, testing & commissioning of 500V Distribution Boards as specified & shown on drawing with i) Copper busbars together with tapped neutral bar for individual phases. ii) Copper earth strip iii) Interconnections and earthing. iv) Sheet steel enclosure suitable for recessed or surface mounting with hinged lockable doors interlocked with the incomer switch. v) Phase to phase isolation (PPI) in case of 3Ph boards. vi) Necessary support frame & painting, labeling, phase indicating lamps with fuses etc. complete. vi) Brass glands for sending and receiving ends suitable for cable sizes mentioned in SLD. (Crimping lugs forming part of the termination)				
4.1.1	PTW-ELE-17	Lighting Distribution Board (LDB) as specified & shown on drgs. consisting of Incomer: i) 1# 32A TPN MCB ii) 1 set phase indicating lamps with fuses. Outgoing: iii) 3# 25A DP ELMCB (30 mA) iv) 4 x 3 # (10A SP MCB)	Each	9	12,803	115,227
4.1.2	PTW-ELE- 18	Power Distribution Board (PDB) as specified & shown on drgs. consisting of Incomer: i) 1# 32A TPN MCB ii) 1 set phase indicating lamps with fuses. Outgoing: iii) 3# 25A DP ELMCB (30 mA) iv) 4 x 3 # (16A SP MCB)	Each	9	12,803	115,227
4.1.3	PTW-ELE- 19	Emergency Lighting Board (EDB) as specified & shown on drgs. consisting of Incomer: i) 1# 25A DP ELMCB ii) 1 set phase indicating lamps with fuses. Outgoing: iii) 12 # (10A SP MCB)	Each	9	9,027	81,243
5		**16SWG GI Junction Box Complete with Earthing terminal, Interconnection & wiring**				
5.1	ME-1-20	16 SWG G I Junction Box of various sizes For loop in loop out cables. Junction box shall have suitable no. of knock out for incoming & outgoing cables. Cables shall be terminated in 10A heavy duty connector. Cost of the connector shall be included in the cost of Junction box. Colour shade shall be RAL 7032 Siemens gray as per IS 5. (IP55)				
5.1.1	ME-1-20-a	50mm x 50mm x 50mm size GI Junction box with knock out & 10Amp. Connector block /strip	No.	2	224	448
5.1.2	ME-1-20-b	100mm x 100mm x 50mm size GI Junction box with knock out & 10Amp. Connector block /strip	No.	5	306	1,530
5.1.3	ME-1-20-c	75mm x 75mm x 75mm size GI Junction box with knock out & 1 No. 5Amp. SP switch for local ON, OFF operation	No.	2	297	594
5.1.4	ME-1-20-d	100mm x 100mm x 50mm size GI Junction box with knock out & 1 No. 5Amp. SP switch for local ON, OFF operation	No.	1	306	306
6		**Sheet Moulding compound (SMC) Junction Box, for Outdoor Use**				
6.1	ME-1-21-a	SMCJB - 1414, Hinged cover, Size 170 x 170 x 105mm	No.	2	585	1,170
6.2	ME-1-21-b	SMCJB - 1510, Removable cover, Size 195 x 140 x 65mm	No.	5	552	2,760
6.3	ME-1-21-c	SMCJB - 1816, Removable cover, Size 225 x 205 x 65mm	No.	15	552	8,280
6.4	ME-1-21-d	SMCJB - 2818, Removable cover, Size 320 x 220 x 65mm	No.	10	1,039	10,390
7.00		**CABLES, EXCAVATION, G.I. CABLE TRAYS & ACCESSORIES, CABLE JOINTS, CABLE PROTECTION PIPE.**				
		Cables : Supply & laying " XLPE cables" on walls or through existing trenches etc.				

Item No	Item Code	Description of Item	Unit	Qty	Total Rate	Total Amount
		2	3	4		
		LV Cables of following sizes to be laid buried in ground/ laid in cable trays in ready made trenches, cables shall be fitted on wall / ceiling by the means of saddle & spacers. Miscellaneous items such as cable dressing accessories like nylon tie, Aluminium clamps, GI cleats, cable tags etc. are included in the scope. Removal of empty drums, cartoons and making the site normal as instructed by Purchaser client is included in scope.				
8	ME-2-1	**1.1 kV grade stranded Al conductor, XLPE insulated, extruded PVC inner and outer sheathed, galvanised steel round or strip armoured cables**				
8.1		**1st Category**				
8.1.1	ME-2-1-t	4C x 25 Sq.mm	Mtr.	50	171	8,550
8.1.2	ME-2-1-v	3.5C x 50 Sq.mm	Mtr.	70	245	17,150
8.1.3	ME-2-1-w	3.5C x 70 Sq.mm	Mtr.	100	343	34,300
8.1.4	ME-2-1-y	3.5C x 120 Sq.mm	Mtr.	200	519	103,800
8.1.5	ME-2-1-ab	3.5C x 240 Sq.mm	Mtr.	1,000	949	949,000
8.1.6	ME-2-1-ac	3.5C x300 Sq.mm	Mtr.	20	1,156	23,120
9		**1.1 kV grade stranded Cu conductor, XLPE insulated, extruded PVC inner and outer sheathed, galvanised steel round or strip armoured cables**				
9.1	ME-2-3	**1st Category**				
9.1.1	ME-2-3-a	2C x 1.5 Sq.mm	Mtr.	5,100	74	377,400
9.1.2	ME-2-3-b	3C x 1.5 Sq.mm	Mtr.	1,000	93	93,000
9.1.3	ME-2-3-f	3C x 2.5 Sq.mm	Mtr.	1,200	125	150,000
9.1.4	ME-2-3-k	4C x 4 Sq.mm	Mtr.	200	224	44,800
9.1.5	ME-2-3-n	3C x 6 Sq.mm	Mtr.	140	242	33,880
9.1.6	ME-2-3-o	4C x 6 Sq.mm	Mtr.	750	309	231,750
9.1.7	ME-2-3-u	4C x 16 Sq.mm	Mtr.	300	671	201,300
10	**AB**	**Excavation**				
10.1	ME-2-8	Excavating the trenches and refilling,reinstatement of the same after the cable is laid in approved manner (750 mm deep, 600 mm wide),in all types of soils 1 Cu. Mtr. = 2.2 RMT.	Cu. Mtr.	30	300	9,000
10.2	ME-2-9	Excavating the trenches and refilling the same after the cable is laid in approved manner (Size of trench: 750 mm deep, 600 mm wide) in concrete/ masonary / asphalt. 1 Cu. Mtr. = 2.2 RMT. And reinstatement.	Cu. Mtr.	30	463	13,890
11	**AC**	**M. S. Grating**				
11.1	ME-2-10	M S Grating	Sq.Mtr.	35	656	22,960
12	**AD**	**Cable End Termination For Aluminium Cables : (SP-ME- TS-6)**				
12.1	ME-2-11	Cable end terminations for LV, XLPE/PVC insulated, PVC sheathed, armoured/ unarmoured cables including supply and fixing of Double compression cable glands, stripping of cable insulation, supply and fixing of **aluminium lugs for aluminium cables** for all phases and crimping the same to the conductor for the following cables. Miscellaneous items like cable lugs, G.I nut - bolts and G.I washers , consumables and other hardware materials as required to make the installation complete, are in the scope. All G.I Nut, bolt and washers shall be HDGI with 80 micron. One set of termination includes gland, lugs for cable core & accessories				
12.1.1	ME-2-11-u	3.5C x 50 Sq.mm	Set	4	687	2,748
12.1.2	ME-2-11-v	3.5C x 70 Sq.mm	Set	8	806	6,448
12.1.3	ME-2-11-x	3.5C x 120 Sq.mm	Set	4	1,180	4,720
12.1.4	ME-2-11-aa	3.5C x 240 Sq.mm	Set	26	2,152	55,952
13	**AE**	**Cable End Termination For Copper Cables :**				
13.1	ME-2-12	Cable end terminations for LV, XLPE/PVC insulated, PVC sheathed, armoured/ unarmoured cables including supply and fixing of Double compression cable glands, stripping of cable insulation, supply and fixing of **tinned plated copper lugs for copper cables** for all phases and crimping the same to the conductor for the following cables. Miscellaneous items like cable lugs, G.I nut - bolts and G.I washers , consumables and other hardware materials as required to make the installation complete, are in the scope. All G.I Nut, bolt and washers shall be HDGI with 80 micron. One set of termination includes gland, lugs for cable core & accessories				
13.1.1	ME-2-12-g	3C x 2.5 Sq.mm	Set	50	214	10,700

Item No	Item Code	Description of Item	Unit	Qty	Total Rate	Total Amount
		2	3	4		
13.1.2	ME-2-12-j	3C x 6 Sq.mm	Set	6	273	1,638
13.1.3	ME-2-12-q	4C x 4 Sq.mm	Set	12	280	3,360
13.1.4	ME-2-12-r	4C x 6 Sq.mm	Set	14	285	3,990
13.1.5	ME-2-12-t	4C x 16 Sq.mm	Set	10	375	3,750
14	**AF**	**G.I. Cable tray with all other accessories : Perforated Type**				
14.1	ME-2-13	Readymade 2500mm standard length, prefabricated, perforated cable tray from MS sheet and then hot dip galvanised, of following sizes and associated accessories such as coupler plates, tees, elbow etc. Galvanisation thickness shall be minimum 86 Micron.				
14.1.1	ME-2-13-a	75 x 25mm (W x H) - (16 SWG - 1.6mm) without cover	Rmtr.	50	241	12,050
14.1.2	ME-2-13-b	100 x 25mm (W x H) - (16 SWG - 1.6mm) without cover	Rmtr.	550	282	155,100
14.1.3	ME-2-13-c	150 x 25mm (W x H) - (16 SWG - 1.6mm) without cover	Rmtr.	500	369	184,500
14.1.4	ME-2-13-d	200 x 50mm (W x H) - (16 SWG - 1.6mm) without cover	Rmtr.	20	538	10,760
14.1.5	ME-2-13-e	300 x 50mm (W x H) - (16 SWG - 1.6mm) without cover	Rmtr.	350	709	248,150
14.1.6	ME-2-13-f	75 x 25mm (W x H) - (16 SWG - 1.6mm) with cover	Rmtr.	1,600	462	739,200
14.1.7	ME-2-13-g	100 x 25mm (W x H) - (16 SWG - 1.6mm) with cover	Rmtr.	1,100	545	599,500
15	**AG**	**G.I. Cable tray with all other accessories : Ladder Type**				
15.1	ME-2-14	Readymade 2500mm standard length, prefabricated, Ladder type cable tray from MS sheet and then hot dip galvanised, of following sizes and associated accessories such as coupler plates, tees, elbow etc. 50 mm side flanges shall be provided. Galvanisation thickness shall be minimum 86 Micron.				
15.1.1	ME-2-14-a	150 x 50mm (W x H) - (16SWG - 1.6mm)	Rmtr.	20	376	7,520
15.1.2	ME-2-14-c	300 x 75mm (W x H) - (16SWG - 1.6mm)	Rmtr.	50	655	32,750
16	**AL**	**Providing & laying Hume pipe across road or below the plinth beams and buried cable protection**				
16.1	ME-2-19	Supply and laying of Heavy duty RCC Hume pipe for road crossing, below plinth beam of following size as diameter.				
16.1.1	ME-2-19-a	100 mm Dia.	Mtr.	50	351	17,550
18	**AN**	**Supply & Laying of double wall corrugated (DWC) pipes of HDPE for underground cable protection**				
18.1	ME-2-22	Supply & Laying of double wall corrugated (DWC) pipes of HDPE for underground cable protection as per IS 14930 Part II. With necessary connecting socket/couplings, tees of some material at required depth up to 900 mm below road ground surface. backfilling of with light ramming is included in the scope.				
18.1.1	ME-2-22-a	50 mm OD / 38 mm I.D.	RMtr.	400	100	40,000
18.1.2	ME-2-22-b	63 mm OD / 51 mm I.D.	RMtr.	200	114	22,800
18.1.3	ME-2-22-c	77 mm OD / 63 mm I.D.	RMtr.	300	138	41,400
18.1.4	ME-2-22-f	125 mm OD / 109 mm I.D.	RMtr.	50	246	12,300
19	**Group C**	**MAINS AND SUBMAINS WIRING, POINT WIRING**				
19.1	AO	**WIRING FOR SUBMAINS/ CIRCUIT WIRING**				
19.1.1	ME-3-1	Wiring for circuit/ submain wiring along with earth wire with the following sizes of FR PVC insulated copper conductor wire in surface/ recessed medium class PVC conduit as required				
19.1.2	ME-3-1-a	2 X 1.5 sq. mm + 1 X 1.5 sq. mm earth wire in 20mm Conduit	Mtr.	20	99	1,980
19.1.3	ME-3-1-b	2 X 2.5 sq. mm + 1 X 2.5 sq. mm earth wire in 20mm Conduit	Mtr.	100	126	12,600
19.1.4	ME-3-1-c	2 X 4 sq. mm + 1 X 4 sq. mm earth wire in 25mm Conduit	Mtr.	150	179	26,850
19.2	ME-3-2	Wiring for circuit/ submain wiring along with earth wire with the following sizes of FR PVC insulated copper conductor wire surface/ recessed flexible conduit as required				
19.2.1	ME-3-2-a	2 X 1.5 sq. mm + 1 X 1.5 sq. mm earth wire in 20mm Conduit	Mtr.	20	99	1,980
19.2.1	ME-3-2-b	2 X 2.5 sq. mm + 1 X 2.5 sq. mm earth wire in 20mm Conduit	Mtr.	50	126	6,300
19.2.1	ME-3-2-c	2 X 4 sq. mm + 1 X 4 sq. mm earth wire in 25mm Conduit	Mtr.	50	179	8,950
19.3	ME-3-3	Wiring for circuit/ submain wiring along with earth wire with the following sizes of FR PVC insulated copper conductor wire in surface in casing and capping as required				
19.3.1	ME-3-3-a	2 X 1.5 sq. mm + 1 X 1.5 sq. mm earth wire in 20 x 12 mm (1/2")	Mtr.	20	107	2,140

Item No	Item Code	Description of Item	Unit	Qty	Total Rate	Total Amount
		2	3	4		
19.3.2	ME-3-3-b	2 X 2.5 sq. mm + 1 X 2.5 sq. mm earth wire in 20 x 12 mm (1/2")	Mtr.	50	134	6,700
19.3.3	ME-3-3-c	2 X 4 sq. mm + 1 X 4 sq. mm earth wire in 25 x 12 mm (3/4")	Mtr.	50	184	9,200
19.4	ME-3-5	Wiring for circuit/ submain wiring along with earth wire with the following sizes of FR PVC insulated copper conductor wire in surface/ recessed hot dipped GI conduit as required				
19.4.1	ME-3-5-a	2 X 1.5 sq. mm + 1 X 1.5 sq. mm earth wire in 20mm Conduit	Mtr.	500	314	157,000
19.4.2	ME-3-5-b	2 X 2.5 sq. mm + 1 X 2.5 sq. mm earth wire in 20mm Conduit	Mtr.	11,000	341	3,751,000
19.4.3	ME-3-5-c	2 X 4 sq. mm + 1 X 4 sq. mm earth wire in 25mm Conduit	Mtr.	3,300	450	1,485,000
20.00		**POINT WIRING**				
20.1	ME-3-9	Point wiring by using PVC insulated copper conductors (alongwith same size of pvc insulated copper conductor for earthing & 3 plate ceiling rose) using **G.I. CONDUIT**				
		First Category Material				
20.1.1	ME-3-9-a	Light /Fan / Ex. fan Points	Each Pt.	15	2,149	32,235
20.1.2	ME-3-9-b	2/3 Pin Independent Plug (IP)	Each Pt.	10	1,803	18,030
20.1.3	ME-3-9-i	15 / 5 A / 6 A Combined Power Plug Socket Point with Fuse and Indicating Lamp, One 15 Amp SP Switch	Each Pt.	135	2,263	305,505
20.1.4	ME-3-9-j	5A/6A - 3/5 Pin Plug On Board	Each Pt.	20	203	4,060
20.1.5	ME-3-9-k	Group Control Point Wiring 4-8 Points Controlled by One 15 A SP Switch	Each Pt.	2	331	662
20.1.6	XMW-06-002.005-06	Supply & Installation of 6A Switch Socket Outlet & box including connections with lugs & hardware,	Each Pt.	50	450	22,500
21		**FITTINGS & FIXTURES:**				
21.1		**Landscape lightings**				
21.1.1	PTW-ELE-26	Supply & Installation of 300 -400 W Pole light minimum 18-20M High with Approx 226000 Im Lumen Output,Required lux 450 and Colour Temprature 3000 K requiredwith all accessories	Each	30	120,000.00	3,600,000
21.1.2	PTW-ELE-27	Supply & Installation of Pole Light For Walkway 3m High Approx 360 Degree With minimum 3000 Lumen Output Required Lux 80-100 And Colour Temperature 4000k And Cri 80 with required accessories	Each	19	68,432.00	1,300,208
21.1.3	PTW-ELE-28	Supply & Installation of minimum 6 w Footlight 1 Ft. High From F.F.L With minimum 417 Lumen Output And Colour Temp. 3000k And Cri 85 with required accessories	Each	32	20,496.00	655,872
21.1.4	PTW-ELE-29	Supply & Installation of minimum 6w Linear Light For Seating With 200lm/M minimum Lumen Output,3000k Colour Temperature With Per10 M Driver To Be Installed And Cri 95 with required accessories	Rmtr	152	6,903.00	1,049,256
21.1.5	PTW-ELE-30	Supply & Installation of ❷ minimum 6w Linear Light For Steps With 200lm/M minimum Lumen Output,3000k Colour Temperature With Per10 M Driver To Be Installed And Cri 95. with required accessories	Rmtr	525	6,903.00	3,624,075
21.1.6	PTW-ELE-31	Supply & Installation of minimum 56w Pole Light 4.5 M High For Periphery With 4690Lm/M minimum Lumen Output,4000k Colour Temperature And Cri 70. with required accessories.	Each	30	73,752.00	2,212,560
21.1.7	PTW-ELE-32	Supply & Installation of minimum 52 w Pole Light 3.5 -4 M High 6 Fixtures Per Pole For Tree Uplighting With 5000 Lm/M minimum Lumen Output,3000k Colour Tempearature with required accessories.	Each	40	130,928.00	5,237,120
21.1.8	PTW-ELE-33	Supply & Installation of minimum 12w Spotlight For Pergola With 1200 Lm/M minimum Lumen Output,35 Degrees,3000k Colour Tempearature And Cri 85 with required accessories	Each	21	12,862.00	270,102
21.1.9	PTW-ELE-34	Supply & Installation of minimum 9w Spotlight For Pergola With 823 Lm/M minimum Lumen Output,31 Degrees,3000k Colour Tempearature And Cri 85. with required accessories	Each	60	12,862.00	771,720
21.1.10	PTW-ELE-35	Supply & Installation of minimum 6w Linear Light For Gate With 200lm/M minimum Lumen Output,3000k Colour Tempearature With Per10 M Driver To Be Installed And Cri 95. with required accessories	Rmtr	100	6,903.00	690,300

Item No	Item Code	Description of Item	Unit	Qty	Total Rate	Total Amount
		2	3	4		
21.1.11	PTW-ELE-36	Supply & Installation of T❷ 12-20 w Tree Uplighter For Entrance Area With 1200 Lm/M minimum Lumen Output,37 Degrees,3000k Colour Tempearature And Cri 85. with required accessories	Each	21	17,360.00	364,560
21.2		Supply, installation, testing & commissioning of light fixtures complete with high efficiency drivers : a) All fixing accessories mounting bracket b) Earthing of fittings				
21.2.1	PTW-ELE-20	1 X 24W LED Surface Mounted Light fixture	Each	778	3,136	2,439,808
21.2.2	PTW-ELE-21	1 X 18W LED Surface Mounted Light fixture	Each	195	1,888	368,160
21.2.3	PTW-ELE-22	1 X 11W LED Surface Mounted Light fixture	Each	35	1,416	49,560
22.00		**INVERTER**				
22.1	PTW-ELE-23	Inverter of 10KVA , Three phase input and output with Tubular Battery(12X2) Duration 4 Hrs. as per specification with required accessories.	No.	1	275,530	275,530
23.0	BI	**FANS (SP-ME-TS-28)**				
23.1	ME-4-12-b	Ceiling fan of 900 mm sweep with **all accessories including Electronic Regulator** for completing installation as per specification.	No.	5	2,649	13,245
23.2	ME-4-12-d	Ceiling fan of 1200 mm sweep with **all accessories including Electronic Regulator** for completing installation as per specification.	No.	4	2,649	10,596
24	BL	**S' TYPE HOOK FOR CEILING FANS:**				
24.1	ME-4-15-a	S' type M.S. fan hook fabricated from suitable dia. M.S. rod duly painted for fixing of ceiling fan. The 'S' type hook shall be fixed to steel bar in RCC ceiling. The ceiling shall be replastered with sand, cement & neeru etc. The cost of labours for chipping out ceiling upto steel bar & fixing of 'S' hook & resurfacing the ceiling is included in the cost of item.	No.	9	137	1,233
24.2	ME-4-15-b	S' type M.S. fan hook fabricated from suitable dia. M.S. rod for fixing ceiling fan by using pair of Anchor fastener.	Set,	9	162	1,458
24.3	ME-4-15-c	S' type M.S. fan hook fabricated from suitable dia. M.S. rod & suitable size M.S. brackets, nut bolts, washers for fixing ceiling fan on trusses. The 'S' type hook & bracket shall be painted in approved manner.	No.	9	162	1,458
25.0		**EARTHING**				
25.1	CS	**Earthing (SP-ME-TS-37)**				
25.1.1	ME-7-1-b	Earthing station with 100mm Dia., 13mm thick, 3000 mm long **GI pipe (Class B or better) earth pit** as per IS 3043. The earth pit shall be provided with watering pipe (Class B) with wire messed funnel, 25x3 GI strip / 8 SWG GI wire up to chamber (wire or strip size as per fault level), disconnecting links with 600 x 600 mm (clear) RCC chamber & heavy duty 3mm thick CI chequered plate cover with hinge & stainless steel bolts. Bentonite/ Charcol & Salt shall be provided for earth pits. Excavation, backfilling, removal of excess soil is included in the scope	Nos.	4	12,000	48,000
25.1.2	ME-7-1-d	600 X 600 X 3.15 mm **Copper Plate**, 3000mm dip with suitable size cu strip earth pit as per IS 3043. The earth pit shall be provided with watering pipe (Class B) with wire messed funnel, 12 SWG cu wire upto chamber, disconnecting links with 600 x 600 mm (clear) RCC chamber & 3mm thick heavy duty CI chequered plate cover with hinge. Bentonite shall be provided for earth pits. Excavation, backfilling, removal of excess soil is included in the scope	Nos.	4	14,000	56,000
25.2	**CU**	**Test links**				
25.2.1	ME-7-3	Supply and installation of following size Test Links with required wiring				
25.2.1.1	ME-7-3-a	25 x 3 mm GI (length : 300 mm)	Nos.	2	29	58
25.2.1.5	ME-7-3-e	50 x 6 mm GI (length : 300 mm)	Nos.	6	117	702
25.3	**CV**	**Earthing Continuity Conductors**				
25.3.1	ME-7-4	Supply & installation of Earth conductor of the following sizes to be				
25.3.2	ME-7-4-a	25 x 3mm Tinned copper	Mtr	100	696	69,600

Item No	Item Code	Description of Item	Unit	Qty	Total Rate	Total Amount
		2	3	4		
25.3.3	ME-7-4-e	25 x 3mm GI	Mtr	1200	97	116,400
25.3.4	ME-7-4-f	25 x 6mm GI	Mtr	200	195	39,000
25.3.5	ME-7-4-h	Bare Copper Conductor size 14 SWG	Mtr	500	30	15,000
25.3.6	ME-7-4-i	Bare Copper Conductor size 12 SWG	Mtr	100	51	5,100
25.3.7	ME-7-4-j	Bare Copper Conductor size 10 SWG	Mtr	20	77	1,540
25.3.8	ME-7-4-k	Bare Copper Conductor size 8 SWG	Mtr	50	120	6,000
25.3.9	ME-7-4-l	Bare G.I. Conductor size 10 SWG	Mtr	20	11	220
25.3.10	ME-7-4-m	Bare G.I. Conductor size 8 SWG	Mtr	10	17	170
26	DL	**PUBLIC ADDRESS, PUBLIC COMMUNICATION AND COMPUTER ACCESSORIES (SP-ME-TS-56)**				
26.1	ME-12-10	**PUBLIC ADDRESS SYSTEM (SP-ME-TS-65)**				
26.1.1	ME-12-10-d	Ceiling Speaker	Nos.	231	1,985	458,535
26.1.2	ME-12-10-g	Supply & installation of P.A. Cassette Amplifier.	Nos.	1	27,237	27,237
26.1.3	ME-12-10-h	Supply & installation of control panel to control the output of the amplifier.	Nos.	3	6,530	19,590
26.1.4	ME-12-10-i	Supply & installation of wall mounting box speakers.	Nos.	10	2,598	25,980
26.1.5	ME-12-10-j	Supply & installation of Microphone	Nos.	1	5,401	5,401
26.1.6	ME-12-10-k	Supply & installation of Microphone floor stand	Nos.	1	2,832	2,832
26.1.7	PTW-ELE-24	Supply & Laying of 2C 1.5 sqmm copper,YRY armoured cable (Black colour) having fire retarded low smoke insulation	Mtr	2,500.00	130	325,000
26.1.8	ME-12-10-m	Supply & installation of PVC conduit for speaker wiring	Mtr	3000	131	393,000
26.1.9	ME-12-10-n	Supply and installation of SSA- 250 make amplifier or equivalent	Nos.	1	42,665	42,665
27	ME-12-13	**CCTV**				
27.1	ME-12-13-a	Dome type Camera, fixed lens with SMPS	Nos.	50	8,810	440,500
27.2	ME-12-13-b	Colour Infra Red (IR) camera with SMPS	Nos.	5	7,589	37,945
27.3	ME-12-13-c	Day & Night PTZ Camera, Outdoor	Nos.	5	66,945	334,725
27.4	ME-12-13-d	Digital Video Recorder Real time P.C.based software	Nos.	1	49,940	49,940
27.5	ME-12-13-e	2 KVA UPS true online	Nos.	1	45,270	45,270
27.6	ME-12-13-f	Personnel Computer and 16 Channel digital Video recorder cards for CPU	Nos.	4	46,021	184,084
27.7	ME-12-4-e	RG-11	Mtr	5500	102	561,000
27.8	PTW-ELE-25	SITC of Client PC Hardware with a minimum Specification of with a minimum of i7 Processor at 3 GHz 12MB Cache, 3 x 4 GB or more of RAM , suitable for viewing 250 cameras 500 GB 10KRPM 3Gbps HD for OS. latest Windows 64bit, 4 nos USB ports , Dual NIC Cards Joystick controller, Two NVS 395 or higher version, 1024 MB or better; DVI Graphics Card to support 4 multiplexed Monitors on One CCTV Client.with 22" Flat LED Colour graphics dual monitors (HDMI) With different content possiblity on each of the monitor i.e Multiplexed, Alarm, Maps, sequence or any combination. Also Support Drag-n-drop of images by using connected mouse device.	Each	1	160,723	160,723
27.9	PTW-ELE-37	Under carriage inspection cameras system with required software & accessories	Each	1	1,814,250	1,814,250
28		**HAND HELD METAL DETECTOR & DOOR FRAME METAL DETECTOR.**				
28.1		**Hand Held Metal Detector**				
28.1.1	ME-SECU-02	Supply of High sensitivity Hand held metal detector .Capable of auto set, self calibration.Must detect all metals of Ferrous, Non-ferrous & Ferrite including stainless steel. Larger search coil preferred. Variable audio on metal detection to indicate size of metal. Visual indications for ON, Metal, Charge & Low battery. Dual power 9V Rechargeable battery & 9V dry Cell. Low power consumption Continuous use 350 hrs or more, In built charger. Casing made up of high resistant ABS.	Each	4	5,703	22,812
28.2		**Metal Detector-Walkthrough**				
28.2.1	ME-SECU-01	Supply, installation, testing & commissioning of Walk Through Door Frame Multizone Detector with highly visible display. Capable of local or remote programming (Through LAN network -optional card) .Generally as specified & as per technical specs. Standalone Door Frame Metal Detector with minimum 8 Overlapped zones, Visual Alarms on both side of panels, Detects all types of metals, IP 55 rated	Each	8	290,559	2,324,472
29		**Intelligent parking guidance system with required accessories.**				

Item No	Item Code	Description of Item	Unit	Qty	Total Rate	Total Amount
		2	3	4		
29.1	PTW-ELE- 38	Ski Data comprehensive ticketing & parking system for 2 Entry & 2 Exit with 4 nos barrier gate,2 nos column entry in-built with ticket dispenser,two exit stations with cash management logic.	Each	4	462,443	1,849,772
29.2	PTW-ELE- 39	Parking availability display at main entrance & at all levels,showing clearly available & total parking slots with all the logic,hardware & cabling. (Two Main Display at Entry & 3 Small Display on Every Floor)	Each	1	1,121,000	1,121,000
29.3	PTW-ELE- 40	Red & Green indicator led light per way with & inbuilt sensor sensing the occupancy of the way supply & installation with all the necessary accessories. (without cabling cost)	Each	568	5,817	3,304,056
30		**WATER CIRCULATION SYSTEM**				
30.1		Supply, Installation, Testing and Commissioning of hydropneumatic system complete as specified with system complete as specified with with control panel,mounting skid,suction and discharge header,Butterfly valves, Non return valves, Y type strainer,gauges, pressure tank,conrol cabling & earthing .				
30.1.1	PTW-ELE- 41	Supply, Installation, Testing and Commissioning of hydropneumatic system complete as specified with with control panel,mounting skid,suction and discharge header,Butterfly valves, Non return valves, Y type strainer,gauges, pressure tank,conrol cabling & earthing . As per (Datasheet VSP-D & VSPP-D 1.5 KW each)	Each	1.00	682419.00	682,419.00
30.1.2	PTW-ELE- 42	As per Datasheet VSP-F & VSPP-F (Datasheet VSP-F & VSPP-F 1.5 KW each)	Each	1.00	932200.00	932,200.00
30.1.3	PTW-ELE- 43	Supply, Installation, Testing and Commissioning of sump pumps to (Data Sheet SW-SP 0.75 KW each).(Sewage sump)	Each	2.00	107923.00	215,846.00
30.1.4	PTW-ELE- 44	Supply, Installation, Testing and Commissioning of Irrigation water pumpsas per (Data sheet STP - I 9.3 KW each)	Each	3.00	108896.00	326,688.00
30.1.5	PTW-ELE- 45	Supply, Installation, Testing and Commissioning of sump pumps to (Data Sheet SP 1.1 KW each).	Each	14.00	106969.00	1,497,566.00
		Total Amount				**62,848,545.00**

FIRE FIGHTING
BOQ

Item No.	Item code	Description	UNIT	Qty	RATE	Amount
1.0		**FIRE HYDRANT AND**				
		SPRINKLER PUMPING SYSTEMS				
1.1		Supply, installation, testing & commissioning of fire pumps, electrically driven generally as specified and shown in data sheetscomplete with: i) all accessories ii) Suction , discharge flexibles,suitable vibration isolating mounts and foundation bolts. iii) test connection excluding starter panel & foundation.				
1.1.1	PWT-FF-01	Fire Pumps (HP & SP)	Each	2	536,900	1,073,800
		(HP - Hydrant Pump)				
		(SP - Sprinkler Pump)				
		(Data sheet HP & SP)				
1.1.2	PWT-FF-02	Jockey Pumps (HJP & SJP)	Each	2	152,922	305,844
		(HJP - Hydrant Jockey Pump)				
		(JSP - Sprinkler Jockey Pump)				
		(Data sheet HJP & SJP)				
1.1.3	PWT-FF-03	Water curtain pump	Each	1	519,200	519,200
		(Data sheet WCP)				
1.1.4	PWT-FF-04	Supply, installation, testing & commissioning of common standby fire pump disel engine driven generally as specified and shown in data sheet complete with: i) all accessories ii) Suction & discharge flexibles iii) test connection excluding starter panel & foundation Fire Standby Pump (SBP) (Data sheet - SBP)	Each	1	932,200	932,200
1.1.5	PWT-FF-05	Supply, installation, testing & commissioning of pressure gauge panels for hydrant system ,sprinkler system generally as shown and comprising: i) Pressure gauges ii) Pressure switches iii) Water piping (25 dia) from various systems (Hydrant & sprinklers) upto the gauge panel. iv) Painted Sheet metal enclosure with glass paneling.\	Set	5	24,249	121,245
2.0		**HYDRANT SYSTEM**				
2.1	ME-17-1-q	Supply, installation, testing & commissioning of internal and external hydrants as shown on drawings and meeting the intents of specifications Internal hydrants/landing valves Providing and fixing in position 2 lengths of 15 M long flexible canvas rubber lined hose reels 63 dia with adapter, branch pipe and nozzle and stroking them in metal cabinets with lockable glass shutters and fixing the metal cabinet at ground level in a location where it can be easily spotted including painting tec. complete. With hose box	Nos	36	21,102	759,672
						-
						-
2.2	SG-FA-FF-20	Supply, Installation, Testing & commissioning fire authority approved of following: Single headed yard hydrantm comprising of 80mm dia. standpipe, 80 mm dia. bend and 63 mm. dia.SS. landing valve conforming to IS: 5290 with instantaneous female coupling on the outlet with S.S.orifice flange 6mm thick as required to maintain 3.5kg/sq.cm. gun metalblank cap & chain, necessary companion flanges (as per table 'E' nuts, bolts, washers and gasket complete).	Nos	11	18,000	198,000
						-
2.3	SG-FA-FF-25	G.M. fire Brigade inlet connection head as per IS:904 specification three way tested for 20kg/sq.cm. with 63mm with built in non-return valve for fire brigade connection to underground tanks and fire risers including companion flanges of Table E with nuts, bolts & washers etc.	No	1	13,700	13,700
2.4	SG-FA-FF-26	Providing & Fixing gunmetal Fire breaching head as per IS:904 specification tested for 20 kg/cm. with 63 mm Dia 4 nos. instantaneous type inlet and 150 mm dia flanges outlet with built in non-return valve for fire brigade connection to fire risers including companion flanges of Table E withnuts, bolts & washers etc.	No	1	32,300	32,300

3.0		**SPRINKLER SYSTEM**				
3.1		Providing and fixing in position 150 mm size sprinkler installation control with all trims, Alarm motor and going, pressure gaugee (2 Nos) Water flow switch (1 No.) pressure switch (1 No.) drain and test valve with associated piping 1 No. 150 NB sluice valve on the underside of control valve approved and listed by TAC.				
3.1.1	ME-17-6	150mm size	Each	3	99,999	299,997
3.2		Providing and fixing 15 mm gunmetal sprinkler head with quartzoid bulband set to operate at specified temperature pendent/ upright/ side wallas per the location indicated on the drawings. sprinklers 68 degree C FOC/UL/FM approved complete with socket nipple, adaptoretc. Sprinkler shall be pendant type. Temperature of operation 68 deg.C A.				
3.2.1	SG-FA-FF-32	Pendant exposed type 15/10mm 68°C	Each	2737	510	1,395,870
3.2.2	SG-FA-FF-41	Supply, installation, testing & commissioning of water curtain nozzles (HD model WC 15, K23 or equivalent)	Each	66	350	23,100
3.3		Supply, installation, testing & commissioning of water curtain nozzles (HD model WC 15,K23 or equivalent) Supply and Installation of deluge valveassembly as specified and shown on drawings and complete with: i) Inline Y Strainer ii) 2# Isolation Valves (before and after deluge valve) iii) Deluge Valve iv) Actuator / Pilot Assembly v) Drain Valve vi) Pressure Gauges (above and below deluge valve) vii) Alarm Assembly (consisting of gong or sounder) viii) All inter connected galvanised heavy class steel piping connection etc complete				-
3.2.7.1	PWT-FF-06	100mm size,PN 10	Each	3	74,635	223,905
4.0		**PIPING FOR FIRE FIGHTING**				
4.1		**External Piping**				
4.1.1	SG-FA-FF-14	Laying external piping (UNDERGROUND) generally as specified using G.I. Pipeconfirming to IS 1239 heavy' class complete with: i) All pipes and fittings together with flanges, neoprene gaskets, bolts & nuts ii) "Pypcoat" wrapping as specified. 200 n.b	mtr	500	4,500	2,250,000
4.1.2		Supply, installation, testing & commissioning of butterfly valves with holding flanges generally complete as specified.				
4.1.2.1	PWT-FF-07	200 n.b,PN10	Nos	7	16,013	112,091
4.1.2.2	PWT-FF-08	150 n.b,PN10	Nos	3	9,898	29,694
4.1.2.3	PWT-FF-09	100 n.b,PN10	Nos	12	6,924	83,088
4.1.2.4	PWT-FF-10	80 n.b (For yard Hydrant)	Nos	11	5,141	56,551
4.2		**Internal Piping**				
4.2.1		Providing and fixing in position G.I. Heavy grade 'C' class pipes (I.S. 1239 part I) with screwed on couplings/ fittings (I.S. 1239 Part II) including disconnecting arrangement (unions /Flanges) as necessary clamping to wall bems and ceilingswith hangers and clamps anchor fasteners wherever required to firmly support piping, testing to 1.5 times to working pressure for minimum 2 hours after instalation and painting as required by Fire Authority after primer cost.				
4.2.1.1	SG-FA-FF-8	150 mm	mtr	35	2,250	78,750
						-
4.2.1.2	SG-FA-FF-7	100 mm	mtr	1178	1,750	2,061,500
						-
4.2.1.3	SG-FA-FF-6	80 mm	mtr	917	1,450	1,329,650

						-
4.2.1.4	SG-FA-FF-5	65 mm	mtr	376	1,050	394,800
						-
4.2.1.5	SG-FA-FF-4	50 mm	mtr	780	900	702,000
						-
4.2.1.6	SG-FA-FF-3	40 mm	mtr	480	750	360,000
						-
4.2.1.7	SG-FA-FF-2	32 mm	mtr	590	650	383,500
						-
4.2.1.8	SG-FA-FF-1	25 mm	mtr	7240	550	3,982,000
						-
						-
						-
4.2.2		Supply, installation, testing & commissioning of valves				-
4.2.2.1	SG-FA-FF-18	Butterfly valves with holding flanges generally complete as specified.200 n.b.	Nos	4	15450	61,800
						-
4.2.2.2		Gate valves with holding flanges generally complete as specified.				-
4.2.2.2.1	PWT-FF-11	200 n.b.	Nos	2	61,589	123,178
						-
4.2.2.2.2	PWT-FF-12	150 n.b.	Nos	6	37,170	223,020
						-
4.2.2.2.3	PWT-FF-13	65 n.b.	Nos	4	14,160	56,640
						-
4.2.2.3	ME-9-41-a	Supply, installation, testing & commissioning of ball valves with supports etc. 25 n.b gun metal (screwed)	Nos	9	4,342	39,078
						-
4.3		Providing and fixing in position C.I. Double flanged non return valves of dia Kirloskar or other approved make including fixing with all nuts bolts, gaskets etc complete				-
						-
4.3.1	ME-17-1-b	150 mm (flanged)	Nos	3	12,661	37,983
						-
4.3.2	ME-9-42-f	65 mm (screwed)	Nos	2	8,062	16,124
						-
4.4		Supply, Installation, testing & commissioning double flanged C.I 'Y' Strainers with C.I body and brass strainer.				-
4.4.1	ME-9-44-b	Size 150 mm	Nos	3	17,364	52,092
						-
4.4.2	ME-9-44-f	Size 65 mm	Nos	2	8,062	16,124
						-
4.5	PWT-FF-14	Supply, fabrication, installtion,testing & commissioning of air vessels 250mm diameter and 1000mm high in the plant room fabricated from 6mm M S plate with valve inlet and outlet with automatic air vent and valved drain including painting as shown in drawing	Nos	2	40,509	81,018
						-
4.6	SG-FA-FF-28	Providing and fixing single acting air release valve with Screwed inlet 25 mm dia.	Nos	10	2,875	28,750
						-
4.7	PWT-FF-15	Supply, installation, testing,& commissioning best Indian make flow switch assemblycomplete with: i) Flow switch ii) Isolating ball / Butterfly valve with 2A tamper switch. iii) flanges or union connections (Butterfly valve with tamper switch must be a single item) 100 mm with butterfly valve	Nos	9	17,700	159,300
						-
4.8		Providing, laying, testing and commissioning of brass orifice plate to restrict operating pressure to 5.0 kg/sq.cm as desired by Mumbai Fire Brigade this include rubber gaskets, G.I. Nut, bolt, washers etc. for reducing the down stream				-
4.8.1	ME-17-1-r	Orifice plate to fit in 100mm nb pipes	Nos	36	1,296	46,656
						-

4.9	SG-FA-FF-29	Supply and installation of pressure gauge for hydrant /Sprinkler system generally as shown and comprising with dial type (100 mm) pressure gauge with isolation ball valve suitable for working pressure of 250 PSI. Cost shall be inclusive of providing any short pieces, nipples, elbows etc as required.	Nos	12	3,341	40,092
5.0		**PORTABLE FIRE EXTINGUISHERS**				-
						-
5.1		Supply, installation, testing & commissioning of Portable Fire Extinguishers as described below:				-
5.1.1	SD1-09-002-FRE34	ABC type Fire Extinguishers IS:13849 ISI mark - 5 kg. capacity, Safe Zone brand/make	Nos	100	5,075	507,500
		Grand Total				**19,211,812**

HVAC BOQ

Item No.	Item Code	Description	Pay Unit	Qty	Rate	Amount
1.0		**VENTILATION & EXHAUST SYSTEMS**				
1.1		**Ventilation Fan Systems**				
1.1.1		Supply, installation, commissioning & testing of VENTILATION SYSTEMS in accordance with and meeting the intents of fire norms,the specifications and data sheets which shall further refined by CFD analysis for all basements complete with: i) Inline centrifugal fan or SISW fan or Axial flow fan or Propeller fan as specified in the data sheets. ii) M S Mounting frame iii) Vibration mounts iv) Canvas connection v) Filter with necessary frame wherever necessary vi) Drive assembly and motor Note:CFD analysis is under vendor's scope.				
1.1.1.1	PTW-HVAC-01	Jet Fans for Basement Exhaust as per data sheets JF - 1, JF - 2, JF - 3	Each	42	80,359	3,375,078
1.1.1.2	PTW-HVAC-02	Basement Ventilation Exhaust fan as per data sheets EX -(LG+B1+B2)-Z1-N & EX -(LG+B1+B2)-Z2-N	Each	6	356,859	2,141,154
1.1.1.4	PTW-HVAC-03	Basement Ventilation Exhaust fan as per data sheets EX -(LG+B1+B2)-Z3-N	Each	3	130,323	390,969
1.1.1.5	PTW-HVAC-04	Basement Ventilation Exhaust fan as per data sheets EX -(LG+B1+B2)-Z1-F & EX -(LG+B1+B2)-Z2-F	Each	6	339,816	2,038,896
1.1.1.7	PTW-HVAC-05	Basement Ventilation Exhaust fan as per data sheets EX -(LG+B1+B2)-Z3-F	Each	3	123,928	371,784
1.1.1.8	PTW-HVAC-06	Basement ventilation Fresh air fan as per data sheets FA -(B1+B2)-Z1-N & FA -(B1+B2)-Z2-N	Each	4	356,859	1,427,436
1.1.1.10	PTW-HVAC-07	Basement ventilation Fresh air fan as per data sheets FA -(B1+B2)-Z3-N	Each	2	130,323	260,646
1.1.1.11	PTW-HVAC-08	Basement ventilation Fresh air fan as per data sheets FA -(B1+B2)-Z1-F & FA -(B1+B2)-Z2-F	Each	4	356,859	1,427,436
1.1.1.13	PTW-HVAC-09	Basement ventilation Fresh air fan as per data sheets FA -(B1+B2)-Z3-F	Each	2	130,323	260,646
1.1.1.14	PTW-HVAC-10	Propeller fan for exhaust as per data sheets PF-1 AND PF-2	Each	2	3,371	6,742
1.1.1.15	PTW-HVAC-11	Basement ventilation Staircase pressurization fan as per data sheets SP-1	Each	1	305,824	305,824
1.1.1.15	CE4-07-010-M/E30	Supply, Installation, Testing and Commissioning of 600 cfm, 1inch SP	Each	4	22,712	90,848
1.1.2		**Dampers**				
1.1.2.1	PTW-HVAC-12	Back draft dampers	No	30	5,971	179,130
1.1.3	PTW-HVAC-13	Supply & Installation of Return air grilles extruded aluminium powder coated as specified and complete with i) Face bars horizontal / vertical, adjustable / non - adjustable ii) 20mm Margins iii) Sidewall or linear as shown as drgs.	Sq.m	5	5,310	26,550
1.2	CE4-07-010-M/E101	Fabrication, installation, testing and commissioning of GSS ducting of 0.63 mm (24 SWG) thickness including necessary supports, adjustable damper, vanes, suitable pads between duct work and supports, etc. as per specifications complete as required	Sq.m	10	578	5,780
1.3	PTW-HVAC-14	Supply, installation, testing and commissioning of CO sensor complete with mounting arrangement and cabling from sensors to fan control panel.	Each	84	17,093	1,435,812
1.4		**MV SWITCHGEAR & POWER PANELS**				

1.4.1		Supply, installation, testing and commissioning of cubicle type panels as per specifications and shown on drawing. i) Main AL busbars with bar type feeder connections & all internal wiring and connections. ii) Earthing all components, frame etc. to a common internal earth bar. iii) Painting all sheet metal works. iv) All accessories & supporting structure. v) Brass glands for sending and receiving ends. (Crimping lugs forming part of the termination) vi) All ammeters with C.T's and voltmeter and energy meters with necessary fuses. (All meters shall be digital) vii) Panel components as specified. viii) MS base frame. ix) All switch gear to have short circuit levels as specified. vii) Isolator, Starter panel with breaker, starter & interconnecting power cabling including Cable termination and earthing as per schematic L571-M-201				
1.4.1.1	PTW-HVAC-15	MAIN BASEMENT VENTILATION PANEL	Each	1	275,104	275,104
		Complete as per drawing L571-M-201				
1.4.1.2	PTW-HVAC-16	VENTILATION PANEL LOWER GRND-Z2	Each	1	287,639	287,639
		Complete as per drawing L571-M-201				
1.4.1.3	PTW-HVAC-17	VENTILATION PANEL LOWER GRND-Z3	Each	1	248,146	248,146
		Complete as per drawing L571-M-201				
1.4.1.4	PTW-HVAC-18	BASEMENT 1 VENTILATION PANEL	Each	1	267,572	267,572
		Complete as per drawing L571-M-201				
1.4.1.5	PTW-HVAC-19	BASEMENT 1 VENTILATION PANEL-Z1	Each	1	179,274	179,274
		Complete as per drawing L571-M-201				
1.4.1.6	PTW-HVAC-20	BASEMENT 1 VENTILATION PANEL-Z2	Each	1	179,274	179,274
		Complete as per drawing L571-M-201				
1.4.1.7	PTW-HVAC-21	BASEMENT 1 VENTILATION PANEL-Z3	Each	1	179,274	179,274
		Complete as per drawing L571-M-201				
1.4.1.8	PTW-HVAC-22	BASEMENT 2 VENTILATION PANEL	Each	1	179,274	179,274
		Complete as per drawing L571-M-201				
1.4.1.9	PTW-HVAC-23	BASEMENT 2 VENTILATION PANEL-Z1	Each	1	179,274	179,274
		Complete as per drawing L571-M-201				
1.4.1.10	PTW-HVAC-24	BASEMENT 2 VENTILATION PANEL-Z2	Each	1	179,274	179,274
		Complete as per drawing L571-M-201				
1.4.1.11	PTW-HVAC-25	BASEMENT 2 VENTILATION PANEL-Z3	Each	1	179,274	179,274
		Complete as per drawing L571-M-201				
1.5		**CABLING**				
1.5.1		LV Cables of following sizes to be laid buried in ground/ laid in cable trays in ready made trenches, cables shall be fitted on wall / ceiling by the means of saddle & spacers. Miscellaneous items such as cable dressing accessories like nylon tie, Aluminium clamps, GI cleats, cable tags etc. are included in the scope. Removal of empty drums, cartoons and making the site normal as instructed by Purchaser client is included in scope.				
	ME-2-1	1.1 kV grade stranded Al conductor, XLPE insulated, extruded PVC inner and outer sheathed, galvanised steel round or strip armoured cables				
1.5.1.1.1	ME-2-1-ab	3.5C 240sqmm A2XFY	mtr	125	949	118,625
1.5.1.1.2	ME-2-1-w	3.5C 70sqmm A2XFY	mtr	408	343	139,944
1.5.1.1.3	ME-2-1-t	4 C 25sqmm A2XFY	mtr	565	171	96,615
	ME-2-3	1.1 kV grade stranded Cu conductor, XLPE insulated, extruded PVC inner and outer sheathed, galvanised steel round or strip armoured cables				
1.5.1.1.4	ME-2-3-U	4C 16sqmm YRY	mtr	330	671	221,430
1.5.1.1.5	ME-2-3-S	4C 10sqmm YRY	mtr	30	482	14,460

1.5.1.1.6	ME-2-3-K	4C 4sqmm YRY (Armoured)	mtr	2181	224	488,544
1.5.2		Cable Termination				
1.5.2.1	**ME-2-11**	Cable end terminations for LV, XLPE/PVC insulated, PVC sheathed, armoured/ unarmoured cables including supply and fixing of Double compression cable glands, stripping of cable insulation, supply and fixing of aluminium lugs for aluminium cables for all phases and crimping the same to the conductor for the following cables. Miscellaneous items like cable lugs, G.I nut - bolts and G.I washers , consumables and other hardware materials as required to make the installation complete, are in the scope. All G.I Nut, bolt and washers shall be HDGI with 80 micron. One set of termination includes gland, lugs for cable core & accessories				
1.5.2.1.1	ME-2-11-aa	3.5C 240sqmm A2XFY	SET	4	2,152	8,608
1.5.2.1.2	ME-2-11-v	3.5C 70sqmm A2XFY	SET	14	806	11,284
1.5.2.1.3	ME-2-11-s	4 C 25sqmm A2XFY	SET	22	432	9,504
	ME-2-12	Cable end terminations for LV, XLPE/PVC insulated, PVC sheathed, armoured/ unarmoured cables including supply and fixing of Double compression cable glands, stripping of cable insulation, supply and fixing of tinned plated copper lugs for copper cables for all phases and crimping the same to the conductor for the following cables. Miscellaneous items like cable lugs, G.I nut - bolts and G.I washers , consumables and other hardware materials as required to make the installation complete, are in the scope. All G.I Nut, bolt and washers shall be HDGI with 80 micron. One set of termination includes gland, lugs for cable core & accessories				
1.5.2.1.4	ME-2-12-t	4C 16sqmm YRY	SET	10	375	3,750
1.5.2.1.5	ME-2-12-s	4C 10sqmm YRY	SET	2	282	564
1.5.2.1.6	ME-2-12-q	4C 4sqmm YRY (Armoured)	SET	100	280	28,000
		GROSS TOTAL				**17219438**

ELEVATORS
BOQ

	ABSTRACT OF COST FOR ELEVATOR					
Item No	**Item Code**	**Description of Item**	**Unit**	**Qty**	**Total Rate**	**Total Amount**
		2	**3**	**4**		
1		**ELEVATORS**				
		Design, manufacture, supply, loading at site including transportation upto site, unloading & storing at site, handling, installing, testing & commissioning including obtaining statutory approvals / operating license for the following elevators at site as per specifications				
1.1	PTW-ELV- 1	1360 Kg, 20 Pass, 1.0 mps as per Schedule of Requirment	EACH	2	2,755,001	5,510,002
		Total Amount				**5,510,002.00**

GARDEN DEVELOPMENT BOQ

	Garden development	Qty	Unit	Rate	Total
	Kids Play Equipments				
JM-JD-2	**Providing & Fixing rubber flooring** - Rubber Flooring36mm thickness.36mm thk SBR with EPDM insitu Rubber Flooring for Outdoors.Base layer 30mm SBR(Buffling) with 6mm EPDM Top layer insitu Rubber flooring.the size of EPDm Granules is 1-4 mm.The base will be SBR buffling size 0.8mm to 2.36mm, well compacted with BASF PU Birder at ratio 18% by weight of EPDM.	3228	Sqft	300.9	971305.2
ME-15-1-f	Circular Horizontal Scrambler	1	NOS	115886	115886
ME-15-1-h	Deluxe slide 1.5 mtr	1	NOS	107354	107354
ME-15-1-r	Spiral Slide 2.7 mtr ht	1	NOS	452443	452443
ME-15-1-bx	Net Rock Scrambler 2.1 M	1	NOS	133988	133988
ME-15-1-gg	Rock Climber 2.1 Mtr (maps)	1	NOS	136779	136779
ME-15-1-bp	Crescent Slide 2.7 Mt	1	NOS	407199	407199
ME-15-1-ac	Crawl Tube	1	NOS	141995	141995
ME-15-1-ao	Frp Platform Merry Go Round	1	NOS	133295	133295
ME-15-1-aq	Standard See Saw	2	NOS	23319	46638
ME-15-1-ar	Multi Seater See Saw	2	NOS	51678	103356
ME-15-1-be	Four Seater Arc Swing	2	NOS	164444	328888
ME-15-1-bl	Spring Rider Bike	2	NOS	49074	98148
ME-15-1-bm	Spring Rider - Jumbo / Elephant	2	NOS	67345	134690
ME-15-1-bn	Spring Rider -Rabbit	2	NOS	51678	103356
				Total	**3415320**
	Gymnasium Equipments				
ME-14-1-g	Hip Machine 60 Kg	2	NOS	75675	151350
ME-14-1-f	Leg Press Horizontal 100 Kg	2	NOS	76598	153196
ME-14-1-s	Chest Press 60 Kg	2	NOS	67261	134522
ME-14-1-t	Bench Press 90 Kg	2	NOS	67261	134522
ME-14-1-w	Double Arm Pulley (50+50) Kg	2	NOS	76598	153196
ME-14-1-bk	Non motorised treadmill without meter	2	NOS	50202	100404
ME-14-1-p	Seated Rowing 70 Kg	2	NOS	91547	183094
ME-14-1-v	Shoulder Press 70 Kg	2	NOS	69128	138256
ME-14-1-r	Peck Deck Machine 60 Kg	2	NOS	82210	164420
ME-14-1-x	Bicep-Tricep Pulley 60 Kg	2	NOS	61648	123296
				Total	**1436256**
	Garden Irrigation				
SOR No.	**Description**	**Unit**	**Qty**	**Rate**	**Amount**
	Pumping & Filtration System				-
PTW-GD-01	Supply, installation, testing and commissioning of hydropneumatic pumping system with a total system capacity of 5 LPS @ 40-45 m head with with Variable Frequency Drive mounted on a skid etc. completee	Nos	1	732,780.00	732,780.00
	Valves and Valve Boxes				-
	Supply, installation, testing and commissioning of wafer type Butterfly Valve / Ball Valve as Section valves of suitable size as per specifications including the cost of all fittings complete				-
CE5-13-030-FAIR2	Valve on 63mm Pipe (Ball Valve)	Nos	18	1,831.00	32,958.00
ME-17-1	Supply, installation, testing and commissioning of Air Release Valves of cast aluminium body for fixing on the mainline at regular intervals or at elevational changes as required with all fittings complete	Nos	10	2,233.00	22,330.00
PTW-GD-02	Supply, installation, testing and commissioning of Brass Quick Coupling Valves with requisite number of Keys and Swivell Hose Ells as per specifications and fittings along with a Galvanised Stake for supporting the QCV.	Nos	15	2,814.00	42,210.00
ME-2-3-a	Supply, installation, testing and commissioning of 1.5 sq. mm. automation cable with necessary fittings and accesoories (2Cx1.5 sqmm)	Mtr.	3000	74.00	222,000.00
				TOTAL	**1052278**

Summary - Patvardhan Bagh					
	Garden development	Kids Play Equipments		3,415,320.20	
		Gymnasium Equipments		1,436,256.00	
		Garden Irrigation		1,052,278.00	
TOTAL				5,903,854.20	

ELEVATORS
CSMC BOQ

	ABSTRACT OF COST FOR ELEVATORS CSMC					
Item No	**Item Code**	**Description of Item**	**Unit**	**Qty**	**Total Rate**	**Total Amount**
1		**ELEVATORS**				
1	PTW-CSAMC	**Annual Maintenance Contract**				
		Annual maintenance charges (comprehensive all risk contract) after expiry of defect liability for a period of 5 years.				
1.1	PTW-CSMC-1	Year-1	NOS	2	182,900.00	365,800
1.2	PTW-CSMC-2	Year-2	NOS	2	201,190.00	402,380
1.3	PTW-CSMC-3	Year-3	NOS	2	221,309.00	442,618
1.4	PTW-CSMC-4	Year-4	NOS	2	238,933.00	477,866
1.5	PTW-CSMC-5	Year-5	NOS	2	256,854.00	513,708
		AMC comes into play after 1 years of Defects Liability Period				
		Total Amount				**2,202,372.00**

GARDEN & LANDSCAPING BOQ

Summary - GARDEN & LANDSCAPING			
Sr.No.		Description	COSTING
1	Horticulture work	Excavation & Soil restoration	572,013
2		Lawn	2,296,531
3		Mound	389,180
4		Shrubs	1,911,289
5		Hedges & Ground covers	1,272,037
6		Trees	184,485
7		Garden furniture	2,609,990
8		Miscellaneous	9,792,373
9		Irrigation	1,293,811
10		Plantation	10,761,799
		TOTAL	**31,083,506**

PATWARDHAN PARK LANDSCAPE BOQ					
GW Schedule Section 1					
ITEM CODE	**ITEM DESCRIPTION**	**QTY**	**UNIT**	**Rate**	**Total amount**
GW 1-2	**Excavation for Shrubs**				
a	**Excavation for preparing Shrubbery on Soft surface**: Excavating the ground for preparing Shrubbery in the earth / murum/ sand for a depth of 0.60 m	2151	Sqm	121	260210.5
b	**Excavation for preparing Shrubbery on Hard surface**: Excavating the ground for preparing Shrubbery in the Concrete/ masonry/ asphalt/ hard rock for a depth of 0.60	380	sqm	178	67551
GW 1-4	**Excavation for Hedges/ Edges/Ground covers**				
a	**Excavation for planting Hedges/ Edges/ Ground covers on Soft surface**: Excavating the ground to the depth of 30 cm removing excavated material from	924	Sqm	61	56364
b	**Excavation for planting Hedges/ Edges/ Ground covers on Hard surface**: Excavating the ground to the depth of 30 cm removing excavated material from the site.	165	Sqm	89	14685
GW 1-5	**Excavation for Trees**				
a	**Excavation for planting Trees on Soft surface(Individual):**Excavating the ground for planting individual Tree sapling ht. 4'-5' at the time of plantation) in the earth/murum/sand for a pit size of 1.0 m X 1.0 m X 1.0 m	232.1	No.s	202	46884.2
b	**Excavation for planting Trees on Hard surface (Individual)**: Excavating the ground for planting individual Tree (sapling ht. 4'-5' at the time of plantation) in the Concrete/ masonry/ asphalt/ hard rock for a pit size of	44	No.s	296	13024
	Excavation for Trees (Transplantation)				
	Excavation for Transplanting Trees on Soft surface: Excavating the ground in the earth / murum / sand for transplanting the tree to the desired location, with required machinery. Tree to be lifted with roots & replaced in fresh soil. Making trench at suitable distance away from the stem based on age of the plant in a circular fashion to a sufficient depth to remove the ball of earth & applying fungicide on cut portion.				
GW-1-6-A-3	Tree Girth upto 0.6 M or more	58	No.s	721	41818
GW-1-5-A	**Excavation for planting Transplanted Trees**: Excavating the ground for planting individual Tree (Transplanted tree) in the area demarketed making trench based on age of the plant.	58	No.s	202	11716
					512252.7
GW 1-7	**Soil Restoration (Excavation and Storage)**				
	Existing Topsoil to be excavated for restoration to a depth of 200 mm (not more than 400 mm) and separated from subsoil debris and stones larger than 50 mm diameter to be stockpiled to a height of 400 mm in designated area. Stockpiled topsoil to be protected from erosion during storage by installing earthern berms/solid walls/temporary grass plantation/covering with mulch/ plastic sheets. Stockpiled topsoil to be protected with sand bags/solid walled enclosures (2 feet high) on all sides for containment. Appropriate drainage channels to be dug around the storage area to prevent flooding of	720	Sqm	83	59760
			TOTAL		**572013**
	GW Schedule Section 2				
ITEM CODE	**ITEM DESCRIPTION**	**Qty**	**UNIT**	**Rate**	**Total Amount**
GW 2	**Softscape Works and Plantation**				
GW 2-1	**Plantation: Lawn**				
	Planting Lawn on Soft/Hard surface: Providing and filling Red Hill Earth & Cow Dung Manure mixing in 2:1 proportion,watering to the depth of 1" three times,weeding after every watering before plantation of the grass,leveling,rolling after proper compaction,planting of good quality lawn suckers by dibbling method in staggered fashion at specified intervals including transport & unloading. Watering and proper mowing etc. maintaining for 1 month after completion of plantation and replacement of casualties till 1 month.	4266.9	Sqm		
GW-2-1-A	Filling good garden soil mix with manure (Fine		Sqm	216.22	
GW-2-1-B	Leveling		Sqm	16	
GW-2-1-C	Weeding		Sqm	16	
GW-2-1-D	Maintenance		Sqm	15	
GW-2-1-A-5	Planting Lawn/Shrubs (Labour, transport and unloading) (Excluding cost of plant)		Sqm	50	
	Total	4266.9	Sqm	313.22	**1336478.418**
GW-2-1-A-9	Planting carpet of Jumping / Korian / Zoycia grass	4266.9	Sqm	225	**960052.5**
c	**Preparation of Mound:**Providing and filling Red Hill Earth & Cow Dung Manure mixing in 2:1 proportion over debries put to desired shape of mound,watering to the depth of 1" three times, weeding after every watering before plantation, leveling, rolling after proper compaction, planting of good quality plants at specified intervals including transport & unloading. Watering etc. maintaining for 1 month after completion of plantation and replacement of casualties till 1 month.				

GW-2-3-A	Filling debries for earh mound in desired shape (Fine Dressing)	2447.5	Cum	105	256987.5
GW-2-3-B	Filling good garden soil mix with manure	612	Cum	216	132192
	Total				**389179.5**
	Plantation: Shrubs				
	Planting Shrubbery on Soft/Hard surface: Filling Red Hill Earth & Cow Dung Manure in the excavated area mixing in 2:1 proportion, watering, weeding after every watering before planting the shrub, leveling, providing and planting well grown, healthy, bushy shrubs including transport and unloading as per specified variety and sizes, planting at desired location and specified distances, maintaining for 1 month after completion of plantation and replacement of casualties till 1 month.	2866	Sqm		
GW-2-4-A	Filling good garden soil mix with manure (Fine Dressing)		Sqm	410	
GW-2-4-B	Leveling		Sqm	16	
GW-2-4-C	Weeding		Sqm	16	
GW-2-4-D	Maintenance		Sqm	150	
GW-2-4-E	Planting Shrubs (Labour, transport and unloading) (Excluding cost of plant)		Sqm	75	
	Total	2866	Sqm	667	**1911288.5**
	Plantation: Hedges/ Edges/ Flower Beds/ Ground covers				
	Planting Hedges/ Edges/Ground covers on Soft/Hard surface: Filling Red Hill Earth & Cow Dung Manure in the excavated area mixing in 2:1 proportion, watering, weeding after every watering before planting the shrub, leveling, providing and planting well grown, healthy, bushy shrubs including transport and unloading as per specified variety and sizes, planting at desired location and specified distances, maintaining for 1 month after completion of plantation and replacement of casualties till 1 month.	2529	Sqm		
GW-2-7-A	Filling good garden soil mix with manure (Fine Dressing)		Sqm	216	
GW-2-7-B	Leveling		Sqm	16	
GW-2-7-C	Weeding		Sqm	16	
GW-2-7-D	Maintenance		Sqm	175	
GW-2-7-E	Planting Ground covers (Labour, transport and unloading) (Excluding cost of plant)		Sqm	80	
	Total	2529	Sqm	503	**1272036.7**
	Plantation: Trees				
	Planting Trees on Soft/Hard surface (Individual): Filling of Red Hill Earth, Cow Dung Manure & good earth from excaveted pit in the excavated pits mixing in 2:1:1 proportion, watering & providing well grown trees with minimum average girth of 2" and minimum height of 10' above finished level after plantation of specified variety,at desired location & at specified distances. Achieving finished grade level. Planting the tree with appropriate anchoring, leveling the top soil surface as specified after plantation, staking to balance the tree. Including transport to the site & planting , preparation of tree basin, watering & maintaining for 1 month after completion of plantation and replacement of casualties till 1 month.	251	No.s		
GW-2-8-A	Filling good garden soil mix with manure (Fine Dressing)		No.s	519	
GW-2-8-B	Leveling		No.s	28	
GW-2-8-C	Weeding		No.s	28	
GW-2-8-D	Maintenance		No.s	60	
GW-2-8-E	Planting Tree (Labour, transport and unloading) (Excluding cost of plant)		No.s	100	
	Total	251	No.s	735	**184485**
			TOTAL		**6238006**
	GW Schedule Section 3				
ITEM CODE	**ITEM DESCRIPTION**	**Qty**	**UNIT**	**Rate**	**Total Amount**
	Garden Furnitures				
GW-3-2-f	SS Dust Bin (Refer sketch 10) Product area:0.76Sqm, Capacity in ltrs: 42.0 ltrs, Product height:0.92m	30	Nos	17265	517950
GW-3-1-g	Providing and laying**Natural unpolished Black/Brown Pebbles**of size 75mm to 125mm laying in 3 layers (finish layer of 75mm nominal thickness),graded pebbles etc complete as per drawing as specified as directed by Engineer.(Refer sketch 26)	35	Cum	1850	64750
GW-3-1-h	Providing and laying**Polished White Pebbles**of size 75mm to 125mm laying in 3 layers(finish layer of 75mm nominal thickness),graded pebbles etc complete as per drawing as specified as directed by Engineer. (Refer sketch 27)	50	Cum	3550	177500
GW-3-1-i	Providing and laying**Polished Black/Brown Pebbles**of size 75mm to 125mm laying in 3 layers(finish layer of 75mm nominal thickness),graded pebbles etc complete as per drawing as specified as directed by Engineer. (Refer sketch 28)	75	Cum	2950	221250
GW-3-2-p	**Sleek Bench**(Refer sketch 20) Product area: 1.2 x 0.6 mts, Capacity in nos: 3 nos, Product height:0.5m	25	Nos	31396	784900
GW-3-2-q	**Deluxe Bench**(Refer sketch 21) Product area:1.3 x 0.9 mts, Capacity in nos: 3 nos, Product height:1.2m	20	Nos	42182	843640

			TOTAL		2609990
ITEM CODE	**ITEM DESCRIPTION**	**Qty**	**UNIT**	**Rate**	**Total Amount**
JM-CIVIL-6	Providing and installing drinking water fountain on site.As per Approved.	108,560.00	Nos	10	1085600
PTW-LD-01	**Drainage cell**:: Providing light weight Drainage cell made of PP 30 mm thk (Make : JKD or equivalent) compressive strength 146 KN & Laying per the drawings and as per manufactureres specifictions & instructions of laying etc complete.	11050	Sqm	392	**4331600**
PTW-LD-02	**Geo fabric**: Providing & Fixing High Strength non woven 150 Gsm Geo Textile filteration Fabric to prevent soil from entering & clogging the drainage system & as per manufactureres specifictions & instructions of laying etc complete.	17000	Sqm	91	**1547000**
PTW-LD-03	**Pots**: Supplying Plastic containers cubo 40 Harshdeep or equivalent of Gray stone finish with UV resistant, Light weight, Frost resistant, Unbreakable, Eco efficient of Size 40cmX37cm height. as per the instructions given by PMC etc complete (rate for Soil filling & Planting plants is consider in GW 2-4 refer plant list attached for planting)	300	Nos	1,087	**325983**
PTW-LD-04	**Pots**: Supplying Plastic containers cubo 40 Harshdeep or equivalent of Terracota with UV resistant, Light weight, Frost resistant, Unbreakable, Eco efficient of Size 40cmX37cm height. as per the instructions given by PMC etc complete (rate for Soil filling & Planting plants is consider in GW 2-4 refer plant list attached for planting)	300	Nos	998	**299250**
PTW-LD-05	**Pots**: Supplying Plastic containers florence Harshdeep or equivalent of Gray stone finish with UV resistant, Light weight, Frost resistant, Unbreakable, Eco efficient of Size 90cmX45cmX37cm height. as per the instructions given by PMC etc complete (rate for Soil filling & Planting plants is consider in GW 2-4 refer plant list attached for planting)	300	Nos	2,334	**700080**
PTW-LD-06	**Pots**: Supplying Plastic containers florence Harshdeep or equivalent of Terracota with UV resistant, Light weight, Frost resistant, Unbreakable, Eco efficient of Size 90cmX45cmX37cm height. as per the instructions given by PMC etc complete (rate for Soil filling & Planting plants is consider in GW 2-4 refer plant list attached for planting)	300	Nos	2,095	**628560**
PTW-LD-07	**Pots**: Supplying Plastic containers flora 60 Harshdeep or equivalent of Gray stone finish with UV resistant, Light weight, Frost resistant, Unbreakable, Eco efficient of Size 90cmX45cmX37cm height. as per the instructions given by PMC etc complete (rate for Soil filling & Planting plants is consider in GW 2-4 refer plant list attached for planting)	400	Nos	1,137	**454800**
PTW-LD-08	**Pots**: Supplying Plastic containers flora 60 Harshdeep or equivalent of Terracota with UV resistant, Light weight, Frost resistant, Unbreakable, Eco efficient of Size 90cmX45cmX37cm height. as per the instructions given by PMC etc complete (rate for Soil filling & Planting plants is consider in GW 2-4 refer plant list attached for planting)	400	Nos	1,049	**419500**
			TOTAL		**9792373**

	GW Schedule Section 4				
ITEM CODE	**ITEM DESCRIPTION**	**Qty**	**UNIT**	**Rate**	**Total Amount**
	Supply, installation, testing and commissioning of PVC Pipe / ASTM (SCH 40) pipe of the size and pressure rating as shown below, including the supply of all requisite molded PVC fittings etc as specified and as required complete.				
GW-4-9-i	75mm x 6 Kg/Cm2	390	Mts	165	64350
GW-4-9-f	63mm x 6 Kg/Cm2	300	Mts	117	35100
GW-4-9-c	50mm x 6 Kg/Cm2	930	Mts	76	70680
GW-4-9-b	40mm x 10 Kg/Cm2	492	Mts	78	38376
					0
GW-4-6-l	Supply, installation, testing and commissioning of Y type screen filter with a total flow exceeding that of the pump's rated flow with all accessories as per specifications complete.	1	Nos	10459	10459
GW-4-7-i	Supply, installation, testing and commissioning of automatic hydraulic control Media Filter with a total flow exceeding that of the pump's rated flow with all accessories as per specifications complete.	1	Nos	101682	101682
					0
GW-4-8-b	Valve on 75mm Pipe	6	Nos	7229	43374
					0
PTW-LD-09	Supply, installation, testing and commissioning of 12" Rectangular Irrigation Control Valve Box etc complete	4	Nos	0	0
PTW-LD-10	Supply, installation, testing and commissioning of 10" Round valve Box for housing the ball valve	18	Nos	0	0
GW-4-13-s	Supply, installation, testing and commissioning of 50 /40 mm flush valve.	25	Nos	83	2075
					0
PTW-LD-11	Supply, installation, testing and commissioning of 6" dia round valve boxes for housing the quick coupling valves	15	Nos	387.04	5805.6
	Sprinklers And accessories				0
	Supply, installation, testing and commissioning of Rotor Sprinkler with popup height of 4" / 5" including swing joints and all accessories as per specification complete in various radii range as specified below				0
GW-4-8-j	Sprinkler with radius 5-8 Mtr	75	Nos	1277	95775
GW-4-8-g	Sprinkler with radius 8-12 Mtr	75	Nos	1853	138975

	Drip Irrigation Equipment				0
GW-4-1-a	Supply, installation, testing and commissioning of Drip Irrigation Lateral pipes of 16mm dia with all necessary fittings like take off, gromet, connectors, tees, elbows, end caps, stakes etc as required and specified complete	6000	Mts	18	108000
GW-4-2-d	Supply, installation, testing and commissioning of Pressure compensating emitters of 4LPH and 8LPH with all required distribution tubing and accessories complete as specified	3000	Nos	4	12000
GW-4-2-a	Supply, installation, testing and commissioning of inline Polutube of 16 mm dia., 0.4 cm spacing with 4 lph discharge with all necessary fittings like take off, gromet, connectors, tees, elbows, end caps, stakes etc as required and specified complete	17000	Mts	21	357000
	Automation Equipment				0
GW-4-8-n	Supply, installation, testing and commissioning of 6 station Electronic automation Controller with necessary fittings and accesoories	3	Nos	26709	80127
GW-4-8-l	Supply, installation, testing and commissioning of Solenoid Valve as per specifications of size 2" dia complete with all necessary fittings accessories.	18	Nos	5934	106812
PTW-LD-12	Supply, installation, testing and commissioning of 10" Round Irrigation Control Valve Box etc. complete	18	Nos	1290	23220
				TOTAL	**1,293,810.60**

	GW Schedule Section 5							
Item Code	**Botanical Name**	**Common Name**	**QTY**	**Unit**	**Pot/Polybag of 50 micron**	**Required Ht.**	**Rates**	**TOTAL AMOUNT**
	Shrubs							
GW-5-74	Heliconia pisttacorum	Yellow flower	2475	Nos	Polybag	9"to12"	45	111375
GW-5-72	Heliconia humilis	Heliconia	523	Nos	Polybag	9"to12"	90	47025
GW-5-236	Areca Catechu	Areca palm	605	Nos	Polybag	9"to12"	55	33275
GW-5-113	Mussaenda	Red double mussanda	1375	Nos	Polybag	9"to12"	70	96250
GW-5-224	Bambusa vulgaris	Golden bamboo	550	Nos	Polybag	9"to12"	99	54450
GW-5-168	Alpinia speciosa	Red ginger	792	Nos	Polybag	9"to12"	158	125136
GW-5-187	Jacquemontia		2235	Nos	Polybag	9"to12"	143	319633.6
GW-5-72	Heliconia humilis	Red orange flowers	220	Nos	Polybag	9"to12"	90	19800
GW-5-50	Dracaena	Dracena red	7315	Nos	Polybag	9"to12"	40	292600
GW-5-49	Dracaena colorama	Dracaena Victoria	3548	Nos	Polybag	9"to12"	45	159637.5
GW-5-62	Ficus Benjamina	Bushy Prince Ficus	2569	Nos	Polybag	9"to12"	80	205480
GW-5-148	Schefflera	Schefflera green	550	Nos	Polybag	9"to12"	40	22000
GW-5-179	Differenbachia Ceylon	enbachia Various Vari	1139	Nos	Polybag	9"to12"	92	104742
GW-5-157	Thuja Compacta	Umbrella Grass	198	Nos	Polybag	9"to12"	50	9900
GW-5-155	Spathyphyllu hybrid	Spathiphyllum	880	Nos	Polybag	9"to12"	60	52800
GW-5-193	Nephrolephis biserrata	0	3058	Nos	Polybag	9"to12"	75	229350
GW-5-171	Chamaedorea metallica	Metallic Palm	3713	Nos	Polybag	9"to12"	450	1670625
GW-5-22	Bougainvillea Sp	Mix var Specimen	7700	Nos	Polybag	9"to12"	105	808500
GW-5-181	Euphorbia pulcherrima	Poinsettia White, Pink, Red)	1496	Nos	Polybag	9"to12"	250	374000
GW-5-167	Aglaonema commutatum	Aglaonema Various Varieties	1650	Nos	Polybag	9"to12"	92	151800
GW-5-172	Chameadorea Metallica	0	446	Nos	Polybag	9"to12"	317	141223.5
GW-5-317	Cordia cebastina	Cordia	33	Nos	Polybag	10"to12"	575	18975
GW-5-218	Brassia actinophylla	0	1232		Polybag	9"to12"	957	1179024
GW-5-174	Chrysalidocarpus lutecens	Areca Palm	127	Nos	Polybag	9"to12"	200	25300
			44426			**TOTAL**		**6252901.6**
	Trees							
GW-5-311	Bauhinia Purpurea	Kanchan	9	Nos	Polybag	4' to 5'	575	5060
GW-5-334	Swetania mahogani	Mahogani	17	Nos	Polybag	4' to 5'	417	6880.5
GW-5-246	Callistemon vimnalis	Bottle brush	31	Nos	Polybag	4' to 5'	68	2094.4
GW-5-254	Cordia cebastina		24	Nos	Polybag	4' to 5'	60	1452
GW-5-228	Lagerstomia speciosa	Jarul	18	Nos	Polybag	4' to 5'	23	404.8
GW-5-285	Messua fessea	Nagkeshar	7	Nos	Polybag	4' to 5'	187	1234.2
GW-5-286	Michelia champaca	Son Chapha	3	Nos	Polybag	4' to 5'	161	531.3
GW-5-297	Spathodea companulata	Fountain Tree, Bahava	9	Nos	Polybag	4' to 5'	50	440
GW-5-202	Plumeria alba		7	Nos	Polybag	4' to 5'	1750	11550
GW-5-148	Schefflera		17	Nos	Polybag	4' to 5'	40	660
GW-5-302	Tabebuia rosea		11	Nos	Polybag	4' to 5'	55	605
GW-5-337	Terminalia montana		19	Nos	Polybag	10' to 12'	500	9350
GW-5-336	Termenalia Arjuna		12		Polybag	4' to 5'	725	8772.5
GW-5-236	Areca catechu	Kath	26	Nos	Polybag	4' to 5'	55	1452
GW-5-248	Cassia fistula	Amalas, Indian laburnum	4	Nos	Polybag	4' to 5'	190	836
GW-5-233	Alstonia scholoris	Satveen, Devils tree	15	Nos	Polybag	4' to 5'	50	770
	PALMS							
GW-5-322	Foxtail Palm		12	Nos	Polybag	4' to 5'	2350	28435
						TOTAL		**80527.7**
	Lawns & Grasses		Qty	Unit	Rate	Total		
GW-5-347	Zoysia Species	Korean carpet	3830	Sqm	265	**1014950**		

	Ground covers							
GW-5-41	Chlorophyttum species	Dusty miller	6500	Nos	Polybag	9”to12”	20	130000
GW-5-133	Hemigraphis colorata	Hemigraphis	3730	Nos	Polybag	9”to12”	25	93250
GW-5-192	Nephrolepis aurea	Fern Golden	1600	Nos	Polybag	9”to12”	75	120000
GW-5-48	Cynodon species	American blue grass	3450	Nos	Polybag	9”to12”	115	396750
GW-5-131	Philodendron Ceylon	Philodendron	2515	Nos	Polybag	9”to12”	15	37725
GW-5-343	Ophiopogon japonicus	Monkey Grass / Mondo	2890	Nos	Polybag	9”to12”	23	66470
GW-5-153	Tradescantia albiflora	Laal math	1866	Nos	Polybag	9”to12”	20	37320
GW-5-344	Ophiopogon jaburan	Ribbon Grass white	3780	Nos	Polybag	9”to12”	24	90720
GW-5-219	Silver Yucca		1455	Nos	Polybag	9”to12”	431	627105
GW-5-12	Asparagus sprengerii	shatawari	690	Nos	Polybag	9”to12”	30	20700
GW-5-160	Zebrina pendula		134	Nos	Polybag	9”to12”	20	2680
GW-5-164	Hypoestes sanguinolenta		10230	Nos	Polybag	9”to12”	30	306900
GW-5-155	Spathiphyllum hybrid		2935	Nos	Polybag	9”to12”	60	176100
GW-5-122	Pentas karmesiana		4800	Nos	Polybag	9”to12”	24	115200
GW-5-95	Lantana Sellowiana	Purple creeping	4300	Nos	Polybag	9”to12”	25	107500
GW-5-73	Heliconia metallica		3500	Nos	Polybag	9”to12”	75	262500
			54375			**Total**		**2590920**
	Potted plants							
GW-5-28	Canna variegated	Ordinary varieties	1200	Nos	Polybag	9”to12”	35	42000
GW-5-29	Canna variegated	Canna variegated	1200	Nos	Polybag	9”to12”	40	48000
GW-5-36	Codieum variegatum	Petra croton	300	Nos	Polybag	9”to12”	60	18000
GW-5-59	Euphorbia caracasana	Burgandy leaves	375	Nos	Polybag	9”to12”	25	9375
GW-5-68	Galphimia glauca	Canary bush	375	Nos	Polybag	9”to12”	35	13125
GW-5-81	Ixora chinensis lutea	Yellow ixora	600	Nos	Polybag	9”to12”	35	21000
GW-5-82	Ixora chinensis sunkist	ixora nana pink	600	Nos	Polybag	9”to12”	35	21000
GW-5-83	Ixora chinensis sunkist	ixora nana red	400	Nos	Polybag	9”to12”	40	16000
GW-5-91	Jatropha pandurifolia	Jatropa	300	Nos	Polybag	9”to12”	30	9000
GW-5-94	Lantana camara depressa	Lantana yellow	600	Nos	Polybag	9”to12”	25	15000
GW-5-95	Lantana camara sanguinea	Haldi kumkum	900	Nos	Polybag	9”to12”	25	22500
GW-5-97	Lantana sellowiana	Purple creeping	900	Nos	Polybag	9”to12”	25	22500
GW-5-98	Lantana sellowiana	White creeping	900	Nos	Polybag	9”to12”	25	22500
GW-5-105	Meyenia erecta	Meena	1800	Nos	Polybag	9”to12”	25	45000
GW-5-117	Nerium petit salmon	Dwarf nerium	300	Nos	Polybag	9”to12”	37	11100
GW-5-119	Pachystachys lutea	Lolipop plants	300	Nos	Polybag	9”to12”	28	8400
GW-5-120	Pentas lanceolata alba	White pentas	600	Nos	Polybag	9”to12”	28	16800
GW-5-121	Pentas lanceolata carnea	Pink pentas	600	Nos	Polybag	9”to12”	28	16800
GW-5-206	Salvia splendens	Salvia red	900	Nos	Polybag	9”to12”	50	45000
GW-5-189	Kalanchoe blossfeldiana	Kalanchoe pink	1200	Nos	Polybag	9”to12”	50	60000
GW-5-185	Impatiens wallerania	Shady balsum	2000	Nos	Polybag	9”to12”	53	106000
GW-5-184	Gerbera Hybrids tissue culture	Gerbera	2000	Nos	Polybag	9”to12”	75	150000
GW-5-142	Portulaca Grandiflora	Office time double	600	Nos	Polybag	9”to12”	25	15000
GW-5-212	Vinca sp. Hybrid	Vinca	1200	Nos	Polybag	9”to12”	57	68400
						Total		**822500**
					Total Cost		**10761799**	

GARDEN CSMC
BOQ

	Patwardhan Park Landscape CSMC						
ITEM CODE	**Garden Maintenance**	**Qty**	**Rate**	**Unit**	**Main. cost/month**	**Main. cost/year**	**Main. cost/36 month**
FMG-Y-G-1	Sweeping	18000	4500	3000 Sq.Mtr/month	27000	324000	972000
GW-5-357	Security	18	5000	shift/month	90000	1080000	3240000
GW-2-8-D	Maintenence of Trees	356	60	Nos	21360	256320	598080
GW-2-4-d	Maintenance of Shrubs	2865	150	Sq.Mtr.	429750	5157000	15471000
GW-2-1-D	Maint. Of Lawn & Ground cover	6536	16	Sq.Mtr.	104576	1254912	3764736
					Total Maintainance cost		**24045816**

CIVIL SPECIFICATIONS

PROPOSED UNDER GROUND PARKING ON PATWARDHAN PARK, PLOT BEARING C.T.S NO. 371A & 371B OF VILLAGE BANDRA, AT LINKING ROAD, BANDRA WEST, H/W WARD, MUMBAI.

CIVIL WORKS SPECIFICATIONS

BASEMENT WATER PROOFING WORK

1.0 GENERAL

1.1 Standards

Indian and other International Standards followed for this section shall be as listed below. Any discrepancies or ambiguities seen shall be brought to the notice of the PM and clarification / confirmation sought. His decision shall be final. However, as a general rule, more stringent specifications shall be followed.

1. IS 269 Specification for 33 grade ordinary Portland cement.
2. IS 383 Specification for coarse and fine aggregates from natural sources for concrete.
3. IS 2645 Specification for integral cement water proofing compound.
4. IS 6494 Code of practice for water proofing of underground reservoirs and swimming pool.
5. IS 8112 Specification for 43 grade ordinary Portland cement.
6. IS 12118 Specification for two part polysulphide based sealant :

   Part ï I general requirements.
7. IS 13826 Method of Test.

1.2 Quality Assurance

1.2.1 Manufacturerôs Qualification

a) Not less than five yearsôexperience in manufacturing of membrane roofing.

   1. Obtain primary materials from single manufacturer. Manufacturer's name shall appear on containers and accessories.
   2. Provide secondary materials as required by manufacturer of primary materials.

1.2.2 Applicators Qualification

a) Approved by manufacturer prior to execution of this Contract, with experience on at least five projects.

b) Foreman of Field Crew: Minimum five yearsô experience with system of waterproofing being installed.

1.2.3 Certifications

Manufacturerôs certifications on manufacturerôs letterhead:

1. Certify system design; penetration, transition, and perimeter details; and system specifications are appropriate and satisfactory for this particular project.
2. Certify products proposed for use comply with standards.
3. Certify materials ordered and supplied are compatible with each other, suited for local and purpose intended and shipped in sufficient quantity to ensure proper timely installation.

4. Certify materials have express warranty of merchantability and fitness for particular purposes of this Project.

5. Certify manufacturer has reviewed Project and will issue warranty upon successful completion of installation.

6. Certify materials shipped to site meet membrane manufacturer's published performance standards and requirements of this Specification.

7. Membrane manufacturer's approval of insulation type and method of installation.

8. Manufacturer's approval of installer.

1.3 Submittals

1.3.1 Product Data

Contractor to submit along with his proposal product data for material he proposes to use.

1.3.2 Informational Submittals

a) Certifications specified in quality assurances

b) Manufacturer's instructions

1.4 Waterproofing compounds

1.4.1 Waterproofing compounds shall be cementitious (cement based) non-shrinking, self curing mixtures. These shall be

Free from sodium and chlorides

Free from material detrimental to concrete and reinforcement.

Able to create a membrane in one or multiple coats as per manufacturer's instruction.

Membrane capable to prevent infiltration when applied to interior faces and ponded.

Permeability, shear bond strength, compressive strength, volume changes meets minimum requirements of codes.

1.4.2 Accessories

All other accessories materials such as primers, bonding agents, polymers etc. shall be as recommended by waterproofing manufacturer.

1.5. Warranty

A. Special Warranty:

1. Warranty with attachments for full replacement value of completed installation signed by manufacturer, applicator and Contractor warranting against water infiltration and defects of materials and workmanship for period of ten years.

2. Provide warranty that covers labour and workmanship, including labour for access to waterproofing, for watertight warranty.

a. Warrant penetrations, terminations, changes of direction, and membrane.

b. Warranty shall include removing and reinstalling superimposed work covering waterproofing.

2.0 MATERIALS

2.1 Cement

2.1.1 Cement shall be ordinary Portland Cement conforming to IS and shall be of grade 43 or 33.

It shall be received in bags of 50 kg and each batch shall be accompanied with a test certificate of the factory. Also it shall be tested before use to ascertain its strength, setting time, etc. In case cement has been stored for over 6 months or for any reasons the stored cement shows signs of deterioration or contamination, it shall be tested as per the direction of the PM prior to use in the works.

2.1.2 Cement shall be stored in such locations so as to prevent deterioration due to moisture dampness. A dry and water proof shed shall be provided. Bags shall be stacked on rigid water-proof platforms about 15 to 20 cm clear above the floors and 25 to 35 cm clear or away from the surrounding walls. A maximum high stack of 12 bags is permitted. Stacks shall be so arranged that the first batches are used first (FIFO), and that they permit easy access for inspection and handling.

2.2 Sand

2.2.1 Natural sand deposited by stream or glacial agencies as a result of disintegration of rock is the best form of sand and shall be used.

2.2.1.1 Sometimes it is obtained from crushed stone screenings but often contains a high percentage of dust and clay. It tends to be flaky and angular. This type produces harsh concrete and should be avoided.

2.2.2 Sand shall be hard, durable, clean and free from adherent coatings and organic matter and shall not contain any appreciable amount of clay. Sand shall not contain harmful impurities such as iron, pyrites, coal particles, lignite, mica shale or similar laminated material, alkali, and organic impurities in such form or quantities as to affect the strength or durability of concrete or mortar.

2.2.2.1 When tested as per IS 2386 Part I and Part II, sand shall not exceed permissible quantities of deleterious materials as given in table 1of IS 383.

2.2.3 Grading of sand shall conform to IS and shall fall within limits.

2.2.4 Sand shall be stored in such a way that it does not get mixed with mud, grass, vegetables and other foreign matter. The best way is to have a hard surface platform made out of concrete, bricks or planks. It should be to the approval of the PM.

2.3 Water

2.3.1 Water used for mixing and curing shall be clean, reasonably clear and free from objectionable quantities of silt, oils, alkalies, acids, salts so as not to weaken mortar or concrete or cause efflorescence or attack the steel in RCC while curing. It shall be free of elements, which significantly affects the hydration reaction. Potable water is generally satisfactory, but it shall be tested prior to use in the works.

2.3.2 Water tested shall be in accordance with IS 3025. Maximum permissible limits of deleterious materials in water should be as given in IS 456.

2.3.3 Water storage tanks shall be such as to prevent any deleterious materials getting mixed with it.

2.3.4 Water shall be tested and approved in writing by the PM prior to use in the works.

2.4 Accessories

Primers, bonding agents, water stops or plugs etc. as per recommendations of the manufacturer.

2.5 Mixes

a) Mix materials in accordance with manufacturerõs instructions

b) Mix in clear containers

c) Do not re-temper mix after initial set.

2.6 Membrane

2.6.1 HDPE Membrane

1) Resist hydrostatic pressure of > 70 m head of water (as per ASTM D5385 modified)

2) Peel adhesion to concrete- 880 N/mm (as per ASTM D903 modified)

3) Puncture Resistance ï 950 N minimum (as per ASTM E154)

4) Tensile Strength, Film ï 27 MPa minimum (as per ASTM D412)

5) Elongation - 300% minimum (as per ASTM D412 modified)

2.7 Delivery / Storage.

All materials shall be delivered and stored at site conforming to following minimum requirements.

Material received is approved by EIC,

Material is in unopened container and labeled with manufacturerõs name, brand name and instructions for use.

Material received shall be along with manufacturerõs certificate for quality and period of manufacture.

Material shall be stored in dry, well ventilated and covered storage if so desired by manufacturer.

Primers, adhesives etc. shall be as recommended by the membrane manufacturer.

3.0 SCOPE OF WORK

3.1 Work shall include design, supply, install and test proprietary waterproofing systems to underground structure, terraces, and toilet sunk slabs, UG and Overhead water tanks etc. This shall be guaranteed for 10 years on Rs.100/- stamp paper in proforma to be approved by the PM.

a) Waterproofing of basement including sealing of services junctions, drain points, sumps shall be as per approved box type proprietary treatment.

3.2 Work shall include design, supply, install and test proprietary systems for basement, terrace sloped/flat roofs as approved by the EIC. This shall be guaranteed for 10 years on Rs.100/- Stamp paper in proforma to be approved by the EIC.

Work shall conform to minimum standards specified. Systems detailed hereunder are to clarify type of water proofing system expected. Contractor is at liberty to suggest and submit equivalent system with products meeting / exceeding standards.

3.3 Sub-Contractor / Specialist shall be from the approved list and shall be approved by the PM in writing before being employed by the Contractor.

3.4 The Contractor shall submit

1. Statement giving detailed brief of work he proposes to carry out.
   a) Name of agency with his experience certificate and quantum of work carried out.
   b) Technical Specifications
   c) Product data sheets of material to be used
   d) Shop drawing detailing
      - Sections coordinated with typical installation details
      - Vertical termination and sealing
      - Laps needed if any
      - Typical expansion, construction and control jointing details with minimum requirement.
      - Horizontal fixing and laying details.
      - Typical finishing arrangement.
      - Flashings if required.
   e) Protective measures to be taken.
   f) Installation guidance
   g) Samples of each product in duplicate fixed over plywood boards or similar to enable proper cross sections.
   h) Manufacturerôs certificate that product and material to be used is correct and shall give intended results when applied through authorized agency.

4.0 WORKMANSHIP

4.1 Preparation of Surfaces

a) The surfaces to receive the treatment shall be thoroughly cleaned of

Laitances, scales, loose material on surface.

Grease, oil or other contaminants by etching with 10-15% of solution of muriatic acid using commercial grade alkaline cleaner, flushing with clean water drying and vacuuming.

b) Surfaces shall be examined, and well-defined cracks grouted by making ó/ô groove / notches with cement slurry, shall be cured and dried well before treatment.

c) Any honeycombs shall be carefully cut and plugged and cured well before treatment.

d) Examination of surface shall account for the fact that,

Surfaces are cured for 14 days and no condensation has taken place.

Horizontal and vertical surfaces have smooth finish, free from defects.

Surfaces are dry, clean, free of grease, oil, dirt, rust, corrosion, other coatings and contaminants which could affect bond of water proofing system.

4.2 Basement Waterproofing

Membrane method

FLOOR

1) surface preparation over PCC, removing loose concrete, foreign material, standing water and providing lean RCC wall against shore pile surface to make the surface uniform before applying a 1.2mm thick, pre-applied, fully bonded HDPE sheet membrane having UV exposure limit of 56 days of approved make to convenient length by cutting wherever necessary, carefully align the membrane over blind concrete and fix on vertical shuttering using appropriate flat heading fixing sealed later with double sided adhesive tape and roll it out with removable plastic release liner side facing uppermost (against which fresh liquid concrete shall be poured) and white HDPE face towards leveled substrate (PCC fro Raft & Uniform Lean wall/Plum concrete surface for confined retaining wall), lay adjacent sheets by keeping overlap of standard 75 mm, end overlaps to be treated using double sided coated adhesive tape etc. complete. "Mechanically bonded membranes/Membrane with mesh or geotextile on top not permitted ".

2) 'Membrane shall form integral and permanent bond to poured concrete and capable of preventing water migration between membrane and structural concrete, be chemically resistant in all types of soil or water, has zero permeance to moisture, is solar reflective to reduce heat gain while exposed, shall not activate prematurely due to wet conditions and remain unaffected by ground settlement beneath slabs. The membrane along with ancillaries shall be BBA Certified for basement Grades 1,2&3 to BS 8102:2009. All systems to be installed as per manufacturer's recommendations, etc. complete with all lead and lift for all materials and labour and as directed by Engineer in-charge.

3) 'Sealing of Pressure- Release Pipes:

   The Pressure-Release Pipes penetrations will be sealed all around on the HDPE sheet membrane at PCC level with a 2-component asphalt modified urethane liquid membrane, hydrophilic water stop & a double sided adhesive tape (applied by original manufacturer's approved installer), as per drawing. All systems to be installed as per manufacturer's recommendations, etc. complete with all lead and lift for all materials and labour and as directed by Engineer in-charge.

4) Sealing of pre-stressing ground anchor penetration, 32 mm diameter all around on the HDPE membrane with a 2-component asphalt modified urethane liquid membrane, (applied by original manufacturer's approved installer). All systems to be installed as per manufacturer's recommendations, etc. complete with all lead and lift for all materials and labour and as directed by Engineer in-charge.

5) Supply and installing Elastomer & hydrophilic resin-based water stop of (20 x 10) mm fixed with nailing or MS Polymer adhesive, having good all-round chemical resistance, capable of delayed initial swelling and reversible

swelling in case of wet-dry cycles, (installed by original manufacturer's approved installer) at required locations such as

(i) Junction of raft/retaining wall &

(ii) at all other locations as mentioned in drawings

All systems to be installed as per manufacturer's recommendations, etc. complete with all lead and lift for all Materials and labour and as directed by Engineer in-charge.

4.3.5 Measurements shall be in square metre for finished surface area. Rates shall include all items right from cleaning of surface to completion and testing required against defects such as leakage, seepage, dampness, sweating etc.

5.0 TESTING

5.5.1 On completion of installation and prior to next operation or as directed by PM work shall be tested by the Contractor. Required water shall be arranged and disposed of by the contractor at his cost.

a) All openings, drains etc. shall be plugged.

b) Water shall be flooded about 200 mm over the Sunk portion. Water shall be kept for 72 hours.

c) Surfaces shall be observed critically and in case any leakage is observed areas shall be treated again and tests to be carried out again to the satisfaction of the PM.

5.5.2 Approval of water test does not relieve the contractor of his obligation of providing installed water proofing guaranteed for 10 years as per contract.

5.5.3 All arrangement of material, labour etc. required including preserving and maintaining areas flooded shall be carried out by the Contractor at his cost.

6.0 GUARANTEE

6.1 All waterproofing systems described above are to be referred as guide-lines only. The contractor shall propose the system before starting waterproofing work giving full description for approval of EIC.

6.2 The system shall be guaranteed for 10 years against all defects and liabilities thereof from the date of completion of project. The guarantee shall be on Stamp Paper of Rs.100/- in proforma to be approved by Employer/ EIC. (The contractor shall submit proforma for approval of Employer/ EIC before being written on Stamp Paper.) The cost of Stamp Paper shall be to the contractorÕs account.

6.3 Work shall be carried through approved specialist agency as per method of working approved in writing by the EIC.

* * * * *

POLYCARBONATE SHEET

ROOFING

1.0 GENERAL

1.1 Standards

Indian and other International Standards followed for this section shall be as listed below. Any discrepancies or ambiguities seen shall be brought to the notice of the PM and clarification / confirmation sought. His decision shall be final. However, as a general rule, more stringent specifications shall be followed.

1.2 Quality Assurance

1.2.1 Manufacturerôs Qualification

a) Not less than five yearsôexperience in manufacturing of polycarbonate sheet roofing.

1. Obtain primary materials from single manufacturer. Manufacturer's name shall appear on containers and accessories.
2. Provide secondary materials as required by manufacturer of primary materials.

1.2.2 Applicators Qualification

a) Approved by manufacturer prior to execution of this Contract, with experience on at least five projects.

b) Foreman of Field Crew: Minimum five yearsô experience with system of waterproofing being installed.

1.2.3 Certifications

Manufacturerôs certifications on manufacturerôs letterhead:

1. Certify system design; penetration, transition, and perimeter details; and system specifications are appropriate and satisfactory for this particular project.
2. Certify products proposed for use comply with standards.
3. Certify materials ordered and supplied are compatible with each other, suited for local and purpose intended and shipped in sufficient quantity to ensure proper timely installation.
4. Certify materials have express warranty of merchantability and fitness for particular purposes of this Project.
5. Certify manufacturer has reviewed Project and will issue warranty upon successful completion of installation.
6. Certify materials shipped to site meet membrane manufacturerôs published performance standards and requirements of this Specification.
7. Membrane manufacturerôs approval of insulation type and method of installation.
8. Manufacturerôs approval of installer.

1.3 Submittals

1.3.1 Product Data

Contractor to submit along with his proposal product data for material he proposes to use.

1.3.2 Informational Submittals

a) Certifications specified in quality assurances

b) Manufacturerôs instructions

1.4. Warranty

A. Special Warranty:

1. Warranty with attachments for full replacement value of completed installation signed by manufacturer, applicator and Contractor warranting against water infiltration and defects of materials and workmanship for period of ten years.

2. Provide warranty that covers labour and workmanship, including labour for access to waterproofing, for watertight warranty.

a. Warrant penetrations, terminations, changes of direction, and membrane.

b. Warranty shall include removing and reinstalling superimposed work covering waterproofing.

2.0 MATERIAL

Polycarbonate sheet roofing system shall be approved make, shade and as per approved sample.

Polycarbonate Sheets

Polycarbonate sheet shall be 22 mm thick multi-layered panel co-extruded UV protected panels. Panels shall have 7 layers with angular walls in opaque and translucent clear combination as per required Lux Level inside the building. Panels shall be with grip-lock notch standing seam running lengthwise to accommodate the connectors. The sheets shall be free from cracks, split edges, twists, surface flaws etc. They shall be clean, bright and smooth. Panel shall be co-extruded with special anti-glare compound to make it anti-glare/soft light to prevent glare and sun streaks. Panels shall be manufactured with vertical standing seam at both sides of the panel

Purlins

Purlins of the specified material or M.S. rolled sections of requisite size shall be fixed over the principal rafters. These shall be spaced as per manufacturerôs specifications.

3.0 INSTALLTION

The sheets shall be laid and fixed as per manufacturerôs specifications, unless otherwise as per approved shop drawings or directed by the Engineer-in-Charge.

The sheets shall be laid on the purlins to a true plane, with the lines normal to the sides of the area to be covered unless otherwise required as in special shaped roofs.

Panels shall be fixed on purlins with Stainless steel retention clips and connectors as per approved shop drawings. Snap-on connectors to interlock the panels shall have a grip-lock single tooth locking mechanism to ensure maximum uplift capability. Panels shall have End-cap/ Aluminium U-profile/ Glazing bar for ends as per requirement.

The weight of the system shall not be less than 2.46 kg per square meter. Panel shall be co-extruded with special anti-glare compound to make it anti-glare/ soft light to prevent glare and sun streaks.

The laying operation shall include all scaffolding work involved.

Panels shall be fixed over structural steel/ MS purlins (will be paid extra) conforming to the detail technical specifications and as per drawings and as directed by engineer in charge.

Finish

The roof when completed shall be true to lines, and slopes and shall be leak proof.

4.0 MEASUREMENTS

Actual installed surface area of roofing sheet shall be measured for payment without allowance for wastage.

The item shall be measured and paid in sqm.

5.0 RATE

The rate shall include the cost of all the materials, labour, scaffolding and equipment involved in all the operations described above including Stainless steel retention clips and connectors, Snap-on connectors but exclude the cost of MS frame work.

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SERVOKAT

1.0 GENERAL

1.1 Standards

Indian and International Standards followed. Any discrepancies or ambiguities seen shall be brought to the notice of the PM and clarification / confirmation sought. His decision shall be final. However, as a general rule, more stringent specifications shall be followed.

1.2 Quality Assurance

1.2.1 Manufacturerôs Qualification

a) Not less than five yearsôexperience in manufacturing.

1. Obtain primary materials from single manufacturer. Manufacturer's name shall appear on containers and accessories.
2. Provide secondary materials as required by manufacturer of primary materials.

1.2.2 Applicators Qualification

a) Approved by manufacturer prior to execution of this Contract, with experience on at least five projects.

b) Foreman of Field Crew: Minimum five yearsô experience with system of waterproofing being installed.

1.2.3 Certifications

Manufacturerôs certifications on manufacturerôs letterhead:

1. Certify system design and system specifications are appropriate and satisfactory for this particular project.
2. Certify products proposed for use comply with standards.
3. Certify materials ordered and supplied are compatible with each other, suited for local and purpose intended and shipped in sufficient quantity to ensure proper timely installation.
4. Certify materials have express warranty of merchantability and fitness for particular purposes of this Project.
5. Certify manufacturer has reviewed Project and will issue warranty upon successful completion of installation.
6. Certify materials shipped to site meet manufacturerôs published performance standards and requirements of this Specification.
7. Manufacturerôs approval of method of installation.
8. Manufacturerôs approval of installer.

1.3 Submittals

1.3.1 Product Data

Contractor to submit along with his proposal product data for material he proposes to use.

1.3.2 Informational Submittals

a) Certifications specified in quality assurances

b) Manufacturerõs instructions

1.4. Warranty

A. Special Warranty:

1. Warranty with attachments for full replacement value of completed installation signed by manufacturer, applicator and Contractor warranting against water infiltration and defects of materials and workmanship for period of ten years.

2. Provide warranty that covers labour and workmanship, including labour for access to waterproofing, for watertight warranty.

a. Warrant penetrations, terminations, changes of direction, and membrane.

b. Warranty shall include removing and reinstalling superimposed work covering waterproofing.

2.0 MATERIAL

Emergency Fire Exit Covers made up of Galvanized steel Zn 1.0037 of size W 1500 L 4500, 4 parted uniface h= 50 mm with Gas springs for opening from inside. Provided with two sealing for Air & Water suitable for Load class A-15 as per Euro Norms EN 124. Delivered with lifting handle. Overall opening size of 1500 x 4500 mm Load Class A-15. Art. No- Z320790

3.0 INSTALLTION

3.1 General

1. Contractor should ensure the minimum dimensions and installation guidance provided are suitable for the intended application and place of installation.

2. ACO floor access covers are intended for horizontal installations so that the upper surface of the cover and frame are either flush or slightly below (approximately 2mm) the surrounding finished floor/ pavement level.

3. It is recommended that covers remain fitted to their frame at all times during installation. If not there is a possibility the cover will not fit correctly after installation.

3.2 Mortar and concrete specifications

To enable covers to carry their intended service loads the following minimum material specifications must be used or exceeded.

1. Frame bedding mortarð minimum class M6 to BS EN 998-2:2016.
2. Frame haunch and recessed cover structural infill concreteð minimum grade C35/45 concrete to BS EN 206:2013 (maximum aggregate size 10mm).
3. If access covers are to be used in a wet area, waterproofing additives may be required. Fast-curing cementitious mortars or concrete may be used as long as the performance is at least equivalent to those stated above. The concrete specified above must not be replaced by screed.
4. The gas spring must only be fitted once the frame has been installed and the cover has been fully filled with structural concrete . Mortar bedding, concrete haunch and structural infill must be fully cured before attempting to fit the gas spring. When fitting the gas spring please note it must be correctly orientated to operate correctly.

3.2 Installation Specification:

1. All single access covers are delivered with an installation and maintenance booklet, a set of lifting/locking keys, Locking screw dust caps, spacer shims.
2. Check that the shaft size is not larger than the clear opening dimension (AxB) of the access cover. The clear opening size of the access cover frame may be up to 20mm larger than the shaft size.
3. A minimum rebate, 200 mm wider than the over frame size and 40mm deeper than the over frame height of the access cover is to be provided for bedding and haunch material.
4. Ensure upper surfaces of the cover and frame, joints and locking areas are protected from accidental spillages or the ingress of installation materials . This will help reduce the need for cleaning at the end of the installation.
5. Lay a mortar bed of minimum 40mm thickness all round the shaft opening covering the full width of the frame. Minimum mortar class M6 to BS EN 998-2:2016. For ASSIST covers only level the cover and frame centrally over the shaft and shutter internal clear opening. Use minimum grade C35/45 concrete to BS EN 206:2013 to anchor and bed the ASSIST frame. Allow concrete to sufficiently harden before removing shutter. Ensure the ASSIST frame is fully supported by the concrete bed with no voids.
6. Bend out steel anchors horizontally. Bed and level the access cover and frame centrally over the shaft opening. When tapping down to level use a piece of wood to protect metal surfaces. Ensure the frame is fully supported by the mortar bed with no voids. Allow mortar to sufficiently harden. Insert spacers between the frame and cover to maintain an even gap.
7. Haunch the frame fully with concrete (minimum 150mm wide) and fully fill the cover to within 15mm of its upper surface. Use a notched batten to help level concrete. Vibrate concrete where necessary to ensure no voids. Minimum grade C35/45 concrete to BS EN 206:2013 (maximum aggregate size 10mm). Recommended slump S2 or S3.
8. Allow concrete to sufficiently harden and dry out. Remove any spacers or tape protection. The gas spring can now be fitted. Point any gaps in the bedding under the frame if required. Close or refit the cover. The final floor or pavement finish can now be installed.
9. Once the final floor or pavement has been fully installed, remove any excess adhesive or grout from around the cover and frame. Open the cover with the lifting/locking keys provided. Clean all surfaces and ensure the seating areas of the cover, rubber seals and hinges where fitted are free from debris. Lubricate all seals and hinges with a suitable silicone grease.
10. Close/refit the cover and check that there is an even gap between the cover and frame. Once all installation materials have fully cured, the access cover is now ready for use and service loads. Retain all spare parts, the installation and maintenance booklet for future use.

4.0 MEASUREMENTS

The item shall be measured and paid in Number as per size.

5.0 RATE

The rate shall include the cost of all the materials, labour, scaffolding and equipment involved in all the operations.

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CONVEX MIRROR

1.0 GENERAL

1.1 Quality Assurance

1.1.1 Manufacturer's Qualification

a) Not less than five years' experience in manufacturing of convex mirror.

1. Obtain primary materials from single manufacturer. Manufacturer's name shall appear on containers and accessories.
2. Provide secondary materials as required by manufacturer of primary materials.

1.1.2 Certifications

Manufacturer's certifications on manufacturer's letterhead:

1. Certify products proposed for use comply with standards.
2. Certify materials ordered and supplied are compatible with each other, suited for local and purpose intended and shipped in sufficient quantity to ensure proper timely installation.
3. Certify materials have express warranty of merchantability and fitness for particular purposes of this Project.
4. Certify manufacturer has reviewed Project and will issue warranty upon successful completion of installation.

1.2 Submittals

1.2.1 Product Data

Contractor to submit along with his proposal product data for material he proposes to use.

1.2.2 Informational Submittals

a) Certifications specified in quality assurances

b) Manufacturer's instructions

1.4. Warranty

. Warranty with attachments for full replacement value of completed installation signed by manufacturer, applicator and Contractor warranting against water infiltration and defects of materials and workmanship for period of one year.

2.0 MATERIAL

Convex mirror shall be approved make, shade and as per approved sample.

Convex Mirror (Unbreakable) shall be of 32 Inch or 800mm with company fitting accessories Body ABS Mirror Polycarbonate and weight shall be approx. 6.3 Kg or as per approved manufacturer's specifications

3.0 INSTALLTION

Mirror shall be fixed as per manufacturer's specifications, unless otherwise as per approved shop drawings or directed by the Engineer-in-Charge.

4.0 MEASUREMENTS

The item shall be measured and paid in numbers.

5.0 RATE

The rate shall include the cost of all the materials, labour, all accessories, fittings, fixtures and equipment involved in all the operations described above.

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SPECIFICATIONS FOR INSTALLATION OF PERMANENT PASSIVE ROCK ANCHORS FOR UPLIFT RESISTANCE

1.0 Drilling of Anchor Holes

Drilling for anchors will be completed by pneumatic methods as per installation pattern, sizes and lengths provided in drawings. Drilling will commence from top of PCC level after completion of PCC.

Drill hole diameter will be minimum of 115mm in rock. Drill hole diameter in overlying soil/fill portion will be 136mm to 160mm to accommodate MS steel casing.

Borehole sides shall be adequately protected against side collapse by use of ODEX drilling bits and MS Casing up to hard rock.

The deviation of the anchor hole entry angle from its verticality shall be no greater than $\pm$ 3 degrees.

2.0 Anchor Reinforcement

Torsteel bars of diameter as per drawings will be cut to length of complete anchor including bending of development length in raft portion.

The torsteel bars shall be pretreated to remove rust/oil, scaling, grease, etc. Three coats of epoxy formulation shall be applied on the rebar. The 2nd coat shall be applied only after allowing the 1st coat to dry for 2-3 hours. Quartz sand to be sprinkled to roughen the surface. Following epoxy formulation will be used:

Araldite: GY257 (2 Parts)
Aradur hardener– gy140 (1 Part)

Centralizers or spacers shall be utilized to position the torsteel bar so a minimum cover of 10mm to reinforcement bar is achieved.

3.0 Primary Grouting of Anchors

The grout shall entirely fill the annular space between the torsteel bar and the borehole wall/steel casing.

Gravity grouting will be done with GP2 (for 5 day setting) or neat cement grout with Cebex100 admixture for 12 day setting time.

Two (2) grout cubes (7.5cm x 7.5cm x 7.5cm) will be cast for each day of grouting. One cube will be tested at 7 days while the other cube will be tested at 28 days.

4.0 Testing of Anchorage

At least 1.5% of the total rock anchors shall be proof tested to 1.1 times the design load. The load will be held at the final test load for at least 15 minutes.

The anchors shall be proof tested to 1.1 times the design load in 1 increment. A jack of adequate capacity should be utilized for testing the anchors. The load will be held at the final test load for at least 15 minutes.

TENDER DOCUMENT

DESIGN SPECIFICATIONS

SIGNAGE SYSTEMS

DESIGN SPECIFICATIONS: SIGNAGE SYSTEMS

1.0 Introduction

This document outlines the material specifications and performance requirements for execution and installation of signage for the project. The material specifications are given for the key materials used in manufacture of the signage and performance criteria serves as a guideline for the detailing and implementation of the various details of the signage. This document shall be the key reference to be read in conjunction with the sign drawings, sign schedules, general arrangement drawings and bill of quantities.

1.1 Outline scope of the contract

It is to be noted that the various sign types are specified and agreed for their design , visual appearance, dimensions, orientations, form, colour, suggestive fixing and placements at the project and will be binding on to the contractor. However the actual detailing and design of the structure, at times material specification, detailing for fixing, joineries, integration with the built architectural elements, connection and coordination with electrical and data cabling, installation, stability, accuracy and correctness of design implementation as per the performance criteria is the responsibility of the contractor.

Contractor is provided with design drawing for each sign type indicating overall dimensions, material specification, suggestive fixing, artworks, location of fixing, quantities, through the sign drawings, general arrangement drawings, schedules and bill of quantities. This document gives the technical specification for the specified materials and notes on best practice, workmanship which shall be guideline for the contractor to accomplish the job. It is contractor responsibility to detail for fabrication by creating shop drawing/ working drawing which shall be presented to the Engineer in Charge for approval. The integration and coordination of the signage for their fixing with architectural element like walls, floor, ceiling and structural member shall be detailed and worked out by contractor based on performance and design criteria given in the document.

1.2 List of materials

Following materials are mentioned in the document which cover the majority of the work for sign fabrication but is not limited and newer options/advanced materials can be explored basis their meeting the performance criteria of signing. Components and accessories like hardware shall be procured of the best quality confirming to the Indian standards for matching life expectancy to the materials they are used in combination with.

No	Material	Format
1	Acrylic	Sheets
2	Polycarbonate	Sheets
3	Vinyl films	Films and laminates
4	Aluminium	Profiles, sheets
5	Stainless steel	Sheets, Rolled sections
6	MIld Steel	Sheets, Rolled sections
7	Illumination and electrical	Lamps and electronics
8	Powder coating	
9	Polyurethane painting	
10	Photoluminiscent signs	

2.0 Common notes

2.1 Sign detailing and construction

Fabrication quality must be of a high standard and all illuminated signs will need to meet general electrical safety standards as determined by Indian Standards. It is envisaged that all illuminated signs will also need to offer an IP54 rating to prevent water and dust ingress. There should be no dangerously sharp corners or raw edges and all burrs must be removed. All graphics must be sealed to resist the abrasive action of weather or washing. All graphics and construction materials must be able to withstand the effects of heat and cold within the range of -5ºC and 65ºC.

All signs must be able to be cleaned back to a visual standard equal to that when first installed.

In addition to design the sign structure for dead loads and imposed or live loads - structure must be able to withstand accidental damage or knocks without becoming dangerous. Graphic surfaces or panels must be easy to replace in case of damage or change in text. Replacement of complete signs must be straight forward and not need to be achieved by the use of any specialized equipment. Ideally, graphic panels should be removable without any adjustment to any fixing bracket, rod or support.

2.2 Warranty

All sign structures should be provided with a 10 year warranty for the graphics and sign panels. All warranties from the manufactures shall be transferred to the Employer.

2.4 Typical sign details: Non-illuminated signs

Some location signs are non-illuminated. They shall manufactured to look identical to the illuminated signs but with vinyl graphics sign faces. They do not need to be as deep as the illuminated sign units but fixing requirements and details will remain the same.

Some signs in the schedule may require only graphics to be changed on the faces of existing signs. These signs have been manufactured using vinyl graphics which can be removed and replaced with new vinyl where the type, thickness and colour of vinyl must be as per the new artwork provided.

Information, prohibition and some safety signs faces can be manufactured as shallow trays. Around the outside the sign is framed with either a stainless steel profile or an aluminium extrusion. Sign fixing brackets and hinges can be the same as used earlier but allowance must be made for height adjustment and leveling.

2.5 Typical sign details: Emergency escape signs

Emergency escape signs shall be executed using all fire resistant materials namely MS CRCA powder coated sheet sign frames and boxes, laminated glass for the sign face with vinyl graphics applied from the inside to protect them against heating in case exposed to fire. The sign shall be have internal illumination from a UPS with a min 1.5 hour backup. In general materials shall in Emergency signs comply with flame spread Index of '0'.

All fire life safety plans shall be sandwiched between glass panels mounted on wall.

2.6 Typical sign details: Vinyl signs/graphics

At some places application of vinyl graphics is required to provide counter numbers, gate numbers, signing text, door signs and statutory signing labels. Full artwork, layout guides and detailed schedule information is available for this vinyl application.

2.7 Drawings

The Engineer will supply to the Contractor profile drawings showing sizes of sign face and fixing type. Structural drawing and detail has to be worked out by contractor and get approved by Engineer in charge.

Should there be any discrepancy in the drawings the Contractor is to refer the matter to the Engineer. The Contractor shall further provide a drawing showing the accurate setting out to line and level of all the anchor bolts intended for the work in sufficient time for their inclusion in the work so as to maintain the building program.

The contractor is to prepare all the necessary fabrication shop drawings and these shall be submitted to the Engineer in duplicate and be approved by him before fabrication is commenced. All such drawings shall show the dimensions of all parts, method of construction, assembly, installation. A further set of all approved fabrication drawings shall be supplied by the Contractor for use of the Engineer as required.

The drawings for illuminated signs shall cover the placements and layout of luminares inside the sign panel.

Approval by the Engineer of drawings or any other particulars submitted by the Contractor shall not relieve the Contractor of full responsibility for any discrepancies, errors or omissions therein. The Contractor shall at his own expense supply such additional copies of his working drawings as are required for the use of the interested parties.

The contractor shall also create as built drawings for all the sign types for the documentation requirements for the project management and operations.

2.8 Quality check and inspection

Each material to be used in the fabrication of signs shall be approved by presenting 2 copies of samples prior to its purchase and use.

The contractor shall inform the Engineer of the progress in fabrication and as to when individual pieces are ready for inspection. All gauge templates, sample materials, sizing templates, colour swatches, necessary to satisfy the Engineer shall be supplied by the contractor. The Engineer may at his discretion check the results obtained at the contractor's works by independent tests and should the material so tested be found unsatisfactory, the cost of such tests shall be borne by the contractor. During Inspection, the component/member shall not have any load or external restraint

3.0 Colours

All the Signage for the proposed project shall use the following colours specifications

Sr. No.
Application
Colour
Colour reference
1
Background
TBD
TBD
2
Primary Message
TBD
TBD

3
Secondary Message
TBD
TBD
4
Sign Framing
TBD
TBD
5
Safety/Emergency escape signs
Green
PANTONE 340C
6
Prohibition/Fire sign
Red
PANTONE 032C
7
Warning sign
Blue
PANTONE 108C
8
Mandatory sign
Yellow
PANTONE 299C

The above specified colours will be used through various materials like

3.1 Vinyl Films, Powder Coating, Painting, Printing.

All the above materials shall be presented as samples in multiple copies for approval of engineer-in-charge before commencing any work.

In case of special colour to be developed it will be contractorôs responsibility to coordinate with the manufacturer and present the various swatches to the engineer in charge for approval. All materials specific to the colour are important for the visual appearance of signs and execution of these shall confirm to the technical specifications and notes for quality of workmanship given in this document.

4.0 Materials

For all other material required for the works, the approval of the Engineer shall be obtained by the Contractor prior to the use of the material in the works.

Contractors are expected to provide the standard warranty and the invoices from the manufacturers covering all the materials used.

4.1 Acrylic

White Cast acrylic sheets with 40% light transmission shall be used as face of all illuminated signs.

The acrylic should have excellent weather-ability and UV stability for min 10 years.

Acrylics made from virgin polymers shall be used for the sign faces

A 4mm or 6 mm thick Acrylic sheet is proposed for illuminated sign faces with a +/- 0.6mm tolerance for the thickness. For larger sign faces more than 700mm height and 1600mm long shall use a 6mm thick acrylic. The sign face should not bulge or cave in normal conditions.

4.2 Polycarbonate

All polycarbonate sheets should be UV stabilized outdoor grade

No visual defects are allowed by inspection from a close inspection and the material should offer a min 10 years warranty against yellowing and loss of light transmission.

4.3 Workmanship for both Acrylic and Polycarbonate

The surfaces of Acrylic come covered with a masking film on both surfaces for protection during transport, storage and fabrication. The masking film should be left in place during fabrication workand all marking-out drawn on the film. It is recommended not to remove the marking film until necessary to prevent dust collection and accidental surface scoring or scratching. However, care should be taken not to have the surface scratched during handling.

Before pasting the vinyl graphics it is advised to wash the sheet surfaces to be decorated with clean, fresh water using a soft cloth. This has the advantage of removing all traces of static charge from the sheet after removal of the film which might otherwise attract dust. For all general purpose cleaning operations, acrylic should be washed simply with clean cold water to which a little detergent has been added. The use of any solvents such as methylated spirits, turpentine, white spirit or proprietary window cleaning products is neither necessary nor recommended.

Flatness of the sheets is very important for the signs to appear neat.

The cutting shall be done using powered saw to a tolerance of +/- 1mm. The edges shall be cleaned of any bur and chamfered to make the acrylic comfortably sit inside the frame.

4.4 Vinyl Films

Block out vinyl films

Cast films should to provide complete light blocking characteristics with less than 0.001% light transmission.

A luster/matt finish colour matching to specified Pantone colours on the outside and uniformly white on the adhesive side.

A cast vinyl face film of thickness between 0.1mm to0.13mm, with clear acrylic based permanent pressure sensitive adhesive.

The film shall provide strong adhesion to a wide variety of substrates with perfect dimensional stability and perform well as second surface media.

The films should have self extinguishable property and have a performance guarantee against colour fading, peeling, cracking.

4.5 Opaque vinyl films

Cast opaque films of thickness between .063mm to .09mm, with clear acrylic based permanent pressure sensitive adhesive.

The film shall provide strong adhesion to a wide variety of substrates with perfect dimensional stability and perform well as second surface media.

The films should have self extinguishable property and have a performance guarantee against colour fading, peeling, cracking.

4.6 Transluscent Vinyl film

Translucent Graphic Film to allow light transmission

Cast vinyl film of thickness (0.05 mm) with clear pressure sensitive adhesive

A cast vinyl film with a clear, permanent, pressure-sensitive adhesive and a translucent synthetic liner that does not split if wet

The films should have self extinguishable property.

Should have a performance guarantee against colour fading, peeling, cracking

Should be able to withstand temperatures in the range -45° to +77°C

4.7 Protective overlaminate

Shall be a luster/semi-matt cast films resistant to chemicals and abrasion while cleaning.

All other following listed below products, will have to be used with a maximum life specified within the range manufactured by supplier and all warranties for the above products shall apply.

4.8 Other films

4.8.1 Printable vinyl/ Opaque vinyl/ Printable floor application/ Floor laminate

All vinyl has to have exact match with the color specified for each sign. Sample shall be approved by Engineer-in-charge before exclusion.

4.9 Workmanship for Vinyl pasting (Plotter cut Vinyl sheet graphics/text)

Vinyl shall be pasted on Acrylic sheets or on glass/metal panel after removing the masking film/cleaning the surface.

Proper preparation of application surface is essential to obtain high quality and long lasting markings.

4.10 Application:

Clean the substrate as per recommendation of vinyl manufacturer.

Remove entire liner from adhesive side of film.

Align the film and press one edge to surface with finger.

With a squeeze, apply remaining film using overlapping strokes. Hold the film away from surface to avoid pre adhesion.

The plotted vinyl sheet should be applied to the substrates with the use of approved application tape to insure correct placement and accuracy. Vinyl application should be done in a dust free environment.

4.10.1 Remove pre-mask:

Remove application film from the face of the film by pulling tape back upon itself at a 180-degree angle. Application film should be removed after 24 hours of application.

Re-squeeze all edges to prevent edge lifting. This must be done after application of film removal. Use firm even pressure. If not thoroughly re squeezed after pre mask removal, the adhesion at edges of film loosened by pre mask removal may start peeling off due to dirt or moisture and subsequently lift or be susceptible to damage from pressure washing.

4.10.2 Remove entrapped air:

All film pasting on the surface including the over laminate should be free from air bubbles. Inspect the film in flat areas for bubbles. To eliminate the bubbles, puncture the film at one end of the bubble with a pin and press the entrapped air with the thumb or squeeze or moving towards the puncture.

Self-matching and complementing films should be used for all situations involving layers of films laminated in a single sign.

The graphics for the Block out vinyl sheet should be plotted in accordance with specified artwork accurately on a computerized plotter cutter. The edges of the plotter cut vinyl sheet should be clean and smooth. Vinyl sheet should be plotted in a dust free environment.

The final applied graphics shall be free from any kinds of wrinkles, air bubbles and placement / orientation problems.

Contractors are expected to provide the standard warranty and the invoices from the vinyl manufacturers covering all the vinyl used.

4.11 Printing

The graphics and text of the signage system shall be printed with inkjet /Eco solvent printers Ink type: solvent ink, designed for 2 years outdoor application Provide a hard lamination film to resist scuffing, scratching printing shall be done in cyan, magenta, yellow, black or spot color as specified.

Same colours of the signages shall be uniform as specified and shall not vary from sign to sign. Printer has to get approval on all printed colours in graphics matching to specified PANTONE colours and submit 3 copies of each swatch 100mm X 100mm.

Facility of printing directly onto a variety of specially treated vinyl and other materials.

4.12 Aluminium Sections:

Aluminium plates and sections shall conform to Aluminium alloy of grade 63400 WP of IS-733. For all illuminated signs - The sign framing section matching to the one used in existing sign shall be approved basis a presented sample finished as sign prototype. Aluminum section has to be of minimum dimension not less than 180mm in width and 12 mm of face holding. Section shall be strong enough to take load of the signage and shall not distort on application of dead of live load. Section shall be easily openable for maintenance/cleaning/changing laminate.

For all Information signs - Off-the shelf Aluminium sections shall be procured which snap-close using a spring clip creating a hinged action holding the infill panels in place. Vandal proof sections shall be used, which secure type is requiring a special tool to open. Image included below for reference.

These sections shall be capable to hold a total infill panel upto a maximum thickness of 8mm and shall have the rigidity to make A0 size panel frames.

All sections shall be perfectly straight free from surface damages, bends and twists. Bent profiles shall not be forcefully straightened. Straightness tolerance shall not exceed of 1.5mm per 1000 mm.

4.13 Stainless steel

Stainless steel types 304 shall be used for sheets for paneling and cladding while 304L shall be used in heavy gauge components for example pipe, plate and fixing to improve weld ability.

Tools to be used only for fabrication of stainless steel and components shall be stored separately to avoid accidental switching with tools previously used on carbon steel fabrication work. For stainless steel pipe, plasma cutting and grinding back to bright sound metal is required if the pipe ends cannot be machined. Flame cutting is not allowed. All weld end preparations and adjacent Single continuous straight lengths of pipe should be used instead of joints.

Use of hot or cold hammering as a means for repair is prohibited.

4.14 Misalignment Tolerance

All piping fit-ups shall be subjected to the following bore misalignment tolerance.

4.15 Components with Equal and Unequal inside Diameters

Nominal Pipe Size	**Misalignment**
DN 150 and smaller	1mm
DN 200-300	2mm
DN 350 and larger	2.5mm

NOTE: Misalignment should be minimised wherever possible by rotating the pipe/fitting for best fit and/or by grinding the bore as required

All fabrication/joint should be at true rite angle or mentioned otherwise.

Surfaces of piping components/fabricated units/signs shall be kept free of foreign materials such as grease, paint, oil and the like.

Steel wire slings shall not be used for handling and transportation of stainless steel pipes. Canvas or nylon slings shall be used.

All parts assembled for bolting shall be in close contact over the whole surface and all bearing stiffeners shall bear tightly at top and bottom without being drawn or caulked. The component parts shall be so assembled that they

are neither twisted nor otherwise damaged as specified cambers if any shall be provided. Drilling done during assembling shall not distort the metal or enlarge holes. The butting surfaces at all joints shall be so cut and milled so as to butt in close contact throughout the finished joints.

The edges and ends of all cut/sheared flange plates, web plates of plate girders, and all cover plates shall be planed/grind to make it free from any burr.

Final finish has to be done in the workshop itself after fabrication is complete. Sign has to be bubble wrapped/packed safe to transport is to the site without any distortion/damage.

4.16 CRCA M.S. Sheets

The CRCA mild M.S sheets to be used in the work shall conform to IS 513 - normal D-grade type mild steel.

4.17 Sheet Metal fabrication

The Metal handling and Fabrication work for CRCA Mild Steel sheets shall be got executed from a specialized agency.

CRCA mild Steel sheets Fabrication shall be executed with CNC bending, CNC Laser and punching machines with precise work control and quality generation. Besides the specified machines, the Metal handling and Fabrication must have in-house CO2 welding and skilled CAD/CAM facilities, engineers and skilled and trained personnel and adequate storage facilities.

Sheet metal blanking shall be preferably done using laser cutting to save on material, reduce wastage, have less burr on cut blanks, speed of execution and achieve accuracy

All surfaces exposed to view shall be clean and free from dirt, stains, grease, scratches, distortion, waves, dents, buckles, tool marks, burrs and other defects which mark the appearance of finished work. Cutting edges shall be smooth and free from all defects.

All surfaces exposed to view shall be straight and true to lines or curves. Arises and angles shall be as sharp as practicable. Miter joints shall be formed in true alignment with profiles accurately intersecting and all joints carefully eased to a radius of approximately 1 mm unless otherwise shown. Metal corners shall be bent to the smallest radius possible without causing grain separation or otherwise impairing the work.

All exposed connections shall be formed with hairline joints flush and smooth. All face panels must be flat, true and free from weld stud witness or other surface imperfections/blemishes. Edges shall be machined and finished free from cutter marks (not guillotined). All fabrication should have dressed welds, bend radii, finish, permitted texture levels, squareness of construction, no twist or warp or sagging of shape.

The Tolerances in the fabrication work shall be as under :

Linear dimensions	:	+/- 0.5 mm
Hole and Slot Punches	:	0.3 mm
Finished edge radius	:	0.3 mm ï 0.5 mm

Finish for sheet metal 0.062" (1.6 mm) CRCA

Surfaces indicated "A" finished to match sample

Surfaces without identification or indicated "C" to be unfinished.

Parts to be free of visible defects on "A" and "B" surfaces.

Flat surfaces to have: Flatness tolerance of 0.05 mm per 25 mm. Not to exceed 0.50 mm over the entire surface.

Each Part to be approved by Engineer-In-charge prior to production.

Definitions:

- "A" surface: The top or front, most often viewed surface by consumer.
- "B" surface: Generally the front edge/sides or back/bottom of a part. Not viewed as often as an "A" surface.
- "C" surface: Internal surfaces. Part surfaces not normally seen. Normally "c" surfaces are not inspected for cosmetic attributes.

4.18 Structural Steel Fabrication

The Contractor shall supply to the Engineer copies of the manufacturer certificate that the steel brought to the site for incorporation in the works is of a quality fully complying with the specification. If required by the Engineer, the Contractor shall arrange for testing of the steel samples.

4.18.1 Workmanship and Fabrication for metal work:

For all the works, workmanship shall be of first class quality, throughout, and true to line, level and dimension as shown in the drawings or instructed by the Engineer.

All parts assembled for bolting shall be in close contact over the whole surface and all bearing stiffeners shall bear tightly at top and bottom without being drawn or caulked. The component parts shall be so assembled that they are neither twisted nor otherwise damaged as specified cambers if any shall be provided.

Drilling done during assembling shall not distort the metal or enlarge holes. The butting surfaces at all joints shall be so cut and milled so as to butt in close contact throughout the finished joints. Hand flame cutting will not be permitted.

The edges and ends of all cut/sheared flange plates, web plates of plate girders, and all cover plates, and the ends of all angles, tees, channels and other sections forming the flanges of plate girders, shall be planed/ground.

Punching of holes will not be permitted. All drilling shall be free from burrs.

No holes shall be made by gas cutting process.

The Engineer in charge may at his discretion order periodic tests of the welder and/or of the welds produced by them. All such tests shall be carried out by the Contractor at his cost.

All the welding shall be done as possible shops except some site work. The pieces shall be manipulated to ensure down hand welding for all shop joints as far as possible. All parts to be welded shall be arranged so as to fit properly on assembly. After assembly and before the general welding is to commence the parts are to be tack welded with small fillet or butt welds as the case may be. The welding procedure shall be so arranged that the distortion and shrinkage stresses are reduce to a minimum.

All joints required in structure to facilitate transport or erection shall be shown on the drawings or as specified by the Engineer. Should the Contractor need to provide joints in locations other than those specified by the Engineer he shall submit his proposals and obtain the prior sanction of the Engineer for such joints.

Each piece of steel work shall be marked distinctly before delivery, indicating the position and direction in which it is to be fixed. Three copies of a complete marking plan are to be supplied to the Engineer before erection commences.

In the case of welded fabrication any distortion remaining in the member after welding operations are completed shall be rectified by and/or at the expense of the Contractor to the approval of the Engineer.

Templates and jigs used throughout the work shall be all steel. In cases where actual materials have been used as templates for drilling similar pieces, the Engineer shall decide whether they are fit to be used as parts of the finished structure.

Apart from the requirements of welding specified under the above sub clauses, sections above, the Contractor shall ensure the following requirements in the welded joints.

- Strength-quality with parent metal.
- Absence of defects
- Corrosion resistance of the weld shall not be less than that of parent material in an aggressive environment.

No gasket or other flexible material shall be placed between the holes. The holes in parts to be joined shall be sufficiently well aligned to permit bolts to be freely placed in position. Driving of bolts is not permitted. The nuts shall be placed so that the identification marks are clearly visible after tightening. Nuts and bolts shall always be tightened in a staggered pattern and, where there are more than four bolts in any one joint, they shall be tightened from the centre of the joint outwards.

4.18.2 Protection of Steel Works:

Painting shall be applied under the temperature requirement specified by the manufacturer.

The steel work, prior to delivery, shall be cleaned form scale, rust, dirt and grease etc. but means of chipping, scraping and wire brushing using skilled operators as described in the painting systems below. The cleaning shall proceed each day over the extent of surfaces which can be painted on that day. The paint shall be applied by brushing or spraying as per approval of the Engineer.

The spraying equipment shall be compatible with the paint material, fitted with necessary gauges and controls and approved by the Engineer.

Site weld locations shall be left free from paint within 50mm of the weld position, and contact surfaces in connection using High Strength Friction Grip Bolts shall not be painted. Immediately after completion of erection all damaged paint shall be scraped off and made good to the approval of the Engineer.

The Steelwork specialist shall also clean down and apply one coat of primer to all site bolts, site bolted connections and site weld locations and the paint work generally shall be left in sound condition for any subsequent painting.

All paints and primers shall be of best quality and to be stored and applied strictly in accordance with the manufacturer's instructions.

In addition, the following specification shall apply to the shop painting of contact and inaccessible surfaces:

- Surfaces to be painted shall be thoroughly cleaned from scale, rust, dirt, grease etc. by means of sand/grit/shot blasting or other equivalent means.

- Surfaces which are to be brought permanently into close contact or made inaccessible either in the shops or upon erection shall, after cleaning, be given two coats of Red Lead Priming Paint. The surfaces shall be brought into contact while the paint is still wet.

- All enclosed surfaces of box members shall be completely sealed by oiling or by coating with approved bitumen paint and all such members and tubes shall have their ends closed by suitable plates welded in position.

Surfaces in contact during shop assembly shall not be painted. Surfaces which cannot be painted, but require protection, shall be given a rust inhibitive grease.

The Contractor shall take all precautions to prevent dust and dirt coming in contact with freshly painted surfaces or with surface being painted. The second coat of paint shall only be applied when the first coat has dried.

Exposed machined surfaces shall be adequately protected.

A uniform film thickness of paint is to be ensured throughout the work.

Surfaces, which have not been shop coated, but require surface treatment shall be given necessary surface preparation and coats at site as specified in the painting system.

4.18.3 Erection & Site Work

The Contractor shall be responsible for checking the alignment and level of foundation and correctness of foundation bolt centers, well in advance of starting erection work, and shall be responsible for any consequences for non-compliance thereof. Discrepancies if any shall immediately be brought to the notice of the Engineer for his advice.

Following the completion of the straightening, the surface of the member shall carefully be inspected for damage and got approved by the Engineer before further use.

All equipment used by the Contractor shall be sufficient for the purpose and for the erection of the steel work, in the time specified in the contract. Any lifting or erecting machinery shall be to the approval of the Engineer and shall be removed from the site if he considers such appliances dangerous or unsuitable for their functions. Adequate arrangement shall be made to resist wind loads and lateral forces arising at the time of erection.

The Contractor is entirely responsible for the stability of the structure during erection and shall arrange that sufficient tack bolts, braces or guy ropes are used to ensure that work will remain rigid until final bolting, riveting or welding is completed. The Contractor shall supply and fix, without extra charge, any temporary bracing which may be necessary.

At stanchion splices and at other positions where concrete cover to the steel is liable to be restricted, bolts will be placed with their heads on the outside of the members.

All field assembly bolting and welding shall be executed in accordance with the requirements for shop fabrication excepting such as manifestly apply to shop conditions only. Where steel has been delivered painted the paint shall be removed before field welding for a distance of at least 50mm on either side of the joints. The number of washers on permanent bolts shall not be more than two for the nut and one for the bolt head.

4.19 Lamps and fixtures:

T5 luminaries shall be used in all the illuminated signs.

All lamps shall be supported using clips to ensure no damage and facility to easily replace them when required.

In case of single ended lamps the free end of C.F.L. shall be duly supported by supporting clamps/ brackets of approved makes.

Contractors are expected to provide the standard warranty and the invoices from the manufacturers covering all the lights used.

4.20 Wiring for Indoor Signs:

4.20.1 Illuminated signs

The contractor shall also ensure that all the connections inside the sign are made through Bakelite connectors and thimbles & screws are used for end terminations of wires. Thimbles wherever installed shall be properly covered with insulated sleeves and no temporary taping is done at any point. All the connectors shall be ISI marked.

All connectors and joints shall be mounted or fixed to the internal structures of signs with insulating fixtures

The interconnecting wiring between light fixtures within the sign shall not be less than 1.5 Sq.mm and shall be FRLS, PVC insulated 1.1 KV grade, with multi-stranded copper conductor.

If specified - An earth terminal shall be provided on each of the lit sign which shall be connected with the earthing conductor laid along with incoming circuit wiring.

All wiring within the sign enclosure shall be covered with flexible conduit which shall be properly fixed with clamps, saddles etc. in such a way that no shadow is cast on the illuminated surfaces. In no case any loose wiring shall be left inside the sign enclosure.

Wiring for all type of sign needs to be counseled and out of public reach and sight. No conduit shall have joint in the floor where it is exposing to humidity or water seepage.

Airport name at air side and land side shall be internally illuminated using LED which is not less than 1w per LED. Life of LED shall not be less than 50,000 hours and color as specified and approved by Engineer in Charge.

4.21 Powder Coating

4.21.1 Powder coating on Aluminium Plates/sections

Wherever specified the aluminium plates shall be coated in approved colour and shade with pure polyester powder to a minimum thickness of 75 microns.

The pure polyester powder coating shall be got executed from specialised agency.

The pure polyester powder shall have following properties:-

- Free Flow-ability : Satisfactory
- Particle size : < 50-70 microns suitable for electrostatic spray.
- Specific gravity : 1.1 to 1.5 depending on the colour.
- Self life : 6 months.
- Stoving Schedule : 2000 C for 10 mins. (metal temp.)
- Test Certificates from approved laboratory for the representative samples shall be submitted by the Contractor. Testing will be done in presence of Employerôs representatives at the cost of contractor.

The curing schedule shall be as specified by the manufacturer of pure polyester powder.

The surface of aluminum shall be prepared and pretreated as follows before powder coating:

- Removal of all foreign matter.
- Chromatisation of aluminum surface as specified by the manufacturer of pure polyester powder by at least a five stage process consisting of alkali degrease, rinse and chromate conversion followed by two rinses.

- Proper curing at required temperature shall be done for specified time period so as to achieve the desired properties.

The pure polyester coated surface shall be of uniform texture, colour and gloss and shall be free from cracks, warps and other imperfections.

4.22 Powder coating on Mild Steel

Wherever specified the Aluminium sections, plates M.S and CRCA mild Steel plates and sections shall be powder coated coated in approved colour and shade with pure polyester powder of Berger/Interpon/Asian Paints/Nerocoat to a minimum thickness of 75 microns.

The surface of steel shall be prepared and pretreated as follows before powder coating:

- Removal of all foreign matter.
- Low weight Zinc Phosphate conversion treatment of M.S and CRCA mild Steel surface as specified by the manufacturer of pure polyester powder by at least a seven stage process consisting of oxide and scale removal, alkali degrease, rinse twice and Zinc Phosphate conversion treatment followed by two rinses. Last wash shall be from diluted acid and immediately after that powder coating process shall be started without wasting much time.
- Proper curing at required temperature shall be done for specified time period so as to achieve the desired properties.
- The pure polyester coated surface shall be of uniform texture, colour and gloss and shall be free from cracks, warps and other imperfections.

4.23 Polyurethane Painting

PU paints matched to shades as per colour specifications shall be having good recognize make to ensure the quality and life of the product.

PU paint applications shall be done in following steps or as instructed by the each manufacturer.

4.23.1 **Surface cleaning:**
Remove grease, oil and other contaminants by using a degreasing solventusing mechanical tools. Ensure that all the dust particles are removed by suction or air blast and surface is fully dry and cleaned.

4.23.2 **Application of primer:**
Stir the components thoroughly and then mix base and catalyst in proportions by volume as instructed in the product specifications to uniform consistency. Avoid agitation of mixing. Add 10 % thinner immediately before application. However additional thinner may be added if required to achieve a good workability. For Airless spray use any standard equipment having pump ratio 45:1.This requires an over coating interval of minimum one over night and a dust free environment.

4.23.3 **Application of the final finish**:
Stir the base thoroughly and then mix base and catalyst by volume as instructed in the product specifications to uniform consistency. Allow the mixture to mature for 30 minutes and stir again before use and application. Apply using a conventional spray .Add 10 % thinner depending on conditions. Use any standard equipment at an atomizing pressure of 3.5 ï 4.9 kg/cmsq. Two coats could be applied for a good result.

4.23.4 Contractors are expected to provide the standard warranty and the invoices from the manufacturers.

4.24 Photoluminiscent signs

All Photoluminiscent signs shall be procured from specialised agency providing signs with following secifications but not limited to:

Water proof Non corrosive

Withstand temperatures from 300 C up to 650 C.

Non reactive to Dilute Alkalis and Acids.

Glow time in excess of 2 mcd/m2 after 60 minutes

UV-stable and weather-resistant for outdoor applications.

Ability to absorb energy from almost any light source (sunlight, fluorescent, incandescent) and then to emit light when ambient darkness occurs.

The light produced is yellow-green in color and is highly visible, lasting up to 10 hours.

Note- In case of discrepancy in the MCGM specification and the ones mentioned above ,the final decision will be taken by the MCGM engineer in charge.

DG SPECIFICATION

Note: In case of discrepancy in the MCGM specification and the once mentioned in this specification, the final decision will be taken by the MCGM engineer in charge.

SECTION : 2.3

DIESEL ENGINE

1.0 Construction

1.1 The Diesel Engine shall be 4 cycle, multi cylinder, turbo charged heavy-duty industrial type with rated electrical output. Engine shall be rated generally in accordance with data sheet & ISO 8528-1

1.2 Cylinder housing and crank case shall be of high grade cast iron with overhead valves. Housing and heads shall be provided with necessary cooling fins.

1.3 Crank shaft shall be manufactured from solid forging with hardened crank pin and main bearing journals. The entire shaft shall be truely balanced.

1.4 Pistons shall be of close grained cast iron of aluminium alloy and provided with necessary compression and scrapper rings and a fully floating gudgeon pin.

1.5 Connecting rods shall be H-section steel stampings. Camshaft shall be gear driven (fly-wheel end) and easily removable. Fly wheel shall be accurately balanced meeting the requirements of cycle variation as set down in BS: 649.

1.6 Lubrication system shall be complete with necessary gear pump, piping and drilled oil passage strainer, oil cooler etc. and relief valve.

2.0 Cooling

2.1 The engine shall be radiator cooled as specified in the equipment schedule. A thermostatic valve should by-pass the coolant in the primary circuit until a pre-set operating temperature is reached.

2.2 The heat exchanger shall be cleanable shell and tube with prime surfaced copper tubes of minimum 15mm dia. The cooling side of the exchanger shall be designed for the system pressures encountered.

3.0 Fuel System

3.1 Fuel injection equipment shall be driven by the timing gear train and complete with oil strainers, injectors etc. Fuel is to be supplied from the day tank with necessary piping.

3.2 A tank of specified capacity shall be provided for lasting atleast for 10 hour period or 900 ltrs whichever is lower. The tank should be complete with filter breather unit and drain plug.

4.0 Filtration

4.1 The engine shall have cleanable fuel oil filters. Lub oil filtration shall be through strainers which are capable of being cleaned when the engine is running. Air filtration shall be through oil bath or cleanable dry type filters.

5.0 Engine Exhaust

5.1 The engine exhaust piping shall be amply sized for minimum back pressure and connected to the engine manifold through flexible connection on one side and to a silencer on them other side. The silencer shall be packed type with adequate attenuation for urban use (Residential type), constructed from heavy guage galvanised steel. The sound absorbent infil shall be nonhygroscopic, verman proof, non-combustible material. The silencer should be adequately sized to impose minimal additional aerodynamic loading on rotor fans.

5.2 The exhaust piping from the silencer on wards shall be led upto the top most level and discharged through a rain cowl as shown on drawings. Entire exhaust piping and silencer shall be insulated with 75 th 48Kg/cum density fibreglass white wool. The insulation shall be held in position with galvanised steel wire mesh 0.63 dia 20 mesh and finished neatly with 26 SWG Aluminium cladding.

5.3 The exhaust piping shall be fabricated with mild steel as shown in the equipment schedule and all flanged joints shall have spiraget high temperature gasket. The piping shall be installed with necessary thermal expansion facility as required and shown on drawings.

6.0 Safety Systems

6.1 The Governor is to be driven by bavel gears from the engine camshaft with manual adjustment of engine speed between +5% and -10% of rated speed. The Governor shall control the engine speed with atleast class 'A2' limits permissible under B.S 649/1958. A governor shall trip the engine at the pre-set over-speed and shut-off the fuel supply.

6.1.1 The governor shall be electronically controlled with provision for paralleling of DG sets and for load sharing. Steady state frequency regulation shall be +0.25% and load sharing shall be with in ± 5%.

6.2 The engine cooling water temperature shall be monitored by a two point thermostat which should acuate an audible cum visible alarm at one point and trip the engine at the second point. Likewise the low oil pressure cut-out shall trip the engine with visible indication.

Other safety controls and indicating instruments shall be as shown in Equipment Schedule ES 04.

7.0 Engine Starting

7.1 The engine shall be electrically started and the battery shall be 24V lead acid high discharge tubular or plante type and rated for 4 (four) consecutive starting kicks and the continous drain for signals and controls. All batteries shall be complete with associated charger incorporated in the generator panel. The starting system shall be complete with necessary relays solenoid valves for fuel, control and indicating panels as specified and required.

8.0 Mounting and installation

8.1 A common rigid bed plate shall be provided for the engine and alternator which shall be flexibly coupled. The coupling must be done after ensuring proper alignment of generator and engine shafts.

8.2 The entire engine set shall be mounted on suitable vibration mounts as specified in the datasheet. A nominal base concrete pad (if required) shall be provided by clients, over which the engine set with its own base frame and vibration mounts shall be mounted. The base concrete pad in turn

shall be mounted on multiple cork pads of 300 x 300 x 50mm wrapped in polythelene faced hessian.

Note: In case of discrepancy in the MCGM specification and the once mentioned in this specification, the final decision will be taken by the MCGM engineer in charge.

SECTION : 2.4

ALTERNATOR

1.0 Type & Rating

1.1 Alternator shall be 3 phase, 4 wire 50 cycles 415 volt, brushless screen protected drip proof with self contained excitation systemed and self regulating and conforming to BS 4999/5000 & continuously rated in accordance with BS 2613. The alternator should have the rated capacity at 0.9 PF. The alternator shall be designed to suppress radio interference in conformity with BS 800.

1.2 The alternator shall be of fabricated steel construction conforming to IP class specified dynamically balanced rotor with two bearings and damper windings. The unit shall be with a large terminal box for outgoing cable connections specified. Necessary adaptor box shall be provided wherever required.

1.3 Alternator rotor shall be salient pole type with a damper cage and dynamically balanced. Insulation shall be to class 'F' or 'H' (BS 2757/1957). Insulation on other windings of minimum class 'F'. All winding shall be fully impregnated for tropical climates with high quality oil resistant varnish. Necessary RTD/ BTD for protection of windings / bearings shall be provided.

1.4 Ventilation to the alternators shall be by means of fans fitted on the rotor.

2.0 Excitation system

2.1 The main exciter shall receive power from a permanent magnet generator via Automatic Voltage regulator. The AVR shall be of solid state circuitary and shall provide regulated voltage to the exciter compensating for all normal variations. The main exit or output is fed to the main motor windings via a rotating 3 phase bridge rectifier assembly which shall be protected from voltage surges, short circuit, overload and diode failures. The AVR and control gear shall be mounted in a component box on the side of the machine. Electrical connections to the AVR shall be taken through a multiway plug and socket.

2.2 Voltage regulation shall be within +/- 2.5 (two and half percent) under all conditions of load, power factor and temperature including cold to hot variation. Voltage drift shall be negligible. There shall be no radio or television interference. Line voltage wave form shall be as true as possible with a total

harmonic distortion not exceeding 3% on 3 Ph load. The response to transient load should be rapid as specified.

2.3 The excitation system and engine governor should be such that the alternator is capable of starting up induction motors having a starting KVA of not less than 1.8 times the alternator rated KVA.

Manufacturer should indicate the voltage dip and duration under such conditions as required under equipment data.

2.4 The neutral of each generating set shall be earthed solidly to ground with facility for isolation through a fully rated contactor or manual switch as shown on drawings.

3.0 Automatic Mains Failure (AMF) operation

3.1 The mains and DG set contactor or breakers shall be mechanically and electrically interlocked. Neutrals shall be grounded through neutral contactors and only one of multiple sets shall be earthed during operation.

3.2 The AMF logic shall start the set automatically only in the event of:

i) mains failure
ii) phase failure
iii) voltage, drop to 85% of rated voltage

The set shall be capable of starting and taking up the load within the time stipulated in equipment schedule.

3.3 The sequence of AMF operation shall be as follows:

i) Upon main power failure, the generator shall receive 4 kick starts and the generator breaker shall close only after building up of voltage.

ii) Hold the Mains Breaker (MC) open.

On restoration of power, AMF logic should provide the following commands.

i) Trip the engine

4.0 Auto Synchronization

4.1 An auto-synchronizer and load control system shall be provided wherever two or more sets are required to be operated in parallel. The system shall be microprocessor based using a wood ward speed control for synchronization,

parallel operation, loading, unloading and load-sharing of the generators in parallel. The control system shall be suitable for similar or dissimilar generators, if necessary

4.2 The system shall perform the following functions:

- Automatic synchronization based on slip frequency with voltage matching
- Automatic generator loading and unloading with smooth load transfer.
- Isochronous load sharing based on fixed frequency regardless of the load and provide load and unload ramp for smooth transition.
- Base loading of a generator in the event of trouble on the other
- Equal sharing of VAR load of the generators in parallel operation
- Reverse power flow monitoring and control
- Digital communications network between the various generator controls
- Self – diagnostic and hi/Lo limit alarms.

4.3 The synchronizer shall be a fully tested product having been used in at least 5 installations and operative for more than 3 years. Vendor to furnish the data with his offer.

5.0 **Testing & Commissioning**

5.1 After installation, each shall be run for a minimum period of 30 minutes continuously on no load. On satisfactory completion of the no-load run the set shall be run for a period of 12 hours at 100% full load. All consumables including fuel and lub oil required for commissioning the set shall be supplied by the contractor. Test readings as per Annexure 2.1.6 together with a log of the running test shall be furnished. Load banks shall be provided by the clients.

5.0 **Mode of measurement**
(for sections 2.2 & 2.3)

1) The diesel generating set complete with:

i) Engine and alternator with flexible coupling.

ii) Mounting frame with vibration isolation mounts.

iii) 24V battery with leads, stand, acid etc.

iv) Expansion tank, heat exchanger and piping to and heat exchanger, exp. tank. (Not Applicable)

v) Flexible connection and exhaust piping upto and including Exhaust Silencer insulation of the same.

vi) Erection, testing and commissioning

shall be considered as one unit of measurement.

2) The AMF panel comprising:

i) Panel with an AMF section as specified complete with battery charger.

ii) Indication and alarms

iii) Auto synchronization control system

iv) BMS Port to be provided as per drawing.

Shall be treated as one unit of measurement.

3) Cooling tower along with starter panels shall be treated as one unit. (Not applicable)

4) Cooling tower pumps along with starter panel shall be treated as one unit. (Not applicable)

5) All control wiring from D.G Power Panel to generating sets shall be through 1.5 or 2.5 sqmm copper PVC insulated armoured and sheathed multi-core cables and this will be paid per unit length including the elemental cost of terminations, glands, lugs, cable supports etc. No separate payment shall be made for cable supports, terminations, glands etc.

6) All power cabling shall be paid for per unit length and all cable joints shall be measure per unit.

7) Bus duct, wherever used shall be paid per unit as specified in the schedule of work.

Alternator 4 of 4

Note: In case of discrepancy in the MCGM specification and the once mentioned in this specification, the final decision will be taken by the MCGM engineer in charge.

SECTION : 2.5

TESTING OF DG SETS

1.0 Type Test Certificates

1.1 The Tenderer shall enclose copies of type test certificates, wherever applicable, for all the equipments and materials, quoted by him, along with the bid for Employer's reference as per the relevant standards specified.

2.0 Testing of DG Sets

2.1 All the type tests, if not conducted earlier on similar type of equipments, covered under the relevant standards, shall be conducted, wherever required, by the suppliers for all the equipment and materials at manufacturer's works in the presence of the Employer's representative. The test certificates of all the equipments / materials shall be approved by the Employer's representative before dispatch / acceptance of the equipment and materials. Routine tests for all equipment will be witnessed by Engineer's Representative.

2.2 The following tests shall be done at works before dispatch

2.2.1 Tests on Alternator:

1 DC Resistance Measurement

1.1 Stator
1.2 Rotor
1.3 Exciter Stator
1.4 Exciter Rotor
1.5 PMG Stator(if applicable)

2 Insulation Resistance Measurement, before and after High Voltage Test

2.1 Stator
2.2 Rotor
2.3 Exciter Stator
2.4 Exciter Rotor
2.5 PMG Stator

3 High Voltage Test

3.1 Stator
3.2 Rotor

3.3 Exciter Stator
3.4 Exciter Rotor
3.5 PMG Stator

4 Functioning Tests on RTDs

4.1 DC Resistance Measurement

5 Characteristics

5.1 **No Load Saturation Tests**

5.1.1 Open Circuit Magnetization Characteristics
5.1.2 Voltage Measurement
5.1.3 Symmetry of generated voltage
5.1.4 Phase Sequence (Phase Rotation) check
5.1.5 Direction of Shaft Rotation check
5.1.6 Sustained 3Phase Short Circuit Magnetization Characteristics

5.2 **Vibration Measurement**

5.2.1 During No Load Mechanical Run
5.2.2 During No Load Open Circuit Magnetization Test
5.2.3 During Sustained 3Phase Short Circuit Magnetization Test

5.3 Over speed test (120% of rated speed for 2 minutes).
5.4 Regulation Tests
5.4.1 Voltage & current
5.6 Temperature Rise Test
5.7 No Load losses
5.8 Determination of efficiency

The following tests shall be carried out on Generator and Excitation system:

a) Insulation Resistance Tests

b) Winding Resistance Test

c) Phase sequence Test

d) Open and Short Circuit Characteristic Test

e) AVR response / Regulation Test.

f) Load test on Generator at both unity and 0.8 PF.

g) Excitation at full load and under specified variation of voltage and speed

h) Measurement of voltage dips at the generator terminals while feeding the base load 75% and on simultaneous starting of the largest motor.

i) EMPLOYER reserves the right to reject the equipment if the guaranteed performance is not met with.

j) All instruments required for performance testing of the equipment covered in this specification shall be provided by the TENDERER at no extra cost to the purchaser for entire duration of the performance test.

k) The TENDERER shall ensure that instruments and gauges to be used for testing and inspection of critical parameters as identified in the specification shall have valid calibration and the accuracy can be traceable to National Standards.

l) In addition to the above guarantees, TENDERER shall also guarantee the period for completing supply, erection, testing and commissioning as six (6) months for DG set and accessories from the date of Letter of Award.

2.2.2 **Load Test**

The load tests will be witnessed by consultant & client at works. The supplier shall provide advance information for pre dispatch tests conducted at works.

These tests shall form part of this contract. Above tests shall be conducted for all DG sets. The test results shall match with the technical requirements specified in the technical data sheet.

The Consultant / Employer shall have the right to accept or reject the modules if it does not meet the technical requirements.

The load test shall be conducted through resistive load bank at unity power factor. Before conducting test, following shall be recorded on test report :

a) Engine serial No.
b) Engine model & make No.
c) Alternator serial No.
d) Engine & alternator rating
e) Date of testing
f) Rated speed, voltage & kW

Loads & duration:

Idle run	: 05 mins
25% load	: 30 mins
50% load	: 30 mins
75% load	: 30 mins
100% load	: 2 Hours
110% load	: 60 mins

The following parameters shall be noted on the test report :

a) Load in kW
b) Power factor
c) Voltage
d) Current
e) Frequency
f) Alternator winding temperature
g) Alternator bearing temperature
h) Lube oil pressure
i) Water temperature
j) Lube oil temperature
k) Fuel consumption though flow meter

Impact test:

A block load of at least 50% shall be put on the DG from no load condition & similarly when DG is 100% loaded, the load is removed & the parameters like voltage, frequency & RPM is noted. The readings should be with in acceptable limits.

2.2.3 Rejection & Penalty

The purchaser may reject any DG Sets during tests or service any of the following conditions arise and the provision under the relevant clause of the general conditions of contract shall immediately become applicable:
If it is not adhere to:-

a) GUARANTEED TECHNICAL PARTICULARS- Diesel Engine

b) GUARANTEED TECHNICAL PARTICULARS- Generator

c) DG Sets fails on performance guarantee test at works.

d) DG Sets fails on performance guarantee test at site.

e) Proven performance in number of running hours for the type / Model of the DG set

f) DG Sets is proved to have been manufactured not in accordance with the agreed specification.

g) The purchaser reserves the right to retain the rejected DG Sets and take it into service until the tenderer replaces the defective DG Sets by a new acceptable DG Sets at no extra cost. The tenderer shall repair or replace the DG Sets within a reasonable period mutually agreed time to the satisfaction of the purchaser at no extra cost.

2.3 Performance Test

- The following items of performance shall be guaranteed during site performance tests in respect of the DG and the auxiliaries for the specified site conditions:
- Net electrical output (continuous)
- Fuel oil consumption at ¼, ½ , ¾, 85% and full load
- Lubricating oil temperature to and from engine
- 10% overload for one (1) hour out of a total of twelve (12) consecutive hours of operation without over-heating or showing signs of undue stress and within specified frequency variation
- Freedom from vibration and noise

- Governor response, over-speed trip and speeder gear capability

- Voltage regulator response
- Excitation at full load and under specified variation of voltage and speed.
- 12 hrs continuous performance test to prove the reliability of the machine. In case at any point of the test a trip should occur the test shall be conducted again. The necessary fuel oil, lube oil & consumables required for the test shall be included in the scope of supply.

Penalties for non-performance:

- Reduced net output Power. (Rs 50,000/- for every 1% reduction from the rated power)
- Increased fuel oil consumption.
- Increased lube oil consumption.
- Noise level
- Stack emission SOX, NOX, Particulates, CO.
- In addition the following items of performance shall be guaranteed during site performance tests at site by the TENDERER and the auxiliaries for the specified site conditions. All instruments and accessories for performance testing shall be provided by the TENDERER.
- Noise level over the full range of load up to 110% MCR load
- Vibration level over the full range of load up to 110% MCR load.

2.4 Start-up & testing at site

A equipment manufacturer's representative approved by the Consultant / Client shall be engaged to perform start-up and load test upon completion of installation with the Consultant / Client in attendance. A certified test record shall be provided.

Tests shall include, but are not be limited to, the following:

a) Check fuel, lubricating oil, and antifreeze in liquid cooled models for conformity to the manufacturer's recommendations under environmental conditions present.

b) Test, prior to cranking of engine, for proper operation of accessories that normally function while the set is in a standby mode.

c) Check, during start-up test mode, for exhaust gas leaks outside the building, cooling air flow, movement during starting and stopping, vibration during running, line-to-line voltage and phase rotation.

d) Test by means of simulated power outage, automatic start-up by remote-automatic starting, transfer of load, and automatic shutdown. Engine generator sets are to be synchronized and paralleled during tests. Monitor throughout the test, engine temperature, oil pressure, battery charge level, generator voltage, amperes, and frequency.

e) Tests shall demonstrate capability and compliance of system with operating requirements. Where possible, correct malfunctioning units at site then retest to demonstrate compliance; otherwise remove and replace with new units, and proceed with retesting. Retesting to be at no cost to the Consultant / Client.

f) This section includes a very basic outline of the start-up sequence. The actual sequence will be determined after the final design is completed. The commissioning of the new generators will occur on weekends and after-hours depending upon the scheduling requirements of the business.

Note: In case of discrepancy in the MCGM specification and the once mentioned in this specification, the final decision will be taken by the MCGM engineer in charge.

SECTION: 2.6

ACOUSTIC ENCLOSURE – FOR DIESEL GENERATING SETS

1.0 Scope

1.1 The scope of work covers providing Acoustic Enclosure to reduce the noise from Diesel Generating Sets as required in the schedule of work.

2.0 Design Criteria

2.1 The design criteria shall be that the insertion loss across the enclosure shall not be less than 20dB, while the sound pressure level at 1m from any part of the enclosure shall be less than 75dBA.

2.2 The enclosure shall provide for an air intake, engine exhaust outlet, cable and fuel pipe entries. A control & monitoring panel shall be accessible from outside with toughened glass cover. An emergency trip device shall be provided in the control panel.

2.3 The enclosure should also accommodate a breaker panel appropriate for the set capacity. Access door shall be suitably gasketted so that the opening does not degrade the integrity of the acoustic enclosure.

2.4 In the case of sets larger than 1000 KVA, the DG room should be acoustically insulated meeting the above noise criteria.

3.0 Acoustic Enclosure

3.1 The enclosure shall be fabricated from MS sheets of 16G thickness sandwich insulated with suitable sound absorbing material. With the enclosure in place, it should be possible to operate the DG set with out any deration.

3.2 The enclosure should be such that the Diesel Generating set can be directly mounted inside the MS fabricated container with proper clamping, mounting and supporting arrangement. The enclosure should have hinged doors.

3.3 Provision should be made for air intake and exhaust silencers.

3.4 Openable doors should be provided allowing easy access to all parts of the DG Set. The doors shall be double wall insulated.

3.5 The sound barrier shall consist of the following.

a) Layer of HDPE / Vinyl sheet for anti – droning.
b) Non ferrous sheet sound barrier
c) Rock wool or equivalent sound absorbing material 48kg/ m^3 and 100mm thick.

3.6 It should be possible to dismantle the enclosure completely to make the engine accessible from all the sides.

3.7 Acoustic property of the insulation material used shall be as under.

Sound Absorption Coefficient at Octave Mid band frequency HZ				
250	500	1000	2000	4000
0.32	0.82	0.95	0.96	0.94

3.8 The glass wool shall be specially selected shot – free non corrosive non setting variety.

4.0 **Acoustic Insulation of DG Rooms (Not Applicable)**

4.1 **Wall & Ceiling Acoustic**

4.1.1 Walls and ceilings shall be acoustically insulated wherever shown on drawings or as required by the Engineer-in-charge. The wall/ceiling surface shall be cleaned and a grid work of 600 x 600 shall be made using 50 x 50 x 0.8 G.I pressed steel forms. 50mm resin bonded fibre glass shall be cut to size and positioned within the grid work and held with 1.0 mm galvanised steel wire at 300 mm intervals. Entire insulation shall be covered with 0.8 mm thick aluminium sheets having 3 mm perforations at 5 mm staggered centres. The sheet shall be neatly cut and the edges reinforced with a 20 mm sheet fold and made into neat looking panels. The panels shall be fixed on the frame work using cheese headed No. 8-20 mm sheet metal CP brass screws at 300 mm centres.

4.1.2 Where the insulation thickness is 100 mm the channels shall be 50 x 100 and the remaining work shall be as specified above.

4.2 The materials for acoustic insulation shall be as follows:

Application	Material	Sound Absorption Coefficient at Octave Mid band frequency HZ				
		250	500	1000	2000	4000
Walls & Ceiling	Resin bonded Fibre glass 32 Kg/Cum 50mm thick	0.76	1.04	0.75	1.15	0.83

5.0 **Mode of measurement**

5.1 The acoustic enclosure with all its attachments complete shall be measured as one unit.

Note: In case of discrepancy in the MCGM specification and the once mentioned in this specification, the final decision will be taken by the MCGM engineer in charge.

SECTION: 2.7

PROTECTIVE EARTHING

1.0 **Scope**

1.1 The scope of work shall cover earthing stations, laying aluminium/ copper earth strips and connecting the power panels, DBs and switch boards.

2.0 **Standards**

2.1 The following standards and roles shall be applicable:

1) IS:3043 - 1966 Code of Practice for earthing.
2) Indian Electricity Act and Rules

2.2 All codes and standards mean the latest.

3.0 **Plate Earthing Station**

3.1 The substation earthing shall be with copper plate earthing station unless otherwise specified.

3.2 The earthing station shall be as shown on the drawing. The earth electrodes shall be 600 x 600 x 3mm copper plate. The earth resistance shall be maintained with a suitable soil treatment and watering arrangement as shown on drawings. Excavated soft soil shall be thoroughly mixed with Bentonite material and the earth pit is back-filled 300 x 300 earth chamber with cast iron cover shall be provided to house the earth terminal and water pipe & funnel.

3.3 The resistance of each earth station should not exceed 3 ohms.

3.4 The earth lead shall be connected to the earth plate through copper/brass bolts as shown on the drawing.

4.0 **Pipe Earthing Station**

4.1 The pipe earth station shall be as shown on the drawing and shall be used for equipment protective earth grid. The earth electrode shall be 2.5m long 50mm dia 5mm thick galvanised steel pipe. The earth resistance shall be maintained with a suitable soil treatment as shown on drawings and as for plate electrodes. An earth chamber shall be provided as for plate earth station.

4.2 The resistance of each earth station should not exceed 3 ohms.

4.3 The earth lead shall be fixed to the pipe with a clamp and safety set screws. The clamps shall be permanently assessable.

5.0 Earth leads and connections

5.1 Earth lead shall be bare copper or aluminium or galvanised steel as specified with sizes shown on drawings. Copper lead shall have a phosphor content of not over 0.15 percent. Aluminium and galvanised steel buried in ground shall be protected with bitumen and Hessian wrap or polythene faced hessian and bitumen coating. At road crossings necessary hume pipes shall be laid. Earth lead run on surface of wall or ceiling shall be fixed on saddles on wall so that the strip is atleast 6mm away from the wall surface.

5.2 All earth strip shall be jointed as follows:

Copper	:	Copper riveting with 80mm fish plate and brazing
Galvanised Steel	:	Lap welding with 50mm minimum lap

5.3 All strips shall be run on walls/beams with 6mm thick galvanised steel earth saddles at 500mm centre to centre as shown on drawings.

6.0 Equipment earthing

6.1 All apparatus and equipment transmitting or utilising power shall be earthed in the following manner:

Size and type of conductor shall be as per area mentioned in the drawings

The protective earth continuity conductor may be drawn inside the conduit in which case, it should be insulated.

Copper earth wires shall be used where copper wires are specified. Aluminium wires may be used where aluminium phase wires are specified unless otherwise indicated in the schedule of work and drawings.

6.2 Metallic conduit shall not be accepted as an earth continuity conductor. A separate insulated/bare earth continuity conductor of size related to phase conductor shall be provided. Non-metallic conduit shall have an insulated earth continuity conductor of the same size as above. All metal junction and switch boxes shall have an inside earth stud to which the earth conductor shall be connected. The earth conductor shall be distinctly coloured (green) for easy identification.

6.3 Armoured cables shall be bonded to the earth by 2 distinct earth connections to the armouring at both the ends and the size of connection being as above. In multiple cables entering a panel/DB, the cable joints shall be bonded together using a bonding wire selected on the basis of the largest size of cable in the group. In the case of unarmoured cable, an earth continuity conductor shall either be run outside along the cable or should form a separate insulated core of the cable. 3 Ph. power panels and distribution boards shall have 2 distinct earth connections of the size correlated to the incoming cable size. In case of 1 Ph. DB's a single earth connection is adequate. Similarly for 3 Ph and 1 Ph. isolating switches there shall be 2 and 1 earth connections respectively, sizes being correlated to the incoming cable.

6.4 3 Ph. motors and other 3 Ph. apparatus shall have 2 distinct earth connections of size equal to incoming feeder size. For 1 Ph motor and 1 Ph apparatus, the single earth connections shall be provided of the above size.

7.0 **Earthing Installation**

7.1 All work shall be carried out in accordance with local Electrical Inspectorate, and IS Code of Practice 732. Reference to above codes, specifications and regulations shall mean the latest.

7.2 All materials used on the installation shall be new and of approved make. Tenderer should indicate makes of materials proposed to be used on the job.

8.0 **Testing**

8.1 The following earth resistance values shall be measured with an approved earth meggar and recorded.

1) Each earthing station
2) System as a whole
3) Earth continuity

9.0 **Mode of measurements**

9.1 Providing earthing station complete with excavation, electrode, watering pipe, soil treatment, masonry chamber with cast iron cover etc. shall be treated as one unit of measurement.

9.2 The following items of work shall be measured and paid per unit length covering the cost of the earth wires/strips clamps, labour etc.

(a) Main protective earth terminal and connections to the earthing stations

(b) Connections to the switchboard, power panels, distribution boards etc.

9.3 The cost of earthing the following items shall become part of the cost of the item itself and no separate payment for earthing shall be made.

a) Motors - earthing forming part of the cabling/wiring for the motors.

b) Isolating switches and starters should form part of mounting frame, switch starter etc.

c) Light fittings - form part of installation of the light fittings.

d) Conduit wiring - should form part of the wiring

e) Cable armouring - should form part of the cable termination.

f) Street lighting - should form part of the external cable which shall incorporate a protective earth-conductor which shall be used for

earthing of the pole etc.

Note: In case of discrepancy in the MCGM specification and the once mentioned in this specification, the final decision will be taken by the MCGM engineer in charge.

SECTION: 2.8

MEDIUM VOLTAGE CABLING

1.0 Scope

1.1 The scope of work shall cover supply, laying, connecting, testing and commissioning of low and medium voltage power and control cabling.

2.0 Standards

2.1 The following standards and rules shall be applicable:

1) IS: 1554 Parts I & II	PVC Insulated Heavy duty cable
2) IS: 3961	Recommended current Rating of cable
3) IS: 7098	XLPE Insulated cables

All codes and standards mean the latest.

3.0 Cables

3.1 All cables shall be 1100 Volt grade PVC insulated, sheathed with or without steel armouring as specified and with an outer PVC protective sheath. All cables shall have Flame Retardant, Low Smoke Sheath (FRLS) and meet, ASTM norms for the smoke density and Oxygen Index norms. Cables shall have high conductivity stranded aluminium or copper conductors and cores colour coded to the Indian Standards.

3.2 XLPE cables shall be same as PVC with an FRLS outer sheath.

3.3 All cables shall be new without any kinks or visible damage. The manufacturers name, insulating material, conductor size and voltage class shall be marked on the surface of the cable at every 600mm centres.

4.0 Installation

4.1 Cables shall be laid in the routes marked in the drawings. Contractor shall install all conduits/Pipes required for the cable work as per drawings. Where the route is not marked, the contractor shall mark it out on the drawings and also on the site and obtain the approval of the Architect/Consultant before laying the cable. Procurement of cables shall be on the basis of actual site measurements and the quantities shown in the schedule of work shall be regarded as a guide only.

4.2 All cables running indoor shall be supported with necessary GI cable trays. Cable trays shall be hot dip galvanized & minimum 1.8 mm thick. All cable trays shall be suspended but supported on MS frame work with supports at every 1.5 m distance including necessary anchor fasteners, insert plates etc. for completeness of installation. Cables laid in built up trenches shall be on steel supports.

Cable support dimensions shall be as per table 1.1.

Sr. no.	Size	Cable Support
1	1500MM wide	2nos x 40 x 40 x 5MM GI Angle
2	1200MM wide	2nos x 40 x 40 x 5MM GI Angle
3	1000MM wide	2nos x 40 x 40 x 5MM GI Angle
4	750MM wide	2nos x 32 x 32 x 5MM GI Angle
5	600MM wide	2nos x 32 x 32 x 5MM GI Angle
6	For 2 Tier	2nos x 32 x 32 x 5MM GI Angle
7	450MM wide	2nos 8MM DIA GI RODS
8	300MM wide	2nos 8MM DIA GI RODS
9	150MM wide	2nos 8MM DIA GI RODS

4.3 Cables shall be bent to a radius not less than 12 (twelve) times the overall diameter of the cable or in accordance with the manufacturer's recommendations whichever is higher.

4.4 In the case of cables buried directly in ground, the cable route shall be parallel or perpendicular to roadways, walls etc. Cables shall be laid on an excavated, graded trench, over a sand or soft earth cushion to provide protection against abrasion. Cables shall be protected with brick or cement tiles as shown on drgs. Width of excavated trenches shall be as per drawings. Backfill over buried cables shall be with a minimum earth cover of 600mm. The cables shall be provided with cable markers at every 35 meters and at all loop points.

4.5 The general arrangement of cable laying is shown on drawings. All cables shall be full runs from panel to panel without any joints or splices. Cables shall be identified at end terminations indicating the feeder number and the Panel/Distribution board from where it is being laid. All cable terminations for conductors upto 4 sqmm may be insertion type and all higher sizes shall have tinned copper compression lugs. Cable terminations shall have necessary brass glands and all lugs shall be double compression type whether so specified or not. The end terminations shall be insulated with a minimum of six half-lapped layers of PVC tape. Cable armouring shall be earthed at both ends.

5.0 **Testing**

5.1 MV cables shall be tested upon installation with a 500V Meggar and the following readings established:

1) Continuity on all phases

2) Insulation Resistance
   (a) between conductors
   (b) all conductors and ground

All test readings shall be recorded and shall form part of the completion documentation.

6.0 **Mode of measurement**

6.1 Cable will be measured on the basis of a common rate per unit length indoor or outdoor and shall include the following:

For cables laid indoors:

i) Cables and clamps

ii) Installation, commissioning and testing

iii) Cable marking

OR

For cable buried underground:

i) Cables and protective bricks & tiles

ii) Installation, commissioning & testing

iii) Cable markers

6.2 Cable trays/racks will be measured on the basis of unit length for individual sizes and shall include

i) Galvanised steel perforated tray with necessary suspenders and frame supporting the tray.

ii) Installation and painting in 2 coats of black bituminous paint on one coat of red oxide primer.

6.3 Each cable termination will be measured as one unit for payment. Certain cable sizes are grouped together and rates shall be furnished against each group. The item shall include the following:

i) Lugs, glands, bolts, nuts

ii) All jointing materials

iii) Installations, testing and commissioning

iv) Earthing the glands

6.4 For cables buried under ground excavation shall be paid for additionally for the following per unit volume:

i) Excavation and back filling

ii) 6" Soft Earth Cushioning below and above cable

The cost of laying protective tiles shall be part of cable cost as stated above.

Note: In case of discrepancy in the MCGM specification and the once mentioned in this specification, the final decision will be taken by the MCGM engineer in charge.

SECTION: 2.9

M V SWITCHGEAR

1.0 **Scope**

1.1 The scope of work shall cover the supply, installation, testing and commissioning of all power panels, incorporating circuit breakers, switch fuses, busbars, interconnections, earthing etc.

2.0 **Standards**

2.1 The following standards and rules shall be applicable:

1) IS:13947:1993 Switchgear & Control gear specification

2) IS:8623:1993 Parts 1 & 3 Low Voltage Switchgear and Control gear assemblies.

3) Indian Electricity Act and Rules

All codes and standards mean the latest. Where not specified otherwise the installation shall generally follow the applicable Codes of Practices of the Bureau of Indian Standards.

3.0 **Air Circuit Breakers**

3.1 Air circuit breakers shall be heavyduty air break horizontal draw out fully interlocked and meeting the requirements of Indian Standards. Breakers shall be rated for a medium voltage of 600V and rated full load amperes as indicated on drawings. Breakers shall be capable of making and breaking system short circuits specified.

3.1.1.1 Breakers shall be, motorised or manually operated as specified, complete with front-of-the-panel operating handle, isolating plugs with safety shutters, mechanical ON/OFF indicator, silver plated arching and main contacts, arc chutes and trip free operation. Breakers shall be capable of being racked out into 'testing', 'Isolator' and 'Maintenance' position and kept locked in any position. Breakers for remote and automatic operation shall be motor operated spring charged with closing and trip coils. Breakers shall have minimum 3 NO-NC contacts. Breaker terminals shall be shrouded.

3.3 **Construction**:

1) ACB should be with safety shutter, Anti-pumping and rating error preventer.
2) Cradle: Should be service, test, isolate & maintenance positions Racking handle should be stored in cradle.
   Electrical breaker should not close during travel from service and test position and vice versa.
3) Inter-phase clearance should be more than 25 mm after termination of bus bar.
4) Neutral pole rating should be equal to phase rating unless specified otherwise

5) Electrical /Mechanical life: 15000 Cycles up to 2500A and 5000 cycle above 3200A.

3.4 **Release:**

1) All releases in ACB should be communicable microprocessor Based and having over load, short circuit and earth fault protection.
2) Release should be operated through magnetic fluxing device direct on trip rod.
3) Release should be True RMS, self powered using CT.
4) Release should have zone selectivity facility.

3.5 **Breaking:**

1) As per SLD ICU=100%ICS=ICW for 1 sec
2) Breaking capacity should be tested by CPRI/ERDA and reputed international authority. (Type test certificates not older than 3 year shall be provided when asked.)

4.0 **MCCB's**

4.1.1 Construction

1) MCCB should be current limiting type, and of trip free mechanism.
2) MCCB operated with rotary handle having door interlock facility.
3) All accessories like Shunt release, UV release, Aux & trip contacts should be site fittable.
4) Phase to phase barrier should be provided with MCCB.
5)

4.2 **Breaking:**

1) As per SLD ICU=100% ICS.
2) Breaking capacity should be tested by CPRI/ERDA and reputed international authority. (Type test certificates not older than 3 year shall be provided when asked.)

4.3 **Release:**

1) Ratings equal and above 200Amp. should be Microprocessor based with over load ,short circuit ,earth fault protections
2) Ratings less then 200A should be adjustable thermal and magnetic type.

5.0 Switch Fuse Units & Disconnectes

5.1 Switch fuse units shall have quick-make, quick-break silver plated preferably double break contacts with operating mechanism suitable for rotary operation in the case of cubicle mounting.
All switches shall be rated according to the equipment schedule or drawings and shall withstand the system prospective fault current let through.

Cam operated rotary switches with adequate terminal adaptors upto 25A are acceptable but for all higher rating switch fuse units shall be heavy duty type. All switch fuse unit should be AC23A.

5.2 Fuses shall be HRC cartridge type conforming to IS:2208 with a breaking capacity corresponding to system fault level. Fuses shall be link type with visible indication. Screw type diazed fuses are not acceptable for any ratings.

5.3 All disconnecting isolators shall consist of switch units quick-make, quick-break type with silver plated contacts. The switches shall preferably have double breaks. The switches shall have sheet steel enclosure, which in turn is mounted on suitable angle iron frame work. In wet locations switches shall have cast iron enclosures. Disconnects shall have a minimum breaking capacity of 5KA at 415 Volts.

6.0 Isolators

6.1 Isolators shall be fixed on wall on self-supported angle iron frame work as required and mounted as near to the motor as possible. Where several motors are installed, isolators if required shall be provided at a central location on a common frame work.

6.2 Painting, earthing and labels shall be provided as generally indicating for MV Switchgear and shown on drawings.

7.0 Instrument Transformers, Meters & Relays.

7.1 Ammeters and voltmeters shall be electronic digital type. Meters shall conform to BS:89 and have grade 'A' accuracy.

7.2 Energy meters shall be electronic two element switch board mounting type suitable for unbalanced loads. In case of two incoming feeders, a summating C.T shall be provided with the meter. Meters shall conform to IS: 37.

7.3 The energy meters for grid supply and DG supply shall be calibrated and got certified by the respective Electricity Authority wherever required.

7.4 CTS shall be cast resin type and conform to IS:2705 in all respects. Rated secondary current shall be 5A unless otherwise stated. Accuracy class of metering CT's shall be 1.0 & for protection 5P20 or as specified in the datasheets.
Test links to be provided in secondary connection to facilitate testing of instruments, meters & protection device. CT burden shall be minimum of 10VA but appropriate to the instruments, relays connected or as specified in the datasheets.

7.5 Relays and trip devices shall be any one of the following as specified:

i) Adjustable Thermal – Magnetic trips – direct acting
ii) Solid state relays with shunt tripping.
iii) Microprocessor controlled relays numerical type with shunt Tripping.

All trips shall be 400/230V AC series type unless shunt tripping is specified for.

7.6 LED indicating lamps to be provided for phase indication & breaker position as required.

7.7 All wiring for relays shall be of stranded copper with colour coding and labelled with appropriate plastic tags for identification.
Minimum size of control wiring shall be 2.5 sqmm stranded copper. All control circuits to be provided with protective MCB's or fuses consistent with short circuit levels.

8.0 **Cubicle Boards**

8.1 All boards shall be combination of 14 SWG (Main Body) & 16 SWG (Doors & partitions) sheet steel, free standing, extensible, totally enclosed, dust tight, vermin-proof cubicle as per IP 52, flush dead front and of modular construction suitable for 3 phase 415V 4 wire 50 Hertz system TN-S neutrals grounding. All boards shall be accessible from the front or as shown on Drgs, for the maintenance of breakers, switch fuses, busbars, cable terminations, meters etc. Cables shall be capable of entering the board both from top as well as bottom as specified in drawings. All panels shall be machine pressed with punched openings for meters etc. mounted on a 75mm high base channel frame. All sheet steel shall be rust inhibited through a process of degreasing, acid pickling, phosphating etc. The panels shall be finished with powder coating of approved colour applied over a primer. Aluminium anodized

Engraved labels having white letters on black background shall be provided indicating the feeder details and capacity. All panels shall be provided with danger boards on bus bar & cable chamber.

8.2 The boards shall accommodate air insulated bus bars, air circuit breakers, mccb's switch fuse units with HRC fuses, starters, necessary meters, relays, contactors etc. as required and arranged in suitable tiers. All breakers and switch fuses shall be suitably derated taking into account specified ambient temperature and ruling temperature inside the cubicle.

8.3 The switch board shall be fully compartmentalised in vertical tiers housing the feeder switches in totally enclosed independent compartments. Each compartment shall be self sufficient with switch unit, fuses, contactors, relays, indicating lamps and an inter-locked door with facility for padlocking. Each switch or MCCB or ACB shall have provision for locking in the OFF position for life safety. Each feeder must terminate in an independent labelled terminal block. Strip type terminal block accommodating several feeders together is not acceptable. Pressure clamp type terminals suitable for aluminium wires may be used upto switches of 25A and cable lugs for higher ratings. Glands shall be of heavy duty brass casting, machine finished & complete with check nut, washers etc. The lugs shall be tinned Cu /Al depending upon cable conductor & of solderless crimping type. All terminations shall be shrouded in an approved manner. The entire enclosure shall meet with IS: 13947. Feeder connections shall be of solid insulated copper/aluminium wires or strips with bimetallic clamps wherever required and if insulated, the insulation shall be able to withstand the high temp at the terminals. Internal wiring, bus bar markings etc. shall conform to IS:375/1963. Internal wiring shall have terminal ferrules.

Main switch should be at an easily accessible height and the highest switch operating handle should not be over 1.75M from floor level. Cable glands shall form part of the switch board.

8.4 Space heaters of adequate capacity shall be provided inside each panel. They shall be suitable for 240V, 1ph 50 Hz supply. They shall be complete with MCB or HRC fuses, isolating switches & adjustable thermostat.

8.5 Each panel shall be provided with 240V 1ph 50Hz , 5A 3pin receptacle with switch located at a convenient position.

9.0 Bus bars shall be three phase and neutral and of copper or aluminium or aluminium alloy (E91E) as specified and shown on drawings and rated for a temperature rise of 30 deg C over the ambient temperature specified, (IS:8084-1976). Neutral bars may be of one half the size of the phase bars or as shown on drawings. The main horizontal bus bars

shall be of uniform cross section and rated for the incoming switch. The vertical bus bars for the feeder columns may be rated at 75% of aggregate feeder capacity and shall be uniform in size. Bus bars and

interconnections shall be taped with PVC colour coded tape to prevent bar-to bar accidental shorts. Each bus bar shall be directly and easily accessible on removal of the front cover. Bus bars shall be totally enclosed, shrouded and supported on non-hydroscopic insulator blocks to withstand thermal and dynamic overloads during system short circuits.

Feeder connections shall be solid copper bus bars duly insulated with bimetallic damps where we required. Bus bars shall be designed for easy extension in future on either side. All feeder connections shall be rated for 25ºC temperature rise over the ambient.

10.0 **Earthing**

10.1 An earthing bus shall be provided at the bottom & extended throughout the length of panel. It shall be be bolted / welded to the frame of each unit & each breaker earthing bar.

10.2 Protective earthing shall be provided as shown on drawings or as follows:

Phase conductor	Protective conductor
upto 16 sqmm	equal size
16 to 35 sqmm	16 sqmm
over 35 sqmm	50% of phase conductor

In case of dissimilar materials the Protective Earth Conductor shall be suitably sized for equal conductance.

10.3 Protective earthing of each switch shall be connected to the earth bar.

10.4 All non current carrying metal work of the switchboard shall be effectively bonded to the earth bus.

11.0 **Installation**

11.1 All panels shall be supported on MS channels incorporated in the panel during the fabrication. All such supports shall have two finish coats over a prime coat after completion of the work. All panels shall be touched up for damaged painting.

11.2 All panels shall be meggared phase to phase, phase to neutral, phase to earth & neutral to earth using a 1000V meggar with all outgoing feeders in closed position. The meggar value should not be less than 2.5

megohms between phases and 1.5 megohms between phases and neutral.

11.3 Fabrication drawings of all panels shall be approved by the Consulting Engineers before fabrication.

12.0 **Testing & Inspection**

12.1 All switchboards shall be factory inspected before finishing and dispatch unless waived. Type test reports for all switchgear shall be furnished.

12.2 Certificate for all routine and type tests for circuit breakers in accordance with the IS:2516-1963 shall be furnished. In addition, all panels shall be meggared phase to phase and phase to phase neutral, using a 1000V meggar with all switchgear in closed position. The meggar value should not be less than 2.5 megohms between phases and 1.5 megohms between phase and neutral.

12.3 All meters & relays shall be calibrated and tested through secondary injection tests.

12.4 All field tests shall be witnessed by Consultants and recorded unless waived.

13.0 **Mode of measurement**

13.1 Each panel will be considered as one unit for the purpose of measurement and shall include the following:

i) Incoming and Outgoing feeders.
ii) Interconnections and controls and instrument wiring with necessary protective fuses.
iii) Meters, Relays, Indicating lamps, CT's control fuses etc.
iv) Supporting structure, sheet steel enclosure
v) Installation, commissioning and testing

13.2 Isolators shall each be measured as one unit complete with:

i) mounting frame
ii) switch/fuse

13.3 Protective earthing of the panel/Isolator from the equipment earthing system will be measured separately and paid at unit rates.

13.4 Outgoing and incoming feeder terminations will be paid at the unit rates separately as specified under cabling.

Note: In case of discrepancy in the MCGM specification and the once mentioned in this specification, the final decision will be taken by the MCGM engineer in charge.

SECTION: 2.10

PIPING & INSULATION

1.0 Scope

1.1 The scope of work covers supply, installation, testing & commissioning of all piping.

2.0 Standards

2.1 Following codes and standards shall be applicable.

IS . 1239 – 2004 (Parts1 & 2)	-	Mild steel tubes and tubulars & wrought steel fittings.
IS . 3589 – 2001	-	Steel pipes for water & sewage.
IS . 6392 – 71	-	Steel pipe flanges

2.2 All standards mean the latest

3.0 Application

3.1 This specification shall be applicable to pipes covering the following fluids:

i) cooling water not exceeding 50° C
ii) chilled water not less than 6° C
iii) hot water not exceeding 60° C

4.0 Pipes & Fittings

4.1 Pipes shall conform to the following schedule:

NB	Pipe (mm) Min.OD	Thickness	Material
25	33.3	4.05	ERW Heavy class mild steel tube to IS-1239-90 Part I
40	47.9	4.05	
50	59.7	4.50	

65	75.3	4.50	
80	88.0	4.85	
100	113.1	5.40	
150	163.9	5.40	

200	219.1	6.00	
250	273.0	6.00	ERW pipes to IS 3589-1991
300	323.9	6.00	
350	355.6	7.00	
450	406.4	7.00	

All pipes shall be factory fabricated.

4.2 All pipes shall be new and from standard manufacturers.

4.3 All bends upto 65 mm NB shall be hydraulically formed with a minimum R/D of three unless space restrictions inhibit, in which case long radius elbows may be used with the approval of the Engineer-in-charge. For sizes upto 40 mm NB, socket weld fittings shall be used. For larger sizes upto 150-mm dia butt welding wrought steel fittings to BS 1965 and matching with the straight pipe wall thickness shall be used. In the case of larger sizes, the bends shall be fabricated from the same stock of pipe and in at least 4 sections with a radius equal to + / - 1.5 times the diameter.

4.4 Flanges shall be slip-on carbon steel with plain faces conforming to IS 6392-1971. Flange shall be rated for 1000 kPa or twice the system working pressure whichever is higher and drilled to suit the equipment or valve flange if already drilled. All bolts & nuts shall be carbon steel and gasket 3-mm fiber reinforced PTFE.

5.0 **Valves**

5.1 All valves and the flanges shall be suitable for 1000 kPa cold non-shock working pressures or twice system pressure whichever is high.

5.2 Valves upto 50 mm NB shall be full bore ball valves with forged body and polished hard chrome plated ball with PTFE seal.

5.3 Higher size valves shall be butterfly type. Butterfly valves shall have a fine grain cast iron body with mirror smooth finished cast steel disc and spindle of stainless steel AISI 410. The valve shall be of wafer-type and should be fitted with two slip on type pipe flanges. The valve shall have an easily replaceable molded EPDM sleeve which shall bring about 100 % tight shut off at the design working pressure. Shaft bottom shall have an axial bearing Where valves are to be insulated they should have on extended neck.

5.4 Non-return valves upto 50 mm NB shall be swing-type of gun metal construction with flanged ends. Larger sizes shall be of cast iron construction with gun mental internals and flanged ends.

5.5 Water strainers shall be either 'Y' or pot type with cast iron bodies for specified test pressure. Strainers shall be complete with brass basket with 3 mm perforations, a dirt blowout plug and a permanent magnet. Strainers shall be designed for easy removal of strainer basket without dismantling the pipe and shall have flanged end connections.

5.6 Manual air vents shall be provided at all high points in the piping systems for air purging. Vent sizes shall be as follows and suitable for specified test pressure.

Up to 152 mm : 12 mm size ball type gun metal valves with hose connections.

Over 152 mm : 20 mm size globe type gun metal valves with hose connections.

Air vents associated with equipment or cooling coils shall be 12mm automatic venting type with a shut off ball cock and a plastic pipe discharging into the condensate drain. Such air vents should form part of the coil or equipment.

5.7 Drains shall be provided at all low points and all drain valves shall be gunmetal globe type with hose connectivity. Drain sizes shall be 25 dia or as shown on drawings.

5.8 Pressure gauges shall be "Bourdon' type with minimum 100 mm dial and required range. All gauges shall be provided with gun metal plug type gauge cocks and copper or S.S capillary connection to prevent system fluctuations affecting the gauge. Gauges shall be provided wherever shown.

5.9 Thermometers shall be industrial direct reading stem type of the required range. Thermometers shall be provided in separable wells.

6.0 **Pipe Installation**

6.1 Pipe installation shall be carried out in a workman-like manner in accordance with approved drawings. Pipes shall be aligned parallel to walls and ceiling and not across a room. Change of direction shall be through hydraulically formed or wrought iron welding fittings as specified. Alignment shall follow the approved drawings and wherever necessary pipe shall be rerouted under the instructions of the Engineer-

in-charge in order to meet the site conditions and or interference from services.

6.2 Pipes passing through walls & floors shall be provided with sleeves as follows:

Space	Sleeve dia (mm)	Sleeve Projection (mm)	Sleeve Material	Sleeve packing and Closure
Floors	D + 50	50 AFF	1.25 mm GSS OR Light duty galvanised tube	32 Kg/cum Resin bonded fibre glass with 8 mm thick polysulphide or Silicon sealant
Walls				
i) Internal	D + 50	Flush with Finish	- do -	32 Kg/cum Resin bonded fibre glass closed on both sides with 1.0 mm GSS split flange
ii) External	D + 50	- do -	- do -	Caulked with lead wool and oakum & closed on both sides with 1.25mm GSS split flanges with brass screws

D = Outside diameter of pipe with insulation
GSS = Galvanised sheet steel
AFF = Above finished floor

6.3 Pipe supports shall be standard factory made galvanised systems or fabricated from steel structurals galvanised after fabrication. Supports shall be spaced as follows:

Size	Horizontal	Vertical
Upto 15 mm	1.25 m	1.8 m
20 to 25 mm	2.00 m	2.5 m
32 to 125 mm	2.50 m	3.0 m
150 & over	3.00 m	3.0 m

6.4 Additional supports shall be provided at the bends, at heavy fittings like valves, near equipment and as directed by the Engineer-in-charge. Pipe hangers shall be from galvanised structural steel, steel inserts in concrete or anchor fasteners, wall brackets or floor supports as decided by the Engineer-in-charge depending upon the location of the support. Hangers shall not be secured to light weight roof, wall, false ceiling or any other member which is not structurally meant for such loading. Hangers from structural steel shall be from suitably designed clamps or attachments and in no case should drilling or punching of such steel members be allowed. All pipe supports shall be capable of being adjusted in height to the tune of 50mm. All supports suspenders and hangers shall be galvanised after fabrication.

5.5 Pipe clamps shall be specially fabricated fittings for pipes. All clamps shall be of galvanised mild steel. Clamps shall take into account pipe movement owing to temperature variations & anchors, and in no case shall the clamp- ing arrangement induce stresses beyond the safe load limits of the pipe under fully filled conditions. Where pipes are insulated, the clamping shall interpose a hard insulation material or shall be designed so that the insulation is not compressed for more than 60% of its compression strength.

6.6 Vertical pipe risers shall be supported at each floor and in addition, the riser shall have a duck-foot support at the lowest point.

6.7 All pipe joints shall be welded except where flange joints are specified. Pipes upto 40 mm NB shall use socket-weld fittings with fillet welding and larger sizes use butt-welding type single V 35 deg weld preparation. Flange joints shall be provided at the following positions:

i) Pair of flanges for isolation of equipment
ii) Mating flanges for equipment flange connections
iii) Mating flanges for valves, strainers as the case may be
iv) Pair of flanges at every 30 m continuous run of piping

Galvanised pipes when welded, the joints shall be painted with zinc – rich paint as approved by the Engineer.

6.8 Where valves, strainers, NR valves adjoin, there is no need for additional mating flanges and valve flanges may be used to mate with the other valves, strainers etc.

6.9 Entire piping shall be self-draining, using only eccentric reducers at all change of sections. 25mm NB drain points with a dirt leg and a shut off valve shall be provided at all low points of the piping and the piping system shall be pitched 1% towards such low points. All air handling unit drains shall be pitched 2% with a 75-mm water seal trap. Fan coil unit drains also shall be pitched likewise but the water seal could be 40 mm. All traps shall be built-up or prefabricated. In the case of the multiple risers of supply and return water lines, isolating valves with a strainer and drain valve shall be provided wherever required. All isolating valves shall be gate/ball/ butterfly valves suitable for tight shut-off. Valves shall not have their spindles downwards.

6.10 A vent shall be provided at high points. All vents shall have a shut off ball valve with hose connectivity.

6.11 Where pipes are directly buried in ground, the pipes shall be coated 2.0mm "Sealfas' or equivalent coating.

6.12 Pipes shall be buried at a depth of 750 mm to top of pipe. The excavated trench be filled with soft earth/sand for atleast 150 mm over the top of pipe before being refilled with the excavated soil.

6.13 Where pipes are buried at less than 750 mm, the pipes shall be duly protected as directed by the Engineer-in-charge.

6.14 All piping shall be laid and tack welded in position with flanges, valves etc. After inspection and approval by the Engineer as to the alignment and height, the piping shall be full welded. Slip-on flanges shall be demounted for welding. Piping may be presented to the Engineer for such approval in sections. Random samples of valves shall be tested for leaks and seating. Necessary hand pump and blank flange facilities with pressure gauge, valves etc. should be provided at site.

7.0 **Testing**

7.1 Hydraulic testing of piping shall be carried out before equipment connections are made. No insulation shall be carried out unless and until the piping, in section, is tested and tests approved. Piping may be tested in sections, with the approval of the Engineer and in such cases all open ends shall be blanked off with necessary flanges.

7.2 All piping shall be tested for pressure equivalent to the following:

2 x dynamic head of the pump plus the gravity head due to expansion tank or cooling tower.

In such a pressure test, the system shall hold for a minimum period of 3 hours. All pipe testing shall be witnessed and certified by the Engineer-in- charge and leaks or defects found in the joints shall be rectified.

7.3 The contractor shall make all arrangements for testing & removal after testing of all water connections, if any, without causing any damage to the property of the employer or any other contractor.

7.4 After the entire piping has been tested and equipment connected, the system of water piping shall be filled and drained till all the dirt, milscale and any other foreign matter is flushed out to the satisfaction of the Engineer-in- charge. At any rate, the system shall be flushed atleast 3 times before commissioning. All strainers shall be cleaned of all accumulated dirt before the system is charged.

8.0 **Mode of measurement**

8.1 All pipes shall be in unit length rounded off to the nearest centimeter and measured along the center line of the pipe and all fittings, flanges etc. excluding the flange to flange distance of valves, strainers or any other equipment. The rate shall include all clamps, bolts etc. cutting holes in ceiling, floor or wall and making good the same including scaffolding, staging supports, flexible etc. and painting of piping as per the painting specifications or as directed by the Engineer – in – charge.

8.2 All valves, strainers etc. shall be measured per unit in each size and paid for.

8.3 All pressure gauges complete with socket, gauge cock and pressure gauge and CP brass capillary shall be measured per unit.

8.4 Thermometers together with thermowell, conducting fluid etc. shall be measured as one unit.

8.5 Air vents and drains shall each be measured per unit and paid for. Auto air vents with cooling coils / equipment shall form part of the coil or equipment.

9.0 Insulation

9.1 Boiler Flues, Engine Exhaust pipes shall be insulated with 48 kg/cum unbonded fibre glass with galvanised wire netting on one side. The flue/ pipe shall be thoroughly cleaned with wire brush to remove all milscale and painted with one coat of bitumastic paint. The wool blankets 100mm thick shall be applied with the wire netting on the out side. The insulation shall be held in position by lacing with 1.0mm dia galvanised steel wire and covered with fibre glass tissue with 75mm overlapping. The finished surface shall be clad with 0.50mm thick aluminium sheets with 50mm overlap and fixed with self-tapping M8 sheet metal screws.

LIGHTING SPECIFICATION

Note: In case of discrepancy in the MCGM specification and the once mentioned in this specification, the final decision will be taken by the MCGM engineer in charge.

SECTION: 2.14

EXTERNAL LIGHTING

1.0 Scope

1.1 The scope of work covers the supply, installation and testing of lighting poles, weather proof light fixtures, wiring to the fixtures, Junction boxes, cable laying & termination, earthing as specified and shown on drawings including necessary minor civil work like excavation & backfilling, foundation for poles etc. for completeness of installation.

1.2 Wherever fixtures and poles are supplied by the client, the installation shall include erection of poles, excavation, coping & necessary foundations etc for completeness of installation.

2.0 Standards

2.1 The following standards and rules shall be applicable:

1) IS: 1913 - 1969 General and safety requirements for light fittings.
2) IS: 2944 - 1981 Code of Practice for lighting public thoroughfares
3) IS: 3528 - 1966 Water proof electric lighting fitting
4) IS: 1239 - 1966 Water tight electric lighting fitting
5) IS: 1239 - 1958 Mild steel tubulars and other wrought steel pipe fittings
6) IS: 2149 - 1978
7) IS: 2149 - 1970 Luminaries for street lighting
8) Indian Electricity Act and Rules

2.2 All codes and standards mean the latest. Where not specified otherwise the installation shall generally follow the Indian Standard Codes of Practice or the British Standard Codes of Practice in the absence of Indian Standards.

3.0 Light Fixtures (Weather proof & Water proof)

3.1 The light fixture construction shall be of die cast aluminium with a separate compartment for integral ballast equipment. The reflector shall be anodized polished aluminium. The glass refractor shall be heat-resistant.

3.2 Lamp holder shall be of porcelain and shall comprise a terminal block of non-hygroscopic material. The luminaries shall have integral ballasts as specified housed in water tight and dust tight metal cases. Ballasts shall be prewired to the lamp socket and terminal block, requiring only power supply leads to the ballast primary terminals.

3.3 The lamp & Luminaire shall be as specified in BOQ.

4.0 Lighting Poles

4.1 The lighting poles shall be fabricated from heavy duty cold-rolled steel tubes to IS: 1239-1958 and hot dip galvanized or painted as specified. The pole shall have a base plate, a large access panel, and necessary fixture mounting bracket at top. The access panel shall provide easy access to a multiway porcelain connector and fuse board, to be mounted inside the pole. The access shall be specially fabricated with adequate reinforcement and weather gasket to prevent ingress of moisture and vandal proofed. Poles shall have large diameter entries for incoming and outgoing cable and two earth studs. The pole fabrication shall conform to the drawings and, the contractor shall make drawing and have it approved before fabrication.

4.2 The pole shall house a multiway porcelain junction box with MCB and rewirable fuse as shown on the drawings. Pole shall have a concrete coping.

5.0 Feeder Pillar

5.1 Feeder Pillars shall be factory fabricated distribution centres housing necessary

a) Fuses, MCB's with holders
b) Copper busbars and a separate earth bar
c) 15A weather proof socket outlet and switch
d) Atleast 2Nos 9W bulkhead CFL fittings with weather proof switches.

5.2 The feeder pillar shall be fabricated out of 14SWG mild steel with 12 SWG hinged lockable door panel. Hinges shall be heavy duty minimum 100mm long and of CP brass or S.S 304. Mild steel panel shall undergo a rigorous treatment of 7 bath anti-corrosion process and powder coated. The Feeder pillar shall be rendered dust proof, vermin proof and weather proof conforming to IP 65. Feeder pillar shall be mounted on concrete pedestal (400mm above ground) with suitable provision for entry and engross of cables. Feeder pillar shall be amply sized to accommodate all the internals and at the same time achieve an internal temperature of not more than 40 ^{o}C, 2Nos earth studs shall be brought out. All hard-ware such as door handles, hinges, locks etc. Shall be chromium plated brass or stainless steel.

5.3 Feed pillars shall house necessary fuses, MCB's , tag blocks etc. as shown on drawings and as specified.

6.0 **Cable laying**

6.1 Cabling shall be generally as specified in the section 'M V CABLING.'

6.2 Cables shall be terminated in a junction box inside the pole or attached therewith as shown on drawings.

6.3 Cable route shall be as shown on the drawings or the contractor shall mark out the route and lay the cables only upon approval of the route.

6.4 If Flexible wires are used, then they have to be laid in FR RIGID PVC conduits buried in soil. It shall be terminated in terminal block inside the pole. Route shall be as shown on drawings or the contractor shall mark out the route & lay the conduits with wires only upon approval of the route.

7.0 **Earthing**

7.1 All street lights fixtures and poles shall be earthed as specified.

8.0 **Mode of measurement**

8.1 Each light fitting with lamp, control gear, earthing etc. shall be considered as one unit for measurement and payment.

8.2 Each lighting pole, concrete coping, base plate, earthing etc. shall be considered as one unit for measurement and payment.

8.3 Wiring from the junction box to the light fitting shall be considered as one unit for measurement and payment.

8.4 All cabling work shall be measured on the basis of unit length and the cost shall include, cost of cable, minor civil work required for laying cables, laying tiles etc.

8.5 All cable terminations shall be measured as one unit complete with necessary glands, lugs, nuts, bolts, jointing material, earthing of glands etc. for completeness of installation.

8.5 Feeder pillars shall be measured per unit complete with all components as specified.

8.6 Wherever light poles and fixtures are supplied by client, the installation shall be paid per unit and the unit cost shall include excavation, erection, concrete coping, earthing etc.

External lighting 3 of 3

SPECIFCATIONS FOR PATWARDHAN PARK

Following points should be taken care of while procuring, installing & commissioning of different lighting fixtures for LED lighting.

A) General Specification -

1. Please ensure the details of material receipt is as per the requirements / specifications issued by consultants.
2. Ensure the quantity indicated on each box & verify with the required qty. In case of short supply, same needs to be taken in writing with respective vendor on priority basis.
3. Open each packed box & verify the length of each linear light with respect to required specifications in the presence of the vendor / representative of vendor.

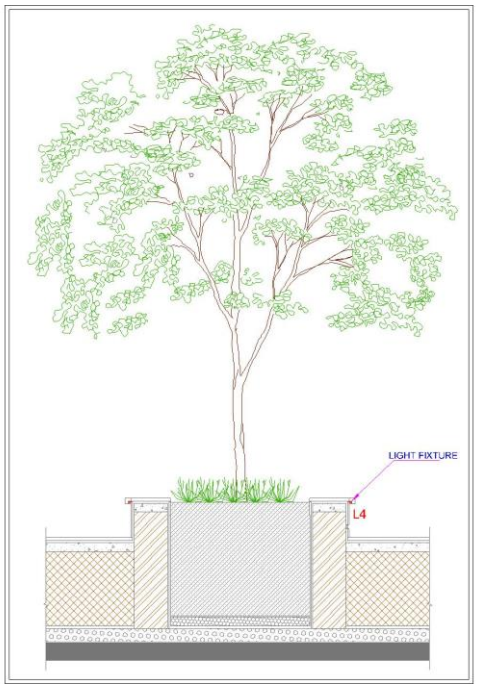
B) Technical Specification -

1. Do remember that the colour of the light that the lamp produces is important. Light colour is measured in in Kelvin using an index called Correlated Colour Temperature. The lower the Kelvins, the warmer the light. LED's are available in a wide range of colour temperatures from very warm to very cool, and even coloured. Do check that the LED’s will give the required colour rendering index in the space.
2. Do make provision to ensure that access is possible for LED lighting system installation, for aiming/Re-focusing and future maintenance.
3. Do review operating temperature information and how this data relates to luminaire efficiency and lumen depreciation in proposed installation location.
4. Do check ingress protection (IP) ratings of all LED systems components (including any remote drivers located nearby). Choose an appropriate rating for the intended application
5. Do remember to ensure compatibility with dimming equipment if you require to dim LED's.
6. Do ensure arrangement are made for regular cleaning of the luminarie and periodic inspection, testing and maintenance
7. Do check the lumens/ lumens per watt and beam distribution
8. It is advisable that each circuit of installation including driver and associated light shall be checked on ground before installation
9. Kindly ensure length of wires /cables from driver to light fitting is minimum.

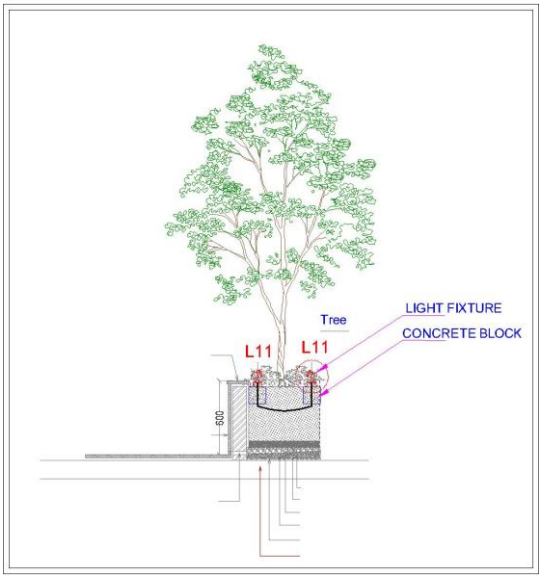
1. Don’t tamper any electrical module while checking the received material
2. Don’t keep all boxes of material open to air. It should be stored in proper covered and well-ventilated room
3. Don’t forget that all LED’s will reduce output with the passage of time. So, make sure that illuminance will still be adequate at the end of life.
4. Don’t install LED sources directly within the line of sight. LED’s are often small and very bright point sources of light and can cause visual discomfort if it hits the naked eye.
5. Don’t rely on claims that an LED is equivalent source to a particular Halogen / GLS Source
6. Not all LED lights can be dimmed. Those that can be dimmed may not always work with your existing dimmer or dimming equipment.
7. Don’t allow non-technical / untrained personnel to install / maintain the luminaires.
8. Don’t forget to follow installation guidelines issued by vendor along with each luminaire.
9. Don’t over load the drivers with excess luminaires. Each driver can optimally supply power to fixed lengths / numbers of luminiares. Extra load on drivers will lead to premature failure of both the driver as well as the luminaire.
10. Don’t install LED lighting system in a situation where they will be operating beyond the temperature tolerances specified by the manufacturer.

TYPICAL LIGHTS INSTALLATION DETAILS

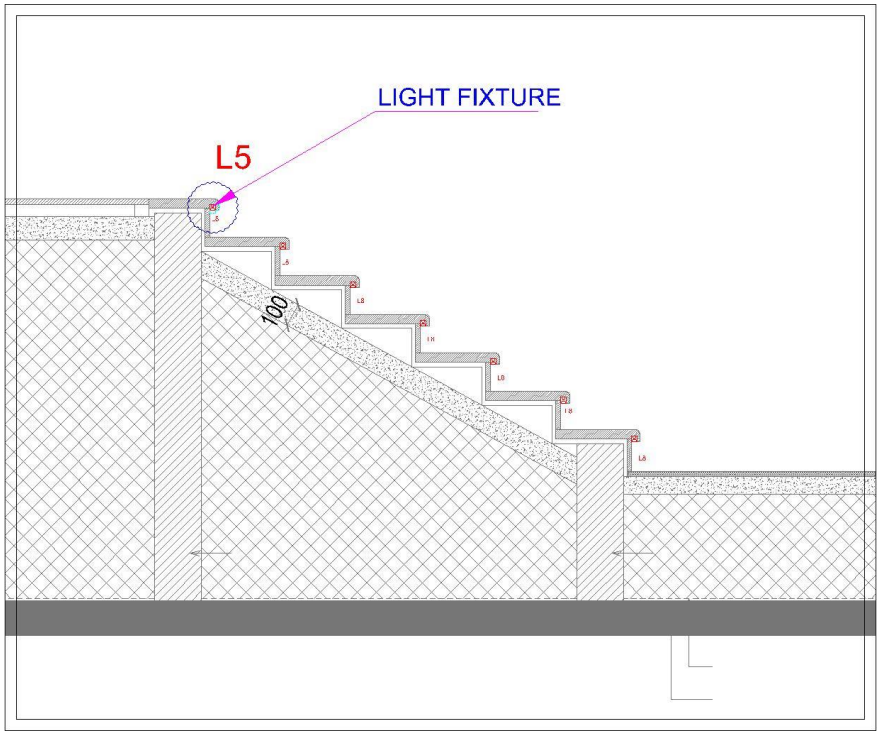
1.Typical Seating light Installation detail :



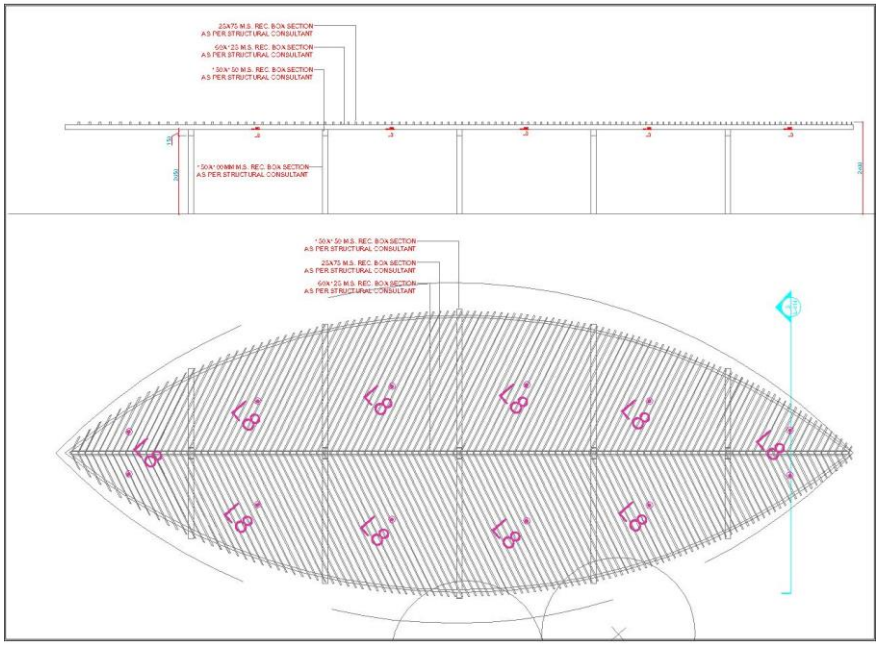
2.Typical Tree up Installation :



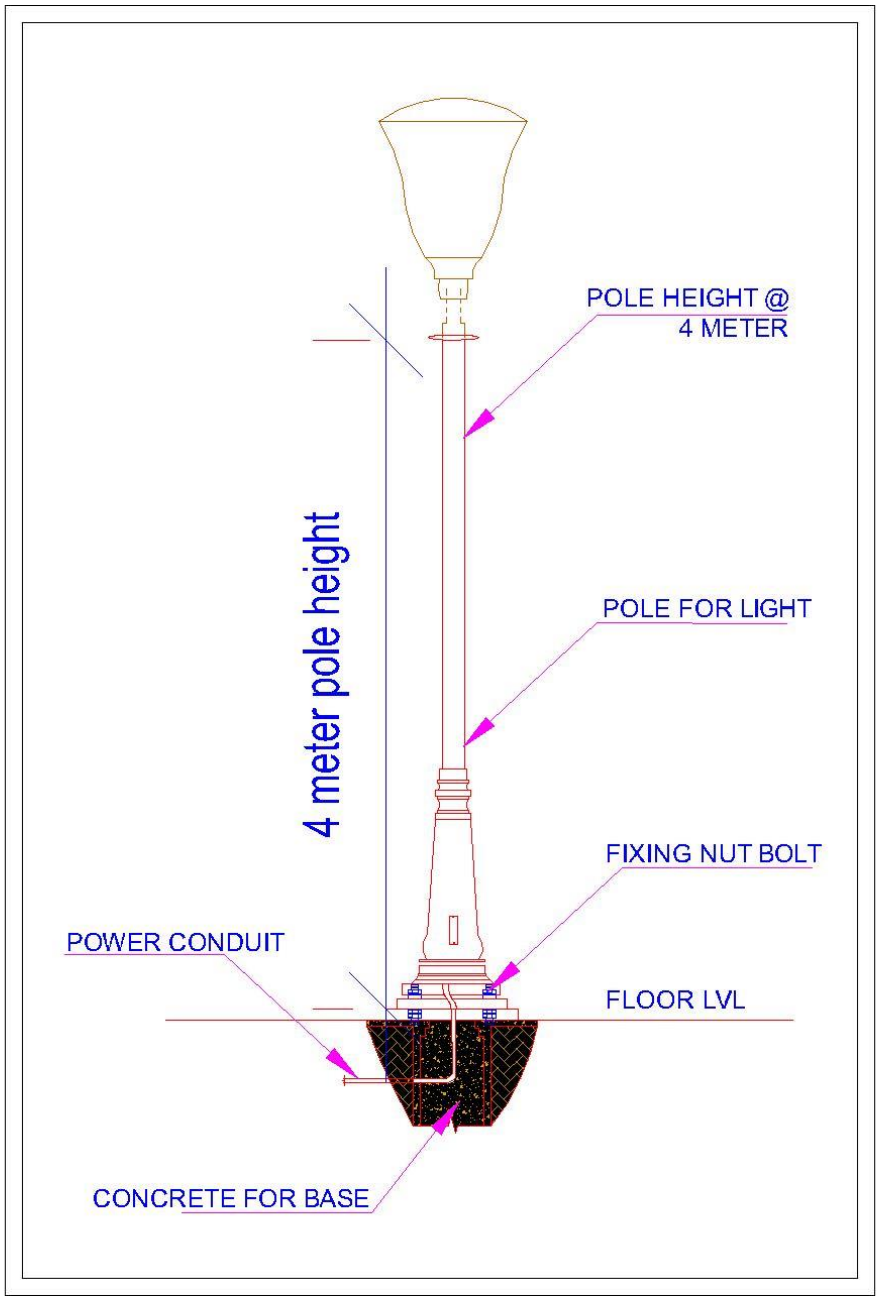
3.Typical Steps light Installation detail



4.Typical pergola light Installation detail:



5.Typical pole light Installation detail:



List of Approved Makes External Lighting				
Sr. No.	Area/Location Types Of Fixtures	Approved Makes		
1	HIGH MAST POLE LIGHT FOR LAWN	Philips	Sill	Faelluce
2	POLE LIGHT WALKWAY	Schreder	Iguzzini	Ligmen
3	FOOT LIGHT	Simes	Bega	Ligmen
4	LINEAR LIGHT FOR SEATING	Led linear	Tridonic	Arcluce
5	LINEAR LIGHT FOR STEPS	Led linear	Tridonic	Arcluce
6	POLE LIGHT FOR PERIPHERY	Simes	Iguzzini	Ligmen
7	POLE LIGHT FOR TREE	Endo	Iguzzini	Ligmen
8	SPOT LIGHT FOR PERGOLA	Endo	Iguzzini	Ligmen
9	SPOT LIGHT FOR PERGOLA	Endo	Iguzzini	Ligmen
10	LINEAR LIGHT FOR GATE	Led linear	Tridonic	Arcluce
11	TREE UP LIGHTER FOR ENTRANCE TREE	Endo	Iguzzini	Ligmen

PARKING SPECIFICATION

Tender Specification for Smart Parking (Ticketing, Level Display and Parking Availability indicator Display)

Scope Of Work:

Designing, Supply, Installation, Testing and Commissioning of the following:
Following are the key objectives from the smart parking initiative:

1. To uniquely identify all parking spots through sensor and other smart parking technology solutions
2. To enable accurate information on availability of parking slots in real time through monitoring entry and exit of each vehicle in each parking lot and sensors installed in each parking bay.
3. To enable parking guidance system to direct drivers to available parking spot
4. To enable users to pay on the spot or at the manual PoS station by submitting his barcode ticket that he has acquired while
5. To Scan the vehicle underneath and store the color video footages for at least one month

Brief of Work: Smart Parking Functional Requirements

The overall functional requirements for the Smart Parking Solution are mentioned below:
1. Should be equipped to monitor and manage indoor (covered) parking, open (outdoor) parking and open street parking.
2. Each demarked parking slot should have one on one mapping by individually installing parking sensors.
3. Should include a Parking Management and Parking Guidance System to direct drivers to available parking slots
4. Should have the capability to uniquely identify each motorist entering any of the parking lots. Vendor may propose barcoded tickets, RFID cards, Smart Cards entry.
5. Integrating information related to all Smart Parking components, including hardware components like entry/exit devices, barriers, wireless handheld devices, sensors; and software applications to perform parking related functions like payment, reporting, providing guidance, etc. This information will be monitored and managed in the Centralized Server.
6. Should ensure that all sensors, devices and equipment for parking have the capability to communicate back and forth with the Server with respect to data and feedback
7. Should ensure availability of real time parking information by monitoring sensors, entry and exit points in each parking lot
8. Should scan the vehicle from beneath and the surveillance shall be of clear color images (Black and white will not be accepted). Should store the same for at least one month.
11. The solution should be automated, reliable, value for money, effective, scalable, secure, environment friendly, energy efficient and must entail minimum human intervention for day- to-day parking management.

12. Should include provisions for the following types of parking reservations:

Walk-in Parking: This category includes motorists who enter a parking lot without any prior booking. This category of motorists may be provided a bar-coded ticket.

The parking system broadly comprises of two subsystems, namely Parking Management System and Parking Guidance System. The Parking Management System consists of the parking revenue management and access control system for tracking vehicles in and out of the parking lot, billing information, and real-time information about availability of parking slots. The Parking Management System comprises of components like entry columns, barriers, exit

devices, payment device, payment mechanism, wireless handheld device, etc. The Parking Management System components should communicate back and forth with the centralized server.
The Parking Guidance System will guide the motorist to appropriate parking spots using a combination of digital LED Display signs and indicators within the parking lot. The Parking Guidance System comprises of the components like ultrasonic and magnetic loop sensors for vehicle detection, level/zone display modules, light indicators, electronic displays, map based guidance mobile app and web portal system etc.

1. Parking Management Subsystem

Functional requirements for the parking management components are described below:

1.1 Entry Requirement

- A vehicle, detected by the loop, shall activate the Entry Device. The Entry Device will not be functional without the car present on the activation loop.
- The color LCD display (minimum 7") shall instruct visitors to push glowing ticket button for ticket, or flash RFID data carrier at the same device.
- The display should have a capability to show the customer's logo in high resolution or run an advertising video for additional revenue generation.
  The Entry Device should have Near Field Communication (NFC) capability
- The device should have touch screen to connect with Intercom, microphone, speaker and other subsystems.

- The entry device display should have capability to display messages in English and local language (Hindi/ Marathi)
- Only after completing the full cycle (i.e. pressing the button, pulling the ticket, and crossing the entry barrier) correctly the transaction shall be considered as valid within the car park.
- In the case of paper tickets issued by the Entry Device but not removed by the driver, such tickets will be moved back into the Entry Device. This ticket is 'written' on in such a way as to make it useless within the system, and dumped into a storage space within the Entry Device. The fact that this ticket has been so processed must be transmitted to the other parking equipment within the system, to ensure that this ticket cannot be used at any other Device. This fact must be stored as part of the system audit trail. This is commonly known as a 'back- off ticket'.
- The entry device should have a protection crash guard hardware from the same OEM to provide safety in case of physical accident.
- The entry device should have a LED glowing strip for indicating the lane during low light conditions.
- The Entry Device shall be able to detect and report:
  - Anti pass back on RFID data carriers.
  - Customer slot full on RFID data carriers, in case multiple data carriers are given to the
    same account.
  - Back-out ticket
  - Low ticket stock
- The Entry Device shall allow full integration of 3rd party readers, and report all transactions of the 3rd party readers in the standard reports.

- The Entry Device shall be possible to be programmed in Traffic Jam mode during weekends/ public holidays, so as to give out tickets at a faster rate than normal speeds, to help burst the long queues i.e. the Entry device should be able to keep another ticket ready at the back, while the first ticket is still being pulled by the driver.
- The barcode ticket/ QR Code and Smart Parking Card or any other technology used should be capable of capturing data that is easily retrievable at the exit.
- Every vehicle entering the parking space should be stopped by barrier. The barrier is raised when the motorist is issued a ticket or has been identified as a legitimate user.
- In case the parking lot is already occupied to its capacity, the ticket issuing should automatically be blocked and therefore, the barrier should not open. A message should also be displayed on the column screen stating “Car Park Full”.
- A separate Digital Imaging solution with a high-resolution camera should be there to capture the image of every vehicle entering and associate this image with the ticket dispensing by the entry device

Complete Technical Requirement:

Entry Device

- ⇨ The Entry Device shall be fabricated out of non-corroding aluminum and heavy-duty color impregnated resin.
- ⇨ The Entry Device shall be fitted with an illuminated feather touch ticket request button. o A large Graphical display (7” high resolution 800 X 480 pixel) shall be integrated to display messages to the customer in both English/ local languages. The display should have capability to project dynamic digital advertisements in image or video format. This sponsored advertisement will be relayed from centralized server. Touch screen functionality should be available as an option.
- ⇨ System shall have capability of Bi-directional (i.e., duplex) video communication (solution includes camera hardware)
- ⇨ The graphical display shall display icons for easy understanding.
- ⇨ Whenever text is displayed it shall be in English and local regional language (i.e.Marathi/Hindi).
- ⇨ Inbuilt, Integrated Intercom capability to be available in the Entry device. The intercom will allow VOIP communication with the control room. Intercom will be an industrial intercom system, with background noise cancellation technology (Analog or integrated digital intercom based on Ethernet).
- ⇨ The Entry Device shall use single slot technology.
- ⇨ The following technologies shall be processed by the entry Device in a single slot. o Thermo paper tickets (barcode technology) for short term parkers
  RFID/ Barcode data carrier for contract parkers
  Capability of Magstripe tickets as a option
- ⇨ The RFID antenna shall be fully integrated into the Device design. External installation of antennas and/or readers shall not be accepted.
- ⇨ The RFID antenna shall be able to process the following technologies: ➔ KeyCard 13 MHZ
  Mifare ISO 14443A
  Mifare ISO 15693
- ⇨ NFC (Near field communication)

- ⇨ Prepared for contactless parking cash debit cards and parking credit cards
- ⇨ The Entry Device should be NFC Ready and capability to add this in the future. Shall be proven to the customer with a demonstration.
- ⇨ The entry Device shall have optional touch screen to offer programmable function buttons, this for future expansion such as credit card entry, special ticket, hotel ticket, etc.
- ⇨ The entry device should have large installation space for add-on modules (e.g., PIN pad, credit card reader, etc.)
- ⇨ Tickets are fan-folded in stack of 2 x 7,000 pieces in each device, with advertising capability. o The Entry Device shall be able to house 2 stacks of tickets.
- ⇨ Optional capability of possibility to switch automatically from one box to the other. This ensures continues feed of tickets from both boxes.
- ⇨ Alarm shall be raised when ticket box is empty. And this alarm to be reflected at the monitoring console and server on a real time basis.
- ⇨ The entry device shall have capability to house a 3rd party CCTV camera to capture the image of the vehicle driver's face. This CCTV camera would be linked to the respective CCTV system installed in the facility.
- ⇨ External Installation of CCTV camera shall not be accepted for this purpose.
- ⇨ Paper tickets must be encoded with at least the following user readable information: i. Entry time & date;
  - ii. Unique ticket transaction number (Random number);
  - iii. Entry Device identification;
  - iv. Site identification.
- ⇨ Printed information shall always be using Thermo technology. The usage of inkjet and or matrix printing technology will not be accepted.
- ⇨ All Device activity must be logged in the system activity database.
- ⇨ The Entry Device shall be able to operate in Offline mode. It will retain a maximum of its functionality even if the communication with the server is not available due to network failure or server crash.
- ⇨ Every Entry Device shall have a local memory of 6,000 transactions, in case of no connectivity. Upon reconnecting to the server the unit will update and restore all data.

  Under all circumstances the system shall be fully auditable for every single transaction.
- ⇨ Entry Device shall be fitted with the induction loops for presence and security.
- ⇨ Induction Loops shall be installed in the lane. The layout of the loops and installation shall ensure a trouble free operation of the system.
- ⇨ Communication protocol shall be TCP/IP o Power: 100-240V + 10% / 50- 60HZ.
- ⇨ Degree of protection based on IEC 60529: IP43
- ⇨ Operating temperature- –20 °C (–4 °F) to + 50 °C (122 °F) (in shade)
  –20 °C (–4 °F) to + 40 °C (104 °F) under sun exposure
- ⇨ Max. ambient humidity 90 % (non-condensing)
- ⇨ Support stand color Brushed, anodized aluminum. The device should be made out of recyclable materials only.
- ⇨ In-built Scanner to read pre-booked barcode tickets. The Scanner should have following features: i. 1-D-Barcodes ii. 2D-Barcodes iii. Widely format-free

iv. Laser-free (safety)
v. Maintenance and wear-free
vi. Very compact construction
vii. High resolution
viii. Very special optical lenses for reading paper tickets as well as reflecting displays of mobile phones!

Entry Device with the following capabilities:

a. The Entry Device should be capable of dispensing tickets with printed barcode. Upon pressing the 'Ticket' button, a ticket will be issued with the following details:

- Entry time & date
- Unique ticket transaction number o Entry Device identification
- Site identification

b. The Entry Device should have QR/ barcode scanner to allow motorist to scan the Unique Booking QR/ barcode received by the motorist in case of online/ mobile booking. Post scanning the barrier opens and parker is allowed to park.

c. The Entry Device should be NFC Ready and should have the capability to read Smart Parking Card, monthly passes, Corporate Cards or any other device

Standards: Conform ISO 9001 Quality Assurance Standard, CE, FCC, IC, CNRTLUS certified,

1.2 Exit Requirements

Any vehicle, before leaving the parking area, should be stopped by a barrier system at the exit pay station.

If the exit lane is with an Exit Pay Station it will allow the parker to pay for his/her parking tariff, issue a receipt and allow him to exit. Barrier only post completion of payment.

If the exit lane is with an Exit Column it is an Express lane and all the parker who have paid their parking tariff at the Central Pay station can get their tickets scanned at Exit Column and leave. Barrier opens only post detecting a Paid ticket.

A Digital Imaging Solution should be there to capture the image of the vehicle by scanning the ticket at the exit pay stations. While scanning the ticket, entry and exit image both should pop up. The operator has to examine two vehicle images associated with that particular ticket and allow/ disallow the vehicle to exit. The entry and exit images along with ticket information should be stored at digital imaging server. For any mismatch found associated with the ticket and images, operator has to inform about the incident to the control room using intercom system installed at the pay station. During peak traffic, this visual verification exercise may not be necessarily performed at Exit but still the system shall store all the associated images ensuring the security aspect for future reference.

1.3 Manual Pay Station

- Manned POS to be deployed at service kiosks or at the car park exit.
- The POS solution shall be fool and temper proof with users not allowed to install applications and change any settings of the operating system
- POS to be complete with CPU, LED Monitor 19”, keyboard, mouse, handheld barcode scanner, 2D barcode/QR barcode reader & Ticket Receipt Printer.

- Clearly instructed easy to use interface
- Capability of using Touch screen POS
- Operator will scan the Entry ticket using the Scanner.
- The system will calculate the fee automatically and indicate this on the screen. No manual intervention should be necessary to compute the fee.
- The system shall be capable of accepting all supported means of payment that are valid within the car park (credit cards, debit cards, cash, NFC,).
- It should be possible to have a view of the health check/ status of the entire parking system from a Manual Pay station using a high level administration password or service technician password.
- It should be possible to have RFID reader, interface board from the same manufacturer as Parking Software, for seamless integration and reliability.
- Exit of every parking should be equipped with a manned Pay station (booth).
- The exit booth should have appropriate space for keeping devices such as a computer with internet connectivity, barcode/QR code reader, credit card reader, printer etc.
- For motorists who enter the parking lot using Smart Parking Card, RFID Monthly pass/Card or any other NFC capable card provided by vendor, the exit booth should also have RFID/NFC facility for motorist to tap his/her Smart Parking Card for express exit. The payment can also be linked to the e-Wallet of the motorist with auto-debit option and corresponding limits and alerts to the same.
- A Digital Imaging Solution should be there to capture the image of the vehicle by scanning the ticket at the exit pay stations. While scanning the ticket, entry and exit image both should pop up. The operator has to examine two vehicle images associated with that particular ticket and allow/ disallow the vehicle to exit. The entry and exit images long with ticket information should be stored at digital imaging server. For any mismatch found associated with the ticket and images, operator has to inform about the incident to the control room using intercom system installed at the pay station.
- Once the vehicle exits a parking slot, the total parking slots available in that parking space should automatically get updated.
- Only after completing the full cycle correctly the transaction will be considered as valid within the car park. However, audit trail of each complete, incomplete and cancelled transaction should be available in the system.
- The solution should be equipped with Anti-pass back technology and be able to detect and report any instance pass back.
- The solution should track each and every revenue source and should ensure no leakages due to manual intervention.

Complete Technical Specifications:

Manual Pay Station

- POS shall be PC based and run on Original Windows license.
- The CPU to having latest market available hardware specifications:
- Capability to process the following technologies:
    - Thermo paper tickets (barcode technology)
    - Magstripe tickets
    - Magstripe ISO Cards
    - Credit cards ISO track
    - Credit cards Chip ISO 7816
    - NFC Technology and

- Handheld barcode/QR code Scanning Device shall be connected using a USB interface
- Automatic receipt issuing is a must.
- Operators shall log in and out of their shift using a unique authentication password.
- At the end of the shift a shift-report shall be printed. Blind cashiering should be possible
- It should be possible to accept the validations and issue free or discounted parking for the short term parkers.
- It shall be able to send a report to the validation provider with the amount billed to them automatically at a defined time.
- To ensure full accountability the system is able to process a parker that has no means of payment. The respite function allows the operator, with approval of the supervisor, to handle a respite transaction. The operator fills the client details into the system and the ticket is coded for exit. A special respite receipt is printed. The driver can at any time come to any cashier and settle his respite amount.
- Operator value cards should be re-loadable at the cashier stations.
- Single-phase 230VAC 50Hz supply; 1000 W maximum power consumption

- The Pay Station solution should be foolproof and tamper proof with users not allowed to install applications and change any settings of the operating system.
- It should have all basic operability functions. It should be connected to the Integrated Industry Standard Platform via the network and be capable of remote monitoring from the same.
- The transactions should get uploaded instantly and automatically to the central server using on-line connectivity via LAN.
- It should be possible to have a view of the health check/ status of the entire parking system from a Manual Pay station using a high level administration password or service technician password.
- Handheld QR / barcode Scanning Device or any other device used should be connected using a USB Interface

The system should be capable of accepting all supported means of payment like cash, credit cards, and debit cards or using digital wallet

  - **Standards:** RFID Technology with the following protocols:
    KeyCard 13 MHZ
    Mifare ISO
    14443 A Mifare
    ISO 15693
- Conform ISO 9001 Quality Assurance Standard RFID reader used at POS shall be CE, FCC, IC certified

1.4 Entry and Exit Barrier

- The entrance and exit of each parking lot should have a boom barrier gate
- The barrier should communicate with the Entry Device over an intelligent communication protocol, not simple relay contacts. This would ensure that the system cannot be bypassed.
- Barrier Arms- straight and folding type must have in built traffic signal capability
  - In closed position the full arm shall be illuminated red.

  - During movement the full arm shall be illuminated yellow.
  - Once reached open position the full arm shall be illuminated Green.
- The Barrier shall receive open and close commands only from the Entry/Exit Device over the communication interface.
- Barrier should have in built glowing LED lane signal (glowing green arrow when open and red cross when close).
- Barrier should have a LED glowing strip for indicating barrier lane during low light conditions.
- Barriers should have protection crash guard hardware from the same OEM to provide safety in case of physical accident.
- Barrier should have capability to be opened and closed remotely through the server and console with detailed logs associated with this to ensure no unauthorized opening and closing of the barrier is done.
- Upon horizontal impact by a vehicle, the barrier arm shall get detached from the barrier unit (fall off design), with minimal damage to the vehicle and the barrier motor mechanism. Swing design is not acceptable, as this is prone to accidents to the 3rd parties in proximity. An alarm shall also be raised and sent to the server and monitoring console, when the barrier is detached.
- An alert should be sent to the console and server to ensure that the administrator is informed that the barrier is not attached or barrier breakage.
- All vehicular passages during the time that the barrier is not attached should be recorded and displayed in the reports separately in order to audit the necessary revenue transactions during that time.
- Upon impact during closure, the arm will stop and stay in the same position. Under no circumstances shall the arm re-open upon impact. This is to prevent keeping the arm open for illegal exits.
- The barrier arm shall be easy to refit with barrier unit in a short duration.

- If for any reason an external override (fire system) needs to be connected, then this shall only be possible over the Entry/exit Device and the switch shall be permanently monitored by the Parking Management System.
- Barrier should have a capability of in built camera to capture the front picture of the car.
- The barrier should remain in open position for optimal period of time for the vehicle to pass at entrance and exit.

Complete Technical Specifications:

Entry and Exit Barrier

- Duty Cycle 100%
- Opening and closing time for the barrier shall not exceed 1.5 sec for barrier boom lengths less than or equal to 2.8 m for 4 wheelers application.
- Barrier body should be made using anodized aluminum and Die-cast aluminum. Barrier arm to be made from GRP. The device should be made out of recyclable materials only.
- The Jointed Barrier arm (folding arm) should be available for locations with low height clearance.
- The Barrier arm shall be fitted with a rubber strip at the lower side.
- Geared motor with integrated frequency converter control and slipping clutch on drive side.
- Self-locking gearing with contactless switches at both terminal positions of barrier arm
- This should be a non –hydraulic mechanism for low maintenance.
- Self locking gear system to ensure that the Barrier arm cannot be lifted manually.

- Use of belts or pulleys for drive assembly is not preferred.
- Free of any front line maintenance requirements – no need of grease application etc.
- Barrier Arms- straight and folding type must have in built RGB traffic signal capability
    - In closed position, the full arm shall be illuminated red.
    - During movement, the full arm shall be illuminated yellow.
    - Once reached open position the full arm shall be illuminated Green.
- The Barrier shall receive open and close commands only from the Entry/Exit Device over the communication interface.
- Barrier should have in built glowing LED lane signal (glowing green arrow when open and red cross when close).
- Barrier should have a LED glowing strip for indicating barrier lane during low light conditions.
- Barriers should have a protection crash guard hardware from the same OEM to provide safety in case of physical accident.
- Single-phase 230VAC 50Hz supply; 250 W maximum power consumption
- The barrier at entrance should receive open and close commands from the Entry Device over the communication interface once ticket issue button is pressed.
- The barrier at exit should receive open and close commands from the Pay Station.
- Barrier should be allowed to be open and close remotely through the server and console with detailed logs associated with this to ensure no unauthorized opening and closing of the barrier is done.
- The entry and exit barrier should communicate with the Entry Device and Exit POS over an intelligent communication protocol to ensure that the system cannot be bypassed.
- Open and closing time for the barrier should be within limits as per latest industry standards.
- Barriers should be monitored for any breakage or forced entry or any manual intervention and provide indication at the central server via its associated Entry Device or Manual Pay station. The Barrier should have an integrated two-channel induction loop detector

Standards:

- Conform ISO 9001 Quality Assurance Standard
- CE, cNRTLus, GOST certified
- Degree of protection: IP44

1.5 Wireless Handheld Device

The solution should include the use of wireless handheld device for on-street and off-street parking. This device shall be used in case of street parking or indoor parking or open parking during peak hours or as a fallback mechanism. However, this device must track every transaction limiting any manual transaction to zero.

Street Parking Mode:

- It should be possible to use wireless handheld devices in street parking model. o On arrival of motorist, it should be able to dispense a ticket
- The same device should also be able to function as cash register
- The transactions should get uploaded instantly and automatically to the central parking management system using on-line connectivity.

Indoor or Open Parking Mode: In case of high traffic at any of the parking lots or during peak hours, it should be possible for the wireless handheld device to be used as central cashiering device (i.e. it should be possible to scan the barcode on tickets issued by the

entry device and issue receipts post payment, so that the motorists could pay for the parking and then drive out quickly), without any time consumed for payment transactions at the exit.

The device to have connectivity with the mobile printer via Bluetooth.

The device should have capability to print parking receipts and bar-coded tickets in real time.

Both the functionality of ticket dispensing & cash register should be possible to be combined in one device.

This wireless handheld device should be an online unit, connected in real-time with server using Wi-Fi or GPRS.

The wireless device to have batteries and power supply along with cradle for charging.

It should be possible to provide validations & issue discounted tickets to the parkers (frequent parkers)

In addition, the mobile device should have the capability of working as an entry ONLY (ticket dispensing mode) or an Exit Only (i.e. exit cashiering mode).

Complete Technical Details:

Wireless Handheld Device

- On arrival of motorist, the wireless handheld device should be able to dispense a barcode ticket.
- The same device should be able to scan the same barcode ticket while leaving and generate and print receipt after receiving payment
- The Handheld device should be windows/Android based device.
- The Handheld device should have a rechargeable inbuilt battery.
- The Handheld device should also have RFID reading capability to be able to read RFID Smart Card Monthly Passes and similar other data carriers.
- The handheld device should be IP based and Wi-Fi enabled, to be included on the secure Wi- Fi network and monitored from the centralized server
- This handheld device will have the basic parking metering and management application, which will be synced with the overall Parking Management System, and its data will be communicated back and forth from the centralized server.
- A wireless handheld device should be provided to the parking managers and operators to manage the parking related operations on the ground.

1.6 Parking Management Server and Software

- The server system to have latest market available configuration.

- The system application to work on Microsoft Windows 2008R2 & MS SQL server 2014 Standard downgrade to SQL 2012, 2008.
- The system should be capable of sending reports to predefined email ids at predefined intervals, using auto email feature.
- The System shall be able to be created various forms of cards and tickets:
  - Short term tickets
  - Contract Parking card
  - Long term ticket quota based card
  - Parking credit card
  - Electronic Purse
  - Convention ticket

- Charter/ Visitor card
- Validation card
- Discount cards
- Single exit ticket
- Ticket loss,
- Substitute ticket
- Special sales

- Following minimum Revenue Reports should be possible to be generated from the system
  - Complete facility
  - Car park wise
  - Device wise
  - Cashier wise
  - Shift wise
- Other MIS Reports
  - Parking Duration reports
  - Parking Movement reports
  - System event reports
  - System total report
  - Fee Group analysis
  - Duplicate ticket generation report

Reports of the contract parkers would be from the same parking management system. External Report for contract parkers shall not be allowed.

It should be possible to handle multiple car parks in a single facility (for eg: 2 wheelers, 4 wheelers) with the possibility of reports generated for either of two parking lots, and both within the same report.

It should be possible to link all multiple parking lot facilities and have a single point reporting station for all of them.

Revenue Control Software Package o Required Features/Functions:

Lane Equipment Program

Additional language for display of messages on the lane equipment in two languages Definable face text to be printed on Short-Term Parking Tickets (e.g., adverts,

Advisory information, etc.)

Ticket processing at exit points (retain, return or offer)

Allow/block exit of Entry Tickets, Cash Debit Cards, Credit Cards and Parking Credit Cards with zero rate

Use of Debit Cards (allow/disallow payment of debit card[s] at exit points) Validation configuration (accept/reject validations)

- Fee Computer/Workstation

Number of invoices, broken down by means of payment Definition of max. credit card spending amount

Definition of min. amount of receipt for issuance

Exit point payment: exit barrier will only open until payment has been received or gate vended manually. (manual gate vends must be recorded and tracked as events in the system)

Flexible keyboard definition for extended keyboard (Control Console or keyboard dialogue)

Definition of up to 5 validations per transaction.

Ability to be used as a control station to review entire system devices for operational efficiencies.

Dynamic Language Selection to allow users of the system to select the language of their choice where upon logging in their selected language is available. This allows for reducing potential operational problems with multilingual teams.

Supports Active Directory

- Password Access Level Programs
  - Assigning of programs and functions to access level categories, based on own access level
  - Minimum of 7 basic access level categories, definition of up to 90 further access level categories
  - Summary of programs and functions available on individual system devices Data filter option
- Reports Program
  - Report Compilation: Customizable compilation of reports by means of the following add-on features:
    - Cashier/Lane/Device Reports (Total Turnover, Net Turnover, Sales, Means of Payment, Validation Providers)
    - Garage Reports (Total Turnover, Net Turnover, System Totals Parking Duration)
  - Data Filters: Customizable compilation of
    - Filtered Reports for definable report periods
    - Daily/Monthly Interim Reports
- Device Equipment/Accessories – Validation Providers
  - Evaluation of validated and surcharged amounts, broken down by validation provider Additional validation calculations:
    - Applicable daily or weekly
    - Applicable on several consecutive days
    - Entrance required within or before specified time window or always possible
- Rate Management Program
  - Ability to comply with sales and parking tax requirements.
  - Ability to provide tax exclude and tax included rates in one rate schedule. Flat Rate Options
    - Applicable daily or weekly
    - Applicable on several consecutive days
    - Entrance required within or before specified time window or always possible
    - Payment/exit required within or after specified time window or always possible o Flat Rate Payment Options
  - Pay Device(s): Fee Computer/Workstation and/or Pay On Foot devices
  - Activation method: automatic or via request button
  - Rate period
- Data Interface Program

  This utility provides system specific data (e.g. payment details, entry/exit statistics, etc) in a platform independent format for evaluation by way of third-party systems.

- Exportable Data Program
  - Parking transactions (entry/exit movements)
  - Parking transactions of Contract Parker Cards and Credit Cards Payments, Sales Payment transactions
  - Payment transactions broken down by method pf payment (cash, check, invoice, credit card)
  - Payment transactions broken down by method of payment (value cards, validations, token)
  - Additional turnover (e.g., handling fees, amount rounding differences, etc) Daily and Monthly Reports, Cash Flow

System Events and Alarms
User details (export of full records or, optionally, of edited items only)
Ticket return details
Card
utilizations
Events
Card Batches
Staff details (export of full records or, optionally, of edited items only)
Settings – Facilities (Main Admin. Units), Garage's, System devices, Articles, Validation Providers

- Vouchers Program :
  Allows for ability to issue a "voucher" upon entry" with transient ticket, with exit transaction or at the POF. The voucher could be with an agreement with a retailer for a percentage/dollar discount of a service or product. This would allow for closer collaboration with other businesses, branding or advertising revenue generation by the owner.
- Data Interface Platform:
  This program supports real-time TCP/IP-based data transfer between the Parking system and a primary host. This host can transmit commands to Parking System as well as request status information. In case of certain pre-specified events, the Parking System automatically transmits relevant information back to the host. Commands shall include:
  - Remote control commands (, i.e., raising/lowering of barriers, lost ticket, etc)
  - Requesting status, shift and level information
  - Requesting counters and counting domains
  - Set counting category mode and level
- Ticket Definition Program
  Definition of cards, ticket types and/or categories (up to 500 categories) Adjust card imprinting
  - Valid for the whole facility
  - Available on all ticket types except Short-term Parking Ticket, Lost Ticket and Ticket Duplicate
  - Definable face text (see Short-Term Parking Ticket)
  - Imprint can be switched on/off for each article (facility, article designation, user name, user number, validity, ticket value, customer name, 'Follow-up ticket' note, insert direction arrow, receipt information, parking lot no., door code)
- Depot Ticket
  - Depot Ticket function for Long-Term Tickets, Charter/Visitor Cards and Renewable Long-Term Tickets
  - Allows for post-dating of tickets intended to become valid at a future date (ticket can be configured for auto-activation upon first use)
  - Multiple card payment: Allows for use of more than one payment card per transaction
  - Extended entry permission: Allows for access to the parking facility even when full.
  - Re-use Waiting Period; Specifies the time a system-based Discount Ticket will not be accepted (i.e., rejected) after being used
  - Utilizations: Specifies how often Discount Tickets can be used
  - Renewable Long-Term Ticket
  - Staff Permit
  - Group Access Control
- Debit Cards:
  - Cash Debit Card, Types
  - Personalized Cash Debit Card

- Execute Commands
  - Manual open gates
  - Lost Tickets
- View Cash levels

Complete Technical Details:

Data Administration Unit (Parking Server)

- The server system to have following minimum configuration:
  - Intel(R) Xeon(R) Quad Core X3430, 2.4GHZ/8MB CACHE, 4 GB DDR-3 U, DIMMS, 500 GB 3.5-inch SAS Hard Drive, * 2 NOS., Perc S 100 (RAID 0,1) 16x SATA DVD- ROM Writer, Keyboard and Mouse (USB),
- The system application to work on Microsoft Windows 2008R2 & MS SQL server 2014 Standard downgrade to SQL 2012, 2008.
- The system should be capable of sending reports to predefined email ids at predefined intervals, using auto email feature.
- The System shall be able to be created various forms of cards and tickets:
  - Short term tickets
  - Contract Parking card
  - Long term ticket quota based card
  - Parking credit card
  - Electronic Purse
  - Convention ticket
  - Charter/ Visitor card
  - Validation card
  - Discount cards
  - Single exit ticket
  - Ticket loss,
  - Substitute ticket
  - Special sales
- Following minimum Revenue Reports should be possible to be generated from the system
  - Complete facility
  - Car park wise
  - Device wise
  - Cashier wise
  - Shift wise
- Other MIS Reports
  - Parking Duration reports
  - Parking Movement reports
  - System event reports
  - System total report
  - Fee Group analysis
  - Duplicate ticket generation report

Reports of the contract parkers would be from the same parking management system. External Report for contract parkers shall not be allowed.

It should be possible to handle multiple car parks in a single facility (for eg: 2 wheelers, 4 wheelers) with the possibility of reports generated for either of two parking lots, and both within the same report.

It should be possible to link all multiple parking lot facilities and have a single point reporting station for all of them.
It should be possible to have the server remotely in the vendor's location or at an alternate location (hosted option).

Standards: CE, FCC.

1.7 Payment options

The primary mode of payment for parking will be by cash at the Exit/Central Pay Station should also support mobile wallets.

1.8 Optimization of Parking Slots

Though the solution should be automated with minimal requirement for personnel, each parking lot should be managed by on-ground staff and managers for better functioning and management:

- Indoor Parking: Each indoor parking lot should have sufficient number of personnel at floor level, bay level etc. for managing parking. In addition, the exit Pay Station should have sufficient manpower to handle peak and non-peak hour activities.

2. <u>Indoor Parking Guidance subsystem</u>

Overview:

Parking Guidance System is an efficient, quick and fast system that helps the user with information to find free places of the parking facility quickly.
This Parking Guidance System should be able to operate without user software, that is, if it is on its own, system should continue to keep counting and displaying information
By using the Parking Guidance system it should offer the benefits as follows:

- Improve the traffic inside the car park. The system drives the motorist in the shortest time to find a free parking lot.
- Increase occupation and car rotation. The system will help reduce the time period when the motorist is looking for a free lot, so in the same period it manages to introduce more cars to the parking facility.

- Reliability information 100% on real time of occupancy.
- To prevent any sabotage or unattended car for long period inside the parking, the system shall offer a detection system alarm integrated that will report when a car
  remains unattended for a designated time to make detection.
- Monitor the vehicles entering the car park to ensure the vehicle that enters has a free space to park.
- Display and export data from Reports and Statistics of information about the occupancy,
  car movements, period of time.
- The guidance system, besides providing information of availability, shall be capable of future integration with other system of the Car Park i.e. LED lighting for fully optimization, alarm systems on some designated areas of parking lot, Access control for opening doors according to some areas occupation.

The motorist shall obtain the next benefits:

- Make decision at selected junctions thanks to the information received by the displays.
- Displays at the main entrances of the car park or on each floor that serves to indicated the number of free spaces that can be found on each area. Those displays provide an overview of available spaces at each level/zone.
- Displays showing the available lots in large areas or levels which also counts for vehicles in areas/levels heading towards free spaces.

A 3 in 1 type sensor should be installed to sense the occupancy, indicate vacancy via. Led color and also provide requisite illumination using LED lights for each bay.

It should control the system functionality and monitoring should be done from other computers and remotely.

It should provide capability to create full report of exact location with respect to floors, areas, levels, etc. It should be customizable and update about occupation and availability in real time.

It should provide real time monitoring of all system status.

It should report alarms when devices are not connected or when any equipment fails so it displays on screen alarm.

The software should notify alarms after a period of time if a car is abandoned.

The software should provide full graphical plan information of the car park with exact locations.

The software should allow downloading the information and configuration of fields for maintenance purpose.

The software application should have built in tools for third party integration to obtain real time information

Should provide access at user levels with passwords.

The software should have historic log for available spaces, period of time.

The software should be able to handle manual overriding of available spaces, special parking requirements for reserved spaces and handicapped lots.

The software should be able to manage energy saving of the car parks according to car park occupation.

The software should be able to reduce brightness of light indicators manually or automatically according to occupation.

2.1. Sensors with built in Aisle Indicator for vehicle detection

The sensor should be intelligent 3-in-one device which accurately detect if the car space is vacant or occupied.

Sensors should be Located at the front end of the bay, detects the presence of a vehicle in the parking space. The sensors should be Double Ultrasonic Capsule along with thermal map.

The sensor should be able to detect a vehicle irrespective of the depth or height of sensor installation.

The sensor should have an incorporated RGB-led indicator for the state of the bay with configurable brightness.

Once a parking spot is occupied and the indicator must turn red, the total parking slots available in that parking space should automatically get updated.

Each sensor should have its own IP address in order to be accurately tracked by the Parking Guidance System.

Each sensor should have an accurate and real-time feedback mechanism to be detected automatically by the system in case of faults.

The sensor cum indicator should have inbuilt LED light which illuminates the bay for an optimal visibility of the bay.
The sensor cum indicator LED lights should be configurable for lighting for different scenarios depending on the occupation of the bay.
Adjustable bay lighting by software and/or by bay and time occupation.

Complete Technical Details:

1.5.2. Indoor Parking Guidance Sub Systems

The system has two levels for configuration. Level I and Level II.
Level I, Engine Software, which is the main control of the system and it is based on a computer that controls in real time the available lots and update the info to the displays and to the energy saving units.
Level II, User software, which is solely used for monitoring, logging of history and event data, create reports, manual modification of some user parameters.
The system is able to operate with or without User Software, that means, if Level II is down, system keep continue counting and displaying information. In addition, there can be several User Software that can be connected at the same time to the Engine Software.At the top of the system, Engine Software communication protocol is many-to-many relationship, so the whole system will only degrade and continue operation with some limitations when one or more devices are down. For example,

- When a communication line (Converter) linked to the Engine software is down, the system still operates normal except that the info from the available lots on that particularly zone cannot be processed.
- When the communication link between Engine Software and User software is down, the
system still operates normal except that Level II will not be able to obtain status and create data reports of the information.
- When the system is down because of the computer at Level I, the system operates with standalone information on each car space without displays.

The system allows progressive installation so that the whole system can be installed, commissioned, be setup and running step by step, zone by zone or level by level.
The systems have the capability to divide the entire park into different zones and operate independently.
The system is completed with a collection of tools and cabling which makes easy, fast and reliable installation.
The system can be remotely controlled, calibrated and set, making it free from any manual configuration at the lots at all time once system setup is done.
The system allows the detection of car by areas/levels/at entrances/at the exits/parking lanes by crossing detectors of ultrasonic / photoelectric beam / ground loop. The system has even the capability to differentiate vehicles from human passing by.
The system is able to interface with third party systems, with OPC Server, XML communication and through protocol.
The communication between system elements at car spaces to converters equipment is RS- 485. The communication between converters and computer is Ethernet.

The complete CIRPARK Guidance system consist on the following components:

- Ultrasonic Sensors for vehicle detection with Built in Light Indicator for external view at parking lane

- Level/Zone displays for available spaces information
- Intelligent signal converters RS-485 to Ethernet
- Engine software + User software for monitoring

Sensors with built in Aisle indicator for vehicle detection

Detection - Double Ultrasonic Capsule
(free/occupied) Indication - 8 RGB predefined colours
Anti-theft alarm flicker
Occupation time alarm flicker
Indication brightness adjustment according to car park occupancy
On/Off each indicator side for Uni/Bidirectional indication.
Lighting - Adjustable bay lighting by software and/or by bay and time occupation Power supply: - Input voltage +24/48 Vdc Min/max 18 / 60 Vdc
Power Consumption: - 1.5 - 5W@0 - 100% lighting
LED Indication: - Luminous flux RGB (mcd) 15000, 3600, 3000
Serial interface: - Interface RS-485 Speed 19200, 8, N, 1
Working temperature -20 ºC a +60 ºC
Working Humidity 5 - 95% Without condensing Degree of protection IP30
Dimensions 117 x 132.9 x 166 mm

3. Informative Display Panels

Overview:

The display panels units should indicate available spaces for each parking zone/ level/ lot, total parking and should be able to be customized by software.
The display panel should be easy to understand and must have directional arrows and bay availability status indication (as red crosses for zone full or green directional arrows to guide drivers to zones with available spaces).

3.1. Digital Imaging System

The solution should have capability to automatically capture the vehicle image at every entry and exit of each parking lot.
The image should be clicked at the entry point when the ticket is issued and at the exit point during payment.
The image of the vehicle should be linked to the details of the corresponding ticket issued in real- time and stored in the database. This information will be stored in the separate Imaging centralized server.
There shall be appropriate no. of cameras at entry and exit of each Parking Lot.

Complete Technical Details:

Indoor LED Display

The display panels should have high intensity bi color LED.
The display panels units should receive information directly from same communication line and its update time should be less than 5 seconds to increase/decrease any car availability value.
The display panel should have 120mm digit
length. Power supply: - +24 Vdc +/- 10%
maximum
Consumption: - 7,2 W
Serial interface: - Interface RS-485
Speed: - 19200, 8, N, 1
Connection: - Power and data connector
Technology: - LEDs
Color: - High brightness LED bicolour
Digit height: - 120 mm
Character height: - 60 mm
Working temperature: - -20 ºC to +60 ºC
Degree of protection: - IP54
Dimensions: - 165,23 x 485 x 39
mm Panel enclosure as per design.

3.2. Provision for Smart Card (optional)

Along with the paper ticket, vendor can propose smart parking solution to include RFID or NFC enabled Prepaid Smart Card system for premium customers and customers opting for monthly reserved parking passes.
The RFID/NFC enabled smart card reader would be available at Pay Station and would automatically deduct the required payment towards parking.
The RFID/NFC enabled smart card solution is implemented; its devices should be able to communicate to the centralized server, to transmit all parking related information back and forth.
Details of the RFID/NFC enabled Smart Card approach will be proposed by vendor.

Accessories Specification:

PGS Cabling

All power and communications cabling supplied shall be Low Smoke and Zero Halogen.
Cabling shall have power and communication on same cable cover and shall have plug and play connectors for quick connect between sensors and other equipment from guidance elements.
Cabling must be previously tested for minimum fail during installation period.

The communication network shouldn’t need master controllers or slaves. Every equipment is connected at the communication line which is connected at the signal converter.

PGS Control Equipment

The control equipment must be able to convert and manage information received from sensors, display panels and crossing detectors and sent it through TCP/IP to the network.

The unit that converts the signal (TCP2RS) should be an intelligent device that store the information of all devices connected at its communication line and sends that data to the main computer for analysis and update the displays.

Each intelligent device should control up to 75 equipment connected to it (sensor, displays, etc.) The control equipment – concentrator – assure that the system becomes standalone when there is no software running.

o Supply Voltage	85VAC/240VAC and 43-63 Hz, via terminals with metal screws
O Power Consumption	2 VA
O Interface	RJ45 Connector for Ethernet Interface
o 10Base-T/100Base-TX	
O LED Indicators	Supply and RX/TX Signals for the RS-232 and RS-485 ports
O Type of Box	2-element modular box made of self-extinguishing polycarbonate,
O Attachable to rail	DIN 46277, IP20
o Configuration Via	Web Page
o Protocols	TCP/IP, UDP/IP, ARP, ICMP, SNMP, TFTP, DHCP, BOOTP, http and Auto IP

PGS SCADA Software

- The engine software should act to monitor and configure all devices (sensors, displays, signal converters, crossing detectors).
- The software shall work as an engine application, so it control the system functionality but monitoring can be done from other computers (Client software) and remotely.
- The software should provide capability to create full report of exact location by floors, areas, levels, totally customized and about occupation and movements of vehicles.
- The software should provide real time monitoring of all system status.
- The software should report alarms when devices are not connected or when any equipment failure so it displays on screen alarm.
- The software should notify alarms when car reports abandon after a period of time.
- The software should provide full graphical plan information of the car park with exact locations.
- The software should have capability to screen in / out of the floor, and accepts multi- floor. In addition, main information could be displayed on screen while multi-floor is running backwards.
- The software should allow downloading the information and configuration of fields for maintenance purpose.
- The software application should have built in tools for third company integration to obtain real time information in XML.
- The software should be secured due to password access according to user levels.
- The software should have historic log for available spaces, period of time.
- The software should be able to handle manual overriding of available spaces, special parking requirements for reserved spaces and handicapped lots.
- The software should be able to reduce brightness of light indicators manually or automatically according to occupation.
- Software shall be able to monitor any CCTV camera with IP connection from the market.
- Software shall be able to report system information on any mobile system with internet connection by using RSS events information.
- Find your car – Function to find where driver park their vehicle with or without ticket based on period of entry into the parking and car still parked.
- Antitheft – Function to configure period of time while the car should remain parked. If bay is unoccupied system should report with alarm popup, sound, relay action and
  third party software or hardware activation for GSM reporting.
- Overstay – Function of reporting cars overstaying (up to 6 months) by graphical information (identify bay number) on screen and option to blinking light indicator for operator notice.
- Easy bay finder – Function for blinking on free bays green colour and red fix, to bring attention of driver on free bays.
- Report of top 100 bays with higher
occupation. o New reports for bay, groups,
parking, etc.
- Drivers for LED Lighting control

Ticketing & Parking Solution Brands: ACS Xerox, Designa, Skidata, Cytel

Parking Guidance (Display & Sensor): Circontrol, Skidata, Parking map, Cytel

4. Under Vehicle Surveillance System (UVSS)

Complete Technical Details:

1. The UVSS shall have Minimum 3 and Maximum 5 camera in a same ramp with lighting integrated into each single module and should be able to Add or subtract Cameras as per client site.

2. The UVSS camera shall provide full-color images and not black and white / monochrome / monolithic image.

3. The UVSS shall be modular up to 5 sections along with end sections for smooth transition to allow ramps of various widths to be easily configured. Modules shall consist of end modules and 1-foot-wide expansion modules.

4. Each UVSS section module shall be available with or without a camera/light module from 3 up to 5 camera options in the same Ramp.

5. The UVSS camera lights shall be bright white LEDs for illumination.

6. The UVSS LEDs shall provide bright white high-intensity light to simulate bright daylight Underneath a dark vehicle in pitch darkness.

7. The UVSS LEDs shall offer a minimum 100,000 hours of operation.

8. The UVSS shall be based on a speed-bump design and not a flat design to prevent accumulation of water, snow, oil, dirt grit etc.

9. The UVSS shall have a minimum weight capacity of 78 tons.

10. The UVSS shall be designed to operate in harsh environments, including extreme of weather.

11. The UVSS shall not be limited as to the length or height of the vehicle being inspected. It shall be designed to identify objects and be used for any type of vehicle irrespective of length or height to the undercarriage.

12. The UVSS shall provide real-time video for viewing the undercarriage of vehicle. It will not be a static image of a line scan system offering s grayscale images.

13. The UVSS shall be stand-alone and independent of the CCTV system. It shall provide real-time video for display, not analysis or alarm reporting. The UVSS requires dedicated cameras in the ramp and may or may not be shown on the security drawings.

14. The UVSS shall include optional storage devices with a recording capacity of up to a minimum of 2 terabyte or more.

15. The UVSS system shall be manufactured out of rust-proof galvanized steel.

16. The UVSS camera assembly shall have a water-proof housing, rated for submersion to a Depth of 20 meters minimum.

17. The UVSS shall offer has a lifetime warranty on camera/LED housing and for corrosion.

18. The UVSS system will not have a Camera vault that has to be dug in ground to install, this makes the maintenance and replacement difficult and increases construction cost.

19. Everything that is need for inspection shall be inside the ramp and is a part of the ramp. There shall be no requirement to dig a camera vault or other in-ground structures that make installation and maintenance difficult.

20. The permanent systems have the flexibility to positions of the camera / light modules as needed in the ramp.

21. The UVSS ramp shall be designed such a way that the users can add additional camera/lights modules, if required for future expansion needs.

22. The UVSS shall have a minimum 1-year standard warranty on parts and labor, with an additional optional 2-year extended warranty.

23. The UVSS ramp shall be easy for the users to replace the camera/light modules or metal ramps that have been damaged, within minutes.

24. The UVSS permanent ramp frame shall be designed for installation on both concrete and asphalt.

25. The UVSS shall have detailed operating and maintenance manual supplied with each unit.

26. The UVSS system shall display real time video and not static fix images.

27. The UVSS system should not require construction of a pit with Heating cooling and ventilation system nor should the system require any sort of sump pump to pump out water for any liquid accumulation.

28. The UVSS system should not require any piping to carry high pressure air and water to clean dust and debris which requires additional compressor and water connections. The system should be maintenance free from cleaning operation.

29. The UVSS system should have multiple cameras with over lapping areas so that no details are missed.

30. The UVSS system should not have just one camera with a fisheye effect to distort the view or if a tire comes and stops on it the screen should not go blank.

31. The UVSS shall have a minimum of four or more cameras in a linear setting for complete seamless coverage.

32. The UVSS LED shall have a minimum of 10 years of operational warranty.

33. The UVSS shall have a history of installation in International markets / Locations.

34. The UVSS shall have history of installation with a few international defense forces / agencies.

35. The UVSS camera housing shall have a sapphire crystal lens for scratch resistance to protect the camera from scratching.

36. The UVSS should not have a single camera only as in a case of a failed camera the system should not be down at security entrance post.

37. It shall be designed to simulate a human eye for depth of viewing as if the person is underneath a vehicle inspecting it.

38. The UVSS shall not have CCTV Cameras with IR lights on it.

39. The UVSS manufacturer shall have a record of existence manufacturing UVSS for a minimum period of 10 years.

40. The UVSS manufacturer must have not been labeled as a manufacturer who had copied

41. The UVSS shall not require different cameras for different height vehicles.

42. The UVSS cannot have just one camera.

43. The UVSS cannot have a camera with fisheye lens. Fish eye lens tends to taper the images towards the edges.

44. The UVSS should be tough to handle heavy loads and if required by the clients it should be able to be offered with an option that can withstand a 110-ton load.

45. The UVSS Length for 3 or even 5 Camera options should be 1974 mm (77.72” / 6.48 ft.)

46. The UVSS weight should not exceed 90 Kg’s, this is calculated in proportion to the weight capacity of 78 / 110T design.

Standards: CE, FCC.

UVSS Brands: Chemring Technology Solution, Techmondial Limited, Gatekeeper, UVIScann , Commport.

Modes of Measurements:

1) Supply, Installation, Testing & Commissioning of 2 nos. of column entry, 2 nos. of exit cash counter, 4 nos. of Boom Barrier & all of these items to perform brief of duties mentioned in the tender of specification.

2) Two main parking availability display at main entrance & 3 small displays at every floor.

3) Supply, Installation, Testing & Commissioning of 2 nos. of UVSS with 4 nos. of cameras.

4) Supply, Installation, Testing & Commissioning of 568 nos. of sensors. Supply and installation with all the necessary accessories.

HAVC SPECIFICATION

AIR MOVING APPARATUS

1.0 **Scope**

1.1 The scope of work covers supply, erection, testing and commissioning of various Air Moving Apparatus as described herein.

1.2 All manufacturers catalogues and performance data physical dimensions & weight shall be submitted and get approved before procurement.

1.3 **Fan performance ratings shall conform to AMCA (Air Movement and Control) standard 211 and 311 and tested in accordance with ANSI/AMCA std 210-99 and AMCA std 300-96 in an AMCA accredited laboratory. Fans shall be certified to bear the AMCA seal for air and sound performance.**

2.0 **Centrifugal fans**

2.1 Centrifugal fans shall have backward curved preferably with hollow heavy section aerofoil blades, with non-over loading characteristic unless stated otherwise. Blades in fans for class III and above applications shall be internally reinforced. Wheel hubs shall be machined cast iron or fabricated for heavy duty operation mounted on liberally sized shaft assembly. Fan assembly including shafts shall be statically and dynamically balanced with critical speeds atleast 30% away from the operating range of speeds of the fan. Fans shall be selected for the specified outlet velocities, default maximum velocity 10m/s.

1.2 Fan bearings shall be unless otherwise specified heavy duty self-aligning, regreasable roller bearings capable of absorbing radial and/or thrust loads. All bearings shall be selected for quiet operation and long life.

1.3 Fans shall have manually operated inlet vanes and quick opening access door. Fan housing shall be constructed of heavy gauge steel completely seam welded and shall have heavy angle or channel side and fixed discharge and inlet flanges conforming to AMCA recommendations.

1.4 Fan drives shall be through multiple vee-belts using multi-vee-grooved pullies. **An OSHA compliant belt guard shall be included to completely cover the motor pulley and belt(s).** . Fan and drive motor shall be mounted on a common fabricated base frame which in turn shall be isolated from the floor through specified vibration mounts. Motor rating shall exceed maximum power the fan absorbs at all operating conditions. **Drive belts and sheaves shall be sized for 150% of the fan operating brake horsepower, and shall be readily and easily accessible for service.**

2.0 **Fan Sections**

2.1 Fan sections shall be similar to single or double skin Air Handling Units as per data sheets fabricated out of mild steel angles and galvanised sheet steel with bracing or beading for structural rigidity.

2.2 Fans shall be backward curve centrifugal double inlet multiple blade type, enclosed inside the unit casing as specified above and together with the drive/s, unless stated otherwise.

2.3 Drive motor shall be mounted on adjustable motor base capable of a minimum adjustment of 100mm. Motor ratings shall exceed the maximum power absorbed by the fan at all operating conditions.

3.0 **Axial Flow Fans**

3.1 Axial flow fans may be tube or vane axial type for in-line installation. Fans shall be selected for low noise levels and meet the flow and pressure requirements specified in the data sheets. These fans should be provided with 1-D sized sound attenuator.

3.2 Drives for all axial flow fans shall be with multiple V belts unless specified otherwise there shall be minimum 2 belts. All motors shall be sized at more than the maximum brake power of the fan in its operating range.

4.0 **Propeller fans**

4.1 Propeller fans shall be direct driven as specified with square frame and heavy deep drawn steel panel construction. Fans shall be capable of being mounted in horizontal or vertical or any angular position. Drive motor shall be single phase/3 phase with necessary starter specified. All fans shall have discharge gravity louvers and bird screen with 1.0mm dia 20 mesh galvanised steel mesh with diaphragm plate & frame, grouted into the wall.

5.0 **Mixed Flow Tubular Inline fans**

5.1 Mixed flow fans shall have a mixed flow designed wheel in a tubular housing for in-line installation. Fan Housing should be aerodynamically designed to reduce incoming air turbulence. The Housing shall include welded steel vanes to straighten air flow prior to exiting the fan discharge. Units shall incorporate a universal mounting system which shall allow the fan to be mounted in either vertical or horizontal configurations and field rotation of motor position in 90

degree increments. Units shall accommodate base mount or ceiling hung mounting without structural modifications to the fan.

5.2 An Access Door shall be provided for impeller inspection and service. For belt driven fans belt guard and motor cover shall be included to completely cover the motor pulley and belt(s). For kitchen grease exhaust application motor pulley and belt assembly shall be securely isolated from the air stream to prevent grease accumulation. Drive belts and sheaves shall be sized for 150% of the fan operating brake horsepower, and shall be readily and easily accessible for service, if required.

5.0 **Sheet Metal Ducting**

5.1 All sheet metal ducting associated with ventilation and exhaust systems shall follow the specifications "SHEET METAL DUCTING".

6.0 **Installation**

6.1 Installation of all fans shall be done with necessary vibration isolation fittings and the minimum static deflection as specified in the data sheets.

7.0 **Testing**

7.1 All fans shall be tested to establish the following ratings:

Air quantity	λ/s
Static pressure	Pa
Fan speed	rpm
Outlet velocity	(m/s)
Noise (On Octave wave band)	(SPL) dB
Full load current	(amps)

8.0 **Mode of measurement**

8.1 Each fan with motor, drive & guard, mounting frame, vibration mounts starter panels, cabling, earthing as per data sheet shall form one unit. In case of propeller exhaust fans, the mounting frame with bird screen and gravity louvres (back draft dampers) should also be included in the unit cost or as defined in the schedule of work.

SHEET METAL DUCTING

1.0 **Scope**

1.1 The scope of work covers supply, installation, testing, balancing and commissioning of:

i) Sheet metal ducting
ii) Volume, Smoke and Fire dampers
iii) Outside intakes & exhausts louvers
iv) Grilles and diffusers
v) All other accessories

associated with air-conditioning ventilation and exhaust systems meeting the intents of specifications & drawings

2.0 **Standards**

2.1 All duct work shall conform generally to the following standards & codes.

IS:277	Galvanised sheet steel
IS:655	Metal Air Ducts
IS:1079	Hot rolled carbon steel sheets
IS:513	Cold rolled low carbon steel sheet
SMACNA	duct construction standards as modified herein

3.0 **Submittals**

3.1 The contractors should submit shop drawings of all duct systems after a thorough survey of the space, obstructions and other services elements. The shop drawings should indicate the following information:

i) Source of manufacture and place
ii) Pressure class of ducting
iii) Bills of materials showing the duct areas in sq. meters for each system under each category of sheet thickness.
iv) Schedule of grilles and diffusers, dampers, Intakes and exhausts.

3.2 Catalogue cuts of all grilles and diffusers, dampers proposed to be used shall be submitted and got approved

4.0 **Material**

4.1 The material for various applications of air ducting shall be as follows:

Application	Material
1) Ducting for Air-conditioning	Cold rolled sheets continuous galvanised with a zinc coating of minimum 180g/m^2 both sides inclusive to IS 277-1977 in the form of sheets or rolls of lock forming quality.
2) Duct for ventilation & Exhaust	- Do -
3) Gasket	Foamed PVC 6 mm
4) Supports & duct flanges	Galvanised steel structural steel sections

4.2 All galvanised plain sheets or rolls shall be reasonably flat and free from twist. The zinc coating shall be clean, even and free from galvanised spots. Sheets shall not crack or peel during bending or fabrication. All sheets or rolls shall be procured from approved manufacturers.

5.0 **Duct Fabrication and Erection**

5.1 All ducts for air-conditioning and ventilation shall be rectangular in cross-section and fabricated for a pressure class of 500Pa positive and negative. **Preference will be given to ducts fabricated in a factory with CNC controlled machinery. These ducts must be brought to site in full duct form and not L shape and assembled at site.**

5.2 Ducts shall be rectangular with dimensional tolerance of 1.5%. Insulated ducts are shown clear sizes after insulation and during fabrication the bare duct sizes shall be accordingly enhanced.

5.3 The following are guidelines for the fabrication from galvanized sheets with transverse joints at 2500mm.

Maximum side (mm)	Minimum thickness (mm)	Transverse Joints	Reinforcement
Upto 250	0.63	25mm S – Slip	-
Over 250 to 400	0.63	25 mm standing S – Slip	-
425 to 600	0.63(24 G)	40mm X 1.00mm Standing S	Same as transverse joint.
625 to 800	0.80(22 G)	40mm X 1.25mm Standing S	Same as transverse joint.
825 to 1000	0.80(22 G)	40 x 40 x 4 mm Companion flanges	25x25x3.2 mm Girth angles @ 1200 mm
1025 to 1500	1.00(20 G)	40 x 40 x 4mm Companion flanges	40 x 40 x 4 mm Girth angles @ 1200 mm
1525 to 2250	1.00(20 G)	50 x 50 x 6 mm Companion flanges	40 x 40 x 4 mm Girth angles @ 600 mm
2275 & above	1.25 (18 G)	50 x 50 x 6 mm Companion flanges	50 x 50 x 4 mm Girth angles @ 600 mm

Longitudinal joints shall be Pittsburgh lock or button punch snap lock. All joints shall withstand 1.5 times the pressure class specified. Duct deflection shall not exceed 6mm for ducts upto 1200mm width.

5.4 For ducts fabricated from coil stock (Transverse Joints every 1200mm approx)

Maximum side (mm)	Minimum thickness (mm)	Transverse Joints	Reinforcement
Upto 450	0.63	C & S or C & SS cleats at 1200mm spacing	Beading
475 to 600	0.63	4 Bolt slip on flanges E class at 1200mm spacing	Beading
625 to 1000	0.80	4 Bolt slip on flanges E class at 1200mm spacing.	Beading
1025 to 1800	1.00	4 Bolt slip – on flanges H class at 1200mm spacing	Beading
1825 to 2250	1.00	4 Bolt slip –on flanges J class at 1200mm spacing	Beading

5.5 In odd positions, the ducts shall be fabricated to suit the site conditions, with the specific approval of the Engineer-in-charge. The aspect ratio shall not exceed for any fabrication.

5.6 Where specified and shown on drawings, round ducts may be used conforming to the following specifications.

Max diameter	Minimum Gauge		Reinforcement	
	Spiral Seam	Long Seam	Spiral Seam	Long Seam
Upto 200 dia	0.55 (26G)	--	0.70 (24 G)	--
Above 200 upto 600 dia	0.70 (24G)	--	0.70 (24 G)	--
Above 600 dia upto 900 dia	0.85(22G)	--	0.85(22G)	Girth angle
Above 900 dia upto 1500 dia	0.85(22G)	--	1.00(20G) N.A	Girth angle
Above 1500 dia	1.00(22G)	Girth angle		Companion Flanges

5.7 Ducting shall be seam locked, spiral or longitudinal as indicated in the layout / construction drawings. Spiral ducts shall have four ply lock seam only. Snap lock seam will require specific approval of consultant / engineers in charge longitudinal seam ducts shall have groove seam only.

All transverse joints for longitudinal and spiral ducts shall be with beaded sleeves of equivalent gauge thickness.

Joints must be screwed or pop riveted at uniform intervals of 300mm along the circumference.

5.8 Flexible ducts shall be used only as connectors and should not be more than 1200mm in one length. Duct attachment collars should be minimum 50mm in length and attached with minimum of 3# M8 screws for lower than 300 dia and 5# for 300 and higher sizes. Insulation shall be factory applied and held in position through a draw band.

5.9 Girth angles and companion flanges shall be mitered and welded at corners and riveted to duct sheets at 75 mm centres. Flanged joints shall be made with 9.5 mm GI bolts spaced at 100 mm centres and provided with 6mm foamed PVC gasket. All joints and seams shall be rendered air tight with sealant. Duct panels are not to be cross-broken, if insulated. Longitudinal seams shall be inside groove or pittsburgh type.

5.10 Standard elbows with a R/D ratio of not less than 1.25 shall be used as far as possible. Where space restrictions do not permit use of standard radius, elbow with lesser R/D ratio and square elbow with equally spaced double thickness vanes may be used. Length of taper ducts shall be at least four times the maximum size difference between the ends.

5.11 All duct fabrication and installation shall conform to the extent modified herein, to the SMACNA standard for Low Pressure Duct Construction upto 75mm pressure. All transverse joints shall be sealed with non-hardening mastic sealant.

5.12 All duct lining for acoustic insulation shall be carried out as specified under section “NOISE & VIBRATION” before the duct is installed in position.

5.13 All ducts shall be sealed to SMACNA class C 24 and 10% of ducting of at least two fan systems shall be proof – tested in the presence of the Project Engineer / Manager and leakage readings recorded and attested.

6.0 **Sheet Metal Duct Accessories**

6.1 Turning vanes

6.1.1 Air turning devices shall be provided at least for first four outlet collars after every elbow and at all non-split branch take offs. Turning blades shall be fabricated out of 0.8 mm (22G) thick G.S sheets and equally spaced on side runner to be riveted/bolted to duct sheets. All vanes shall be of double thickness.

6.2 Splitter dampers

6.2.1 Splitter dampers shall be installed in branches wherever split takes place. Splitter dampers shall consist of double thickness air foil blades hinged at the downstreams edge. The operation rod shall terminate outside of the duct and insulation, and an air tight hub and locking set screw shall be provided. Damper blade thickness shall be the same as the duct in which it is installed but not less than 1.5 mm. Entire splitter damper shall be enclosed in a sheet steel ducting with flanges at both ends aligning with main run of ducting. The enclosure shall be made of sheets one size larger than the upstream duct.

6.3 Louvre dampers

6.3.1 Louvres dampers shall be provided in all branches. Any duct feeding more than four outlets shall be regarded as a branch and louver dampers provided whether shown or not.

6.3.2 Louvre dampers shall be multi-blade type with opposed blades or parallel blades of air foil construction rotating in permanently lubricated ball/ roller bearings. Blades shall be 1200 x 250 maximum mounted in a channel frame. Blades shall be connected with suitable linkage for gang operation by an operating rod extending beyond the frame and insulation if any and terminating in a locking quadrant with damper position indicator. Damper larger than 1200 mm in width shall be furnished in multiple sections. Dampers shall be enclosed in a sheet steel box with flanges at both ends. Thickness shall be one size larger than the upstream duct.

6.3.3 Dampers shall be manual or motorised as shown on drawings & schedule of work. All actuators shall be Belimo or equal rated for operation against static pressure of 650 Pa unless stated otherwise.

6.4 Fire dampers

6.4.1 Fire dampers shall be dynamic rated against minimum static pressure of 100mm WG and fire rated for 1 1/2 hours if installed in a 3 hr rated wall (225 brick wall) and 3 hour rated in higher rated walls. Dampers shall conform to UL 555 and shall be tested and certified by an appropriate authority. A test certificate shall be attached with each damper assembly.

6.4.2 Dampers shall be actuated through Belimo or equal. An access door shall be provided for accessing the damper & its mechanism. Damper open & closed positions shall be indicated.

6.4.3 Damper shall be installed such that the fire integrity of the partition is maintained. Sleeves, if any, used for mounting the damper shall be designed for the rated fire resistance and the opening in the partition fire sealed with an appropriate and approved sealant. Typical arrangement is shown in the drawing construction standards.

6.5 Smoke dampers

6.5.1 Smoke dampers are same as fire dampers but the leakage through the closed damper shall meet class II requirements under UL 555S while maintaining the fire rating.

6.5.2 Damper actuator and installation shall be similar to that of fire damper. Damper open and closed positions shall be indicated.

6.6 Duct supports

6.6.1 Duct supports and suspenders shall be galvanized steel and meet the following requirements:

Duct Width (mm)	Support	Hangar Rod (mm)	Location
Upto 1200	40 x 40 x 3 mm angle	8mm	At Transverse Joints OR Support length not exceeding 2500mm
Over 1200 - 1800	- Do -	10mm	- Do -

Duct Width (mm)	Support	Hangar Rod (mm)	Location
Over 1800 to 2500	40 x 40 x 6 mm steel MS	12mm	At Transverse Joints OR Limiting Support length not exceeding 2500mm
Over 2500	50 x 50 x 6 mm MS angle	12mm	At Transverse Joints OR Limiting support length not exceeding 1200mm

As an alternative slotted galvanized brackets attached to the top two bolts of the four bolt duct jointing system may be used.

6.6.2 Additional supports wherever considered necessary by the Engineer- in- charge shall be provided.

6.6.3 All duct supports, flanges, hangers shall be hot-dip galvanised after fabrication.

6.7 Duct connectors

6.7.1 Ducts connected to air-moving apparatus shall have flexible connectors. Flexible connectors shall be preassembled factory made units with minimum 150mm in width with 50mm galvanized steel rims on both sides. Connectors shall be mildew resistant and shall have fire retardant materials.

6.8 Duct penetrations

6.8.1 Ducts penetrations through walls, slabs or any other partitions shall be sealed as shown on drawings or as required.

6.9 Test Probes

6.9.1 Test probes shall be standard products. Probes shall be of Heavy duty Zinc alloy casting. Expansion plugs shall be of neoprene and capable of withstanding 80°C & 300 kPa.

6.9.2 Probes shall be installed at every fan discharge and suction duct.

7.0 **Air Intakes & Exhaust**

7.1 i) Unless shown otherwise, louvers shall be made of 3mm thick 100mm wide extruded aluminium sections fixed in an extruded aluminum frame. Louvers shall be fixed at 45° to vertical and provide 60% minimum net opening.

ii) 15 x 15 x 1.0 mm galvanized steel bird screen shall form part of the intake or exhaust.

7.2 The entire assembly shall be fitted into the wall clear opening and the edges sealed with a polysulphide or silicone sealant. All frames and clamps used shall be hot dip galvanized or extruded aluminium.

8.0 **Air Diffusing Equipment**

8.1 Supply air grilles shall be double deflection type with horizontal face bars and vertical rear bars placed in a rigid marginal frame. Bars shall be shaped and spaced at 18mm centres with swaged pivot pins positively holding the deflection setting under all conditions of velocity and pressure. All grilles shall be provided with integral opposed blade, grille-face key operated dampers.

8.2 Return grilles shall have fixed face bars shaped and set at 18 mm (3/4) centres. Bars shall be set at 40 deg deflection for vision-proof installation. The grilles shall be complete with rigid marginal frames and shall be matching with the supply grilles.

8.3 Ceiling diffusers shall be round/square/rectangular face flush type horizontal air diffusion pattern. Diffusers shall have ample margins to minimize ceiling smudge. All diffusers shall be provided with face operated volume control dampers. Half diffusers shall be similar to full diffusers.

8.4 Linear diffusers/grilles shall be die formed, flush mounted type with single or double directional air flow. The diffuser /grille shall be in an extruded aluminum frame with minimum 20 mm margin. All linear air diffusing equipment shall be fitted with a distribution sheet metal plenum as shown on drawings.

8.5 Grille types are indicated in the drawings and equivalent types of any other standard manufacturer are acceptable. Mild steel grilles and diffusers shall be fabricated out of 1.0 mm mild steel and painted with two coats of red oxide. All duct collars terminating on to a grille or diffuser shall be given two coats of black paint for a length of 300 mm. Grilles & diffusers shall be selected for an aero-dynamic noise power not in excess of NC 30.

8.6 Aluminium grilles and diffusers wherever specified shall be of extruded aluminium with margins & GSS butterfly dampers. Grilles shall have horizontal face bars and vertical rear bars.

9.0 Testing & Balancing

9.1 Capped air-flow connections shall be provided as necessary for testing and balancing of air distribution.

9.2 The entire air distribution shall be adjusted and balanced for delivery of design air quantities or as required for achieving design space conditions. Tests shall be carried out for each fan or AHU section. After all adjustments are made, the air readings shall be recorded on the drawings vis-à-vis the space conditions. All dampers after adjustment shall be set and locked in position. All air and static pressure measurements shall be done through probe type meters. Vane type meter readings are not considered reliable.

9.3 After balancing the fan speed shall be suitably adjusted. Test readings should display static pressures before and after speed change.

9.4 10% of ducting from at least 2 –fan systems shall be tested to validate leakage.

10.0 Mode of measurement

10.1 All sheet metal ducting complete with duct supports, turning vanes, canvas connections, erected in position shall be measured externally and paid per unit area. All dampers shall be excluded in the duct area.

10.2 All manual control / splitter damper sections with operations linkages locking quadrant, sheet steel enclosure, frame, erection, supporting etc. shall be measured on the basis of damper cross sectional area and paid per unit area.

10.3 Motorized control dampers with actuator are to be paid per unit of upto 0.3, 0.3 to 0.6, over 0.6 to 0.9, over 0.9 to 1.2 and over 1.2 sqm damper area.

10.4 Intake and exhaust louvers with bird screen, louvers and frame, erection & sealing shall be measured on the basis or cross sectional area and paid per unit area.

10.5 Side wall grilles shall be measured on the basis of the core area excluding the margins and shall include necessary dampers. Minimum payable unit is 0.1 sqm.

10.6 In line diffusers and grilles shall be measured per unit length. The back up plenum shall be measured as additional sheet metal ducting or part of the grille as defined in the schedule or work.

10.7 All fire and smoke dampers with operating linkage actuator, locking quadrant sheet steel enclosure, frame, fusible links, access door etc. shall be measured as one unit for upto 0.3, 0.3 to 0.6, over 0.6 to 0.9, over 0.9 to 1.2 and over 1.2 sqm damper area.

10.8 All duct liners for acoustic insulation shall be measured and paid as specified under 'NOISE & VIBRATION.'

10.9 Flexible ducts shall be paid per unit length of each diameter.

GARDEN & LANDSCAPING SPECIFICATION

Project : Proposed Under Ground Parking On Patwardhan Park, Plot Bearing C.T.S No. 381a&381b Of Village Bandra, At Linking Road, Bandra West, H/W Ward, Mumbai.:

TECHNICAL SPECIFICATIONS
FOR
HORTICULTURE AND LANDSCAPING

HORTICULTURE WORK

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

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

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

1.1 TRENCHING IN ORDINARY SOIL

1.1.0 Trenching is done in order to loosen the soil, turn over the top layer containing weeds etc. and to bring up the lower layer of good earth to form a proper medium for grassing, regrassing, hedging and shrubbery. Trenching shall be done to the depth ordered by the Engineer-in-charge. The depth is generally 30 cm for grassing and 60 cm for regrassing in good soil.

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

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

1.1.3 Trenching

Trenching shall consist of the following operations:

1. The whole plot shall be divided into narrow rectangular strips of about 1.5 m width or as directed by the Engineer-in-Charge.

2. These strips shall be sub-divided lengthwise into about 1 m long sections. Such sections shall be excavated serially and excavated soil deposited in the adjacent section preceding it.

3. In excavating and depositing care shall be taken that the top soil with all previous plant growth including roots, get buried in the bottom layer of trenched area, the dead plants so buried incidentally being formed into humus.

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

1.1.4 Measurements

Length and breadth of the plot shall be taken correct to 0.1 m and depths correct to cm. Cubical contents shall be calculated in cubic meters, correct to two places of decimal. No deduction shall be made nor extra paid for removing stones, brick bats and other foreign matter met with during excavation up to initial lead of 50 m and stacking the same.

1.1.5 Rate

The rate shall include the cost of all labor and material involved in the operations described above, including cost of all precautionary measures to be taken for protections and supporting all services etc.met with during trenching. It does not include the cost of mixing of earth, sludge/manure.

1.2 GOOD EARTH

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

1.2.2 Measurements: Length, breadth and height of stacks shall be measured correct to a cm. The volume of the stacks shall be reduced by 20% for voids before payment, unless otherwise described.

1.2.3 Rate: The rate shall include the cost of excavating the earth from areas lying at distance not exceeding one km. from the site, transporting the same at site breaking of clods and stacking at places indicated. The rate shall also include royalty if payable.

1.3 OIL CAKE

1.3.1 Neem/Castor: The cake shall be free from grit and any other foreign matter. It should be undecorticated and pulverized. The material shall be packed in old serviceable gunny

bags of 50 kgs capacity approximately. The weight of gunny bag shall be deducted @1 kg per bag and payment shall be made for net quantity. The quality of cake should be got approved by the Engineer-in-charge before supply.

1.3.2 Measurements

The arrangement for weighing shall be made at site of work by the department. The gunny bags shall be the property of the government.

1.3.3 Rate: The rate shall include the cost of labour and material involved in all operations described above, including carriage up to site of work with all lead and lifts, weighing etc.

1.4 SUPPLY AND STACKING OF SLUDGE

1.4.1 It shall be transported to the site in lorries with efficient arrangement to prevent spilling enroute. It shall be stacked at site. Each stack shall not be less than 50 cm height and volume not less than 3 cum.

1.4.2 Measurements

Length, breadth and depth of stacks shall be measured correct to a cm. The volume of the stack shall be reduced by 8% for looseness in stacking and to arrive at the net quantity for payment.

1.4.3 Rate

The rate shall include the cost of labour and material involved in all operations described above, including carriage up to one km. The rate shall also include royalty if payable.

1.5 SUPPLY AND STACKING OF MANURE

1.5.1 Farmyard Manure: Same as 1.4.1.

1.5.2 Measurements: Same as 1.4.2.

1.5.3 Rate: Same as 1.4.3.

1.6 ROUGH DRESSING OF THE TRENCHED GROUND

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

1.6.1 The trenched ground shall be levelled and rough dressed and if there are any hollows and depressions resulting from subsidence which cannot be so levelled, these shall be filled properly with earth brought from outside to bring the depressed surface to the level of the adjoining land and to remove discontinuity of slope and then rough dressed again. The supply and spreading of soil in such depressions is payable separately. In rough dressing, the soil at the surface and for 75 mm depth below shall be broken down to particle size not more than 10 mm in any direction.

1.6.2 Measurements
Length, breadth of superficial area shall be measured correct to 0.1 metre. The area shall be calculated in sqm. correct to two places of decimal.

1.6.3 Rate

The rate shall include the cost of all the labour and material involved in all the operations described above.

1.7 UPROOTING WEEDS FROM TRENCHED AREAS

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

1.7.2 Measurements

Length, breadth of superficial area shall be measured correct to 0.1 meters. Superficial area of the weeded ground shall be measured for purpose of payments.

1.7.3 Rate

The rate shall include the cost of all the labour and material involved in all the operations described above.

1.8 FINE DRESSING THE GROUND

1.8.1 Slight unevenness, ups, and downs and shallow depressions resulting from the settlement of the flooded ground, in drying and from the subsequent weeding operations, shall be removed by fine dressing the surface to the formation levels of the adjoining land

as directed by the Engineer-in-charge, and by adding suitable quantities of good earth brought from outside, if necessary.

1.8.2 Measurements

Length, breadth and depth of stacks shall be measured correct to a cm. The area shall be calculated in sqm. correct to two places of decimal.

1.8.3 Rate

The rate shall include the cost of all the labour and material involved in all the operations described above.

1.9 SPREADING GOOD EARTH

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

1.9.2 Measurements: The quantity of good earth spread shall be determined by the difference in the volume of good earth in stacks before and after spreading duly reduced for looseness in stacking by
20% of good earth.

1.9.3 Rate: The rate shall include of all the labour and material involved in all the operations described above, but does not include the cost of the good earth which shall be paid for separately unless specifically described in the item.

1.9.A SPREADING SLUDGE/MANURE

1.9.A.1 Good earth shall be thoroughly mixed with sludge or manure in specified proportion as described in the item or as directed by the Engineer-in-Charge. The mixing shall be spread as described in 1.9.1 to the thickness ordered by the Engineer-in-Charge.

1.9.A.2 Measurements

The quantity of good earth and sludge or manure mixed shall be determined by the difference in the volume of good earth and sludge or manure in stack, before and after spreading duly accounted for voids and looseness in stack.

1.9.A.3 Rate

The rate shall include of all the labour and material involved in all the operations described above, but does not include the cost of good earth sludge or manure which shall be paid for separately, unless otherwise described in the item.

1.10 MIXING OF GOOD EARTH AND SLUDGE/MANURE

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

1.10.2 Measurements

The quantity of good earth and sludge or manure mixed shall be determined by the difference in the volume of good earth, sludge or manure in stack, before and after spreading duly accounted for voids and looseness in stack.

1.10.3 Rate

The rate shall include the cost of all labour and materials involved in all the operations described above, but does not include the cost of good earth sludge or manure which shall be paid for separately, unless otherwise described in the item.

1.11 GRASSING WITH SELECT GRASS NO. 1

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

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

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

1.11.3 Measurements

Length, breadth of the lawn grassed shall be measured correct to 0.1 meter and the area shall be calculated in sqm. correct to two places of decimal.

1.11.4 Rate

The rate shall include of all the labour and material involved in all the operations described above, excluding supply of the requisite quantity of good earth and grass so needed for properly maintaining the levels of the lawns. (payment of grass to be paid separately).

1.12 RENOVATION OF LAWNS

1.12.1 The area shall be first weeded out of all undesirable growth. The entire grass shall be scrapped (cheeled) without damaging roots and level of the grounds. Slight irregularities in surface shall be levelled off and the area shall then be forked so as to aerate the roots of the grass without, however up- rooting them.Specified quantity of sludge or manure shall than be spread uniformly with wooden straight edge (phatti) as directed by the Engineer-in-charge. The area shall then be slightly sprinkled with water so as to facilitate proper integration of the manure or sludge with the soil and later flooded. The contractor shall be responsible for watering, proper maintenance and tending of the lawn for 30 days or till the grass forms a lawn fit for mowing, whichever is later.

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

1.12.2 Measurements

Length, breadth of the lawn renovated shall be measured correct to 0.1 meter and the area shall be calculated in sqm. correct to two places of decimal.

1.12.3 Rate

The rate shall include of all the labour and T&P (excluding RH pipe/grass) involved in all the operations described above, excluding the supply of the requisite quantity of good earth

if so needed for proper maintenance of the levels of the lawns. The cost of the sludge or manure shall be measured and paid for separately, unless its supply is specifically included in the description of the item.

1.13 UPROOTING RANK VEGETATION AND WEEDS AND PREPARING THE GROUND FOR PLANTING 'SELECT GRASS NO. 1'

1.13.1 Initially the area shall be dug up to a depth of 30 cm. and weeds and rank vegetarian with roots removed thereon by repeated forking. The whole area then shall be retrenched to a depth of 60 cm in the same manner as described in 1.1. Clods of excavated earth shall then be broken upto the size not more than 75 mm in any direction. The area shall then be flooded with water and after 10 days and within 15 days of flooding, weeds shall be uprooted carefully. The rubbish arising from the above operations shall be removed and disposed off in a manner directed by the Engineer-in-charge, away from the site. The earth shall then be rough dressed and fine dressed as described in 1.6 & 1.8.

1.13.2 Measurements

Length, breadth of uprooted area shall be measured correct to 0.1 meter and the area shall be calculated in sqm. Correct to two places of decimal.

1.13.3 Rate

The rate shall include the cost of all the labour and material involved in all the operations described above.

1.14 EXCAVATION AND TRENCHING FOR PREPARATION OF BEDS FOR HEDGE AND SHRUBBERY

1.14.1 Beds for hedges and shrubbery are generally prepared to width of 60 cm. to 125 cm. and 2 to 4 meters respectively.

1.14.2 Beds for hedges and shrubbery shall be prepared in the following manner. The beds shall first be excavated to a depth of 60 cm. and the excavated soil shall be stacked on the sides of the beds. The surface of the excavated bed shall then be trenched to a further depth of 30 cm, in order to loosen the soil, in the manner described in 1.1. No flooding will be done at this stage but the top surface shall be rough dressed and levelled. The

excavated soil from the top 60 cm depth of the bed stacked at the site shall then be thoroughly mixed with sludge over manner in the proportion 8:1 by ratio or other proportion described in the item. The mixed earth and manure shall be refilled over the trenched bed, levelled neatly and profusely flooded so that the water reaches even the bottom most layers of the trenched depth of the bed. The surface after full subsidence shall again be refilled with the earth and manure mixture, watered and allowed to settle and finally fine dressed to the level of 50 mm to 75 mm below the adjoining ground or as directed by the Engineer-in-Charge. Surplus earth if any, shall be disposed off as directed by the Engineer-in-charge. Any surplus earth if removed beyond initially lead shall be paid separately. Stones, bricks bats and other foreign matter if met with during excavation or trenching shall be removed and stacked within initially lead & lift, such material as is declared unserviceable by the Engineer-in-charge shall be disposed by spreading and levelling at places ordered by him. If disposed outside the initial lead & lift, then the transport for the extra leads will be paid for separately. If a large proportion of material unsuitable for the hedging and shrubbery operations is met with and earth from outsides is required to be brought in for mixing with manure and filling, the supply and stacking of such earth will be paid for separately.

1.14.3 Measurements

Length, breadth and depth of the pit excavated and trenched shall be measured correct to a cm. The cubical contents shall be calculated in cubic meter correct to two places of decimal.

1.14.4 Rate

The rate shall include the cost of all the labour and material involved in all the operations described above. The rate shall not include the cost of supply & stacking of the manure unless the same is specifically included in the description of the item.

1.15 DIGGING HOLES FOR PLANTING TREES

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

1.15.1.1 Holes of circular shape in ordinary soil shall be excavated to the dimensions described in the items and excavate soil broken to clods of size not exceeding 75 mm in any direction, shall be stacked outside the hole, stones, brick bats, unsuitable earth and

other rubbish, all roots and other undesirable growth met with during excavation shall be separated out and unserviceable material removed from the size as directed. Useful material, if any, shall be stacked properly and separately. Good earth in quantities as required to replace such discarded stuff shall be brought and stacked at site by the contractor which shall be paid for separately.

The tree holes shall be manured with powdered Neam/castor oil cake at the specified rate along with farm yard manure over sludge shall be uniformly mixed with the excavated soil after the manure has been broken down to powder, (size of particle not be exceeded 6 mm in any direction) in the specified proportion, the mixture shall be filled in to the hole up to the level of adjoining ground and then profusely watered and enable the soil to subside the refilled soil shall then be dressed evenly with its surface about 50 to 75 mm below the adjoining ground level or as directed by the Engineer-in-charge.

1.15.1.2 Measurements : Holes shall be enumerated.

1.15.1.3 Rate: The rate shall include the cost of all the labour and material involved in all the operations described above, excluding the cost of supply and stacking the requisite quantity of manure/sludge and oil cake.

1.15.2 In Soil other than Ordinary Soil

1.15.2.1 Where holes are dug in (a) Hard soil (b) Ordinary rock or (c) Hard rock, the above soils occurring independently over in conjunction with each other and /or ordinary soil in any hole, the different excavated soil shall be stacked separately. Excavation in hard rock shall be carried out by chiseling only.

1.15.2.2 The stack measurement of ordinary rock and hard rock shall be reduced by 50% and of soil by 20% to arrive at the excavated volume. This excavation shall be paid for as extra over the rate for holes dug in ordinary soil above, at rate appropriate to particular soil concerned.

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

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

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

1.15.2.6 Measurements: The pit shall be enumerated. The volume of excavation in soil and other than a ordinary soil shall be determined by reducing the stack volume of the relevant soil with respective percentage for voids specified in 1.14.2.2.

1.15.2.7 Rate: The rate shall include the cost of all the labour and material involved in all the operations described above, including mixing refilling, watering, dressing etc. but shall not include (a) cost of manure over sludge (b) cost of supplying and stacking of good earth for replacement and (c) the cost of carriage beyond initial lead for disposing off useless materials. The excavation other than that of ordinary soil shall be paid extra over and above the rate if excavation in ordinary soil.

1.16 M.S. FLAT IRON TREE GUARD

1.16.1 M.S. Iron Riveted Tree Guard

1.16.1.1 The tree guard shall be 600 mm in diameter and 2 meter high above ground level and 25 cm in below ground level.

1.16.1.2 The tree guard shall be framed of 4 nos. 25 x 6 m M.S. flat 2 meter long excluding displayed outward at lower and upto an extent 10 cm and 8 nos. 25 x 3 mm vertical M.S. Flat Rivetted to 3 Nos. 25 x 6 mm Flat iron rings in two halves, bolted together 8 mm dia and 30 mm long M.S. bolts and nuts. The entire tree guard shall be given two coats of synthetic enamel paint of approved brand and manufacturer of required shade over a priming coat of ready mixed steel primer of approved brand and
manufacturer. The design of tree guards shall be shown in the drawing.

1.16.1.3 Measurement : The tree guard shall be enumerated.

1.16.1.4 Rate: The rate shall include the cost of all the labour and material involved in all the operations described above.

1.16.2 M.S. Flat Iron Welded Tree Guard

1.16.2.1 The tree guard shall be 600 mm in diameter and 2 meter high above ground level and 25 cm in below ground level.

1.16.2.2 The tree guard shall be framed of 4 nos. 25 x 6 mm MS. Flat 2 metres long excluding displayed outward at lower and upto an extent 10 cm and 8 Nos. 25 x 3 mm vertical M.S. Flat Riveted to 3 nos. 25 x 6 mm flat iron rings in two halves, bolted together 8 mm dia and 30 mm long M.S. Bolts & nuts. The entire tree guard shall be given two coats of synthetic enamel paint of approved brand and manufacturer of required shade brand and manufacturer of required shade over a priming coat of ready mixed steel primer of approved brand and manufacturer. The design of tree guards shall be shown in the drawing.

1.16.2.3 Measurement : The tree guard shall be enumerated.

1.16.2.4 Rate: The rate shall include the cost of all the labour and material involved in all the operations described above.

1.17 FILLING MIXTURE OF EARTH & SLUDGE OVER MANURE

1.17.0 The separately specified earth and sludge shall be broken down to particles of size not exceeding 6 mm in any directions before mixing. Good earth shall be thoroughly mixed with sludge over manure in specified proportions as directed by Officer-in-Charge. During the process of preparing the mixture as above, trenches shall be flooded with water and levelled.

1.17.1 Measurements

Measurement shall be made in (Length, breadth and height of stacks) cubic meter. The cubical contents shall be worked out to the nearest two places of decimal in cubic meter.

1.17.2 Rate

The rate shall include the cost of all the labour and material involved in all the operations described above, but do not include the good earth, sludge or manure which will be paid separately.

1.18 EXCAVATION OF DUMPED STONE OR MALBA

1.18.1 Excavation operations shall include excavation and getting out water if required. During the excavation stone, brick bats and other foreign material if met shall be removed and stacked within 50 meter leads and lifts. Such material as is declared unserviceable by the Engineer-in-Charge be disposed within 50 m. The excavated surface shall be neatly dressed and levelled.

1.18.2 Measurements

Measurement shall be made in (Length, breadth and height of stacks) cubic meter. The cubical contents shall be worked out to the nearest two places of decimal in cubic meter.

1.18.3 Rate

The rate shall include the cost of all the labour and material involve in all the operations described above.

1.19 FLOODING THE GROUND WITH WATER AND MAKING KIARIES

1.19.1 The water for flooding shall be of soft water and free from chemical and good for growing the trees and shrubs etc. Before flooding the kiaries shall be made in required size and shape as per directions of Officer-in-charge. After uprooting weeds from the trenched area and uprooting vegetation, kiaries shall be dismantled.

1.19.2 Measurements

Measurement shall be made in sqm. of area.

1.19.3 Rate

The rate shall be for 100 sqm of area and include the cost of all the labour and material involved in all the operations described above.

2. Maintenance:
SCOPE FOR MAINTENANCE WORK OF GARDEN AND LANDSCAPE:

2.1 Regular Maintenance : The Maintenance work includes the entire lawn, plants/trees/ shrubs/ground covering plants, at the site of works. It includes maintenance of the existing as well as any other additions to the garden/lawn/plants etc. Apart from the above, the day to day maintenance work includes the following:

2.1.1 All trees, shrubs, hedges, plants etc.;

2.1.2 Flower beds and fence tops;

2.1.3 Keeping plants alive and healthy;

2.1.4 Watering plants, shrubs, saplings, trees daily (except on rainy days) preferably in the morning & evening and not in the hot sun to avoid heavy transpiration;

2.1.5 Regular uprooting all kinds of weeds;

2.1.6 Removal of unwanted bushes from the campus;

2.1.7 Removing the dead leaves, cleaning the area including disposal of waste and dead leaves, twigs, garbage on day to day basis, making bunds to the plants wherever required, adding red soil and manure to the roots of the plants wherever necessary;

2.1.8 Keeping the lawn area, garden and the surroundings in a clean and neat condition;

2.1.9 Replacing all the dead, diseased plants, vacant patches any where in the campus including the potted ones as when and where it occurs. Broken pots should be replaced with new ones by the Contractor.

2.1.10 Maintaining all plant hedges decently. Pruning and mowing should be done by keeping the foliage aesthetically at a reasonable size without making them bald with a motive to keep a longer gap for the next job.

2.1.11 Overgrowing trees will have to be pruned periodically

2.1.12 Names of the plants (Marathi, English & Botanical names) have to be written on pliable plastic plates & tagged to the respective plants or erected on small poles on the soil to identify the plants.

2.1.16 Any gap on fences, hedges or elsewhere will have to be filled up with in a week.

2.1.17 Performing all such other relevant maintenance services in accordance with all Laws, instructions from Engineer-in -Charge including complying with all legal formalities required in engaging suitably qualified, experienced, competent gardeners as may reasonably be required for the performance of the services;

2.1.18 Providing daily 4 gardeners with 8 hours diligent work, out of which at least 1 should be a horticulture nursery assistant with necessary experience and training. They should be available daily from 9.00 am to 1.00 pm and from 2.00 pm to 6.00 pm including Sundays and holidays while taking care of statutory provisions in this regard. The same workers cannot be deployed for PCMC's other gardens or any other outside garden. Over and above the minimum number of work force required as stated above, the contractor may engage additional work force as and when required to meet our job requirements mentioned in the terms and conditions of the Agreement for which no extra payment will be made to the contractor. However, in case number of work force deployed is less than what has been prescribed above, the proportionate deductions will be made from the payment to contractor.

2.1.19 The nallah adjoining the site of works is to be maintained well so that the drain water freely flows through without any stagnation/clogging.

2.1.20 The contractor shall take such steps that snakes/bandicoots etc. do not cause any menace in the garden or the surroundings of site of works.

2.2 Other (seasonal) Maintenance :

2.2.1 Pruning, cutting and dressing bushes and plants : pruning should be done at regular intervals, strictly ensuring no damage to the beauty & aesthetics of the hedges & plants on all sides;

2.2.2 Mow and prune the grass everywhere whenever required or at least once in a month by keeping it aesthetically decent

2.2.3 Planting of at least 400 seasonal flower plants like marigold, dahlia, zinnia, sevanthi etc. in each of the three seasons in a year at the places as may be decided by Engineer in Charge.

2.2.4 Replacing dead or withered trees or hedges or bushes.Planting additional 21 trees every quarter as indented by CA

2.2.5 Burn the waste, dried leaves, mowed grass etc., once in a week only in the presence and at the direction of an authorized official of PCMC at the designated place without affecting the live trees in any manner whatso ever / without causing any damage / inconvenience to PCMC or Public in the surroundings.

2.2.6 Apply Insecticides / Pesticides to control pests and cure the insect infections. Organic pesticides like Neem oil can be sprayed periodically to prevent & cure contamination.

2.2.7 Provide suitable and seasoned bio-manure / gobar / compost / fertile red soil to the plants as and when necessary or at least twice a year. Vermi-culture may be done in the garden to make the soil more fertile.

2.2.8 Erosion of soil on any part of the garden due to rain or for whatsoever reason will have to be filled up with good red soil and levelled.

2.2.9 The contractor shall thoroughly clean the dust and dirt, debris etc., and remove all the scaffoldings and other materials used for the works away from the site and keep the site free from all the above.

2.2.10 All garden tools will be brought and maintained by the contractor at his own cost without charging extra cost.

3. Workers related :

3.1 The workers should have experience of gardening / landscaping to perform their duties satisfactorily. They (i.e. gardeners/supervisors) should be skilled, trained, strong, healthy and medically fit, alert, polite, courteous and able to perform their duties diligently. The said workers should be properly dressed and disciplined. Any discourteous behavior on their part may lead to termination of the contract.

3.2 In the course of their activities, the gardeners, workers shall not spoil the landscape garden, plants, trees, shrubs, potted plants etc. in any manner whatsoever. They shall not disturb / cause inconvenience to the officials, participants, campus residents, any third party or their property in any case.

3.3 The Contractor shall adhere to the provisions of applicable labour laws such as Contract Labour (Regulation & Abolition) Act, 1970, Minimum Wages Act, 1948, Employees State Insurance Act, Equal Remuneration Act, 1970 and rules made there under.

3.4 The Contractor shall, at his own expense, arrange to take and maintain till the end of the contract period, in the name of Contractor, an Insurance Policy towards Workmen's Compensation from any subsidiary of General Insurance Corporation for any bodily injury and/or death etc. of the persons engaged for the maintenance work and deposit the said Insurance Policy with PCMC.
3.5 The Contractor, on the request of the Engineer in Charge, shall immediately dismiss from the work any of the Contractor's workers/ gardeners or any person/s engaged by them to carry out the above jobs, who, in the opinion of the PCMC, may be unsuitable or incompetent for the work entrusted. Further if any of the workers/ gardeners commits any misconduct, such person/s shall not be employed again by the Contractor without the permission of the PCMC. Suitable replacement to be made immediately.

3.6 The Contractor shall not engage any person with a criminal record / conviction and shall bar any such person from participating directly or indirectly in rendering the services under this agreement.

3.7 The Contractor shall submit the photographs, names, addresses, phone numbers/contact numbers of the persons deployed to work in the garden.
3.8 Workers' register prescribed by PCMC will have to be used at the site for garden workers attendance.
3.9 There are snakes in and around campus and hence the contractor shall provide gum-boots and hand gloves to the workers / gardeners as a protective measure. The contractor shall also provide rain protective gears to the workers / gardeners during rainy season.

3.10 PCMC shall not accept any claim in the event of any worker / gardener sustaining any injury, damage or loss to either person or property either inside or outside the site of works. If any person engaged by contractor is injured or rendered partially / permanently disabled / indisposed due to any reason such as disease, accident, fire etc. during the working hours, it shall be the sole responsibility of the contractor to take care of them and to pay necessary compensation in respect of such personnel as per relevant labour laws including all medical expenses, legal expenses etc. and PCMC does not hold any responsibility in this regard whatsoever.

4. Penalties in case of violation of the contract

4.1 Contractor has to compensate PCMC in case of any default or dereliction of duty on their part in any manner in adhering to the terms and conditions as agreed to, equivalent to amounts chargeable for getting the job done from outsiders at piece meal rates plus the office overheads for the time and energy of various officials and staff as may be decided by the PCMC.

4.2 Penalty up to Rs.500/- will be imposed for the following lapses:

4.2.1 Non-watering/ partial watering of plants on any day.
4.2.2 Unscrupulous cutting of trees/plants and allowing them die.
4.2.3 Non-replacement of dead plants.
4.2.4 Inadequate care of any plant leading to emaciation.
4.2.5 Garbage disposal without conforming to PCMC stipulations as above
4.2.6 Not following the instructions given by the Engineer in Charge.

4.3 In case the services are not found satisfactory, PCMC shall be at a liberty to withhold any payment/s that may be due to the Contractor till such time, such services are rendered to the satisfaction of PCMC.
4.4 The Contractor shall keep PCMC indemnified fully and without limit against all costs, claims, damages, expenses, fines, losses, liabilities and penalties including attorney's cost, expenses accruing, incurred or suffered by the PCMC directly or indirectly arising on account of:

4.4.1 failure by the Contractor to perform any of the obligations under this contract, in accordance with the provisions of this contract;

4.4.2 any claim from any statutory authority or workers of the Contractor with respect to their terms of services, arising in relation to non-compliance by the Contractor with any matter set out here in;

4.4.3 any act of commission or omission, negligence, fraud, forgery, dishonesty, misconduct or violation of any of the terms and conditions of this contract by the Contractors / workers ;

4.4.4 any offence mentioned in the Indian Penal Code 1860 including theft, robbery, extortion, misappropriation and the like (and its subsequent amendments including ones taking effect even after the effective date), or accident in relation to any assets or properties or documents or instruments of the Contractors which are, or are deemed to be, in custody of the Contractors;

4.4.5 any adverse claim/s of whatsoever nature made on PCMC; and

4.4.6 any act of the contractors' workers in any manner whatsoever

4.5 In case of failure in executing any of the Rate Schedule items and also in case of defective, untimely, delayed execution, PCMC is authorized to assess them in pecuniary terms and deduct such amount from the proceeds payable to the contractor as is deemed fit by the CA.

4.6 PCMC retains the right to rescind the contract at any time without giving reasons thereof and is also empowered to cancel the maintenance contract for failure on the part of the contractor to satisfactorily carry out duties under the maintenance works.

SPECIAL TERMS AND CONDITIONS 1) Third Party

Inspection

All RCC pipes should be tested .Third party Inspection will be carried out independently by the firms such as SGS/ RITES /EIL or similar firms carrying out such type of inspection at state level only after getting approval to the firm from the PCMC. The cost of inspection fee and other charges as required for getting certificates for the inspection of pipes and other materials such as manhole frame and covers from the concerned approved firm is to born by the contractor and no reimbursement of payment is admissible. All correspondence as required with such firm, getting appointments, arranging material for inspection has to be entirely dealt with by the contractor.

The original Test report and Test Certificate for the material inspected should be submitted timely before supplying material on site of works. The material shall be stacked properly and

every care and precaution shall be taken by the contractor against damages, theft etc by the contractor. The pipes shall be stacked in such way that there will be no in convinces to the public.

2) Only ISI standard pipes will be accepted

3) Contractor should keep two nos of experienced Civil Engineers B.E (civil) at each site. These Engineers should have minims of 3 years experience of execution of Gardening work.

4) The records such as working drawings, cross sections, levels, chamber charts, site update resisters, time to time execution photographs & video shooting should be given by the contractor in hard copies three in sets and soft copies in three sets, while handing over the site.

5) Contractor should maintained works registers given by JNNURM in their format. These registers should be updated daily and should be verified by Engineer-in – charge.

6) The Contractor should visit and examine the nature of works required to be carried out at the site of works and its surroundings. He shall obtain for himself on his own responsibility all the information that may be necessary for preparing the tender documents before entering into a contract. He should get confirmed about the actual G.L at ridge/valley /nalla / River side etc along which sewer line is proposed. The successful tenderer before starting of work and procurement of pipes, materials etc has to carryout the complete survey work(with respect GTS) of the area assigned to him at his cost & prepared L-sections and get it approved by Executive-Engineer. After getting approval he should proceed with the work, otherwise no payment will be paid for the work done without approval of Executive-Engineer.

Project : Proposed Under Ground Parking On Patwardhan Park, Plot Bearing C.T.S No. 381a&381b Of Village Bandra, At Linking Road, Bandra West, H/W Ward, Mumbai.:

Specifications for Horticulture and Garden Works

Sr. No.	Content	ITEM CODE
1	Site Dressing and Land Modulation	GW-1
2	Softscape Works and Plantation	GW- 2
3	Hardscape Works and Garden Furniture	GW- 3
4	Garden Equipments and Accessories	GW- 4

Chapter -1

SITE DRESSING AND LAND MODULATION

1.0 SCOPE OF WORK

1.1 The Scope consists of clearance of the Site of Works and preparation of the same to commence the proposed landscape execution activities. Wherever applicable, this is deemed to include all preliminary works like Dismantling/Demolition, Site Clearance, and General Leveling etc.

1.2 The drawings shall be read in conjunction with the specifications and matters referred to, shown or described in one are not necessarily repeated in the other.

1.3 In the event of any element of specification not available in any of the documents the instructions of the Engineer-in-Charge in writing shall be followed by the Contractor.

1.4 The work shall be carried out in accordance with the drawings and designs as would be issued to the Contractor by the Landscape consultant duly signed and stamped by him. The Contractor shall not take cognizance of any drawings, designs, specifications, etc. not bearing Landscape consultants signature and stamp.

1.5 The work shall be executed and measured as per metric dimensions given in the Schedule of Quantities, drawings etc.

2.0 GENERAL ITEMS

2.1 The more important Codes, Standards and publications applicable to this section are listed hereinafter.

2.2 Setting out the works

1.The Contractor shall supply without additional charges the requisite number of persons with the means and material necessary for the purpose of setting out works and checking, weighing and assisting in the measurement or examination at any time and from time to time, of the work or the materials. Failing this, the same may be provided by the client's designated representative In-charge at the expense of the Contractor and the expenses shall be deducted from any money due to the Contractor under the contract or from his security deposit.

2.The Contractor shall arrange for a qualified surveyor to set out the works and obtain certification of its accuracy from the surveyor. The Contractor shall then set out the works and shall be responsible for the true and perfect setting out of the same and for the correctness of the positions, levels, dimensions, and alignment of all parts thereof and for provision of all necessary instruments, appliances and labour in connection therewith. The Contractor shall submit to the client and the Landscape Architects, margins and the verifications of layout within seven days from the date of getting site layout from Landscape Architects / client.

- Mark the layout on the site. All bench marks, levels should be properly established and preserved for future use.

- Clearly check the surveyed map provided by the client and mark all drainage lines, water pipe lines, electrical lines, etc. client has been asked to remove the electrical lines and electrical poles. It needs to be checked by Contractor to satisfy him / herself from safety point of view before starting of work.

- The checking of any setting out or of any line or level by the Landscape Architects and CLIENT's representative or their representative shall not in any way relieve the Contractor of his responsibilities, for the correctness thereof. The Contractor shall carefully protect and preserve all benchmarks and other things used in setting out of the work.

2.3 Site Clearing / Excavation / Site Grading

- Light irrigation, by flooding the whole site with water. The water should penetrate up to depth of 15-20 cm only so that the weeds can germinate. Remove all grasses, small shrubs/weeds etc. with roots. Excavating the site as marked on the drawing/as instructed at the site, up to any lead and lift.

- Verify the levels and bench-marks from the up-dated surveyed drawing made available by the client. If there are any discrepancies between the site and the survey drawing, the same are to be brought to the client's notice by addressing a letter to the client and copy marked to the Landscape Architects.

- Grading and levelling of site as shown in drawing / specified on site by Landscape Architects. This will include spreading manually or by help of soil unloaded at different working areas in the site so as to obtain basic datum levels and grades.

- Excavated material shall be stacked off in the manner indicated at the site including stacking of excavated material up to any lead and lift. The rate shall only cover the cost of excavation, stacking and/or spreading of the material, if required at the site.

- Clearing the area of unwanted materials including the weeds, stones, masonry pieces etc. and all such matter that may cause damage to growth of the plant materials immediately or in future.

3.0 EARTH WORKS

- Earthworks shall involve the grading of soil for earth mounding, the excavation of trenches and soil for formation levels of pathways and foundations, and the fine grading of earth banks and landscape areas roughly graded by others.

- Excavation shall be carried out to the depth shown on or implied in the drawings or to such greater or lesser depths as the Landscape Architect may direct. The Contractor shall supply and fit all shoring, sheeting, strutting and walling required to maintain the sides of excavations as long as necessary and to remove them as required. The Contractor is to allow for making all necessary adjustments to existing manholes in accordance to bring them to the same level as the required profiled grades. No claim shall be entertained for either bulking or compacting and all other quantities shall be measured net from the drawings.
- The stripping and replacement of the subsoil shall only be done in dry weather and ground conditions unless in exceptional circumstances the Landscape Architect authorizes otherwise. Subsoil in heaps or dumps shall not be sited so as to damage or impede water courses or other

drainage so long as they are capable of remaining in operation. Any weeds which may grow on the heaps of subsoil shall be sprayed with an approved selective weed-killer to prevent seeding.

- Notwithstanding the general description for the type of material to be excavated, if original bed rock is encountered during these operations which can only be removed by blasting or compressed air tools this work will be paid for separately as an extra over item for that given for normal excavation. This work shall only be undertaken when authorized in writing by the Landscape Architect.

- During excavation it is expected that the Contractor will take every prudent step or precautions such as tests or borings in order to prove the nature or type of material underneath or the ground bearing capacity in order to protect his workmen, plant or machinery employed in these operations.

- In the event of the Contractor excavating below the proper levels or otherwise in excess of the dimension given, he shall at his own expenses, remove all loose excavated material and replace the soil excavated in error.

- If, in the opinion of the Landscape Architect the bottoms of any excavation or any material to be excavated become unsuitable due to the Contractor's operations, the Contractor shall, at his own expenses, carry out any necessary excavation and make up in a similar manner to the above.

- If, in the opinion of the Landscape Architect the weather conditions are such as to preclude the satisfactory completion of any operation or cause unnecessary nuisance or disturbance to other parties, the Contractor shall, on receiving directions from the Landscape Architect suspend operations on that particular portion of the work until the Landscape Architect considers that weather conditions are satisfactory, or issues a direction to re-commence operations. The absence of such a direction shall in no way constitute the basis of a claim for delay or remedial work to a formation which is unsuitable.

3.1 Major Grading

- Site shall be complete with rough dressing including the base levels by civil contractor before handed over to landscape contractor for execution.

- Role of Landscape contractor involves major grading forming earth mounds / hillocks from imported fill materials where specified, or from the site debris and soil generated by excavations. The soil shall be graded using suitable earth moving machinery to the contoured earth forms indicated on the drawings. Soil, when in a dry enough state for easy working, shall be distributed to the correct areas and laid in layers not exceeding 100mm thick and compacted by at least 2 passes of the earth moving machine in each direction for each 100mm layer.

- Earth slopes are to be formed from the compacted mounds to the gradients and levels shown on the drawings, accounting for the topsoil depths to be included after subsoil formation is complete. If insufficient fill is available to complete the levels shown, additional suitable subsoil is to be imported to make up the required quantities.

Importation of additional fill shall only be carried out with written permission of the Landscape Architect.

- Earthworks levels are to be carried out to the contours shown on the drawings to a maximum tolerance of 150mm measured vertically, and to a maximum gradient of 1:2. All subsoil levels are to account for the later additional of specified depths of topsoil.

- The Contractor shall be responsible for protection of completed subsoil mounds and shall take preventative measures to control erosion and siltation restore or replace any portion of the earthwork areas which erodes, slumps, silts or is otherwise damaged by the out-washing of soil.

3.1.1 Excavation for Formation Levels and Trenches

- For footpath areas or other paving areas, excavate subsoil to create a smooth formation for taking the sub-base for the paved area, to levels shown on the drawings accounting for the depth of the paving build up.

- Firmly compact sub-grade with a smooth wheeled vibratory roller to achieve an even level. Finished sub-grade is to be protected until the path sub-base or other construction such as pool sub-base is laid. If sub-grade is too dry to be compacted, water shall be added until suitable texture is achieved. If sub-grade is too wet, the material shall be left to dry out until workable.

- A completed sub-grade/formation on which there is standing water, soft spots or slurry shall be deemed to be unsuitable and shall be rectified at the Contractor's expense including making up of additional material as required to bring the formation to line and level again.

- Where soft or wet ground is encountered prior to preparation of the sub-grade and this soft or wet ground cannot satisfactorily be compacted, the Contractor shall submit a written request for this to be inspected and the area to be dug out and replaced with suitable material shall be evaluated by the Landscape Architect and directed accordingly.

- Surplus material resulting from excavations for path formation or drainage trenches shall be taken off site at Contractor's own expense unless otherwise directed by the Landscape Architect in writing.

- Excavation of drainage or formation trenches shall be carried out after the major grading has been completed and approved. Trenches shall be cut to lines and gradients shown on the drawings. Planking and strutting shall be carried out as required to make the sides of the trenches safe. The Contractor will be responsible for ensuring that drainage trenches are kept free from mud and water and side slippage.

3.2 Fine Grading and Shaping

- Slight unevenness, ups and downs and shallow depressions shall be removed by fine dressing the surface to the formation levels of the adjoining land, as directed by Landscape consultant and adding suitable quantities of Good earth, brought from approved source, if necessary.

- Fine grading shall be carried out using small sized earth moving equipment or by hand, and shall involve final modeling of the earth contours produced by the major grading exercise. The shaping will follow the contours shown on the plans in general terms, but the final forms will be developed by eye to create smoothly flowing and pleasing contours.

- The Fine Grading will provide the detailed earth contouring prior to cultivation of soil. Soil cultivation and the application of topsoil mixes shall not take place until the Fine Grading is completed.

4.0 SOILS: MATERIALS AND PREPARATION

4.1 Soils

4.1.1 Subsoil

- Subsoil shall be a free draining soil, generally from horizon over 300mm below the original surface to be used as fill materials, either excavated from areas of the site, or imported.

- The Contractor shall:

I. Furnish the source of top soil to Client.

II. Study the soil report provided with the tender document, providing soil details such as pH, alkalinity, total soluble salts, porosity, sodium content and organic matter.

III. Use the restored soil at site for landscape purpose, manure mixture, Neemcake, weedicide shall be added if required.

IV. Not consider any external soil source unless the existing soil conserved from site is lacking in quality and/or quantity.

4.1.2 Topsoil Mixes

- The components of the Topsoil Mixes shall be as follows:

- Topsoil shall be a free draining organic soil from horizons less that 300mm from the original surface, of a workable crumbly and lump free loamy character and shall contain no grass or weed growth of any kind or other foreign material or stones exceeding 25mm in diameter. Total stone content shall be no greater than 15% by volume. A 1 litre sample with back up soil test data is required before installation, or mixing.

- TOPSOIL SPECIFICATION: The following criteria shall be tested at an approved laboratory before use on site.

- pH: 5.5 - 7.8
- Electrical conductivity: 1:2.5 (w/v)
- Soil-water extracts not exceeding 1500 micromho/cm (1500 micro-Siemens/ cm)
- Soil texture:

Sand (0.05 - 2.00mm): Max. 75% Min. 20%
Silt (0.002 - 0.05mm): Max. 60% Min. 5%

Clay (less than 0.002mm): Max. 30% Min. 5%

- Soil Conditioner shall be dried treated sludge, organic compost or other fibrous approved organic matter suitable for mixing with topsoil to make a friable growing medium for plants, resistant to rapid decay, free of soluble salts below 900ppm, pH 6-7, free of large lumps or debris.
- Organic Compost shall be organic vegetable compost produced by a thorough horticultural or industrial composting process or Farm Yard Manure (Cow Dung Manure). Compost is to have a clean, un-decomposed smell free from any rotting substances, debris, refuse, clay or visible fungus. A sample is to be submitted for approval before usage. All composts are to be sterilised before being packed for transport and odorous materials used on site will be rejected. Any vermin resulting from use of organic composts will have to be controlled by the Contractor within 12 hours of any infestation.

- Sand shall be a clean, coarse grained and angular material sourced from a river bed with a minimum 1mm diameter section. It shall be well graded, free from soluble salts ranging in size so that 80-100% passes the 3mm sieve and 0-50% passes the 2mm sieve, with 0% passing through a 1mm sieve.

- Lightweight Aggregate shall be an approved low density inert material such as expanded shale or clay or volcanic scoria or other porous aggregate capable of being compacted within the soil zone to 90% compaction without being crushed, free from dust and debris, pH 6-6.5, free of soluble salts. A 2 litres sample shall be submitted and tested as part of the soil mix for physical and chemical performance. Materials are to be approved in writing before installation.

- Soil Mixes

- The following soil mixes are to be used for different areas and for different types of planting. Minor changes to the proportions shown for particular species may be required, as specified by the Landscape Architect from time to time.

Soil Mix A: for use in natural ground level areas shall comprise the components listed below, which shall be mechanically cultivated to the correct proportions, prior to placement on site or backfilling. Soil Mix A shall comprise the following proportions by volume:

Topsoil: 50%
Sand: 20%
Soil Conditioner: 15%
Organic Compost: 15%

ii. Soil Mix B: for use in podium area shall be prepared under controlled mixing conditions such as a concrete floor to ensure even mixing. Soil Mix B shall comprise the following

proportions by volume:

Topsoil: 30-50%

Sand: 10-30%

Conditioner: 0-20% (as required)

Lightweight Aggregate: 0-20% (as required)

Organic Compost: 20%

iii. Soil Mix C: for use in planter boxes. Soil Mix C shall comprise the following proportions by volume:

Topsoil: 40%
Sand: 30%
Charcoal: 20%
Organic Compost: 20%

4.1.3 Soil Preparation and Application of Soil Mixes

- All subsoil areas to be topsoiled shall be cleaned free of rubbish, weeds, all stones exceeding 50mm in diameter and builders debris shall be removed from site. Any areas which are contaminated by petrol, soil or other toxic substances shall be excavated to 300mm below the contamination and have the excavated material removed form site. The excavated areas shall be back filled with imported topsoil as specified. These operations shall take place immediately before topsoiling (with soil mixes) commences.

- Where directed by the Landscape Architect, the ground shall be decompacted by ripping to a depth of 300mm. All obstructions to cultivation or deleterious material brought to the surface shall be removed from the site and any voids left by this operation shall be backfilled with imported subsoil as specified.

- Subsoil shall be formed to the finished levels and contours after settlement and with overall even compaction.

- No topsoil or soil mixes shall be spread or cultivation carried out until the subsoil operations have been approved by the Landscape Architect.

- Topsoil or soil mixes shall be spread on the designated areas to the depth shown on the drawings. The loose depth of the topsoil shall be sufficient to allow the area to conform to the levels shown on drawings after natural settlement has taken place. Soil Mixes shall not be compressed or rolled to achieve levels. Conversely if levels drop below specified levels, additional soil mixes are to be added to achieve levels.

- Soil Mixes are to be carefully spread by machine or hand in a moist condition. Very wet
or dry soil mixes must not be used. Heavy compaction of soil mixes is to be prevented and compacted soil will be rejected. Soil Mixes are to be spread to the following minimum depths in open ground areas:

i. Lawn / Turf areas: 300mm

ii. Shrub areas: 450mm deep

iii. Tree pits: 1000 x 1000 x 1000mm
Unless directed otherwise or as shown on the drawings

- The prepared topsoil mix shall be compacted to 80% of maximum density to the depth shown on the drawings in 150mm layers. When planter is filled, water topsoil mix thoroughly to ensure proper and uniform compaction. After 2 weeks, fill with additional topsoil mixture and compact to level and before pavers are laid indicated on drawings.

- When in the opinion of the Landscape Architect site conditions are unsuitable for working, soiling operations shall cease and shall only be resumed when authorized by him.

- Contractor shall be responsible for soil protection and shall take preventative measures to control erosion and siltation of all areas and shall restore or replace any portion of the site which erodes, silts up or is otherwise damaged by out-washing of soil.

4.1.4 Fertilizers

- Chemical fertilizers shall be approved granular slow release compound fertilizers. They shall be stored in waterproof sealed bags under shelter away from water and direct sunlight. Samples of the same to be submitted by contractor before use at site.

- Organic fertilizers shall be organic products such as organic liquid fertilizer, pellets or granules manufactured primarily from organic materials. These products are to be from accredited sources and technical data indicating sources or origin and manufacturing process must be submitted before use. Animal by products must be sterilized before being packed for transport and odorous materials used on site will be rejected. Any vermin resulting from use of organic fertilizers will have to be controlled by the Contractor within 12 hours of any infestation. A sample shall be submitted for review by the Landscape Architect before use on site.

4.1.5 Mulches

- Mulches shall be approved friable composted organic materials. Coco-Peat will not be allowed on its own unless mixed in a proportion of 50-50 with another mulching material free from soluble salts or toxic materials and resistant to rapid decay. Mulches shall have a pH of between 5.5 - 7.0. Samples to be submitted and approved before use.

- Mulches are to be applied in a minimum 50mm layer over the entire surface of shrub and ground cover areas.

- Mulches is to be re-applied to all planting areas every 3 months after initial installation until the end of the maintenance period or until complete surface cover by vegetation is achieved.

- Initial mulching is to take place within 2 days of installation of planting.

5.0 SUBSOIL DRAINAGE

5.1 Subsoil, Field Drains and Trench Drains

- Before beginning installation of drain lines establish invert elevation of city storm drains at points where tree drains will tie in and prepare schematic layout for approval of Landscape Architect before digging trench.

- Surplus material resulting from excavations shall be carted to other fill areas within the site. If no additional fill sites are available the Contractor shall remove all surplus material from site and deposit it in a Local Authority approved tip.

- The Contractor shall survey the gradient levels of all trench bases to ensure that all falls are continuous from the highest point down to the outlet point at the sump. These findings shall be submitted to the Landscape Architect for verification before any further work is undertaken, either pipe laying or backfilling.

- All trenches when completed and approved shall be lined with approved filter membrane laid over the base of the trench and up the sides with sufficient membrane to wrap over the top of the gravel backfilling with a minimum overlap of 300mm.

- The base of each drainage trench shall have a layer not less than 30mm and not more than 50mm depth of fine stone chippings 8-12mm diameter or coarse sand laid to accurate falls for bedding the perforated pipes.

- The drainage pipes to the sizes shown on the drawings shall be prefabricated subsoil drainage system or similar approved type. PVC pipes with drilled holes will not be permitted. Drainage pipes shall be laid to the lines to the falls shown on the drawings and accurately boned in to correct gradients before backfilling.

- All pipe junctions shall be as supplied by the selected manufacturer and shall be fitted to the manufacturer's instructions to provide smooth flow and to fit the correct pipe sizes. Where changes in pipe diameters occur the correct junctions shall be used to match the changed pipe diameters.

- Connect drainage system to percolation pits.

- Where subsoil drainage pipes pass under paths or structure the pipe shall be of non perforated pipe joined at either end to the perforated pipe, and be surrounded by 100mm of concrete haunching.

- Trenches shall be backfilled to within 100mm of the finished level with clean coarse grained sand or crushed stone chippings 8-12mm diameter free of any fine particles. The gravel backfill shall be lightly compacted in 100mm depth layers.

- All drains shall be tested on completion to ensure a satisfactory water flow. Any pipes that do not flow are to be taken up and re-laid at the Contractor's expense.

- After testing has been approved, remaining depth of the trench shall be filled with a layer of coarse grained sand up to the finished soil level (after final settlement). Where the top layer is specified as such, clean graded gravel 20-40mm stone chippings free from fine particles shall be placed up to the finished surface mix, free from clay lumps or any item likely to inhibit drainage.

5.2 <u>Sub-surface drainage Layers for podium planters</u>

- Drainage mat shall be 30mm thick mat or cell. Lay drainage mat over base of podium ensuring individual sections are close butted. Lay filter fabric over drainage mat and return 300mm up walls. Overlap filter fabric by 300mm along seams and bond with filter fabric cement. Spread 50mm sand blinding layer, over filter fabric.

- Filter fabric shall be of approved make, as specified in this document. This shall be laid over the drainage mat and turned up the sides of the planter boxes 300mm.

- Filter fabric cement shall be an approved non-solvent bonding agent that will join filter fabric together. Submit manufacturer's technical data and sample for review.
- Sand shall be coarse washed river sand. It shall be free from soluble salts ranging in size so that 80-100% passes the 3mm sieve and 0.50% passes the 2mm sieve with 0% passing through a 1mm sieve.

Chapter -2

SOFTSCAPE WORKS

1.0 SCOPE

The scope of services covers all horticultural operations and services including, labour, equipment, services and transport for all plant materials, Good earth, top soil conservation, manures, pesticides etc. completing the entire work within the scheduled time, maintaining the entire Softscaping work for one year after virtual completion of the work.

The Contractor shall refer to Specifications provided in this document for relating to formation levels, sub-bases, concrete footings, foundations and all associated works. The specifications are to be read along with necessary specifications from other consultants.

Vendors' shop drawings shall be submitted for all such items where the Contractor will procure and install items from/by a reputed vendor. Execution of all such items shall be done after such drawings are approved by the Employer/ Employer's representative.

Contractor shall prepare and issue all required working drawings and get them approved by Employer/ Employer's representative with required number of revisions till the details provided do not satisfy the Employer/ Employer's representative.

The scope includes maintenance of all above for -- Years from the date of end Defects Liability Period (DLP). DLP shall be of one year after completion of Landscape Execution. The Contractor will maintain the entire landscape development area free of cost for a period of one year after completion of all above works as certified by the Employer/ Employer's Representative's in consultation with the Landscape Architect

2.0 SPECIAL CONDITION

The Contractor will have to provide the following items at no extra cost to Employer:

a. The Contractor will supply and install 3.0 metres high barricades for safeguarding landscape development area and works, as indicated in the drawing. He may also install the barricades in the landscape development area according to his own understanding if he feels that any part of the landscape area is bound to be damaged for any reason, after taking prior permission from the Employer/ Employer's Representative.

b. The Contractor will supply, install and maintain at his own cost, the most modern, automated watering system for the landscape, which will take care of the requirement for particular plants, save water and does not waste water, including any requirements specified by the Landscape Architect appointed by contractor. He will give full details of the layout, size of the pipe, size of the sprinklers, bubblers, etc and their warranty period. All equipment must conform to international standards and / or

Indian Standards if available. The design of the irrigation system has to be approved by Employer/ Employer's representative.

c. All equipment required for development shall be made available by Contractor, and its maintenance shall be his responsibility. This includes Tagara, Phawdas, Hose Pipes, Ground Roller, Manual and/or Electric lawn Mowers, Sprinklers, etc.

d. Contractor will ensure that all plants remain free of diseases, pests, etc during development and maintenance periods. The contractor shall, without any additional charge renew any dead or defective plant material and shall fully maintain including watering, de-weeding etc. of the whole landscape as mentioned above.

e. The Contractor shall maintain Nursery at his own cost at designated locations as shown in the drawing or at a suitable location within the plot as directed by Employer/
Employer's Representative. The Nursery will be fenced with gates for protection from cattle. The area of Nursery will be approximately 5000sqm. The item would include construction and maintenance of Green Houses if required.

f. Contractor shall follow pre construction and during construction soil erosion control measures as per the NBC Part 10, section 1, Chapter 4 – Protection of Landscape during Construction.

g. The contractor in co-ordination with the Employer as applicable shall ensure conservation and storage of top soil: Topsoil shall be stripped to a depth of 200 mm from areas proposed to be occupied by buildings, roads, paved areas and external services. It shall be stockpiled to a height of 400 mm in designated areas and shall be re-applied to site during plantation of the proposed vegetation. Topsoil shall be separated from sub-soil debris and stones larger than 50 mm diameter. The stored topsoil may be used as finished grade for planting areas. It is the landscape contractor's responsibility to conserve top soil that is not disturbed by the civil contractor.

h. The Contractor shall:

I. Furnish the source of top soil to Employer/ Employer's Representative.

II. Study the soil report provided with the tender document, providing soil details such as pH, alkalinity, total soluble salts, porosity, sodium content and organic matter. Ref. Soil Test Report

III. Use the restored soil at site for landscape purpose, manure mixture, Neemcake, weedicide shall be added if required.

IV. Not consider any external soil source unless the existing soil conserved from site is lacking in quality and/or quantity.

Soil Analysis for Top Soil fertility determination

To determine the fertility of top soil for conservation, soil investigation shall be carried out by an NABL accredited laboratory.

dequate number of test samples of soil from a depth of 10-200mm below ground level shall be collected from at least 5 representative locations from site, preserved and transported (as per standard procedures specified by the laboratory) carefully to the laboratory for carrying out necessary tests.

All relevant Indian Standards for sampling and conducting laboratory tests shall be followed.

This soil samples shall be analyzed to determine soil type, texture, total organic content, pH, extractable nutrients such as nitrogen, phosphorus, potassium, salinity, cation exchange capacity, % base saturation and extractable heavy metals.

The soil analysis report from the laboratory shall also include a statement on the fertility and suitability of the soil for plant growth based on the analysis, in addition to the test results.

Top Soil conservation

Topsoil shall be removed for conservation to a depth of 200 mm (not more than 400 mm) and shall be separated from subsoil debris and stones larger than 50 mm diameter.

It shall be stockpiled to a height of 400 mm in designated areas. The stockpiled topsoil shall be protected from erosion during storage by installing earthern berms/solid walls, temporary seeding (using native grass), covering with mulch or plastic, etc.

The topsoil shall be protected with sand bags/solid walled enclosures (2 feet high) on all sides for containment.

Appropriate drainage channels shall be dug around the storage area to prevent flooding of the top soil storage area.

The top soil shall be reapplied to site during plantation of the proposed vegetation as finished grade for planting areas.

Seeding will take place immediately after respreading topsoil and decompacting, unless timing is inappropriate (for e.g., not in mid-summer).

i. The contractor to identify erosion prone areas on site and protect them from construction activities throughout the construction period. Prevent / mitigate the disturbances caused to site due to construction activity.

j. The contractor shall execute a sedimentation and erosion control plan that conforms to the best management practices highlighted in the National Building Codes of India

(NBC) Part 10, section 1, Chapter 4 – Protection of Landscape during Construction. This standard describes two types of measures that can be used to control sedimentation and erosion. Stabilization measures include temporary seeding, permanent seeding and mulching. Structural control measures include earth dikes, silt fence, sediment trap, and sediment basin. All of these measures are intended to stabilize the soil to prevent erosion.

k. The erosion and sedimentation control plan must be approved by Employer/ Employer's Representative and the erosion sedimentation control plan must be maintained throughout the execution period.

l. The contractor shall execute measures of protection and preservation of existing landscape on site during entire construction time.

m. Design, execute and maintain a temporary storm water management layout for the duration of construction activity. The storm water management layout should conform to National Building Codes of India (NBC) Part 10, section 1, chapter 4 – Protection of Landscape during Construction.

n. Contractor should take measures to prevent entry of any soluble/ insoluble construction waste to enter the water table/ water ways/ ravines on site.

3.0 GENERAL SPECIFICATIONS

a. Holding Nursery

i. A piece of land has been secured within the site for use as a holding nursery as indicated on the Contract Drawing. (Ref. Dwg. No)

ii. As a holding nursery the Contractor shall provide all necessary plant and equipment to store his plant material, machinery and equipment for the duration of the contract, including the two-year maintenance period.

iii. The Contractor shall be required to install and establish all equipment that may be required to run a major landscape contract and ensure plant materials remains in a healthy and fit condition. The list of requirements includes, but is not limited to:

- Provision of a 3,000 high tensioned chain link fence (with at least 2 no. lockable gates) around the extent of the holding nursery)

- Grading and laying of crusher together with associated storm water drainage to take vehicular loading

- Provision of all site utilities including water, telephone, electricity

- Provision of any shade structures that may be required to maintain the plants in a healthy condition prior to planting out

- Provision of any irrigation systems, pumps, sprinklers that may be required to maintain the plants in a healthy condition prior to planting out

- Provision of a site office to include at least one conference/meeting room capable of comfortably accommodating 15 persons

iv. The Contractor may wish to use the holding nursery for the purpose of propagation of plant stock for the contract. This is not a mandatory requirement since it is assumed that plant stock will need to be outsourced in order to meet the programme target dates. The decision to use the holding nursery as a propagation area rests entirely with the Contractor having taken into account the programme constraints, the nature of the site location (relatively remote) and his own commercial considerations.

b. Provision of Site Utilities

i. The Contractor is to allow for the provision at his own cost of all site utilities for the duration of the contract including but not limited to water, electricity and telephone.

c. Landscape Development Technique

i. The contractor will not be allowed to use different techniques or quality criteria or materials unless his alternative system has been confirmed in writing by the Employer/Employers representative.

ii. No cost increases for alternative specifications will be entertained unless formally submitted in writing as an improvement in the quality of a product and accepted in writing, following Employer/Employer's Representative approval, by the Employer/Employers representative.

d. Quality of Workmanship and Materials

i. All materials and workmanship shall be of the high standards and quality demanded by this specification. Sub-standard work and materials identified by the Employer/Employer's representative will be rejected and will be required to be rebuilt or replaced at the Contractor's costs.

ii. All plant material shall be of the genus, species and variety specified and substitutions will not be permitted unless authorized in writing by the Employer/Employer's representative. The sizes and plant description set out in the section headed Plant Material.

iii. All trees and shrubs supplied for the contract shall be free of pest, disease, discolouration and damage. Plants shall be well branched with vigorous shoots. The root system of each plant shall contain a good proportion of fibrous roots.

iv. All materials are to be approved by the Employer/Employer's representative prior to use on site. Materials shall be obtained from approved sources/manufacturers and/or suppliers. All guarantees and warranties shall be copied and submitted to the Employer/Employer's representative prior to requests for approval.

v. Where particular products are specified, the Main contractor's specialists subcontractors if he wishes to use similar products from other manufacturers must seek prior confirmation from the Employer/Employer's representative.

e. Site Responsibilities

i. From the commencement of the works until the Certificate of virtual Completion has been issued by the Employer/Employer's representative, the Main contractors specialists subcontractors shall, in respect of all areas of soft landscape works, adjacent areas and parts of the site used by him, be responsible as follows:

- For adequate protection to grassed areas, planted areas and trees and for making good Softscape works on removal of any protective measures at completion.

- For any damage to existing works and features and any necessary rectification work required to obtain approval from Employer/Employer's Representative.

- For keeping all paved surfaces used by him in a clean and tidy condition.

- For periodic removal of all surplus excavations and waste matter produced by his operations to a Local Authority registered tip off site, to be found by the Main contractors specialists subcontractors.

- For keeping all Softscape areas in a weed-free and tidy condition and adequately watered.

ii. The Main contractor's specialist subcontractors shall make appropriate allowance for these requirements in his rates.

iii. The Main contractor's specialist subcontractors shall, within 24 hours of notification and as directed by the Employer/Employer's representative, undertake at his own expense any remedial works arising from the stated requirements.

iv. Tree conservation:

- All trees to be conserved shall be protected with a 3-4 foot high enclosure constructed using brick/fencing (with an access gate for tree maintenance) at a distance indicated in the table below depending on the diameter of the tree trunk.

TRUNK DIAMETER (measured at 4.5 feet above natural grade)	DISTANCE FROM TRUNK ON ALL SIDES
Up to 6 inches	Past dripline
6-9 inches	5 feet
10-14 inches	10 feet

- This tree enclosure shall be erected before demolition, grading, or construction begins and remain until final inspection of the project. A 'Warning" sign of size 8.5"x 11" shall be prominently displayed on each protective enclosure to state the following:

- The following activities are prohibited within and in the vicinity of the tree protection zone throughout the entire duration of the construction project:

- Cutting of tree roots by utility trenching, foundation digging, placement of curbs and trenches, or other miscellaneous excavations

- soil disturbance or grade change

- drainage changes

- storage of material, topsoil, vehicles, or equipment

- Activity including but not limited to compaction, grading, construction etc.

- dumping of any material including but not limited to paint, petroleum products, concrete, mortar, dirty water, waste

- use of the tree trunks as a backstop, support or anchorage as

- a temporary power pole, signpost or other similar function

- The following activities are permitted or required within the Tree Protective Zone with approval from Landscape Architect:

- Mulching with wood chips (unpainted/untreated) or approved material to a four to six inch depth, leaving the trunk clear of mulch to prevent inadvertent soil compaction and moisture loss.

- Irrigation, Aeration, fertilization indicated by Landscape Architect for the healthy growth/maintenance of the tree

- if tree is adjacent to or in the immediate proximity to a grade slope of 8% or more, e rosion control measures shall be installed outside the Tree Protection Zone to prevent siltation and/or erosion within the zone

f. Plant Protection

i. All plant material is to be carefully protected and if necessary wrapped in the nursery during lifting, awaiting transportation, during transportation, unloading and during storage on site.

ii. Any evidence of unsatisfactory protection to roots, stems, branches and leaves will result in plants being rejected.

iii. Unprotected plants must not be transported during very hot weather, and all plants must be kept moist during transportation and storage. No plant material shall be left on site unplanted for more than two days.

g. Work by Machine or Hand

i. All operations herein described shall be carried out by suitable approved machines or by hand.

ii. Any work around the base of existing trees, in confined spaces or which is impractical to carry out by machine for any reason shall executed by hand and the contractor shall include for this in his rates.

h. Notice of Intentions

i. The contractor shall give forty-eight hours written notice to the Employer/Employer's representative of his intention to commence any of the following operations:

- Setting out,
- Planting,
- Topsoiling,
- Turfing,
- Sprigging,
- Maintenance visits

i. Heavy Machinery

i. Heavy machinery, which would excessively consolidate the sub-soil, shall not be used during any operations nor shall heavy machinery be taken over areas prepared for planting or grassing.

j. Substitutions

i. If the Main contractor's specialist subcontractor is unable to supply a particular species of plant he is to notify the Employer/Employer's representative in advance of his intention to make a substitution. No substitution will be allowed without prior written agreement of the Employer/Employer's representative.

ii. Notices of substitutions are to be made sufficiently for in advance of installation to ensure that the substituted material conforms to specifications. Substitutions
requested by the Main contractor's specialist subcontractor after work has started on site will not be entertained.

k. Setting Out

i. The Contractor shall be responsible for accurately setting out all the works prior to the commencement of the works and shall rectify errors in setting out at his own expense.

ii. Any discrepancy in site area between that shown on the drawings by Landscape Architect appointed by contractor and the actual area on the ground shall be notified to the Employer/ Employer's representative.

iii. The Contractor shall supply all necessary materials, equipment and labour to enable the Landscape Architect to check the setting out, levels and dimensions on the site along with the Employer/ Employer's representative.

l. Tools and Equipment

i. The Contractor shall use proper tools and equipment for the carrying out of the works and is to ensure that the work force is fully and properly equipped with the correct equipment and experience for the job at hand.

m. Failures of Plants (Pre-practical completion)

i. Any trees, shrubs, grass or other plants (other than those found to be missing or not in accordance with the Contract Documents as a result of theft or malicious damage and which shall be replaced), which are dead, dying, missing or found not to be have been in accordance with the Contract Documents at practical completion of the Works shall be replaced by the Contractor entirely at his own cost unless the Contract Administrator shall otherwise instruct.

ii. The Contract Administrator shall certify the dates when in his opinion the Contractor's obligations under this clause have been discharged.

n. Plants Defects Liability and Post Practical Completion Care by Contractor

i. Any grass which is found to be defective within 24 months, any shrubs, ordinary nursery stock trees or other plants found to be defective within 24 months and any semi-mature, advanced or extra large nursery stock trees found to be defective within 24 months of the date of virtual completion due to materials or workmanship not in accordance with the Contract Documents shall be replaced by the Contractor entirely at his own cost unless the Contract Administrator shall otherwise instruct.

ii. The Contract Administrator shall certify the dates when in his opinion the Contractor's obligations under this clause have been discharged.

iii. Malicious Damage or Theft (Before Practical Completion): All loss or damage arising from any theft or malicious damage prior to practical completion shall be made good by the Contractor at his own expense.

o. Submittals

i. The Contractor shall submit for review drawings by Landscape Architect appointed by contractor completely dimensioned, indicating any pattern layouts, special installation procedure, cutting, fitting, sinking and adjacent equipment materials for coordination.

ii. The Contractor shall submit samples of all materials and samples of workmanship for approval by Employer/Employer's representative.

iii. The Contractor shall be responsible for producing and submitting for comment and approval to the Employer/Employer's representative the shop drawings and samples of all elements indicated in this section. All should be based on the drawings provided by Landscape Architect appointed by contractor. All submissions should be reviewed, approved and endorsed by the Contractor.

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p. Handling, Storage And Delivery

i. The Contractor shall:

- Coordinate delivery with suppliers, to minimize handling.

- Handle and store equipment and materials in such a manner that no damage will be done to the materials or the work of other trades.

- Store packaged materials, undamaged in their original wrappings, or containers with manufacturer's labels and seals intact.

- Stack equipment and materials on wooden platforms at least 150mm clear of the ground and protect with weatherproof covers.

- Damaged equipment, material or works will be rejected by the Employer/Employer's representative whether built-in or not.

- For equipment, materials and work, covering shall be of suitable material containing nothing that may injure or stain the materials.

q. Protection of Work

i. The Contractor shall protect all equipment, materials and completed work from damage until final completion of the work.

ii. The Contractor shall remove and replace damaged work at no extra cost.

r. Reference Standards

i. The Contractor shall comply with all relevant Indian Standards, ASTM, British Standard Code of Practice, Draft BS or DIN Standard applicable to elements indicated in this section, the recommendations and requirements of such documents shall be considered a minimum standard of such work described and must be complied with.

ii. Nothing shall relieve the Contractor of his responsibility for providing a higher standard than the relevant Code or Standard where it is required to comply with other sections of the Specification.

4.0 PLANT MATERIALS AND PLANTING OPERATIONS

The following plant descriptions cover the different categories of plant material to be used on the site.

These descriptions and their accompanying drawings requirements must be studied carefully and adhered to.

Plants that do not reach the specified dimension or quality, characteristics in this section or in the sizes and descriptions set out in the Bill of Quantities will be rejected and will have to be replaced at the Contractor's cost.

Project : Proposed Under Ground Parking On Patwardhan Park, Plot Bearing C.T.S No. 381a&381b Of Village Bandra, At Linking Road, Bandra West, H/W Ward, Mumbai.:

Trees and palms and large feature plants that are growing in open ground are to be prepared for transplanting at least 2 months before moving, either to containers in the nursery or direct to the site.

Preparation of in-ground trees and palms shall be by root pruning to the stated rootball dimensions.

Trenching around the outer edge of the rootball using pruning and a sharp spade shall be done in four separate stages trenching in quarters, with one quarter of the tree roots being cut and backfilled each week, the next quarter the following week, with all of the ball being cut in one month.

If roots over 25mm are encountered these are to be cleanly cut with large secateurs or pruning saw.

The trench which shall be at least 200mm wide shall be dug to the full specified depth of the rootball and undercut at the end of the root-pruning exercise to sever base roots.

The whole trench shall by this time be backfilled with sand. The tree is then to be allowed to settle for one month before final wrapping with protection and lifting. The rootball is to be well watered during this period.

For trees and palms that are to be containerised or root wrapped, the lifting and placing in containers or being wrapped is to be done immediately after the root trenching operation is complete.

Plants to be transported or moved are to be thoroughly wrapped and protected prior to transporting.

Rootballs are to be wrapped and tied with Gunny sack or hessian sacking if not containerised.

Exposed trunks are to be wrapped in rice straw including the lower parts of the branch system.

The upper branch system, especially if well furnished with leaves and twigs during transportation is to be completely wrapped in Lightweight netting or cloth tied and palms are to be laid at an angle to prevent damage from overhead structures and from buffeting and shall be covered by canvas as protection from wind.

Damaged trees will automatically be rejected on arrival at site.

All trees and palms are to be purchased, stored and grown on in suitable nursery conditions within one month of the contract and made ready for direction by the Landscape Architect appointed by Contractor.

Failure to procure within this time and to reveal the source of supply and location will result in the Employer/Employer's representative sourcing the plant materials for the Contractor, and the cost of this sourcing operation will be deducted from the Contractor's payments.

All dimensions shown with tolerances (that is 120 - 150mm) refer to maximum and minimum dimensions that will be accepted. Measurement of all plants of one species shall, as a minimum, average between the upper and lower figures (that is in the above case 135mm).

All trees and palms specified for containerising or root wrapping after root pruning operations are to be well furnished with leaves over the crown of the tree. Thinning of leaves to reduce transpiration to give a 50% cover is permissible providing due notification is given that thinning is required to ensure that the trees can be inspected before thinning work is done. Bare crowned trees will not be permitted.

Leave cover: Any trees or palms which shed their leaves within 2 weeks of transplanting are to be replaced by the Contractor at no extra charge.

4.1. Trees

a. Instant Trees

These are semi-mature trees especially prepared in advance for transplanting.

Root pruning to cleanly cut roots to the diameter of the rootball shall be carried out 3 months in advance of transplanting.

Trees shall be 300 - 450mm (12" - 18") circumference of stem when measured 1.0m (3') from ground level and shall have a clear stem of minimum 1.8 metres.

The head shall be well balanced and contain at least four main branches 500-1000mm long giving an overall height of 3 - 4m after pruning.

All saw cuts are to be painted with an approved insecticide/fungicide solution.

b. Extra Heavy Standard Trees (EHS)

These are large size nursery grown trees pruned during growth to produce a tight well rounded head and a straight stem clear of leaves or twigs.

Trees shall be 140 - 180mm circumference of stem when measured 1m above ground level and shall have a clear straight stem of minimum 2m.

The head shall be well balanced and rounded and contain at least four main branches, and a well developed secondary branch system giving an overall height of 4.5 - 4.8mm at the time of planting.

Trees shall have a defined central leader. Pruning at the time of removal from the nursery will not be permitted.

In dry weather conditions trees are to be sprayed with approved Anti-transpirant.

Rootball dimensions: diameter 750mm x 600 deep minimum. Branching/leaf spread shall be of 2.2 - 2.4m diameter.

c. Heavy Standard Trees

These are large size nursery grown trees pruned during growth to produce a tight well rounded head, and a straight stem clear of leafs or twigs.

Trees shall be 120 - 150mm (5" - 6") circumference of stem when measured 1.0m (3') from ground level and shall have a clear straight stem of minimum 1.8 metres.

The head shall be well balanced and rounded and contain at least four main branches with a well developed secondary branch system and a central leader, giving an overall height of 3.5 - 4.0cm (10' - 13') at the time of planting.

Pruning at the time of removal from the nursery will not be permitted.

In dry weather conditions, trees are to be sprayed with approved Anti-transpirant.

Rootball dimensions: diameter 600mm (2') x 450mm (1'6") deep minimum. Branching/leaf spread to be of 1.8 - 2.0m diameter.

d. Standard Trees

These are medium size nursery grown trees pruned during growth to produce a tight well rounded head, and a straight stem clear of leaves or twigs.

Trees shall be 100 - 120mm circumference stem when measured 0.9m from ground level and shall have a clear straight stem of minimum 1.5mm.

The head shall be well balanced and rounded and contain at least four main branches with a well developed secondary branch system and a defined central leader that has not been pruned, giving an overall height of 2.5 -3.0m at the time of planting.

Pruning at the time of removal from the nursery will not be permitted.

In dry weather conditions, trees are to be sprayed with approved Anti-transpirant.

Rootball dimensions: diameter 500mm (1.6") x 300mm (1') deep minimum. Branching/leaf spread shall be of 1.5 - 1.8m diameter.

e. Standard Feathered Whips

These are medium sized nursery grown trees having a single straight stem and unbroken leader giving an overall height of 2.5 - 3m.

The stem shall be fully furnished with evenly spread and balanced lateral branches down to ground level and shall be 80 - 100 mm circumference of stem when measured 1m from ground level.

The tree shall have a strongly developed fibrous root system and shall be container grown. Leaves or branches shall not be cut off before planting.

Rootball dimensions 450 x 300mm minimum. Branching/leaf spread shall be of 1.5 - 1.8m diameter.

f. Ships/Saplings

These are young tree grown from seed or cuttings which are trimmed or pruned, furnished with branches down to ground level.

Trees shall have a single straight stem and unbroken leader between 900 - 1500mm overall height.

Stem thickness will vary between species, but a strong stem which does not bend over is required.

The tree shall have a strongly developed fibrous root system and shall be container grown. Leaves shall not be cut before planting.

Container dimensions: 250mm diameter x 250mm deep minimum.

4.2. Palms

All palms shall be single stem. Single Stem Palms shall have clear straight trunks of heights as stated in the Bill of Quantities as measured from the root collar to the base of the lowest leaf sheath. The stem girth shall be of dimension normally found for palms for the stem height and species specified.

Acceptable tolerances to variations in stem height shall be +200mm or -200mm from the height specified in the Bills of Quantities.

The heads of palms shall be well balanced with at least 7 leaves and a healthy growing apical shoot all free from pest and disease.

a. Rootball dimensions shall be in proportion to stem heights as follows:

Stem height	Rootball diameter	Depth
1m	400mm	400mm
2m	750mm	600mm
3m	900mm	600mm
4m	1200mm	750mm

4.3. Shrubs, Herbaceous Plants and Ground Covers

a. Shrubs

These are woody perennials of generally multi stemmed and bushy habit ranging from 3 - 4.5m down to 500mm height.

Shrubs shall have no less than three main stems and shall be well balanced and bushy, with strongly developed fibrous root systems, and shall be pruned in advance as required to achieve the specified height tolerances.

Branches shall break from the base of the plant just above the root collar, and shall be well furnished with leaves right down to ground level.

All plants are to be container grown in containers of suitable dimensions for the species.

b. Herbaceous Plants

These are non-woody perennials usually of a clump forming habit.

Plants shall have a well developed main stem or stems with good symmetry, a healthy root system, free from pest or disease.

Clumps of herbaceous plants shall include rhizomes, corns, tubers or roots and soil undisturbed by lifting with evidence of growing shoots emerging above soil level.

All herbaceous plants are to be grown in containers unless specified as being produced by alternative method.

c. Groundcover plants

These are low growing, 500mm or less, or prostrate shrubs or herbaceous plants whose habit is to totally cover the soil.

All groundcover species shall be evenly balanced to allow equal growth in all directions.

Plants shall have fully developed roots and leaves.

Rooted cuttings will not be accepted. All plants to be container grown.

Rooted shoots of certain spreading ground cover plants shall be used only where specified, planted as ‘sprigs’ as opposed to established plants in soil.

Plants shall be rooted shoots and shall have at least one and evidence of vigorous root growth.

Recent cuttings with no root development shall not be acceptable.

d. Climbers

Climbers are plants whose growth habit is to climb upwards by means of twinning stems, tendrils or clinging roots.

Plants shall be grown to reach the recommended size using stocks no less than one year old, and no more than five years old at the time of the start of the contract.

Plants shall have at least two leader shoots up to the recommended height and a vigorous root system.

All plants to be container grown.

4.4. Hedging Plants

Hedging Plants shall be shrubs such as Lawsonia, Ixoras, etc as per design requirements of Landscape Architect appointed by contractor as suited to regular clipping, previously prepared to establish a uniform height and complete foliage cover to the stem from ground level upwards.

Plants shall be a minimum overall height of 500mm with a minimum of 4 branches arising from ground level and a strongly developed fibrous root system.

Branches shall be well clothed in leaves down to ground level.

All plants to be container grown in suitably sized containers.

Hedging plants shall be prepared by root and branch pruning to achieve the 'box' shape shown, at least 3 months before transplanting.

4.5. Container Grown Plants

Container grown plants shall mean trees and shrubs which have been grown in containers sufficiently large to hold the developing root system from seed or cutting and shall be filled with suitable nutrient rich, free draining compost as per design requirements of Landscape Architect appointed by contractor.

Container grown stock shall be well watered prior to dispatch from the nursery and shall remain in the container until planted on site, whereupon the container shall be carefully removed to avoid soil disturbance.

Empty containers are to be removed from site.

4.6. Cultivation of Plant Beds

Cultivation of the completed soil mix beds shall take place only when the seeding or planting operations can begin immediately after cultivation. No cultivation shall be undertaken in weather or ground conditions in which operations may destroy soil structure or where soil mix has not been approved by the Landscape Architect.

Cultivation shall be by approved mechanical or manual means to a depth of 250mm for Ground Cover and 450mm for Shrubs to provide an even, weed free texture.

After cultivation, stone picking from the surface of soil areas shall be carried out such that all stones and lumps exceeding 50mm in diameter are collected. All stones, weeds and rubbish brought up shall be removed from the site to a tip to be found by the Contractor.

Ground cover, rooted shoot and herbaceous beds are to have 25mm solid conditioner spread over the entire area and well forked in to the top 250mm of soil during cultivation. This operation is separate from the mulching specified.

5.0 PLANTING TECHNIQUES AND ACCESSORIES

All plants shall be planted to accommodate the spreading root system of the plant to the same soil depth as in the nursery and shall be well watered before removing them from containers. Plants are to be positioned upright and the soil firmed around the roots.

Planting shall be carried out in accordance with the schedule of plants and drawings supplied by Landscape Architect appointed by contractor. The number of each

species and variety shall be evenly distributed over the area as indicated on the drawings by Landscape Architect appointed by contractor.

For large areas the outer rows are to be set out first to ensure the correct shape to the bed is established. The remaining plants are then to be evenly distributed to cover the planting area. The Landscape Architect is to be notified in advance if there are too many or too few plants to fill the area required and an assessment of setting out adjustments will be directed accordingly.

Setting out of plants is to be completed and approved by Landscape Architect appointed by contractor before planting into the soil bed can commence.

5.1. Small Shrubs, Herbaceous, Ground Cover and Root Planting in Beds

Small shrubs, ground cover and herbaceous plants shall be planted in pockets formed by a trowel or spade.

The pocket shall be deep enough and wide enough to accommodate the root of the plant.

The sides and base of the pocket shall be loosened and the plant roots lightly loosened from the rootball.

The plant shall be placed upright in the pocket and firmed into the ground by backfilling and treading or hand pressure.

The topsoil in areas to receive rooted shoots shall be brought to a fine layer 75mm deep by approved mechanical means or hand raking.

Approved slow release fertiliser shall be applied evenly over the area at a rate of 40gms per square metre and shall be lightly raked into the surface.

Rooted shoots shall be firmly bedded into the soil at 75mm centres with each shoot spread on the topsoil surface, separated from adjacent shoots.

The area shall be top-dressed with finely sifted topsoil/compost mix as approved by the Landscape Architect appointed by Contractor to lightly cover the rooted shoots after laying.

The ground shall then be firmed by lightly treading or hand pressure around the roots, taking care not to damage the shoots, to ensure good contact with the soil.

Watering shall take place immediately after planting, using a fine spray.

The firmed up area is to be tightly cultivated after completion of this operation to leave an even layer before mulching.

5.2. Shrub Pits

Shrub pits for large and medium shrubs, feature plants and climbers shall be excavated to 150mm wider on either side than the root spread, and to a depth of 150mm deeper than the root depth and shall not be less than 300mm x 300mm x 450mm deep.

The bottom 150mm of the pit is to be forked loose prior to backfilling.

Backfill material shall be topsoil Mix A for backfilling purposes. (Ref. Section 8-Part 1: 4.1.3 Soil Mixes)

The Contractor shall note that for planting into turf areas, where topsoil has not been spread topsoil mix will be required for backfilling purposes.

Climber pits shall be 150 - 200mm away from the supporting structure with the roots spread away from the wall or adjacent supporting structure.

The climbing plants shall be trained through the wire mesh with leading shoots directed upwards and tied.

Pits for shrubs and feature plants in planters shall be excavated to 150mm wider on either side than the root spread and to a total depth of the rootball.

The bottom of the pit shall be lightly formed, prior to planting taking care not to damage the terrain layer below.

After planting shrubs the area is to be watered immediately to bed the shrubs in.

Once the water has percolated away and left the surface relatively dry the soil area is to be lightly forked to loosen the surface and leave an even soil layer.

5.3. Tree Pits

Tree pits shall be excavated to the dimensions and the location shown on the drawing by Landscape Architect appointed by Contractor.

Tree pits shall be dug a minimum of 3 weeks period prior to back filling.

The bottom of the pit shall be forked to loosen the soil. In case the soil is clayey, a layer of broken bricks and stones shall be spread on the bottom of the hole and this layer shall be covered with dried leaves or straw.

No tree pit shall be less than 300mm wider on either side than the root spread, and to a depth of 150mm deeper than the root depth, and shall not be less than 1m x 1m x 1m.

The trees shall be planted to the same depth in the nursery or as in their containers.

In case the site is infested with white ants the sides of the pits shall be brushed with a mixture of BHC (10% concentration) and water in a proportion of 200 gms of BHC mixed in 5 litres of water. BHC is the common name for the insecticide.

5.4. Backfilling of Pits (trees, shrubs and climbers)

Before backfilling, imported topsoil and sand is to be thoroughly mixed with soil conditioner and organic fertiliser as specified for Topsoil Mix A. (Ref. Section 8-Part 1: 4.1.3 Soil Mixes)

The tree pit shall be backfilled with the Soil Mix A to a depth which will allow soil, after settlement to match surrounding ground level.

The filled pit shall be watered and allowed to settle. After settlement soil levels shall be topped up as required.

The centre of the backfilled tree pit shall be excavated large enough to allow placing of the rootball, and to allow even compaction all round during backfilling.

After careful removal of the container or wrapping, the rootball of trees shall be placed carefully in the pit, and soil replaced gradually into the pit.

The soil is to be consolidated during backfilling in layers to ensure that the plant is firmly held in the ground and that voids are not left around the roots.

Care shall be taken during planting to avoid damage to the root system, branches or leaves.

After careful removal of the container or wrapping, the rootball of the roots of shrubs and climbers shall be placed carefully and the soil replaced gradually in the pit.

The soil is to be consolidated during backfilling in layers to ensure that the plant is firmly held in the ground and that voids are not left around the roots.

Care should be taken during planting to avoid damage to the root system, branches or leaves.

5.5. Staking and Supports

Stakes shall always be used when planting instant trees, standards and single stem palms and for tall shrubs when directed by the Landscape Architect appointed by Contractor.

Stakes shall be in sawn timber of an approved type and be carried out according to the size of plant to be supported. The types of approved staking methods are:

a. Tripod or Quadropod staking for large trees or palms (extra heavy standard and above)

Three or four stakes each 50 x 50mm section shall be positioned equidistantly around the tree and firmly driven into the ground at angles of between 30 - 40 degrees.

The inner ends of the stakes shall extend beyond the tree stem by not more than 150mm and shall not be higher than 300mm below the lowest branch.

The tree stem shall be wrapped in hessian or gunny sacking at the point where the tree stakes are to be fastened in order to prevent bark damage.

The stakes shall be neatly and firmly fastened to the tree stem using rubber hose or cord; String are not be used.

The stakes are to be adjusted and the position of the protective wrapping is to be altered up or down every month.

The hessian wrapping is to be sprayed with an approved horticultural pesticide.

b. Multiple guying - for large trees or palms (heavy standard and above)

A minimum of three wire guys are to be used per tree.

Each guy wire is to be fastened by a loop around the lowest branches of the tree at the junction with the main trunk or branches of the tree at the junction with the main trunk or stem.

Loops are to have protective rubber or plastic hose to prevent chafing and are to be fastened back to the guy wire by means of U-clamps or bolts.

Guy wires are to be fastened at ground level to short stakes firmly driven at an angle into the ground.

Stakes shall be minimum length of 600mm and are to be driven deep enough to resist movement.

A notch is to be made near the top of each stake for the fastening of the guy wire.

Stakes shall be positioned equidistantly and equally around the tree and shall be at least 300mm beyond the extent to the tree pit.

Distance away from the tree shall be gauged on site to provide firm and secure guying.

Each guy wire is to have one turnbuckle located near the fastening to the stake.

Guy wires are to be kept in a proper tension and adjusted to maintain the tree in a vertical position without guy wires being rigid.

c. Double Staking - for trees and palms (heavy standard and smaller)

Two stakes each 50mm x 50mm cross section shall be driven into the ground in a vertical position on either side of and outside the rootball of the tree so as to form a straight line outside the rootball of the tree so as to form a straight line with the stem at the centre.

Stakes shall be driven in to penetrate the bottom of the tree pit and be deep enough to resist lateral movement when tested.

Stakes shall not extend beyond the lowest branch of the tree and if necessary are to be sawn off at the top.

Fastening or securing of the tree may be carried out by using either:

i. Cross bar

A wooden cross bar of same section as the stakes is fastened in a horizontal position to the outside of the stakes by nails or tying securely at a level below the lowest branch.

The tree is fastened to the cross bar with a single adjustable tie of an approved rubberised or plastic type with a spacer and shall be fastened to prevent any chafing or abrasion of the bark.

No nails or fixings are to be driven into the tree trunk.

ii. Wire/Hose loops

Two separate wire or rope loops are made about the stem just below the lowest branch with each being fastened back to one of the vertical stakes.

Each loop is to have a protective outer covering or sheath of rubber hose to prevent chafing or abrasion of the bark.

The wire or rope is to be fastened to the stakes in a manner that allows adjustment of the tension to be made easily.

Tension on each wire is to be equal to maintain the tree in a vertical position.

Where directed by the Landscape Architect appointed by Contractor the tree may be secured with a second set of loops at a lower level.

d. Single Staking - for trees and palms of sapling size only

A single stake of cross section 50mm x 50mm is driven vertically into the ground 150mm - 250mm away from the tree.

- The stake is driven down beyond the base of the tree pit and shall be firm when tested.
- The top of the stake shall be 100mm below the lowest branch.
- Two ties of an approved rubberised or plastic type are to be used.
- The top tie is to be located 100mm below the top of the stake; the lower tie 300mm from the base.
- Ties are to have spacers to maintain the 150mm - 250mm distance between the stake and the tree.
- Ties are to be fastened to avoid rubbing, chafing or abrasion of the bark.

e. ‘Dead Man’ Guying - for large sized trees standard and above

This method of supporting trees is for use in areas where other conventional methods of support are not feasible due to space constraints.

Prior to backfilling two pairs of preservative treated hardwood planks minimum 100mm x 50mm cross section are laid across the top of the rootball at right angles so that the trunk or stem is enclosed in a square edge of the rootball as possible but kept approximately 100mm in from the edge.

Two pairs of galvanised or stainless steel cables are then led over at right angles to the timber planks and the ends firmly fastened into the ground at the base of the rootball or preferably fastened into structure nearby.

Twin buckles at the midpoint of each cable are installed to tighten the cables to a suitable degree. Cables should be tightened only to hold the rootball firm.

Over tightening may cause the rootball to settle deeper into the ground than desired.

Wherever dead-men guying is specified without a drawing the contractor is to notify the Employer/Employer’s representative.

f. Climber wires

Wires for training climbing plants against walls shall be approved lightweight PVC mesh, fixed at 600mm intervals to screw eyes supplied under the sub contract.

Maximum mesh coverage shall be 180mm high x 240mm wide.

The climbing plants shall be trained through the wire mesh with the shoots directed upwards and tied.

5.6. Turfing

5. Close Turfing

Close Turf shall be a live grass sod or mat at least 300mm square with a well developed root system growing in a minimum of 25mm soil bed, free from stones or extraneous roots, cut mechanically or by hand to give an extra thickness and texture.

A sample of one square metre of Turf shall be submitted to the Employer/Employer's representative for approval before Turf is brought in for use on site.

The source of the material shall be stated by the Contractor.

Turf shall be free from weeds, fungus, pest or disease and contamination or pollutants.

Turf sods shall be kept moist and in shade and shall be planted within 24 hours after lifting.

In exceptionally dry weather, the turf must be kept well watered at the nursery or turf farm in order to keep full green leave structure.

Dry, brown or wilting grass turf will be rejected and growth or recovery on site will not be permitted.

Close Turfing: Ground Preparation

Rake the topsoil mix area to a smooth and uniform grade free of any slight mounds or depressions to achieve a uniformly flat surface.

Re-grade any depressions or humps that may occur until a satisfactory grade is achieved.

The area to be turfed is to be brought to a fine tilth by approved mechanical means or by hand raking.

Any stones over 25mm in diameter shall be removed from the site of turfing.

Watering of the area shall be carried out to produce a moist condition of the soil and to consolidate the soil.

If consolidation occurs to produce any areas with topsoil depths less than 100mm these areas shall have extra topsoil spread to produce finished levels.

Fertiliser shall be applied to all areas to be turfed prior to turfing at the rate of 40gm per square meter, evenly spread over the whole area and lightly worked into the soil.

3. Close Turfing: Operations

Close turf sods shall be laid onto the surface of the prepared ground with leaf turfs upwards, butt jointed as closely as possible to achieve a uniform cover.

The turf shall be laid off planks working over turves previously laid.

The whole area is then to be top dressed with finely sifted topsoil mix to give an evenly smooth surface. The finished close turfing shall be lightly compacted by treading or with a wooden beater to ensure even coverage and compaction.

Watering shall take place over the area that has been turfed immediately after planting. Watering shall be undertaken by use of a fine spray to avoid disturbance of soil particles.

Turfing shall be only accepted as complete after the growth of an even grass cover is evident. Any areas not covered by green healthy grass to the satisfaction of the Employer/Employer's representative within 28 days after turfing shall be re-laid as specified at the Contractor's own expense.

For the period of 28 days after turfing the vegetative cover shall:

4. Evenly cover at least 90% of the areas with leaves and spreading shoots of specified grass variety

6) be free of perennial weeds or disease

III. be healthy and vigorous and showing a strongly developed root system

Should there be any settlement due to lack of even compaction this will be corrected by application of topdressing of finely sifted soil to maximum depth of 25mm.

If the depression is greater than 25mm the grass in the affected area shall be lifted, the depression filled with sifted topsoil, lightly compacted and the affected area re-turfed as specified. These operations shall be done as often as necessary to produce an even and smooth surface free from bumps and hollows.

All turfing operations shall be carried out from wooden planks or plywood boards, with the workers moving away from completed turfed areas, raking any compressed soil or footprints before laying of sods.

All access onto soil areas shall be on wooden boards or plywood sheets. Areas compacted by working are to be re-cultivated and re-laid.

iii. Maintenance of Close Turfing Before Completion

The following operations are to be carried out as often as required to achieve the specified quality of

I. Cutting before Completion shall be carried out as necessary to keep the grass to a maximum height of 30mm.

II. Watering shall be carried out as often as necessary before Completion to allow a satisfactory green sward to develop over the whole close turfed area.

III. One fertiliser application per month is to be carried out for before Completion.

IV. Topdressing as specified as often as required to establish smooth even grades and levels free of hollows.

V. If compaction or consolidation takes place or hard passing or baking of the soil occurs, the soil areas are to be well watered first and lightly loosened by mechanical means such as spiking, slitting or hollow tinning using approved equipment.

VI. Completed close turfed areas are to be kept in a weed free insect free, fungus free and tidy condition until Completion (that is start of maintenance period).

iv. Sourcing of Turf Types

Close turfing materials are to be obtained from a bona-fide horticultural source or private landowner.

No turf is to be removed from unauthorised locations, roadside, riverbanks or private property without permission of the owner.

The Contractor is to inform source of all turf delivered to the Employer/Employer's representative before any turf is laid at site.

b. Fine Turf

Fine Turf shall consist of fine bladed rhizomatous grass such as Bermuda grass or cultivar specified by Landscape Architects appointed by the Contractor.

Fine Turf shall be a live grass sod or mat at least 300mm square with a well developed root system growing in a minimum of 25mm soil bed, free from stones or extraneous roots, cut mechanically or by hand to give an even thickness and texture.

A sample of one square metre of Fine Turf or both types shall be submitted to the Employer/Employer's representative for approval before fine Turf is brought in for use on site.

The source of the material shall be stated by the Contractor.

Fine Turf shall be free from weeds, fungus, pest or disease and contaminants or pollutant

Fine Turf sods shall be kept moist and in shade and shall be planted within 24 hours after lifting.

i. Fine Turfing Operations

Subsoil mix shall be hand raked to provide an even and fine tilth to an even and accurate level matching kerb edge levels.

Any lumps or stones over 25mm in diameter brought up in this operation shall be removed from site.

Soil areas shall be lightly sprinkled with water to moisten surface in dry weather before laying turf.

Pre-Turfing fertiliser shall be applied to all areas to be turfed prior to turfing at the rate of 40gm per square metre evenly spread over the whole area and lightly worked into the soil.

The turves shall be laid on the prepared soil bed and firmed into position in consecutive rows with broken joints, closely butted and to the correct levels.

The turf shall be laid off planks working over turves previously laid.

Where necessary, the turves shall be lightly and evenly firmed with wooden beaters, the bottom of the beaters being frequently scraped clean of accumulated soil and mud.

A dressing of finely sifted topsoil/sand/compost mix shall be applied and well brushed into the joints to give an overall even surface.

Watering shall take place over the area that has been turfed immediately after planting. Watering shall be undertaken by use of a fine spray to avoid disturbance of soil particles.

Fine turfing shall only be accepted as complete when new growth has caused turves to knit together and adhere by rooting to the soil bed.

Any areas not covered by green healthy grass to the satisfaction of the Landscape Architect within 28 days after fine turfing shall be re-laid as specified at the Contractor’s own expense.

If shrinkage occurs or the joints open, finely sifted topsoil/ sand/ compost mix shall be brushed into the gaps and shall be watered in.

Any inequalities in finished levels owing to variation in turf thickness or uneven consolidation of soil shall be adjusted by lifting turves and by re-spreading fine soil mix to correct levels and relaying turves as specified.

The finished level of the Fine Turf shall be 25mm above adjoining paved surfaces or other hard edges after allowing for final settlement.

Turf edges and margins shall be laid with whole turves and uneven edges trimmed to give an even line.

ii. Maintenance of Fine Turfing before Completion

Watering shall be carried out as often as necessary before completion to allow a satisfactory green sward to develop over the whole fine turfed area.

Cutting before completion shall be carried out as necessary to keep the grass to a maximum height of 25mm.

One extra fertiliser application is to be allowed for before completion, to be used if directed by the Landscape Architect appointed by Contractor.

Completed fine turfed areas are to be kept in a weed free inset free, fungus free and tidy condition until completion (that is start of maintenance period).

Edge cutting shall be carried out as required along edges of paths, plant beds or other junctions with other materials. Only sharp edge cutting tools are to be used for this operation.

Over cutting or ragged edges will require the relaying of the turf edge strip as specified (that is 300mm wide).

iii. Specification for Sourcing of Turf Types

Fine Turf is to be specially prepared horticultural turf, re-lawn or turf-carpet, mechanically cut to specified tolerances.

5.7. Watering of all Plants

After planting all plants are to be thoroughly watered to soak the ground all around the rootball.

After watering and the water has percolated away leaving e surface relatively dry the soil is to be lightly cultivated to give an even soil tilth.

5.8. Mulching

After completion of planting and watering and light cultivation operations a 50mm deep layer of approved mulch shall be spread and forked in over all cultivated planting areas.

Around each tree and palm and around the base of each climber, additional mulch is to be applied to a 50mm depth to a diameter of 600mm.

Mulching is to be done within 2 days of completing planting and watering in.

5.9. Fertilising

After a period of settling in of at least one month, all pit planted materials shall be fertilised with an approved slow release fertiliser at the rate of:

Trees : 250gm per tree

Shrubs/climbers : 50gm per plant

Ground Cover/Herbaceous : 100gm per square meter spread

Rooted Shoots : around the base of the plants - 40gm per square meter

All fertilised areas are to be watered immediately after fertiliser application.

5.10. Disease Control

The Contractor shall take all necessary precautions to prevent or eradicate any outbreak of disease or insect attack.

5.11. Planting into Turf Areas

Where planting is to be carried out in areas of turf, the turf shall be carefully cut to the size of the tree or shrub pit, rolled and stored for re-use, being kept moist and in shade.

After planting is complete stored turf shall be re-laid around the base of the plant.

The Contractor shall replace at his own expense, any turf which is damaged during planting operations.

5.12. Protection of Planted Areas

The contractor shall be responsible for protecting all planted areas.

If it is necessary for the Contractor to erect protective fencing, the Contractor shall be responsible for keeping the fencing in position and in good repair until the end of the maintenance period.

Fencing proposals shall be submitted to the Employer/Employer's representative for approval.

Post and string fences shall not be acceptable.

5.13. Maintenance prior to Completion

After planting and prior to the onset of the maintenance period, the Contractor shall be responsible for carrying out all necessary measures to ensure that the plant material thrives and becomes established and that the landscape areas are kept in a clean and tidy condition.

The Contractor shall allow for carrying out the following maintenance operations when necessary prior to the onset maintenance period, all as specified in section 6 of this specification:

- Replacement of dead/missing plants
- Grass cutting around trees
- Watering
- Cultivation and loosening of soil
- Weeding
- Pruning and clipping
- Firming up and adjusting stakes and ties
- Eradication of pest or insect attack
- Topdressing and mulching
- Fertilising

The Contractor shall be responsible for replacing any plants which fail to survive as a result of inadequate maintenance operations, poor workmanship or poor quality of plant material prior to completion.

The Virtual Completion Certificate will not be issued until all plants scheduled on the Drawings and Schedule of Works are installed in a healthy condition in the manner specified.

6.0 MAINTENANCE WORKS

6.1. General

i. The Contractor shall maintain the landscape for a two-year period after the date certified by the Landscape Architect that the work has been satisfactorily completed (issue of Certificate of Completion).

ii. The extent of the landscape to be maintained by the Contractor shall be deemed to cover and include all soft landscape areas within the overall project boundaries as

shown on the drawings including all existing soft landscape not affected by the contract works and retained intact or nearly so through the end of the contract period as well as all the landscape works covered in the contract scope of works. No additional maintenance charges will be allowed unless specifically agreed to by the Landscape Architect in writing.

iii. The Contractor shall ensure that a senior qualified supervisor is made available for organising and running the maintenance programme. The Contractor shall also have available an experience foreman who can supervise the workers on a day-to-day basis. An adequate trained labour force of at least 3 workers must be available for routine work and they must be on site for at least half a working day, 5 days per week during the maintenance period. Additional grass cutting operators will be needed to ensure adequate cutting and cleaning.

iv. The Contractor's Supervisor shall inspect the site once per week during the maintenance period and shall prepare a brief schedule of operations required for the coming week. The format for the schedule of operations will cover each distinct areas of the site such as frontage, rear, courtyard, roof, interior, etc. The schedule shall describe the operations the Contractor intends to carry out in the coming week to cover the items listed in the specification and to ensure that the current weather conditions and growing performances, insect attack, etc is taken into account.

v. A copy of this schedule is to be submitted to the Landscape Architect and Employer every week so that a running record of proposed operations can be checked at the maintenance inspections each month. If in the opinion of the Landscape Architect the maintenance works have not been satisfactorily carried out according to site conditions and the specifications, part of the monthly payment will be withheld until the works have been satisfactorily carried out.

vi. The contractor shall carry out all necessary measures to ensure that all pot plants, trees and shrubs and other plants shall thrive and become established within this period. All landscape areas will be inspected monthly and lists of remedial works issued after each inspection. All items on the remedial lists are to be carried out by the time of the next inspection, ie within one month.

vii. The Contractor shall keep the landscape areas clean and tidy at all times and dispose of all waste materials arising from the cleaning.

6.2. <u>Maintenance of Planted Areas: Trees, Shrubs, Climbers, Herbaceous and Ground Covers</u>

i. The Contractor shall water all trees, palms, shrubs, ground cover, rooted shoots, herbaceous plants and other planting areas as often as necessary to keep the ground moist all around and to the full depth of the roots of the plants to a minimum depth of saturation of:

- 100mm for groundcover
- 300mm for shrubs
- 750mm for trees

ii. Fresh water only shall be used for the Works. Water shall be supplied to the Contractor from agreed points on the site. However, it will be only to necessary for the Contractor to supply his own means of transport from the watering points to the plant beds.

iii. An inspection of watering requirements is to be made by the Contractor at least two times a week in dry weather.

iv. Water shall be supplied using an approved hose or sprinkler so as not to cause compaction or wash-outs of the soil or loosening of plants. The Contractor shall immediately make good any such damage, soil erosion or outwash and plants loosened by erosion are to replanted or if damaged, replaced.

v. All plant beds are to be kept in a weed free condition with a weeding operation once a month. All weeds, stones and rubbish collected from this operation shall be removed from the site to a tip to be found by the Contractor. Herbicides may not be used on this site unless a specific application in writing is made by the Contractor with full back up data on the performance of the chemicals and the particular need for the chemicals use. Approval will in all cases be subject to the Landscape
Architect's decision.

vi. After weeding, at least once per month the soil surface is to be lightly broken up between plants using a pronged fork upto maximum depth of 100mm. Contractor shall Take care not to disturb the root systems of plants. After forking the soil loose, the mulch and loosened soil are to be raked to give an even re-distribution of the mulching materials

vii. Firming up and adjusting of stakes/ties shall be carried out monthly to ensure that the trees and shrubs are firmly held in the ground. If required guy ropes or tree pits shall be adjusted, tightened or loosened. If tree ties or ropes are rubbing the bark of the trees, the ties are to be taken off and retied. Any damaged branches are to be carefully pruned and the wounds sealed.

viii. All protective fencing is to be maintained and kept in good condition and in position until the end of the maintenance period.

ix. Trees shall be pruned if dead, rotten or crossed branches are present or to maintain a clear stem up to the specified height using the methods described below. Tree pruning is to be reviewed monthly.

x. All shrubs and ground covers are to be reviewed monthly and pruned as and when required during the Maintenance Period to promote bushy growth and good flowering characteristics. The shrubs shall be checked and all dead wood, broken, damaged or crossed branches shall be cut back, depending on species. Pruning and removal of branches is to be carried out using sharp clean implements to give a clean sloping cut with one flat face. Ragged edges of bark or wood are to be trimmed with a sharp knife.

xi. Pruning for all plants shall be carried out as follows:

- Pruning is to be done with the cut just above and sloping away from an outward facing health bud.

- Removal of branches is to be done by cutting flush with the adjoining stem and in such a way that no part of the stem is damaged or torn.

- Ragged edges of bark are to be trimmed with a sharp knife.

- Any cuts or wounds over 25mm diameter are to be painted with an approved sealant after trimmed.

- All pruning to be cleared up and removed from site after pruning.

xii. All hedges, mat forming herbaceous plants and ground cover plants shall be clipped with shears as often as necessary (at least monthly) to maintain a tidy appearance. Tall hedges are to be cut to forms shown on the drawings. Fertiliser is to be applied to clipped areas around 1-2 weeks after clipping.

xiii. Selective pruning of flowering plants shall be done where special flowering characteristics are required such as for Ixoras, Hibiscus, Allamanda where flowering takes places on twig ends. Heavy clipping must not be used for these species since this will remove future flower buds. Selective pruning by clipping non flowering twigs and leaving flowering twigs is necessary for these plants, and this operation must be done by experienced workers.

xiv. The Contractor shall allow for monthly fertiliser operations during the Maintenance Period. An approved slow release fertiliser shall be applied to each plant at the rate of 50gm per shrub and 200gm per tree, one month after planting and thereafter monthly. After spreading the fertiliser around the base of the plant the granules shall be lightly forked into the soil, and the plant well watered. Herbaceous and ground cover areas shall receive 25mm of approved soil conditioner, evenly spread and mixed with 50gm/m2 of approved slow release fertiliser, evenly spread over entire area and lightly forked into the soil to break up the top layer, and the area well watered on a month by month basis.

xv. The horticultural requirements of different plants or areas may involve variations to those techniques (such as the use of organic liquid fertilisers for sensitive plants) and variations in method will be authorised as required.

xvi. Heavy feeding plants such as Canna, Heliconia and Lantana shall be dressed with a 25mm mulch of approved organic compost or similar approved compost every 2 months, lightly forked in around the base of the plants.

xvii. Additional mulching layer, 25mm deep to be spread and forked in over all planted areas at 3 monthly intervals.

xviii. The Contractor shall make regular weekly checks to ensure that the plant material is insect and pest and fungus free. No pesticides may be used unless approval from the Landscape Architect is given from the Contractor stating the chemical intended for use; concentration, spraying programme and including full technical details of the product.

6.3. Maintenance of Lawn Areas

i. The Contractor shall mow all lawn areas using approved cutting equipment to maintain a close sward to a height of not less than 20mm and not more than 30mm for all grass types.

ii. Mowing shall be carried out generally weekly, except in dry weather and grass shall not be allowed to flower between cuts.

iii. Weekly inspections are to be made to ensure adequate planning of grass cuts to suit growth and weather conditions. All clippings to be gathered up and removed from site.

iv. All grass areas are to be watered by means of sprinklers during dry weather as often as is required to keep the grass green and the soil moist.

v. The Contractor shall provide hoses and sprinklers for use from water points provided. Weekly inspections are to be made to determine the need for water and, in dry weather watering must be done to moisten the soil to a depth of 100mm.

vi. Fertiliser of NPK value 10-15-15 or similar approved be spread at a rate of 40gm/sq m over all grass areas at monthly intervals, using approved spreading equipment to give an overall even spread. Grass areas that have been fertilised shall be watered if no rain falls within 24 hours.

vii. The Contractor shall apply top-dressing of not more than 15mm depth fine sand and granulated compost raked and spread evenly over the lawn areas. The next top-dressing shall be applied only after the grass has grown through to a mowable height.

viii. There shall be at least two applications of topdressing during the maintenance period, to be directed by the Landscape Architect appointed by Contractor.

ix. If depressions or bumps over 25mm deep or high in turf areas during the maintenance period these are to be levelled out by lifting the turf and raising the soil level with sand/compost mix or trimming to level grades, followed by re-turfing.

x. Grass areas are to be kept free of weeds, annual grasses, fungus and insect attack and free of stones or other debris throughout the maintenance period as often as is required.

xi. All chemicals used shall be to the approval of the Employer/Employer's representative. Assessment of these operations is to be prepared on the basis of the weekly maintenance inspection chart.

xii. If compaction or consolidation takes place or hard passing or baking of the soil occurs, the soil areas are to be well watered first and lightly loosened by mechanical means such as spiking, slitting or hollow tinning using equipment approved by the Employer/Employer's representative.

6.4. Replacement Planting

i. If during the course of the Maintenance Period trees or shrubs or other plants die because of a fault by the Contractor, the Contractor shall replace the plant at no cost to the Employer.

ii. All questions related to responsibility for the replacement planting will be subject to site inspection and agreement of the appointment of responsibility.

iii. This will be done very month at the monthly maintenance inspections.

6.5. Final Handover

i. Two weeks before the end of the Maintenance Period a joint inspection shall be held with the Maintenance Agency, Contractor and the Employer/Employer's representative review the requirements for alteration or replacement in order to gain approval for Final Handover.

ii. In order to ensure satisfactory handover procedures, the site meetings held each month between the Contractor and Employer/Employer's Representative will be used to inspect and approve the maintenance works which will be reviewed to ensure adequate work has been done.

iii. At the time of the final inspection, all areas under this contract shall be free of weeds, neatly cultivated and raked, and all plant boxes in good order.

iv. Grass shall be neatly cut and all clippings removed. No bare patches of earth shall be visible in turf or planting areas unless specified (that is rings around tree trunks).

v. If, after this inspection, the Employer/Employer's representative is of the opinion that all work has been performed in accordance with the drawings and specifications, the Employer/Employer's representative will give written letter of acceptance and completion of the project.

vi. If, all or certain portions of the work are not acceptable under the terms and intent of the drawings and specifications, the formal maintenance period for all the work shall be extended at no cost to the Employer/Employer's representative until the defects in the work have been corrected and the work is accepted by the Employer/Employer's representative.

TERMINOLOGY:

Avenue	A wide road or pathway lined with trees on either sides.
Buffer	The use of landscape to curtail view, sound or dust with plants or earth beams, wall or any such element.
Climber (Creeper / Vine)	A non-supporting plant, woody or herbaceous, which clings to a wall, trellis or other structures as it grows upward.
Columnar	A slender, upright plant form.
Contour	The form of the land, existing or proposed; a part of the topography, indicated by map lines at intervals as desired, to understand the landform clearly. The contour line though imaginary, indicates continuous elevation above mean sea level or an assumed datum line.
Contour Interval	The difference in elevation or the vertical distance measured between consecutive contour lines.
Egress	A way out or exit.
Elevation	A contour line or notation of relative altitude, useful in plotting existing or proposed feature.
Exotic	A plant that is not native to the area in which it is planted.
Fencing	A barrier of plant or construction material used to set off the boundary of an area and to restrict visual or physical passage in or out of it.

	Foliage	The collective leaves of a plant or plants.
	Geo-textile	Any permeable textile (natural or synthetic) used with foundation, soil, rock, earth or any other geotechnical engineering-related material as an integral part of a human made project, structure or system.
	Grade	The slope or lay of the land as indicated by a related series of elevations.
	Natural Grade	Grade consisting of contours of unmodified natural landform.
	Finished Grade	Grade accomplished after landscape features are installed and completed as shown on plan as proposed contours.
	Gradient	The degree or slope or a pipe invert or road or land surface. The gradient is a measure of the slope height as related to its base. The slope is expressed in terms of percentage or ratio.
	Grading	The cutting and / or filling of earth to establish smooth finish contours for a landscape construction project. Grading facilitates good drainage and

		sculpts land to suit the intent of landscape design.
	Grasses	Plants that characteristically have joint stems, sheaths and narrow blades (leaves).
	Groundcover	The planting material that forms a carpet of low

		height; these low-growing plants are usually installed as the final part of landscape construction.
	Hard Landscape	Civil work component of landscape architecture such as pavement, walkways, roads, retaining walls, sculpture, street amenities, fountains and other built environment.
	Hard Plant	Plants that can withstand harsh temperature variations, pollution, dust, extreme soil conditions and minimal water requirements and the likes. These plants have ability to remain dormant in such conditions and survive
	Hedge	Number of shrubs or trees (often similar species) planted closely together in a line. A hedge may be pruned to shape or allowed to grow to assume its natural shape.
	Herb	An annual plant with a non-woody or fleshy structure. Certain herbs are highly useful for cooking or of high medicinal value.
	Ingress	A way in, or entrance.
	Invert	The low inside point of a pipe, culvert, or channel.
	Kerb	A concrete or stone edging along a pathway or road often constructed with a channel to guide the flow of storm water and thereby serving dual purpose.
	Mound	A small hill or bank of earth, developed as a characteristic feature in landscape.
	Native	A plant indigenous to a particular locale.
	Screen	A vegetative or constructed hedge or fence used to block wind, undesirable views, noise, glare and the like, as part of in landscape design; also know as ‘screen planting’ and ‘buffer plantation’.
	Sediment	The product of erosion processes; the solid material, both mineral and organic, that is in

		suspension, is being transported or has been moved from its site of origin by air, water, gravity or ice.
	Shrub	A woody plant of low to medium height, deciduous or evergreen, generally having many stems.
	Soft Landscape	The natural elements in landscape design, such as plant materials and the soil itself.
	Spot Elevation	In surveying and contour layout, an existing or proposed elevation noted as a dot on the plan.
	Street / Outdoor Furniture	Items of furnishing in outdoor landscape
	Swale	A linear wide and shallow depression used to temporarily store, route or filter runoff. A swale may be grassed or lined.
	Topsoil	The uppermost layer of the soil.
	Transplanting	Moving a plant from its place of origin to another location.
	Tree	A woody plant, generally taller than 2.00 m, with a well-distinguished trunk or trunks below the leaf crown.
	Deciduous Tree	Tree that sheds all its leaves in autumn or in dry season.
	Evergreen Tree	Tree that remains green for most part of the year

		and sheds leave slowly throughout the year.
	Tree Grate	A metal grille, installed at the base of a tree otherwise surrounded by pavement that allows the free passage of air, water and nutrients to the tree root, but does not interfere with the foot traffic.
	Tree / Plant Guard	The protection constructed around a tree to deter vandalism and helps to prevent damage. It could be made of metal, bamboo or concrete or the like.

Chapter - 3

HARDSCAPE WORKS AND GARDEN FURNITURE'S

1.0 SCOPE

The scope of services covers all operations and services including, labour, equipment, services and transport for all materials, etc. completing the entire work within the scheduled time, maintaining the entire hardscaping work for one year after virtual completion of the work.

The Contractor shall refer to Specifications provided in this document for relating to formation levels, sub-bases, concrete footings, foundations and all associated works. The specifications are to be read along with necessary specifications from other consultants.

Vendors' shop drawings shall be submitted for all such items where the Contractor will procure and install items from/by a reputed vendor. Execution of all such items shall be done after such drawings are approved by the Employer/ Employer's representative.

Contractor shall prepare and issue all required working drawings and get them approved by Employer/ Employer's representative with required number of revisions till the details provided do not satisfy the Employer/ Employer's representative.

The scope includes maintenance of all above for -- Years from the date of end Defects Liability Period (DLP). DLP shall be of one year after completion of Landscape Execution. The Contractor will maintain the entire landscape development area free of cost for a period of one year after completion of all above works as certified by the Employer/ Employer's Representative's in consultation with the Landscape Architect

2.0 SPECIAL CONDITION

The Contractor will have to provide the following items at no extra cost to Employer:

The Contractor will supply and install 3.0 metres high barricades for safeguarding landscape development area and works, as indicated in the drawing. He may also install the barricades in the landscape development area according to his own understanding if he feels that any part of the landscape area is bound to be damaged for any reason, after taking prior permission from the Employer/ Employer's Representative.

From the commencement of the works until the Certificate of virtual Completion has been issued by the Employer/Employer's representative, the Main contractors specialists subcontractors shall, in respect of all areas of soft landscape works, adjacent areas and parts of the site used by him, be responsible as follows:

- For any damage to existing works and features and any necessary rectification work required to obtain approval from Employer/Employer's Representative.
- For keeping all paved surfaces used by him in a clean and tidy condition.

For periodic removal of all surplus excavations and waste matter produced by his operations to a Local Authority registered tip off site, to be found by the Main contractors specialists subcontractors.

. Work by Machine or Hand

i. All operations herein described shall be carried out by suitable approved machines or by hand.

ii. Any work around the base of existing trees, in confined spaces or which is impractical to carry out by machine for any reason shall executed by hand and the contractor shall include for this in his rates.

a. Substitutions

i. Notices of substitutions are to be made sufficiently for in advance of installation to ensure that the substituted material conforms to specifications. Substitutions requested by the Main contractor's specialist subcontractor after work has started on site will not be entertained.

b. Setting Out

i. The Contractor shall be responsible for accurately setting out all the works prior to the commencement of the works and shall rectify errors in setting out at his own expense.

ii. Any discrepancy in site area between that shown on the drawings by Landscape Architect appointed by contractor and the actual area on the ground shall be notified to the Employer/ Employer's representative.

iii. The Contractor shall supply all necessary materials, equipment and labour to enable the Landscape Architect to check the setting out, levels and dimensions on the site along with the Employer/ Employer's representative.

c. Tools and Equipment

i. The Contractor shall use proper tools and equipment for the carrying out of the works and is to ensure that the work force is fully and properly equipped with the correct equipment and experience for the job at hand.

d. Submittals

i. The Contractor shall submit for review drawings by Landscape Architect appointed by contractor completely dimensioned, indicating any pattern layouts, special installation procedure, cutting, fitting, sinking and adjacent equipment materials for coordination.

ii. The Contractor shall submit samples of all materials and samples of workmanship for approval by Employer/Employer's representative.

iii. The Contractor shall be responsible for producing and submitting for comment and approval to the Employer/Employer's representative the shop drawings and samples of all elements indicated in this section. All should be based on the drawings provided by Landscape Architect appointed by contractor. All submissions should be reviewed, approved and endorsed by the Contractor.

f. Handling, Storage And Delivery

i. The Contractor shall:

- Coordinate delivery with suppliers, to minimize handling.
- Handle and store equipment and materials in such a manner that no damage will be done to the materials or the work of other trades.
- Store packaged materials, undamaged in their original wrappings, or containers with manufacturer's labels and seals intact.
- Stack equipment and materials on wooden platforms at least 150mm clear of the ground and protect with weatherproof covers.
- Damaged equipment, material or works will be rejected by the Employer/Employer's representative whether built-in or not.
- For equipment, materials and work, covering shall be of suitable material containing nothing that may injure or stain the materials.

g. Protection of Work

i. The Contractor shall protect all equipment, materials and completed work from damage until final completion of the work.

ii. The Contractor shall remove and replace damaged work at no extra cost.

h. Reference Standards

i. The Contractor shall comply with all relevant Indian Standards, ASTM, British Standard Code of Practice, Draft BS or DIN Standard applicable to elements indicated in this section, the recommendations and requirements of such documents shall be considered a minimum standard of such work described and must be complied with.

ii. Nothing shall relieve the Contractor of his responsibility for providing a higher standard than the relevant Code or Standard where it is required to comply with other sections of the Specification.

Project : Proposed Under Ground Parking On Patwardhan Park, Plot Bearing C.T.S No. 381a&381b Of Village Bandra, At Linking Road, Bandra West, H/W Ward, Mumbai.:

TECHNICAL SPECIFICATIONS OF VARIOUS COMPONENTS OF LANDSCAPE IRRIGATION SYSTEM & SUBSURFACE DRAINAGE SYSTEM

1. **Agricultural grade PVC pipes** confirming to IS 4985 solvent welded. Minimum pressure rating – 6 kg / cm_2 Make – Finolex / Jain / Supreme

2. **PVC Fittings** – Heavy duty PVC moulded fittings confirming to IS 7834 & IS 554 Minimum pressure rating - 10 kg / cm_2 Make – Finolex / Jain / Supreme

3. **Inline Polytube** – High performance polyethylene inline polytube confirming to IS 13488 Minimum pressure rating – class III – 2.5 kg / cm_2 Make – Finolex / Jain / Netafim

4. **Drip Polytube** – Drip Lateral Polytube manufactured from Virgin LLDPE confirming to IS - 12786 Minimum pressure rating – class II – 2.5 kg / cm_2, Make – Finolex / Jain / Netafim

5. **Emitters / Drippers** – Emitters manufactured from Virgin Plastic confirming to IS – 3487 should have turbulent flow path with wide cross sectional area. UV stable and openable. Make – Finolex / Jain / Netafim

6. **Poly Fittings** – Barbed poly fittings manufactured from reinforced PPCP Minimum pressure rating – 4 kg / cm_2 Make – Finolex / Jain / Netafim

7. **PVC Control Valves** – PVC ball valves with compact double union manufactured from high performance rigid PVC compound Minimum pressure rating – 10 kg / cm_2 Make – Plasson / Jain / Netafim

8. **Disc Clean Filters** – Screen filters manufactured from high quality steel confirming to IS – 12785 with powder coating with effective filtration of 75 microns. Minimum pressure rating – 10 kg / cm2 Make – Amiad / Azud

9. **Valve Box** – Valve boxes manufactured from Rigid Reinforced Plastic , Heavy duty confirming to SASO standards Make – Jain / Rainbird

10. **Rotors** – Gear driven pop up sprinklers light commercial models for radius from 8 mtrs. to 20 mtrs. Made from high quality virgin engineering plastic with concealed gear mechanism with adjustable angle and reversing mechanism. Low and high angle nozzles, riser height of 4” & check valve, rubber cover seal. Models recommended
    Hunter – PGP Ultra, I-25
    K – Rain - Minipro, RPS, Pro Sports

Architect Hafeez Contractor.
Green Space Alliance Landscape Consultant.

Rain Bird- 5004, Falcon
Make – Hunter / K – Rain / Rain Bird

11. **Sprays - Spray** pop up sprinklers from 1.5 mtrs. to 5 mtrs. radius made from high quality virgin engineering plastic with VAN – adjustable angle nozzle & check valve. Models recommended from
Hunter – PS and MP Rotator
K – Rain - HP
Rain Bird- Unispray and Rotory Nozzle

12. **Swing Joints –** Swing joints made from high quality virgin engineering plastic with two fixed elbows and two swivel elbows with leak tight joints and polyethylene connecting tube. Minimum pressure rating – 6 kg / cm_2 Make – Hunter / Rain Bird / Harit

13. **Quick Coupling Valves –** Quick coupling valves made from brass. Auto designing lid made from rubber, single piece construction, stainless steel spring, brass valve, brass key with handles. Make – Hunter / Rain Bird / Harit

Specification For Workmanship For Various Items In Landscape Irrigation System

1. **For joining of PVC Pipes (Agricultural Grade)**
   a) Use special grade solvent cement for joining.
   b) Pipe cutting should be perfectly perpendicular.
   c) Main Line should be at least 1 ½' and Sub main should 1' below finish soil level.
   d) All fittings should be heavy duty, 10 kg./cm_2 rating.
   e) While joining any fittings, pipe alignment should be straight so that there is no stress on fittings later.
   f) Excess solvent used should be wiped out immediately otherwise it damages the pipe.
   g) Keep the joint for 3 hours for setting and only then it can be pressure tested.

2. **Installing Popup Sprinklers**
   a) All popups should be necessarily installed on swing joint or shrub riser assembly.
   b) The connection between popup and swing joint / shrub riser is threaded which should be wrapped with sufficient Teflon tape. No glue should be used for connecting popup sprinkler.
   c) As far as possible the position of popup sprinkler should be perfectly vertical. It should not be inclined.

d) The top of the popup should be level with finish soil level.

e) The angle setting and deflector setting of popup must be in accordance with the guidelines of the manufacturer. Any mishandling of settings will damage the gear assembly of popups.

f) The selection of nozzle must be in accordance with the design.

g) The swing joint threading's should be just tight enough not to allow any leakage.

h) The service saddle mounted on pipe for popup connection must be perfectly vertical.

i) Drill a hole in service saddle outlet same as the size of outlet and not more.

j) Make sure that `O` ring seals the service saddle outlet completely to make it leak proof.

k) Service saddle should be tightened just enough to make it leak proof but not more to damage the pipe.

l) Make sure that service saddle is not under stress after installation.

m) Use P P saddles / metal saddles.

n) Use popup shields with sand filled to allow drainage of leaked water and protect popup.

3. Installing Lateral Poly tubes / Inline Poly tubes

a) Use hose nipple connection to join lateral / inline with submain line.

b) Only barbed fittings will be inadequate.

c) Make sure that lateral laid is not under stress.

d) While laying the lateral the initial twist given to lateral during machine winding has to be removed.

e) Align the lateral properly and make sure that it serves the area it requires to irrigate.

f) Use lateral ends with heavy duty 8 shape end stops only.

4. Installing Control Valves.

a) All fittings used for installing control valves must be heavy duty, 10 kg. /cm_2 rating.

b) Alignment of inlet pipe and outlet pipe must be perfectly straight which otherwise leads to leakage or failure of valve function.

c) All valves should have sufficient reaction through proper support on both sides of valve.

d) All valves should be located near approachable area so that valve operation can be done easily.

e) All threaded ends of fittings / valves should be wrapped with Teflon tape.

f) There should be sufficient protection to valve by using readymade valve chambers or by constructed valve chambers.

5. Installing Filter Station.

a) Filter station (Sand Filter and Disc / Screen Filter) must have sufficient filter foundation to accommodate both filters properly. It should be 0.3 mtr above ground.

b) As far as possible alignment of pump outlet and filter inlet should be straight.

c) All threaded ends should be wrapped with Teflon tape.

d) The inlet and outlet of filters must have either flanged or union connection so that it can be easily dismantled.

e) All fittings used must be heavy duty of at least 10 kg. /cm_2 pressure rating.

f) Back wash water should not be recycled back in the system.

g) Maintain sand level in the filter to the specified mark.

h) Make sure that there is sufficient working space all around the filter station.

i) All pressure gauges should be easily visible.

j) The quality of workmanship must be good enough to give an attractive look for the filter station and must be easy for maintenance.

6. Installing Quick Couple Outlets

a) Use only metal service saddles for giving quick couple outlet connections.

b) Use only brass QRC outlets.

c) Location of QRC outlet should be easily approachable.

d) Use swievel elbows for QRC keys.

e) Distance between two QRC outlets should not be more than 50 meters.

f) Use valve chambers to protect QRC outlets.

g) All QRC outlets must be below finished soil level.

h) Use only metal fittings in QRC outlet.

7. Installing Valve Box.

a) Use only heavy duty HDPE Valve Boxes.

b) Top of valve box must be level with top of finish soil level.

c) Valve box must be properly supported on bricks at bottom.

d) Make sure that valve is placed exactly in the centre of valve box.

e) The size of valve box should be sufficient enough to give working space between valve & valve box.

8. Installing Drippers

a) Use proper lateral punch to make hole in lateral.

b) Use barbed connector to make connection in lateral.

c) Use 6 mm extension tube to connect dripper with lateral.

d) Placement of dripper should be according to the design to irrigate the tree.

9. General Notes For Installation

a) Use hacksaw frame for cutting the pipes.

b) Use suitable spanners, pipe plyers for installation.

c) Use fine polish paper on PVC pipes before applying jointing material.

d) Use brush to apply jointing material.

e) Use hand gloves for handling jointing material.

f) Proper drilling tools and other tools should be used while installation.
The quality of workmanship should be good enough

Irrigation Works:
The works include the supply, installation and testing of the entire irrigation systems.

1. Drawings and Technical Documents

All the drawings shall be prepared on computer through AutoCAD Program.
Drawings shall include layouts for pump room drawings showing exact location of Filters and valves.
These drawings shall contain all information required to complete the Design and Execute the Works and shall contain details of construction, size, arrangement, operating, performance characteristics and capacity of all items of equipment, also the details of all related items of work.
Each item of equipment/material proposed shall be a standard catalogue product of an established manufacturer from the list of approved makes or reviewed without objection by Employer's Engineer.

2. Technical Data and Proposed Equipment

All the technical data and proposed equipment included in this document are estimates only and these shall be assessed and validated by the Firm, before the start of work.

Design Criteria

1. Scope of Work:

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

- Design details & drawing of Irrigation system.
- Supply, installation and commissioning of the irrigation system
- Supply, installation and commissioning of all items included in the scope of works as described below (but not limited to):

✓ Pumping station and ancillaries
✓ Filtration unit
✓ All piping, valves and associated fittings
✓ Sprinklers
✓ Drip system

✓ Irrigation controller
✓ All wiring and associated fittings.

- The detailed drawings and documents shall be prepared covering the all items

✓ Key plan in scale 1:750
✓ Layout plans showing all components at suitable scale.

- Training to the Operation and Maintenance staff for period of one month.
- Operation and Maintenance of Irrigation system till the issue of Completion Certificate.

Design Data:

The Design data as given below,

- Preliminary irrigation system design drawing.

The system will be controlled by Electromechanical Controller.

- Water Source: Location as shown on drawing
- Pump: Hydro pneumatic pump
- Pumping hours: Max 5 hours.
- Sprinkler type: Commercial/Institutional Sprinkler
- Automation: Decoder Based Automatic irrigation system

Project : Proposed Under Ground Parking On Patwardhan Park, Plot Bearing C.T.S No. 381a&381b Of Village Bandra, At Linking Road, Bandra West, H/W Ward, Mumbai.:

Design Intent:

- The design intent of this irrigation system is to uniform water to green area.

4.4 Water Quality:
The water supply shall be filtered through Sand and Screen filter.
4.6 Water Pumping Station & Distribution
Water pumping station shall be provided adjacent main water Source consisting of following: The floor area required is to be mentioned by the vendor along with a layout.
a. Filtration system – Automatic Auto backwash filter
b. Pumps including standby for irrigation network

Water supply pipes emanating from Main pumping station shall run underground in the trench along with communication for automation.

Project : Proposed Under Ground Parking On Patwardhan Park, Plot Bearing C.T.S No. 381a&381b Of Village Bandra, At Linking Road, Bandra West, H/W Ward, Mumbai.:

TECHNICAL SPECIFICATIONS OF VARIOUS COMPONENTS OF LANDSCAPE IRRIGATION SYSTEM & SUBSURFACE DRAINAGE SYSTEM

14. **Agricultural grade PVC pipes** confirming to IS 4985 solvent welded. Minimum pressure rating – 6 kg / cm_2 Make – Finolex / Jain / Supreme

15. **PVC Fittings** – Heavy duty PVC moulded fittings confirming to IS 7834 & IS 554 Minimum pressure rating - 10 kg / cm_2 Make – Finolex / Jain / Supreme

16. **Inline Polytube** – High performance polyethylene inline polytube confirming to IS 13488 Minimum pressure rating – class III – 2.5 kg / cm_2 Make – Finolex / Jain / Netafim

17. **Drip Polytube** – Drip Lateral Polytube manufactured from Virgin LLDPE confirming to IS - 12786 Minimum pressure rating – class II – 2.5 kg / cm_2, Make – Finolex / Jain / Netafim

18. **Emitters / Drippers** – Emitters manufactured from Virgin Plastic confirming to IS – 3487 should have turbulent flow path with wide cross sectional area. UV stable and openable. Make – Finolex / Jain / Netafim

19. **Poly Fittings** – Barbed poly fittings manufactured from reinforced PPCP Minimum pressure rating – 4 kg / cm_2 Make – Finolex / Jain / Netafim

20. **PVC Control Valves** – PVC ball valves with compact double union manufactured from high performance rigid PVC compound Minimum pressure rating – 10 kg / cm_2 Make – Plasson / Jain / Netafim

21. **Disc Clean Filters** – Screen filters manufactured from high quality steel confirming to IS – 12785 with powder coating with effective filtration of 75 microns. Minimum pressure rating – 10 kg / cm2 Make – Amiad / Azud

22. **Valve Box** – Valve boxes manufactured from Rigid Reinforced Plastic , Heavy duty confirming to SASO standards Make – Jain / Rainbird

23. **Rotors** – Gear driven pop up sprinklers light commercial models for radius from 8 mtrs. to 20 mtrs. Made from high quality virgin engineering plastic with concealed gear mechanism with adjustable angle and reversing mechanism. Low and high angle nozzles, riser height of 4” & check valve, rubber cover seal. Models recommended
    Hunter – PGP Ultra, I-25
    K – Rain - Minipro, RPS, Pro Sports

Rain Bird- 5004, Falcon
Make – Hunter / K – Rain / Rain Bird

24. **Sprays - Spray** pop up sprinklers from 1.5 mtrs. to 5 mtrs. radius made from high quality virgin engineering plastic with VAN – adjustable angle nozzle & check valve. Models recommended from
Hunter – PS and MP Rotator
K – Rain - HP
Rain Bird- Unispray and Rotory Nozzle

25. **Swing Joints –** Swing joints made from high quality virgin engineering plastic with two fixed elbows and two swivel elbows with leak tight joints and polyethylene connecting tube. Minimum pressure rating – 6 kg / cm_2 Make – Hunter / Rain Bird / Harit

26. **Quick Coupling Valves –** Quick coupling valves made from brass. Auto designing lid made from rubber, single piece construction, stainless steel spring, brass valve, brass key with handles. Make – Hunter / Rain Bird / Harit

Specification For Workmanship For Various Items In Landscape Irrigation System

10. **For joining of PVC Pipes (Agricultural Grade)**
a) Use special grade solvent cement for joining.
b) Pipe cutting should be perfectly perpendicular.
c) Main Line should be at least 1 ½' and Sub main should 1' below finish soil level.
d) All fittings should be heavy duty, 10 kg./cm_2 rating.
e) While joining any fittings, pipe alignment should be straight so that there is no stress on fittings later.
f) Excess solvent used should be wiped out immediately otherwise it damages the pipe.
g) Keep the joint for 3 hours for setting and only then it can be pressure tested.

11. **Installing Popup Sprinklers**
a) All popups should be necessarily installed on swing joint or shrub riser assembly.
b) The connection between popup and swing joint / shrub riser is threaded which should be wrapped with sufficient Teflon tape. No glue should be used for connecting popup sprinkler.
c) As far as possible the position of popup sprinkler should be perfectly vertical. It should not be inclined.

d) The top of the popup should be level with finish soil level.

e) The angle setting and deflector setting of popup must be in accordance with the guidelines of the manufacturer. Any mishandling of settings will damage the gear assembly of popups.

f) The selection of nozzle must be in accordance with the design.

g) The swing joint threading's should be just tight enough not to allow any leakage.

h) The service saddle mounted on pipe for popup connection must be perfectly vertical.

i) Drill a hole in service saddle outlet same as the size of outlet and not more.

j) Make sure that `O` ring seals the service saddle outlet completely to make it leak proof.

k) Service saddle should be tightened just enough to make it leak proof but not more to damage the pipe.

l) Make sure that service saddle is not under stress after installation.

m) Use P P saddles / metal saddles.

n) Use popup shields with sand filled to allow drainage of leaked water and protect popup.

12. Installing Lateral Poly tubes / Inline Poly tubes

a) Use hose nipple connection to join lateral / inline with submain line.

b) Only barbed fittings will be inadequate.

c) Make sure that lateral laid is not under stress.

d) While laying the lateral the initial twist given to lateral during machine winding has to be removed.

e) Align the lateral properly and make sure that it serves the area it requires to irrigate.

f) Use lateral ends with heavy duty 8 shape end stops only.

13. Installing Control Valves.

a) All fittings used for installing control valves must be heavy duty, 10 kg. /cm_2 rating.

b) Alignment of inlet pipe and outlet pipe must be perfectly straight which otherwise leads to leakage or failure of valve function.

c) All valves should have sufficient reaction through proper support on both sides of valve.

d) All valves should be located near approachable area so that valve operation can be done easily.

e) All threaded ends of fittings / valves should be wrapped with Teflon tape.

f) There should be sufficient protection to valve by using readymade valve chambers or by constructed valve chambers.

14. Installing Filter Station.

a) Filter station (Sand Filter and Disc / Screen Filter) must have sufficient filter foundation to accommodate both filters properly. It should be 0.3 mtr above ground.

b) As far as possible alignment of pump outlet and filter inlet should be straight.

c) All threaded ends should be wrapped with Teflon tape.

d) The inlet and outlet of filters must have either flanged or union connection so that it can be easily dismantled.

e) All fittings used must be heavy duty of at least 10 kg. /cm_2 pressure rating.

f) Back wash water should not be recycled back in the system.

g) Maintain sand level in the filter to the specified mark.

h) Make sure that there is sufficient working space all around the filter station.

i) All pressure gauges should be easily visible.

j) The quality of workmanship must be good enough to give an attractive look for the filter station and must be easy for maintenance.

15. Installing Quick Couple Outlets

a) Use only metal service saddles for giving quick couple outlet connections.

b) Use only brass QRC outlets.

c) Location of QRC outlet should be easily approachable.

d) Use swievel elbows for QRC keys.

e) Distance between two QRC outlets should not be more than 50 meters.

f) Use valve chambers to protect QRC outlets.

g) All QRC outlets must be below finished soil level.

h) Use only metal fittings in QRC outlet.

16. Installing Valve Box.

a) Use only heavy duty HDPE Valve Boxes.

b) Top of valve box must be level with top of finish soil level.

c) Valve box must be properly supported on bricks at bottom.

d) Make sure that valve is placed exactly in the centre of valve box.

e) The size of valve box should be sufficient enough to give working space between valve & valve box.

17. Installing Drippers

a) Use proper lateral punch to make hole in lateral.

b) Use barbed connector to make connection in lateral.

c) Use 6 mm extension tube to connect dripper with lateral.

d) Placement of dripper should be according to the design to irrigate the tree.

18. General Notes For Installation

a) Use hacksaw frame for cutting the pipes.

b) Use suitable spanners, pipe plyers for installation.

c) Use fine polish paper on PVC pipes before applying jointing material.

d) Use brush to apply jointing material.

e) Use hand gloves for handling jointing material.

f) Proper drilling tools and other tools should be used while installation.

The quality of workmanship should be good enough

Irrigation Works:

The works include the supply, installation and testing of the entire irrigation systems.

2. Drawings and Technical Documents

All the drawings shall be prepared on computer through AutoCAD Program.

Drawings shall include layouts for pump room drawings showing exact location of Filters and valves.

These drawings shall contain all information required to complete the Design and Execute the Works and shall contain details of construction, size, arrangement, operating, performance characteristics and capacity of all items of equipment, also the details of all related items of work.

Each item of equipment/material proposed shall be a standard catalogue product of an established manufacturer from the list of approved makes or reviewed without objection by Employer's Engineer.

2. Technical Data and Proposed Equipment

All the technical data and proposed equipment included in this document are estimates only and these shall be assessed and validated by the Firm, before the start of work.

Design Criteria

2. Scope of Work:

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

- Design details & drawing of Irrigation system.
- Supply, installation and commissioning of the irrigation system
- Supply, installation and commissioning of all items included in the scope of works as described below (but not limited to):

✓ Pumping station and ancillaries
✓ Filtration unit
✓ All piping, valves and associated fittings
✓ Sprinklers
✓ Drip system

✓ Irrigation controller
✓ All wiring and associated fittings.

- The detailed drawings and documents shall be prepared covering the all items

✓ Key plan in scale 1:750
✓ Layout plans showing all components at suitable scale.

- Training to the Operation and Maintenance staff for period of one month.
- Operation and Maintenance of Irrigation system till the issue of Completion Certificate.

Design Data:

The Design data as given below,

- Preliminary irrigation system design drawing.

The system will be controlled by Electromechanical Controller.

- Water Source: Location as shown on drawing
- Pump: Hydro pneumatic pump
- Pumping hours: Max 5 hours.
- Sprinkler type: Commercial/Institutional Sprinkler
- Automation: Decoder Based Automatic irrigation system

Project : Proposed Under Ground Parking On Patwardhan Park, Plot Bearing C.T.S No. 381a&381b Of Village Bandra, At Linking Road, Bandra West, H/W Ward, Mumbai.:

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Water pumping station shall be provided adjacent main water Source consisting of following: The floor area required is to be mentioned by the vendor along with a layout.
a. Filtration system – Automatic Auto backwash filter
b. Pumps including standby for irrigation network

Water supply pipes emanating from Main pumping station shall run underground in the trench along with communication

Note: Incase of discrepancies between MCGM specifications and above mentioned specifications, the final decision will be taken by MCGM Engineer In-charge.

Architect Hafeez Contractor.
Green Space Alliance Landscape Consultant.

Project : Proposed Under Ground Parking On Patwardhan Park, Plot Bearing C.T.S No. 381a&381b Of Village Bandra, At Linking Road, Bandra West, H/W Ward, Mumbai.:

TECHNICAL SPECIFICATIONS
FOR
LANDSCAPE CIVIL WORK

1. GENERAL

1.1 All the specifications for the civil works shall conform to the latest Indian Standard Codes of practice unless otherwise specified for local material.

1.2 Any reference to Indian Standard Code of practice shall mean the latest version of the relevant standard in use during the period of contract. For items common to different sections, reference to Indian Standard Code of Practice in one section, will mean, it is applicable to the same item in other sections as well.

1.3 Where no mode of measurements is given in the specification, the mode of measurement shall be in accordance with the latest Indian Standard Code of practice for method of measurement of building works.

1.4 Proprietary names shall also mean material of similar manufacture and equivalent standard.

1.5 All the work shall be carried out in a workman like manner to the entire satisfaction of the Owner. The work shall be guaranteed in quality of material and workmanship.

1.6 Variations in the specifications shall not be permitted unless they are agreed to by the Owner in writing as more suited to the trade under reference and/or economical.

1.7 In all cases, the work shall be executed in strict accordance with the contractor's accepted tender and the specification attached thereto and with such drawings, specifications, quantities and orders, as may be from to time issued by the Architect.

1.8 In case the contract is only for the supply of materials, the materials shall be of such quality as may be specified in the contract and the specifications attached thereto and shall be delivered in such quantities at such places and at such times as may be laid down therein. They shall also be neatly stacked and arranged in such a manner as may be ordered by the Owner or his authorised representative.

1.9 All types of works containing use of cement shall be cured by keeping them moist for a minimum period of 7 days, unless otherwise specified in the relevant specifications for works.

1.10 In absence of any specifications not available for any material or workmanship, the National Code of practice shall be followed in consultation with the Architect.

Project : Proposed Under Ground Parking On Patwardhan Park, Plot Bearing C.T.S No. 381a&381b Of Village Bandra, At Linking Road, Bandra West, H/W Ward, Mumbai.:

1. Cement tiles, Pavers and Shot blasted tiles etc :-

1.1 Applicable Codes

The following Indian Standard Codes, unless otherwise specified herein, shall be applicable. In all cases, the latest editions including all applicable official amendments and revisions shall be referred to :-

IS 1237 - Code of practice for Cement Concrete Tiles - Normal Duty and Heavy Duty for Interiors
IS 13801 - Code of practice for Cement Concrete Tiles – Normal Duty and Heavy Duty for Exteriors
IS 120 - Mode of measurement

All other relevant codes for all related items as per general technical specifications will also be applicable as suitable.

1.2 General :

Tiles and pavers are made with plasticized concrete & with low water cement ratio, on automatic rotary press and machine polished. Interlocking pavers with high quality finish shall have a minimum compressive strength of 300 kg/cm2 and above up to 500 kg/cm2. The tiles may be used in various up to 500 mm x 500 mm and pavers in thickness up to 100mm in sizes. The sizes used shall be as shall be conforming to relevant IS specification. Sample of tile shall be shown & got approved by the PMC or Landscape Architect before procuring materials.

The tiles and pavers shall be classified as for Interior use and Exterior use based on the quality, finish and compressive strength. The tiles/pavers may be smooth finished, shot blasted finish with acrylic coating or exposed aggregate finish with coating as required/directed.

1.3 Quality :
The tiles & pavers shall be of approved quality, size, and thickness and of approved color.

a). Cement tiles shall have the following qualities- Percentage of water absorption of not over 10%.Wet traverse strength of not less than 3N/mm2. Average wear in thickness not more than 3.5mm.Variation wear in size (length and breadth) less than 1 mm Thickness of wearing layer not less than 5 mm. Variation in thickness of tiles not more than 3 mm Concavity or convexity not to exceed 1 mm

b). Paver blocks shall have the following qualities -Variation in length of any side not to exceed 2% Thickness of block not to vary more than 5 mm Wearing layer to be minimum of 3 mm Concavity or convexity not to exceed 1 mm Minimum average compressive strength of 250 kg/cm2 percentage of water absorption of not over 10%. Abrasion not to exceed 3.5 mm

1.4 Laying

a). Pavers :

Sub grade concrete or slab on which pavers shall be laid in grid form in required pattern as shown in drawing. The bedding of pavers shall be with 25mm thick 1:4 cement mortar bed (1 cement : 4 coarse sand). The entire work shall meet the approval of the Engineer.

b). Cement Tiles

Sub grade concrete or slab on which the tiles are to be laid shall be cleaned, wetted and mopped. The bedding of tiles shall be with 25mm thick 1:4 cement mortar bed (1 cement: 4 coarse sand). Cement shall be spread, tamped and corrected to proper level and allowed to Tiles shall first be soaked in water and laid over the grout and tapped with wooden The joints shall be kept as thin as possible not exceeding 1.5mm.

After the tiles have been laid, tapped, surplus cement grout that may have come out of the joints shall be cleaned off.

1.5 Grouting, Curing, Polishing and Finishing

The Joints shall be cleaned of the grey cement grout with a wire brush or trowel on next day. Joints shall be grouted using neat cement slurry mixed with pigment to match the shade of the tiles. The surface shall thereafter be thoroughly cleaned by brushing with water.

1.6 Mode of Measurement :

The work shall be measured in square meter area of tiles/pavers laid for the finished work. The rate shall include the cost of labour and material involved in all the described above or as specified in item description for the work. Operation

2. Flooring : -

2.1 Applicable Codes and Specifications

The following Indian Standard Codes, unless otherwise specified herein, shall be applicable. In all cases, the latest editions including all applicable official amendments and revisions shall be referred to :

IS : 1124 Method of test for determination of water absorption. parent specific gravity & porosity of natural building stories.

IS : 2571 Code of practice for laying in situ cement concrete flooring

IS : 8042 Specification for white Portland cement

IS : 1443 Code of practice for laying and finishing of cement concrete flooring tiles

IS : 777 Specification for glazed earthenware tiles.

IS : 4457 Specification for ceramic unglazed vitreous acid resisting tile

IS : 1130 Specification for Marble

IS : 1121 to 1127 Specifications for natural building stones

IS : 3316 Specification for structural granite

IS : 7779 Schedule for properties and availability of stones for construction

IS : 1478 Specification for clay flooring tiles

IS : 1237 Specification for cement concrete flooring tile

IS : 2114 Code of practice for laying in-situ terrazzo floor finish

IS : 4101 Code of practice for external facing

IS : 5491 Code of practice for laying in -situ granolithic concrete floor topping

2.2 Flooring :-

a). General

This Section shall cover all flooring and wall tiling work as shown in the drawing & as mentioned in the schedule. No work under this section shall be started until specifically allowed by the PMC and until all other major works such as plastering, embedding of conduits and pipes, channels, etc. have been completed. Samples of basic materials & work of adequate size representing the nature of variation including quality, size, texture after finishing to be used and got approved by the PMC sufficiently prior to ordering .The approved samples shall be retained upto the end of the project. The works shall be got done by skilled and specialized workmen experienced in the respective trade of work.

Where the cement concrete flooring is to be laid directly on the R.C.C. slab, the surface of R.C.C. slab shall be cleaned and the laitance shall be removed and a coat of cement slurry at 2 kg. of cement per sq.m. shall be applied so as to get a good bond between R.C.C. slab & concrete floor.

2.3 Lime Stone Flooring

a). General

The stone slabs shall be of selected quality, hard, sound, dense and homogeneous in texture, free from spots, cracks, decay, weathering and flaws. These shall be machine cut to requisite thickness and size for flooring as specified or as shown in the drawing and as instructed by the PMC. Samples of required size and thickness shall be submitted to the PMC for approval prior to procurement of materials required for the whole of work. The slabs shall have the top (exposed) face polished/semi polished/ rough as specified before being brought to site. The thickness of slab shall be uniform 35mm thick or as directed.

b). Dressing

Every slab shall be cut to the required size and shape and fine chisel dressed on the sides to the full depth so that a straight edge laid along the side of the stones shall be in full contact with it. The sides (edges) shall be table rubbed edges of with coarse sand or machine rubbed before paving. All angles and edges of the tile shall be true, square and free from chipping and surface shall be true and plane.

The tiles shall have uniform surface with surface variation not more than 2 to 3mm.The tiles shall be free of any bends or depressions. Sample stone shall be submitted to Landscape Architect for approval before proceeding with the finishing work.

2.4 Preparation of Surface and Laying

Sub grade concrete or RCC slabs on which the stones are to be laid shall be cleaned wetted and mopped. The bedding for the slabs shall be with cement mortar 1:4 (1 cement: 4 coarse sand). Thickness of bedding mortar shall be 25mm average and the thickness at any place under the stone slab shall not be less than 15mm.

The mortar shall be spread under the area of each slab, roughly to the average thickness as specified. The slab shall be wetted, cleaned before lying. It shall be laid with sand blasted surface on top, pressed, tapped with wooden mallet and brought to level with the adjoining slabs. It shall then be lifted and kept aside. The top surface of the mortar shall be corrected by adding fresh mortar at hollows. Mortar shall be allowed to harden a bit and honey like consistency shall be spread over the same at the rate of 4.4 kg. of cement per sqm.

Edges of slab shall be buttered with grey cement with admixture of pigment to match the shade of the stone as show and specified. The slab shall be lowered gently back with wooden mallet till it is properly bedded in level line and with as fine joint as possible.

Subsequent slabs shall be laid in the same manner and surplus cement shall be cleaned off the slab after being laid in position. The tiles shall be laid with gaps in between as specified or shown in drawings to give an open jointed pattern. These gaps shall be left dry.

The flooring shall be cured for seven days minimum. The surface of the flooring as laid shall be true to level and slopes as inspected by the PMC. Slabs that are fixed in the floor adjoining the wall shall enter not less than 12mm under the plaster skirting or dado. Junction between wall plaster and floor shall be finished neatly and without waviness.

Slight unevenness at the meeting edges of slabs are to be removed by chiselling carefully and then finished and cured.

The finished surface shall be an even plane, level or sloped as specified and cleared without any patches meeting the approval of the PM

3. Stone Work:-

3.1 Submittals

a). Shop drawings

The Contractor shall submit shop drawings indicating all jointing locations dimensions of stone slabs of all the stone work. Clearly indicate all methods of attachment & installation details to acceptable scales. These drawings shall be submitted to Architect and Designer for review before any fabrication is commenced.

Contractor shall verify alignment and paving pattern before laying. The stones shall be dressed to match the pattern lines as shown.

b). Samples.

Preliminary samples. Obtain Architect's and Designer's instruction and submit in triplicate samples of each stone proposed to be used. Samples shall be minimum 300 mm X 600 mm or as sizes specified on drawings. Samples shall show representative colour and veining and sample book matching, where required.

3.2 Stone/Granite Work

This section shall cover stone, granite and stone/granite veneering to walls, flooring and counter top work as detailed below.

a). Granite / Stone

Stone/Granite shall be reasonably uniform in colour, hard, sound, dense and homogeneous in texture, pattern, shape in accordance to the sample & of the required size and thickness approved by the PMC. The slabs shall be selected so as to achieve a "grain flow" when laid. Shade / tone, veining or pattern variation of more than 10% for stone selected by Architect / Designer, shall be rejected and replaced at no cost to the Clients. Before placing order a sample of the flooring / cladding shall be installed at the site and got approved.

b). Finishes

All slabs shall be finished as specified and cut to precise sizes as required. The granite slabs in external and internal wall veneer work shall be finished in the factory. All edges of slabs shall be cut to the required chamfers, splays, quirks, and rounded, all as per detailed drawings. Thickness of slab shall be within 2 mm for slabs to floors and vanity tops, counters etc. and 1 mm for slabs to walls from that specified or indicated on drawings. For "seen" ends of slabs the thickness must be accurate to close limits.

All stone slabs in any one room or space shall be of the same colour, veining, pattern and matching taken from the same block of stone.

c). Identification

All slabs shall be clearly indicated with key numbers for proper identification of area and location. This key number shall be cross referred to the approved shop drawings.

d). Defects

It shall be free from stains, sand, vents, flaws, holes, streaks, fossils, cracks, decay and weathering and of specified quality, size and thickness that would affect their appearance and durability. Any slab showing hairline cracks shall not be used, no slabs that have been patched up with clear epoxy resin glue.

3.3 Specialist sub-contractor

The supply & installation of the granite work shall be carried out by the approved renowned specialist agency experienced in the trade. The Specialist agency will be approved by the PMC / Architect after executing necessary samples of relevant veneering, cladding and

flooring works. The work will commence only after approval of relevant shop drawings for Stone/Granite wing.

4. Stone/Granite Veneering Work (Wet Fixing)

4.1 Preparation

Every stone shall be cut to the required size and shape, so as to be free from any waviness and to give truly vertical and horizontal joints. In exposed masonry, the faces that are to remain exposed in the final position and the adjoining faces to a depth of 6 mm shall be fine chisel dressed in both directions or polished as required to a depth of 6 mm so that when checked with a 60 cm straight edge no point varies from it by more than 1 mm. for veneering work. No dressing or polishing shall be done at the back of the stone, so as to ensure better grip with the backing. The dressed slabs shall be of the thickness, as specified with permissible tolerance of (±) 2 mm.

4.2 Fixing with mortar

Mortar for fixing shall be as specified.

4.3 Laying with mortar

The stone shall be wetted before laying. Before installing the stone slabs the backing shall be plastered cured and all surface imperfections removed. Pre-polished stone of the required size shall then be installed in position. The adjoining slabs shall be secured to each other and to the backing by means of stainless steel cramps, pins & dowels and araldite. The material for cramps shall have high resistance to corrosion under condition of dampness and against the chemical action of mortar or concrete in which cramps are usually embedded.

All the joints shall be full of mortar. Special care shall be taken to see that grounding for veneer works are full of mortar. If any hollows grounding are detected by tapping the face stones, these shall be taken out and relayed. The thickness of the face joints shall be uniform, straight and as fine as possible and pointed with mortar as specified.

The walls shall be carried up truly plumb. All courses shall be laid truly horizontal and all vertical joints truly vertical.

4.4 Protection

The work shall also be suitably protected from damage, mortar dropping and all other extraneous materials and rain during construction. Double scaffolding having two sets of vertical supports shall be provided wherever necessary shall be sound and strong.

5. Coping and Stone/Granite Flooring

5.1 Dressing of Slabs

Every stone shall be pre-polished / rough tooled / flame finished as shown in drawings and accurately machine cut to the required size and shape so that a straight edge laid along the side of the stone is fully in contact with it. For patterned flooring actual dimensions shall be taken at the site and shop drawings in suitable scale prepared to identify correctly the sizes and shapes of all stones. Each stone shall be marked with a suitable identification number. All angles and edges of the granite slabs shall be true, square or angular as required and free from chipping and the surface shall be true and plane.

The thickness and width of the slabs shall be as shown in the drawing with allowable tolerance of ±2 mm. In respect of length and breadth of slabs a tolerance of ±5 mm will be allowed.

5.2 Laying

Sub-grade concrete or the R.C.C. slab on which the slabs are to be laid shall be cleaned wetted and mopped. For patterned work the stone shall first be laid in position loose to ensure achievement of the required pattern and any adjustments required shall be made and all stone shall be wetted and washed just before placing and the bedding for the slabs shall be with mortar as described in the item.

The average thickness of the bedding mortar under the slab shall be to suite the overall thickness of flooring specified and the thickness at any place under the slab shall not be less than 12 mm.

Mortar of the specified mix shall be spread under the area of each slab, roughly to the average thickness specified in the item. The Pre-finished slabs first be laid on top of the mortar in accordance with the approved drawing and pressed tapped with wooden mallet and brought to proper level in continuity with the adjoining slabs. It shall be lifted and laid aside. The top surface of the mortar shall then be corrected by adding fresh mortar at hollows. The mortar shall be allowed to stiffen slightly & uniformly and cement slurry of honey like consistency shall be spread over the same at the rate of 4.4 kg of cement per sqm. The edges of the slab already paved shall be buttered with grey or white cement with or without admixture of pigment to match the shade of the slabs as given in the description of the item. The slab to be paved shall then be lowered gently back in position and tapped with wooden mallet till it is properly bedded in level and line with as fine a joint as possible. Subsequent slabs shall be laid in the same manner. After each slab has been laid, surplus cement on the

surface of the slabs shall be cleaned off. The flooring shall be cured for a minimum period of seven days.

The surface of the flooring as laid shall be true to falls and, slopes as required. The slabs shall be matched as shown in drawing or as instructed by the PMC.

Slabs, which are fixed in the floor adjoining the wall, shall enter not less than 12mm under the plaster, skirting or dado. The junction between wall plaster and floor shall be finished neatly and without waviness. Wherever required the flooring shall be laid in patterns and/or with brass divider strips as required.

5.3 Grouting

Epoxy Grout

The surfaces to be grouted must be solid, clean & free from oil, grease & other contaminants that may act as a bond breaker. Remove all loose material & laitance. Concrete surfaces must be dry, sound & roughened to obtain proper bond. The grout & the affected grouting area should be shaded from direct sunlight. Store material at room temperature for at least 24 hours before use.

Immediately after mixing, place grout from one side allowing it to flow to the opposite & adjacent sides. Provide vent holes where needed to prevent air entrapment. Compaction to be achieved by rodding, chaining or light vibration.

Cementious Grout

The day after the slabs are laid all joints shall be cleaned of the cement grout with a wire brush or trowel to a depth of 5mm and all dust and loose mortar removed and cleaned. Joints shall then be grouted with white cement mixed with or without pigment to match the shade of the topping of the wearing layer of the slabs. The Plaster of Paris slurry shall be applied to the entire surface of the slabs in a thin coat to protect the surface from abrasive damage.

Before handing over the protective cover shall be removed carefully and the surfaces cleaned and carefully rubbed to leave a clean & shining floor without any defects to the satisfaction of the PMC. If any slab is disturbed or damaged, it shall be refitted or placed and properly jointed. The finished floor shall not sound hollow when tapped with a wooden mallet.

Backing mortar for stone flooring / veneering shall be of cement and quartz sand mortar in ratio as specified.

6. Kadappa stone edging

Rough Kadappa stone of thickness 35mm shall be used for edging where directed. The stone shall have machine cut uniform edges. The size of stone shall be as specified in the drawings or as directed by PMC.

6.1 Bedding and Backing

Cement concrete of 1:3:6 proportions shall be used as bedding and backing of the kerbs as shown. The concrete shall be laid, after necessary earth work to the dimensions given in the drawings and as directed by the PMC.

6.2 Laying

Kadappa stone edging shall be laid in position in a straight line a profile as required over the bedding and then be grouted with cement sand mortar of 1:2 (1 cement : 2 coarse sand) and rechecked its profile as per the drawings.

Project : Proposed Under Ground Parking On Patwardhan Park, Plot Bearing C.T.S No. 381a&381b Of Village Bandra, At Linking Road, Bandra West, H/W Ward, Mumbai.:

Note: Incase of discrepancies between MCGM specifications and above mentioned specifications, the final decision will be taken by MCGM Engineer In-charge.

Architect Hafeez Contractor.
Green Space Alliance Landscape Consultant.